



## Incremental Black Start RFP Response Template & General Information

### Overview

This document is divided into three sections:

- Section 1: An incremental RFP response template
- Section 2: A summary of the black start business rules
- Section 3: A guide on navigating PJM manuals/agreements for black start business rules

### 1. Incremental RFP Response Template

This section should be used as an incremental RFP response template. RFP Responders should respond with their answers directly in this document and email it to [blackstart@pjm.com](mailto:blackstart@pjm.com). Any relevant attachments should also be included in the email response.

RFP Proposals at a minimum will include responses to all questions in this section. For questions that do not apply please indicate “ Not Applicable”.

#### 1.1. Purpose and Scope

##### 1.1.1. Facility

- 1.1.1.1. Name of facility:
- 1.1.1.2. Indicate owner of facility:
- 1.1.1.3. Geographic details: Indicate the physical location of the generator including: city/town, county, state, latitude and longitude
- 1.1.1.4. Indicate age of facility:

##### 1.1.2. Black Start Unit

- 1.1.2.1. Indicate the type of generation (ie. CT, Combined Cycle, Hydro, Diesel, etc.)
- 1.1.2.2. Indicate the manufacturer (ie. GE, Siemens, etc.), and the model/unit type (ie. 7FA, etc.) for each of the Black Start unit(s) proposed. For configurations involving a diesel cranking the Black Start Unit, include this information for the diesel and the Black Start Unit. See Section 2.4 “Black Start Unit Configurations”.
- 1.1.2.3. Indicate the MW capability of the intended Black Start Unit and the full plant (if applicable).



- 1.1.2.4. Indicate whether MW capability is in terms of ICAP, maximum dependable capability or nameplate MW rating.
- 1.1.2.5. Indicate the Black Start Unit fuel type(s).
- 1.1.2.6. For a plant with multiple units identify which units are being proposed as black start resources.

### **1.1.3. Interconnection**

- 1.1.3.1. Identify the station name and voltage level of the interconnecting station, and Transmission Owner zone.

### **1.1.4. Necessary Upgrade(s) for BS Capability**

- 1.1.4.1. Briefly describe the modifications that are required to convert the facility to black start. If adding a diesel, please indicate the manufacturer, model, and rating of the unit as well as which unit it will be cranking.

## **1.2. Generator Operational Details**

### **1.2.1. One-Line Diagram**

- 1.2.1.1. Provide a one-line diagram for the black start facility. The one-line diagram should include the proposed RFP response unit(s), all associated auxiliary loads, and transmission and distribution level equipment. Formal drawings are not required. Legible hand-written markups of existing diagrams are sufficient. Visio diagrams with adequate detail are also sufficient.

### **1.2.2. Start-Up Sequence Description**

- 1.2.2.1. If known, list the steps that the plant would follow immediately following a full or partial black out to get the Black Start Unit started, close to a dead bus, and any anticipated GO/TO coordination for load pickup from the Black Start Units minimum load to economic maximum load. The description should include clear references to the one-line diagram.

### **1.2.3. MVAR Capability**

- 1.2.3.1. Include a MVAR capability curve (MW, Min. MVAR, Max. MVAR), and a table including up to 8 MW points (if possible) with associated minimum and maximum MVAR points. Include the maximum sustained leading and lagging (MVAR absorption) capability, and any anticipated operational restrictions to the MVAR capability curve.

### **1.2.4. Start-Up Time**

- 1.2.4.1. Indicate the time to close to a dead bus, the time to ramp to minimum load, and the time to ramp to economic max load.

### **1.2.5. Duration**



- 1.2.5.1. Indicate the amount of time the Black Start Unit can run on its own fuel supply. Please note that PJM rules typically require at least 16 hours of continuous output using on-site fuel supplies for oil fired units.

## **1.2.6. Fuel Supply / Onsite Storage**

- 1.2.6.1. Indicate primary and secondary (if available) fuel type(s). If a primary or secondary fuel is natural gas, indicate gas transportation and supply arrangements. Indicate if these arrangements are firm or non-firm as well as any alternate pipeline feeds. Indicate any arrangements for the unit to secure additional fuel. Indicate the on-site fuel storage by type, volume, and number of hours of output assuming sustained economic maximum output of the black start unit. If there is a difference between the current volume in storage tanks and the maximum storage capability, please indicate the details.

## **1.2.7. Staffing**

- 1.2.7.1. Indicate whether or not the plant will be staffed 24x7 if it is selected to provide black start service. If the plant will not be staffed 24x7, can the unit be started remotely? If so, describe the plan for starting the black start unit in the event of a telemetry failure.

## **1.2.8. Applicable minimum load, environmental, and black start testing restrictions**

- 1.2.8.1. Does the unit require an external stabilizing load or have other operational limitations during startup? If so, provide the size of external stabilizing loads required and any other load requirements during startup. These become requirements of the Transmission Owner's restoration plan. Minimum output restrictions at various stages of the startup sequence. Maximum time at minimum load. Preference is placed on those units that are able to 'idle' for the longest time serving only house load with no net output to the transmission grid because this reduces the complexity of GO/TO load pickup coordination. Plants that have multiple units should consider the potential of cranking auxiliaries of other units as additional 'house load'.
- 1.2.8.2. What is the unit's minimum load under the current emissions permit?
- 1.2.8.3. What is the maximum time period the unit can operate below the current emission permit limit minimum load?
- 1.2.8.4. What is the lowest load the unit can operate in a stable steady state configuration if there were no emission permit restrictions? How long can the unit operate at its lowest load if there were no emissions permit restrictions?
- 1.2.8.5. Is it possible to get an emissions permit modification to allow the unit to operate at the lowest possible load for restoration and black start testing?
- 1.2.8.6. Include the ramp rate and any variations in ramp rates that may apply.
- 1.2.8.7. Can the unit perform an annual Black start Test where it operates isolated from the grid in isochronous mode carrying only station auxiliary load for at least thirty minutes? If emission permit restrictions require a time period less than thirty minutes, specify the maximum time period the test can be performed for. If test cannot be performed isolated from the grid, can off line testing of the governor and voltage



regulator be performed?

- 1.2.8.8. For Combined Cycle units – can the Combustion turbines be operated in simple cycle mode?
- 1.2.8.9. If not, does the unit have steam bypass capability?
- 1.2.8.10. What is the minimum and maximum load the combustion turbine can operate in Steam bypass mode? Indicate any time limitations for operating in either mode.
- 1.2.8.11. Is the station's auxiliary load greater than the combustion turbine's lowest possible minimum load? If not greater, then provide MW difference.

### **1.2.9. Evaluation of Generator Existing Condition**

- 1.2.9.1. Is the existing unit black start capable in accordance with the requirements stated in PJM Open Access Transmission Tariff - Schedule 6A Black Start Service and PJM Manual 12 – Balancing Operations.
- 1.2.9.2. If not, what modifications are required?
- 1.2.9.3. For existing black start capable units that would otherwise retire, identify any equipment overhauls or refurbishment work that would be required for continued reliable Black Start Service.

## **1.3. Project Schedule**

### **1.3.1. Estimated In-Service Date**

- 1.3.1.1. Indicate the estimated in-service date as a black start capable unit.

### **1.3.2. Project Schedule**

- 1.3.2.1. Detail the project milestones in tabular and/or graphical form. Include the milestone description and projected start/finish dates.

### **1.3.3. Procurement Plan**

- 1.3.3.1. Detail any work that is planned with vendors.

## **1.4. Total Estimated Capital and Annual Black Start Service Costs**

### **1.4.1. Total Estimated Upgrade Capital Cost**

In addition to any details provided, include a tabular summary of the estimated upgrade capital costs. Costs in RFP Proposal are to consist of an estimate of projected actual costs, including contingency as appropriate. Cost recovery is based on actual costs. Actual project costs with supporting documentation will be submitted to Independent Market Monitor (IMM) for review and final approval upon completion of project in accordance with PJM Tariff Schedule 6A. All capital cost estimates including contingencies will be evaluated by the Independent Market Monitor and PJM for consistency with the rates and terms set forth in PJM Tariff Schedule 6A.. Proposals with



cost estimates deemed by PJM to be inconsistent with those rates and/or terms may be rejected.

**1.4.2. Estimated Annual Fixed Black Start Service Cost**

Proposals shall include an indication of the desired cost recovery method for the unit’s Fixed Black Start Service Costs (Fixed BSSC) (Capital). Only one of the following rates should be selected:

1. Proposed Black Start Units electing to not document Black Start Capital Costs or not requiring additional Black Start Capital Costs should select the Base Formula Rate.
2. Proposed Black Start Units that choose to recover documented Black Start Capital Costs (including capital costs for NERC Standard Compliance) should select the Capital Cost Recovery Rate (CRF). For units that select the Capital Cost Recovery Rate, the Levelized CRF and Black Start Service Term of Commitment are based on the Age of the Black Start unit as of the In-Service Date.
3. Proposed Black Start Units electing to recover only the Black Start Capital Costs associated with compliance with applicable mandatory NERC CIP Reliability Standards should select the Capital Cost Recovery Rate - NERC-CIP Specific Recovery. For units that select the Capital Cost Recovery Rate – NERC-CIP Specific Recovery the Levelized CRF and Black Start Service Term of Commitment are based on the Age of the Black Start Unit as of the In-Service Date or the Capital Improvement Lifespan.
4. Proposed Black Start Units electing to recover Black Start Capital Costs outside the Tariff guidelines will need FERC to approve the desired cost recovery. Black Start Units requesting cost recovery in accordance with a FERC-approved rate are required to file, and receive approval of, their cost recovery method with FERC upon acceptance for Black Start Service.

**1.4.3. Estimated Black Start Service Annual O&M Cost**

Proposals shall include the unit’s projected annual Variable Black Start Service Costs (Variable BSSC) (Black Start O&M including the cost to maintain compliance with NERC Reliability Standards) to provide the Service. Provide a tabular summary of any estimated annual O&M costs to provide Black Start Service from the unit(s).

**1.4.4. Estimated Black Start Service Annual Fuel Storage Cost**

Proposal for units that use oil fuel shall include an estimate of the annual Fuel Storage Costs. Estimates should be based on a 16 hour run period and a Bond Rate of 4.39 percent.

**1.5. Black Start Unit Owner Contact Information**

Please provide a primary and secondary contact for this black start RFP response.

Primary Contact		Secondary Contact	
Name		Name	
Title		Title	



Company		Company	
Phone		Phone	
Email		Email	
Mailing Address		Mailing Address	

## 2. Black Start Business Rules Summary

This section summarizes the black start business rules from the various PJM sources.

### 2.1. Black Start Service Compensation

#### 2.1.1. Black Start Service Annual Revenue Requirements

Selected Unit's Black Start Annual Revenue Requirements will be calculated based upon actual costs submitted to and approved by the PJM Independent Market Monitor and/or PJM.

Details of the PJM Black Start Annual Revenue Rates available are contained in the PJM Tariff – Schedule 6A Black Start Service Section 18. Black Start Annual Revenue Requirements are calculated using the following equation:

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

#### 2.1.2. Black Start Service Annual Revenue Components

Only one of the following rates should be selected for the unit's Fixed Black Start Service Costs (Fixed BSSC) (Capital) :

1. Base Formula Rate
2. Capital Cost Recovery Rate (CRF)
3. Capital Cost Recovery Rate - NERC-CIP Specific Recovery
4. Proposed Black Start Units electing to recover Black Start Capital Costs outside the Tariff rate above will need FERC to approve the desired cost recovery.

The unit's projected annual Variable Black Start Service Costs (Variable BSSC) should include Black Start O&M and the cost to maintain compliance with NERC Reliability Standards necessary to provide the Service.

Black Start Unit's will be compensated for Training Costs at the level of \$3,750 per year per plant.



Units that use Oil Fuel shall estimate the annual Fuel Storage Costs based on a 16 hour run period and a Bond Rate of 4.39 percent.

Units using the Base Formula Rate for Fixed Black Start Service Costs will be able to use an Incentive Factor (Z) of 10. For all other Fixed Black Start Service Rates the incentive Factor (Z) will be 0 percent.

Additional guidance on the calculation of a Unit's Annual Black Start Service Revenue Requirements may be found in the Black Start Cost Submittal Forms in the link <http://pjm.com/~media/markets-ops/ancillary/black-start-cost-submittal-forms.ashx>

Please select the tab associated with the Fixed Black Start Service Cost Rate chosen.

### **2.1.3. Upgrade Estimated Capital Cost Actual Cost Determination**

#### **2.1.3.1. Evidence of upgrade Cost**

If selected, submittal of data supporting actual cost to the PJM Independent Market Monitor (IMM) in accordance with Paragraph 17 of Schedule 6A of the Tariff is required.

#### **2.1.3.2. Timing of review and final determination of actual costs:**

A selected Black Start Unit owner can submit supporting data to the IMM on a monthly basis as incurred or as a single submittal at the completion of the work. The IMM will provide feedback within a reasonable time after submittal. Payment of actual upgrade costs for recovery will begin after the Black Start Unit's in-service date.

#### **2.1.3.3. Supporting Documentation**

Supporting data will include but not be limited to the following:

- 1) actual invoices from third parties;
- 2) internal invoices for work performed on the project;
- 3) payroll report of all hours of the Black Start Unit owner employees that have worked on the project including benefits;
- 4) invoices for overhead, project development cost and project development fee documented by internal invoice from the Black Start Unit owner

The Black Start Unit owner and the IMM will agree on the total capital cost to be reimbursed after the Black start Unit's in-service date.

Payments will begin the month following the agreed upon final capital cost between the Black Start Unit owner and IMM.

#### **2.1.3.4. Cost evidence disputes**



If the IMM and the Black Start Unit owner are unable to come to an agreement on the project upgrade costs to be reimbursed to the Black Start Unit owner, then Black Start Unit owner will notify PJM that it disagrees with the IMM's determination of costs and submit the costs that Black Start Unit owner believes to be accurate. PJM will review such costs submitted by Black Start Unit owner, and determine the upgrade costs to be reimbursed to Black Start Unit owner within 90 days after the Black Start Unit owner submits such costs. If the Black Start Unit owner and PJM are unable to reach agreement on the costs to be reimbursed, then the Black Start Unit owner may file its own proposed costs for reimbursement with the Federal Energy Regulatory Commission for approval.

#### **2.1.3.5. Changes to revenue requirement**

If a Black Start Unit owner incurs additional costs after the initial in-service date to maintain the Black Start Unit's black start-capability, the Black Start Unit owner can submit data evidencing those costs to the IMM pursuant to Paragraph 17 of Schedule 6A and adjust its revenue requirement going forward to recover such costs, along with an applicable extension to the black start commitment term. However, the existing revenue requirement must be effective at least for 12 months prior to making such change. To paraphrase Paragraph 17 of Schedule 6A: "...no change to a Black Start Service revenue requirement shall become effective until the existing revenue requirement has been effective for at least 12 months."

### **2.1.4. Compensation for Energy Output**

#### **2.1.4.1. Testing**

The Black Start Unit will be tested annually and must have a successful annual test on record within the preceding 13 months in order to receive Black Start Service revenues in accordance with paragraphs 12 and 14 of Schedule 6A of the Tariff. Compensation for the energy output delivered by the Black Start Unit during annual testing will be provided at the higher of the Black Start Unit's cost-capped offer or real-time LMP in accordance with paragraph 13 of Schedule 6A of the Tariff and Manual 28 Section 5.2.7. Typically, Black Start Units close to a dead bus during the test and do not provide energy to the grid. Test compensation for such a unit consists of the unit's start cost plus one hour of no-load.

#### **2.1.4.2. Emergency black start dispatch**

In the event of emergency black start dispatch, a Black Start Unit owner shall be compensated for the Black Start Unit's energy output at the unit's cost-capped offer, until such time that PJM is able to reestablish the energy markets and calculate a LMP.

#### **2.1.4.3. Cost-capped offer**





The unit's Cost based offer will be developed in accordance with the guidelines provided in Manual 15 "Cost Development Guidelines".

## **2.1.5. Service after Initial Commitment Term & Termination of Service**

### **2.1.5.1. Service after Initial Commitment Term**

After the Black Start Unit has provided Black Start Service for the initial term of its applicable commitment period (as prescribed by its selected method of revenue recovery) after the in-service date, then Black Start Unit owner may, at its option, elect the service commitment term set forth in Paragraph 5 of Schedule 6A of the Tariff and will receive the compensation set forth in the Tariff for units establishing a service commitment under such Paragraph 5. As set forth in Paragraph 18 of Schedule 6A of the Tariff, for purposes of such compensation for a Black Start Unit's with a term of commitment under Paragraph 5, "Black Start Unit Capacity" means the entire installed capacity of the current delivery year of Black Start Unit

### **2.1.5.2. Termination by Black Start Unit**

Pursuant to Paragraph 6 of Schedule 6A of the Tariff, a Black Start Unit owner may terminate provision of Black Start Service with one year advance notice to PJM, provided that it will forgo any existing entitlement to future black start revenues.

### **2.1.5.3. Termination by PJM**

Pursuant to of Schedule 6A of the Tariff, PJM may terminate provision of Black Start Service with one year advance notice to Black Start Unit owner (before or after actual in-service of the Black Start Unit), but the Black Start Unit owner will be reimbursed for any amount of unrecovered Fixed BSSC (as defined in the Tariff) for a period not to exceed five years. If PJM terminates the contract before in-service date, the Black Start Unit owner will cease work on the project and submit all costs expended up to the date of termination to PJM [for reimbursement in accordance with the Tariff.]. Such costs will include but not be limited to payment for equipment completed (both received and completed but not shipped), cancellation payments and non-refundable advance payment. If PJM cancels or terminates any portion of its Tariff and such cancellation or termination would affect the existing rights of the Black Start Unit owner to receive compensation for Black Start Service, then PJM shall nonetheless be required to reimburse the Black Start Unit owner for any amount of unrecovered Black Start Service revenues to which the Black Start Unit owner has an existing entitlement.

## **2.1.6. Testing**

### **2.1.6.1. Annual Test**

To receive Black Start Service revenues, the Black Start Unit must have a successful annual test on record with PJM within the preceding 13 months in accordance with Schedule 6A of the Tariff.



#### **2.1.6.2. Failed Annual Test**

If the Black Start Unit fails the annual test, it 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 the Black Start Unit owner from the time of the first unsuccessful test until such time as the unit passes an annual test in accordance with Schedule 6A of the Tariff.

### **2.2. Black Start Unit /Transmission Owner Coordination**

Black Start Unit and TO will coordinate the modification to the electrical protection system (transmission system and Black Start Unit Facility) to protect the Black Start Unit and grid during black start startup and operation. Each party will be responsible for the cost of any upgrades to its portion of the system (i.e. Black Start Unit owner will be responsible for upgrades to the Black Start Unit, TO will be responsible for upgrades to the Transmission System).

The Black Start Unit owner and TO will develop the communication protocol between TO and Black Start Unit to meet black start dispatch requirements.

The TO will revise the TO System Restoration Plan to include any Black Start Unit operational limitations.

The Black Start Unit owner and PJM will develop procedures for both the Black Start Unit acceptance test and annual test.

### **2.3. In-Service Date Delays**

The Black Start Unit owner will make every reasonable effort to make the estimated in-service date indicated in their RFP proposal. Should the project be delayed, The Black Start Unit owner will immediately notify PJM of the delay and make every effort to minimize the impact. The Black Start Unit owner will not be required to pay any penalty for any such delays.

### **2.4. Black Start Unit Configurations**

Note that configurations where the cranking unit offers into PJM's Energy Markets and cranks another unit that also offers into the Energy Markets are unacceptable. In that case, if the cranking diesel offers into PJM's Energy Markets, then the cranking diesel is the Black Start Unit and the cranked unit is critical load.

## **3. Black Start Generator Reference Guide**

This section should be used to help navigate to specific black start content throughout the PJM manuals and agreements.

### **3.1. Index of Documents and Manuals**

#### **PJM Open Access Transmission Tariff Schedule 6A – Black Start Service**



Provides the PJM Tariff requirements for black start generators.

**Manual M-01,– Control Center and Data Exchange Requirements**

Describes the control center and telecommunication requirements between PJM and its members.

**Manual M-10,– Pre-Scheduling Operations**

Describes the Pre-scheduling process and information required from generation resources.

**Manual M-12, – Balancing Operations - existing version and proposed future revisions**

Describes the real time operations process.

**Manual M-14D,– Generator Operational Requirements**

Provides a general overview of generator operational requirements.

**Manual M-27,– Open Access Transmission Tariff Accounting**

Describes the accounting for transmission services within the PJM Open Access Transmission Tariff.

**Manual M-36,– System Restoration**

Describes how PJM and the PJM Members are expected to respond to system disturbance conditions or system blackout.

**NERC Reliability Standards**

**3.2. PJM Open Access Transmission Tariff Schedule 6A – Black Start Service**

<http://pjm.com/~media/documents/agreements/tariff.ashx>

- Black Start Service Provisions
- Performance Standards and Outage Restrictions
- Testing Requirements
- Revenue Requirements and Recovery Rates
- Credits
- Charges

**3.3. Manual M-01,– Control Center and Data Exchange Requirements**

<http://pjm.com/~media/documents/manuals/m01.ashx>

- Member Control Center Requirements
  - Data and voice communications
  - Staffing
  - Facility requirements
  - Periodic testing of telecommunications

**3.4. Manual M-10,– Pre-Scheduling Operations**

<http://pjm.com/~media/documents/manuals/m10.ashx>

Planned Outage Restrictions for Black Start Units



### **3.5. Manual M-12,– Balancing Operations**

<http://pjm.com/~media/documents/manuals/m12.ashx>

- Black Start Service
- Definitions
- Minimum Critical Unit Requirements
- Product Description
  - Generator Owner’s Commitment
  - Performance Standards
  - Testing
  - Training Standards and Records
  - Non-performance
  - Termination of Black Start Service
- Attachment C: PJM Black Start Report Forms for:
  - RTO-Wide Five-Year Selection Process
  - Black Start Tests Generation and Transmission
  - Automatic Load Rejection Tests
  - Formulaic Cost Data
  - Actual Cost Data

### **3.6. Manual M-14D,– Generator Operational Requirements**

<http://pjm.com/~media/documents/manuals/m14d.ashx>

- Black Start Generation Procurement
  - Black Start Selection Process
  - Black Start Incremental RFP Process
  - Generator reactive capability testing requirements for Black Start Units.

### **3.7. Manual M-27,– Open Access Transmission Tariff Accounting**

<http://pjm.com/~media/documents/manuals/m27.ashx>

- Black Start Service Accounting
- Black Start Service Credits and Charges

### **3.8. Manual M-36,– System Restoration**

<http://pjm.com/~media/documents/manuals/m36.ashx>

- Generation
  - Communications
  - Governor & Frequency Control
  - Cranking Paths
  - Cranking Power
- Transmission
  - Voltage Regulation and Control
  - Energization Guidelines
- System Restoration Plan Guidelines
- Cross Zonal Coordination



- Minimum Critical Black Start Requirement

### **3.9. NERC Reliability Standards**

<http://www.nerc.com/pa/Stand/Pages/default.aspx>