

RTO-Wide Five-Year Selection Process Request for Proposal for Black Start Service

PJM Interconnection
February 1, 2018





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1.0: Purpose / Statement

1.1. Purpose

PJM is initiating the second RTO-wide black start RFP process and is seeking bids for new black start capability in accordance with the Five-Year Black Start Selection Process as documented in [PJM Manual M14D](#), Generator Operational Requirements Section 10. Please see [PJM View Point – RTO-Wide Black Start RFP Process](#) for additional background information. Black Start Units must have the minimum capabilities listed below. These capabilities must be demonstrated in accordance with the criteria set forth in the PJM Tariff and Manuals and will remain in effect for the duration of the commitment to provide Black Start Service.

- a. A Black Start Unit must have the ability to start without an outside electrical supply.
- b. A Black Start Unit must be able to close its output circuit breaker to a dead (de-energized) bus within 180 minutes (or less based on the characteristics of the specific critical load) of a request from the Transmission Owner or PJM.
- c. A Black Start Unit must be capable of maintaining frequency and voltage under varying load.
- d. 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 (typically 16 hours).

PJM is requesting that all interested and eligible parties respond to this RFP. The purpose of the RFP process is to investigate other black start options beyond what is currently being provided in order to refresh system restoration plans across the RTO, in conjunction with PJM's compliance obligation to perform updated reliability studies every five years in accordance with NERC restoration standard EOP-005.

In order to be deemed feasible, designated potential Black Start Units must be physically located within the PJM RTO footprint (i.e., within one of PJM's transmission zones). However, cross zonal black start solutions may also be considered, where a Black Start Unit in one PJM Transmission Owner zone may be considered to serve in the restoration of another zone or a Black Start Unit can be shared across more than one transmission zone. Examples of acceptable responses include:

- Existing Black Start Capable Units not currently providing Black Start Service
- Conversion of existing generation unit(s) to become black start capable
- New (or interconnection queue) generation under development or construction that can become black start capable
- Existing industrial, manufacturing or cogeneration facilities capable of converting to black start to support system restoration
- Refurbishment of existing black start generators that otherwise would retire from black start and other services without the refurbishment

Potential bidders should be aware that if accepted, the proposed Black Start Unit will have to be included in the NERC Compliance Registry as a Generation Owner and Generation Operator, and as such, will be required to comply with all applicable NERC Reliability Standards. It is the sole responsibility of the Black Start Unit owner to ensure that its proposed Black Start Unit meets all applicable NERC Reliability Standards as necessary to support the provision of Black Start Service, including those that may be applicable if the designated Black Start Unit is deemed a critical asset. PJM makes no representations or warranties regarding the ability of a Black Start Unit Owner to meet all applicable NERC Reliability Standards with regard to a specific proposed Black Start Unit upon acceptance of a submitted proposal.

See Section 7.9 of “Black Start Generator Reference Guide” for “NERC Reliability Standards.”

1.2. Black Start Service Availability Date

Offers should be for resources capable of providing Black Start Service **by April 1, 2020**. This includes completion of a successful black start test prior to providing Black Start Service. In addition, there is also time associated with updating restoration plans (by Transmission Owners), so PJM would prefer to have black start resources available and providing Black Start Service well in advance of the April 1, 2020 milestone. In certain cases, due to the time required to perform unit modifications, PJM will also consider proposals for Black Start Service later than the April 1, 2020 milestone date depending on location and black start need.

1.3. Market Window

The market window for this RFP is from February 1, 2018, through May 31, 2018. See Section 4.0 “Proposal Guidelines” for details on two-tiered approach for RFP submittal.

1.4. Existing Black Start Resources

Existing Black Start Service providers do not need to respond to this RFP as they are expected to provide continuing Black Start Service in accordance with the provisions of the PJM Tariff and applicable Manuals.

In the event that an existing Black Start Unit owner desires to terminate its existing Black Start Service commitment, it must submit a one year termination notice in accordance with the black start termination process outlined in PJM Tariff Schedule 6A.

1.5. Informational WebEx Meeting

PJM will conduct a PJM Operating Committee Special Session WebEx Meeting on Tuesday, February 6, 2018 from 1:00–2:30 p.m. EST. The purpose of this informational WebEx meeting is to review the RFP document and address questions. PJM will provide responses to questions asked during this WebEx meeting and post these responses under the Black Start Services heading on the PJM’s Ancillary Services webpage.

<http://www.pjm.com/markets-and-operations/ancillary-services.aspx>

2.0: Company Background

2.1. Statement

Company Background

PJM Interconnection, L.L.C. ("PJM") ensures the reliability of the high-voltage electric power system serving 65 million people in all parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM coordinates and directs the operation of the region's transmission grid, which includes over 82,000 miles of transmission lines and generating units with 176,569 megawatts of installed capacity.

PJM administers a \$39 billion annual competitive wholesale electricity market with more than 1,000 participants buying and selling electric energy, capacity, ancillary services and transmission rights. PJM plans regional transmission expansion improvements to maintain grid reliability and relieve congestion.

Founded in 1927, PJM was the world's first continuing power pool. Today, it operates North America's largest power grid.

PJM's Operations

PJM's staff monitors the high-voltage transmission grid 24 hours a day, seven days a week. PJM keeps the electricity supply and demand in balance by sending price signals to supply resources, such as generators, to adjust how much energy they produce.

In managing the grid, PJM's experts study hundreds of "what if" scenarios and prepare to deal with virtually any event. Each variable that might affect supply and demand for electricity is carefully considered – from extreme weather conditions, emergency situations and equipment failures to the more easily anticipated cycles of hours, days, weeks and seasons.

PJM exercises a broader reliability role than that of a local electric utility. PJM system operators conduct dispatch operations and monitor the status of the grid over a wide area, using an enormous amount of telemetered data from about 143,900 points on the grid. This gives PJM a big-picture view of regional conditions and reliability issues, including those in neighboring systems.

PJM's Markets

The company coordinates the continuous buying, selling and delivery of wholesale electricity through robust, open and competitive spot markets. In operating the markets, PJM balances the needs of suppliers, wholesale customers and other market participants and continuously monitors market behavior.

PJM's wholesale electricity market is similar to a stock exchange. It establishes a market price for electricity by matching supply with demand. PJM's online tools make trading easy for members/customers by enabling them to submit bids and offers and providing them with continuous real-time data.

Market participants can follow market fluctuations as they happen and make informed decisions rapidly, responding to high prices and bringing supply resources to the region when demand is high.

PJM's Planning

PJM manages a sophisticated regional planning process for generation and transmission expansion to ensure the continued reliability of the electric system. PJM is responsible for maintaining the integrity of the regional power grid and for managing changes and additions to the grid to accommodate new generating plants, substations and transmission lines.

In addition, PJM analyzes and forecasts the future electricity needs of the region. Its planning process ensures that the growth of the electric system takes place efficiently, in an orderly fashion, and that reliability is maintained.

3.0: General Terms

By submitting a proposal to this RFP, you are agreeing to be bound by the rates, terms and conditions of service as set forth in PJM's Open Access Transmission Tariff, ("Tariff"), the Amended and Restated Operating Agreement of PJM Interconnection, L.L.C. ("Operating Agreement"), and/or all other applicable PJM Manuals or other governing agreements (collectively, the "Governing Agreements").

Acceptance of RFP proposals by PJM will be in the form of a notification letter. There will be no separate agreement for Black Start Service between the Black Start Unit Owner and PJM since all the terms and conditions are covered by the Governing Agreements referenced above.

PJM explicitly states that any discrepancies between this RFP document and the Governing Agreements shall be resolved in favor of those Governing Agreements. The Governing Agreements are available at <http://www.pjm.com/library/governing-documents.aspx>.

3.1. Offer in Effect

A proposal may not be modified by the respondent between June 1, 2018, and December 21, 2018, as defined in the RFP Timeline, and respondent so agrees in submitting the proposal. A proposal may be withdrawn or cancelled by written notice to PJM.

3.2. Acceptance of Proposal

PJM reserves the right to reject any and all submitted proposals and any portion of a specific proposal, as well as the right to waive any informality or irregularity in any proposal received by PJM. PJM also reserves the right to accept or reject a proposal based on factors other than price. PJM assumes no obligation under this RFP and

is not bound to procure goods or services from any respondent to this RFP. PJM assumes no obligation to provide a reason for rejection of a respondent's proposal. PJM reserves the right to amend or withdraw this RFP at any time. Respondents assume the risk that PJM may reject proposals for any reason, may reject all proposals, may make no award, and may withdraw the RFP without incurring any liability.

3.3. Retention of Respondent Material

PJM reserves the right to retain all proposals, including proprietary documentation regardless of which response is selected.

3.4. Confidential Matters – PJM Data

All data and information gathered by the respondent and its agents, including this RFP, shall be treated by the respondent and its agents as confidential ("Confidential Information"). The respondent and its agents shall not disclose or communicate the aforementioned matters to a third party, or use them in advertising, publicity, propaganda, and/or in another job or jobs, unless written consent is obtained from PJM. Respondent and its agents shall protect against the unauthorized disclosure of the Confidential Information to third parties. Respondent agrees that it does not, by virtue of this RFP or otherwise, acquire title, or any other rights not specified hereunder, to the Confidential Information.

4.0: Proposal Guidelines

4.1. Initial RFP Proposal Submission (Level 1)

PJM is implementing a two-tiered approach to the RTO-wide Black Start RFP process. Interested parties shall submit initial "Level 1" proposals for proposed black start solutions for one or more proposed Black Start Units, including sufficient basic information required for PJM to make initial determination on whether to proceed with requesting that resource owner submit a Level 2 proposal for further consideration.

Level 1 proposal information is detailed in Attachment 1 of this RFP and generally includes the following:

1. Unit identifying information (e.g., name/location/contact information, PJM Market unit ID, interconnection switchyard/voltage level, Transmission Owner zone)
2. Unit characteristics (ICAP, black start MW, unit type, primary/secondary fuel, fuel type, fuel storage/firm gas contracts)
3. General operational characteristics (minimum load, emissions limitations, CC steam by-pass capabilities)

PJM is requesting that parties interested in submitting an initial Level 1 proposal in response to this Request for Proposal provide a non-binding response by email by 23:59 on March 8, 2018. The Black Start RFP Level 1 proposal response form (same as Attachment 1) should be downloaded from the PJM website, under the Black Start Services heading, <http://www.pjm.com/markets-and-operations/ancillary-services.aspx>, completed, and emailed to: BlackStart@pjm.com.

PJM will notify all Level 1 proposals (Target is March 30, 2018) on a determination of whether or not to proceed with a Level 2 proposal. PJM's notification to a resource owner requesting a Level 2 proposal is not a guarantee that the RFP proposal will be selected; it is just an initial indication that PJM may be interested in pursuing further analysis and studies to determine the viability of the proposal.

For Level 2 proposals, bidders shall provide a full RFP proposal with detailed responses completed for identified units in accordance with Section 5.0.

4.2. RFP Proposal Submission (Level 2)

Level 2 RFP Proposals shall be submitted to PJM by 23:59 on May 31, 2018. The RFP Timeline (Section 4.5) outlines other relevant dates related to RFP Proposal submission and evaluation.

Delivery of Proposals

Proposals shall be submitted via email to BlackStart@pjm.com. Each proposal shall consist of answers to ALL questions as indicated in Section 5 "RFP Proposals."

4.3. Evaluation and Acceptance of Proposals

PJM will work with its Transmission Owners ("TOs") to evaluate proposals and select viable black start solutions based on the basis of Critical Load requirements, location, cost and operational considerations (cranking load, start time, etc.).

Existing Black Start Units with a remaining term of commitment tied to a cost recovery rate would automatically be selected for the length of the recovery period. Existing Black Start Units on bilateral contracts with TOs would be automatically selected for use in those zones.

PJM utilizes the following evaluation criteria in the RFP selection process, working in collaboration with the TOs to select black start solutions for each zone. Preferred black start solutions typically include units located in close proximity (from a transmission topology perspective) to PJM-defined critical loads, which are loads to support quicker starting steam units, CTs, Combined Cycle units, nuclear safe shutdown loads, and electric-powered gas compressor stations.

In addition, RFP proposals for natural gas Black Start Units with dual fuel capability and/or primary firm gas transportation contracts will be given a higher level of consideration in the RFP evaluation process. In the event that proposals received by PJM do not satisfactorily meet the fuel assurance criteria outlined below, PJM will request that the resource owners resubmit proposals with adequate demonstration of dual fuel capability and/or primary firm gas transportation contracts (for gas units).

PJM evaluation criteria includes:

1. Technical Feasibility
 - a. Reliability Analysis/NERC Standard EOP-005 Studies
 - i. Feasibility of power flow study results, including operating within thermal and voltage limits, Black Start Unit has adequate reactive capability to handle line charging of cranking path and critical load requirements.
 - ii. Feasibility of dynamic simulation study results, including operating within voltage, frequency and stability limits.
 - b. Unit Location/Characteristics
 - i. Geographically and electrically diverse from other black start resources in the TO zone.
 - ii. Within TO zone or cross-zonal black start.
 - iii. Interconnection voltage level.
 - iv. Type of generator (Simple Cycle CT, Hydro, etc.)
 - v. Unit can serve multiple transmission outlets or support redundant cranking paths.
 - vi. Unit can provide black start to more than one TO zone
 - vii. Age of unit
 - c. Operational/Environmental Restrictions
 - i. Limitations such as slow ramp to minimum load after synchronizing, minimum load requirements for stabilizing load, turn down ratio, other operational limitations.
 - ii. Environmental permit change needed to operate at emergency minimum output during restoration, other environmental limitations.
 - iii. Unit is able to meet minimum run hour requirements per OATT Schedule 6A (16 hours or as indicated in TO Restoration Plan).
 - iv. Unit's historical availability (GADs).
 - d. Black Start Testing Requirements
 - i. Is unit able to meet PJM black start testing requirements, (e.g., ability to close to a dead bus in 180 min., ability to operate at reduced loads during testing while islanded)?
 - ii. Or, are testing exemptions required (e.g., special switching, stabilizing loads, breaker closing to a live bus, load banks).

2. Fuel Assurance
 - a. Fuel Type/Fuel diversity
 - b. Dual fuel capability/availability, including logistics assessment such as:
 - i. Can unit start on both primary and secondary fuel?
 - ii. Is different start-up fuel required before running on primary or alternate fuel?
 - iii. Special switching requirements to move from primary to alternate fuel (or vice versa)
 - c. Onsite fuel storage
 - d. Primary firm gas transportation contract vs. secondary firm or interruptible gas contracts;
 - e. Single vs. multiple gas pipeline access.
3. Cost/Schedule
 - a. Annual Revenue Requirements (Capital Costs, Net Present Value comparison)
 - i. Capital Costs/Black Start MWs
 - ii. Net Present Value/Black Start MWs
 - b. Black Start commitment period (20 yr. /15 yr. / 10 yr. /5 yr.)
 - c. Cost recovery method – Base Formula Rate, NERC CIP Rate, Capital Recovery Factor Rate, FERC Rate.
 - d. Proposed Black Start Service date alignment with requested in service date (4/1/2020).

Opportunity for cross-zonal black start coordination

PJM will work with the TOs to identify areas to identify cross-zonal black start opportunities as detailed in PJM Manual M36, if necessary to address black start needs

4.4. PJM Contact Information

ALL communication regarding this RFP should be sent electronically to only the contact email address below.

PJM Contact for all RFP communications:

BlackStart@pjm.com

4.5. RFP Timeline

RFP Process Milestone	Date
PJM posts RFP	Feb. 1, 2018
PJM conducts Special OC Session WebEx Meeting	Feb. 6, 2018
RFP interested parties submit Level 1 proposals to PJM	March 8, 2018
PJM provides response to Level 1 proposals	March 30, 2018
Bidders submit RFP Level 2 proposals to PJM	May 31, 2018
PJM evaluation and award of viable Black Start solutions	June 1, 2018–Dec. 21, 2018

5.0: RFP Proposals (Level 2)

RFP Level 2 Proposals at a minimum will include responses to all questions in Section 5.0. For questions that do not apply, please indicate “Not Applicable.”

5.1. Purpose and Scope

5.1.1. Facility

5.1.1.1. Name of facility:

5.1.1.2. Indicate owner of facility:

5.1.1.3. Geographic details: Indicate the physical location of the generator including: city/town, county, state, latitude and longitude

5.1.1.4. Indicate age of facility:

5.1.2. Black Start Unit

5.1.2.1. Indicate the type of generation - CT, Combined Cycle (or CT that is part of a Combined Cycle plant), Hydro, Diesel, etc.

5.1.2.2. Indicate the manufacturer (GE, Siemens, etc.), and the model/unit type (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 6.5 “Black Start Unit Configurations”.

5.1.2.3. Indicate the black start MW capability of the intended Black Start Unit and the full plant (if applicable). Indicate whether MW capability is in terms of capacity resource ICAP, maximum dependable capability (for energy only resources), or nameplate MW rating.

5.1.2.4. Indicate the Black Start Unit fuel type(s) including the fuel(s) used (if different) for any starting or cranking engines/diesels.

5.1.2.5. For a plant with multiple units, identify which units are being proposed as black start resources. Also indicate which of the other units can be started by the proposed black start units.

5.1.2.6. Indicate whether the black start unit is capable of operation in automatic isochronous mode or if it is controlled manually in isochronous mode.

5.1.3. Interconnection

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

5.1.4. Necessary Upgrade(s) for BS Capability

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

5.2. Generator Operational Details

5.2.1. One-Line Diagram

5.2.1.1. Provide a one-line diagram for the plant site, which includes 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 mark-ups of existing diagrams are sufficient. Visio diagrams with adequate detail are also sufficient.

5.2.2. Start-Up Sequence Description

5.2.2.1. 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.

5.2.3. Reactive Capability

5.2.3.1. Include a reactive (MVAR) capability curve (D-Curve), including 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.

5.2.4. Start-Up Time

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

Indicate whether the unit will be staffed 24 x 7 if it is selected to provide Black Start Service. If the plant will not be staffed 24 x 7, can the unit be started remotely? If so, describe the plan for starting the black start unit in the event of a telemetry failure.

5.2.5. Fuel Assurance

5.2.5.1. Indicate primary and secondary (if available) fuel type(s).

5.2.5.2. If a primary or secondary fuel is natural gas, indicate gas transportation and supply arrangements. Indicate if these arrangements are primary firm or non-firm transportation contracts as well as any alternate pipeline feeds. Indicate any arrangements for the unit to secure additional fuel.

5.2.5.3. If unit is dual fuel capable, provide the following details:

- Can the unit start on both primary and secondary fuel?
- Is different start-up fuel required before running on the primary or alternate fuel?
- Indicate any special fuel switching requirements to move from primary to alternate fuel (or vice versa)

5.2.5.4. Indicate the amount of time the Black Start Unit can run on its own fuel supply. Also indicate any issues with maintaining at least 16 hours of continuous output, per PJM business rules.

5.2.5.5. 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 fuel is not constantly maintained in the storage tanks, please indicate the details on why and when fuel is stored. Provide details on fuel replenishment process.

5.2.6. Applicable minimum load, environmental, and black start testing restrictions

5.2.6.1. Does the unit require an external stabilizing load? If so, provide the size of external stabilizing loads required. Stabilizing load requirements will be incorporated in the Transmission Owner restoration plans.

5.2.6.2. Minimum output restrictions at various stages of the startup sequence.

5.2.6.3. Specify the units maximum allowable 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.”

5.2.6.4. What is the unit’s minimum load under the current emissions permit?

- 5.2.6.5. What is the lowest load the unit can operate in a stable steady state configuration if there were no emission permit restrictions?
- 5.2.6.6. Confirm the feasibility of obtaining an emissions permit modification to allow the unit to operate at the lowest possible load for restoration and black start testing?
- 5.2.6.7. Include the ramp rate and any variations in ramp rates that may apply.
- 5.2.6.8. 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 not, specify alternative test options.
- 5.2.6.9. For Combined Cycle units – can the Combustion turbines be operated in simple cycle mode?
- 5.2.6.9.1. If so, identify for how long? (Summer / Winter).
- 5.2.6.9.2. If not, does the unit have steam bypass capability?
- 5.2.6.10. 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.
- 5.2.6.11. Is the station's auxiliary load greater than the combustion turbine's lowest possible minimum load? If not greater, then provide MW difference.
- 5.2.7. Refurbishment of Existing Black Start or Black Start Capable Resources**
- 5.2.7.1. 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?
- 5.2.7.1.1. If not, what modifications are required?
- 5.2.7.2. For existing black start units that would otherwise retire, identify any equipment overhauls or refurbishment work that would be required for continued reliable Black Start Service.

5.3. Project Schedule

5.3.1. Estimated In-Service Date

Indicate the estimated in-service date as a black start capable unit. For the purpose of this RFP proposal, assume a project start date of April 1, 2020. Dates will be adjusted based on actual award date.

5.3.2. Project Schedule

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

5.3.3. Procurement Plan

Detail any work that is planned with vendors.

5.4. Total Estimated Capital and Annual Black Start Service Costs

5.4.1. 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 the Independent Market Monitor (IMM) for review 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.

See RFP Section 6.1.1 for additional details on how to estimate a Black Start Unit's Annual Black Start Revenue Requirements.

5.4.2. 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.

5.4.3. 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).

5.4.4. 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 4.56 percent.

5.5. Black Start Unit Owner Contact Information

	Name	Title	Company	Phone Number	Email Address
Primary Contact					
Alternate Contact					

6.0: Black Start Business Rules Summary

6.1. Black Start Service Compensation

6.1.1. Black Start Service Annual Revenue Requirements

Selected Unit's Black Start Annual Revenue Requirements will be calculated based upon actual costs submitted to the PJM Independent Market Monitor review and PJM for approval.

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:

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

6.1.2. 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. 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. Unit's 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.

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 4.56 percent.

Units using the Base Formula Rate for Fixed Black Start Service Costs will be able to use an Incentive Factor (Z) of 10 percent. 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](#). Please select the tab associated with the Fixed Black Start Service Cost Rate chosen.

6.1.3. Submittal of Estimated Capital Cost, Actual Capital Cost and Annual Black Start Service Costs

6.1.3.1. Evidence of upgrade Cost

If selected, submittal of data supporting actual capital and annual black start service costs to PJM and the PJM Independent Market Monitor ("IMM") in accordance with Paragraph 17B of Schedule 6A of the Tariff is required.

6.1.3.2. Timing of submittal of estimated costs

A selected Black Start Unit owner will submit a best estimate of the unit's projected actual upgrade capital costs, variable Black Start Service costs, and fuel storage costs to PJM at the time the unit enters Black Start service, to serve as an interim annual revenue requirement until reconciliation and approval of final actual upgrade capital costs is complete.

6.1.3.3. Timing of review and final determination of actual costs:

A selected Black Start Unit owner must submit supporting data and documentation of actual upgrade capital costs to PJM and the IMM no later than 90 days after entering Black Start Service. The supporting data and documentation can be submitted on a monthly basis as incurred or as a single submittal at the completion of the work, but all cost documentation must be submitted no later than 90 days after the unit enters Black Start service.

A selected Black Start Unit owner must submit documentation of actual annual revenue costs including variable black start cost and fuel storage costs to PJM and the IMM within 90 days after entering Black Start Service. Annual variable black start service can include annualized capital costs, Black Start O&M costs, existing unit level annual VOM costs and NERC Standard compliance costs.

6.1.3.4. Timing of Black Start Service monthly credits

New Black Start Unit owner's monthly Black Start credits will be held by PJM in a non-interest bearing account until PJM or the Federal Energy Regulatory Commission accepts the owner's annual revenue requirement pursuant to Section 17B of Schedule 6A of the Tariff. Monthly Credits for the unit's annual revenue requirement including recovery of actual upgrade costs will begin after the Black Start Unit's annual revenue requirement is accepted by PJM and will include monthly credits held by PJM back to the unit's in-service date including any required estimated revenue true up.

6.1.3.5. Supporting Documentation

Supporting documentation for actual capital costs will include but not be limited to the following:

- 1) third party invoices supporting costs for contractor services and materials;
- 2) time sheets or other project tracking documentation for internal labor costs (components of labor rates) including rate sheets and applicable overheads;
- 3) when internal costs are charged to the project, they must include documentation supporting all costs that will be included and a breakdown of how the costs were developed;
- 4) when application and certificates for payment are used to confirm completion of any portion of the project, they must be signed and notarized. The signature and notarization must be visible on any copies provided.

Supporting documentation for variable black costs and fuel storage costs (if applicable) will include but not be limited to the following:

- 5) third party invoices supporting costs for contractor services and materials;
- 6) time sheets or other project tracking documentation for internal labor costs (components of labor rates) including rate sheets and applicable overheads;
- 7) if the unit can be fired on oil, additional required documentation for the claimed Minimum tank Suction Level(s), size of tanks, and burn rates. If the tank is shared with other resources, a complete explanation with all supporting data of how tank use is shared and the allocation factor(s) used is required.

6.1.3.6. Cost evidence disputes

The IMM will provide feedback and attempt to come to agreement on the level of each component in the Black Start Service revenue requirement within 90 days after the Black Start Unit owner's final submittal of cost documentation or other date as specified in Schedule 6A paragraph 17B.

If the IMM and the Black Start Unit owner are unable to come to an agreement on the project upgrade costs or any other annual costs to be reimbursed to the Black Start Unit owner, then the Black Start Unit owner must notify PJM that it disagrees with the IMM's determination of costs within seven days after the IMM submittal of the annual revenue requirement to PJM. The Black Start Unit owner shall also submit its proposed costs to PJM provided it has participated in good faith in the process and the Black Start revenue requirements are no higher than the level defined in any agreement reached by the Black Start Unit owner and the IMM. PJM will review the proposed costs submitted by Black Start Unit owner, and determine whether to accept the owner's proposed costs within 30 days after the Black

Start Unit owner written disagreement. 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.

6.1.3.7. 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. Per 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."

6.1.4. Compensation for Energy Output

6.1.4.1. 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 locational marginal price ("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.

6.1.4.2. 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.

6.1.4.3. Cost-capped offer

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

6.1.5. Service after Initial Commitment Term & Termination of Service

6.1.5.1. 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.

6.1.5.2. 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.

6.1.5.3. 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.

6.2. Testing

6.2.1. 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.

6.2.2. Failed Annual Test

If the Black Start Unit fails the annual test, it may be re-tested within a 10-day period without financial penalty. If the Black Start Unit does not successfully re-test within that 10-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.

6.3. 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 Black Start Unit owner and TO will develop the TO System Restoration Plan to include the 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.

6.4. 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.

6.5. Black Start Unit Configurations

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

7.0: Black Start Generator Reference Guide

7.1. Index of Documents and Manuals

PJM View Point – RTO-Wide Black Start RFP Process

<https://www.pjm.com/-/media/about-pjm/newsroom/fact-sheets/20180109-black-start.ashx>

Operating Committee Presentation on Black Start RFP Process – Jan. 9, 2018

<http://www.pjm.com/-/media/committees-groups/committees/oc/20180109/20180109-item-06-rto-wide-black-start-rfp.ashx>

PJM Open Access Transmission Tariff Schedule 6A – Black Start Service – existing version and proposed future revisions

Provides the PJM Tariff requirements for black start generators.

Manual M-01, Rev 36 – Control Center and Data Exchange Requirements

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

Manual M-10, Rev 36 – Pre-Scheduling Operations

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

Manual M-12, Rev 37 – Balancing Operations - existing version and proposed future revisions

Describes the real time operations process.

Manual M-14D, Rev 42 – Generator Operational Requirements

Provides a general overview of generator operational requirements.

Manual M-27, Rev 88 – Open Access Transmission Tariff Accounting

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

Manual M-36, Rev 24 – System Restoration

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

NERC Reliability Standards

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

<http://www.pjm.com/directory/merged-tariffs/oatt.pdf>

<http://www.pjm.com/directory/etariff/MasterTariffs/23TariffSections/4406.pdf>

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

7.3. Manual M-01, Rev 36 – 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

7.4. Manual M-10, Rev 36 – Pre-Scheduling Operations

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

Planned Outage Restrictions for Black Start Units

7.5. Manual M-12, Rev 37 – Balancing Operations

Existing version

<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:
 - Black Start Tests Generation and Transmission
 - Automatic Load Rejection Tests
 - Formulaic Cost Data
 - Actual Cost Data

7.6. Manual M-14D, Rev 42 – 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.

7.7. Manual M-27, Rev 88 – Open Access Transmission Tariff Accounting

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

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

7.8. Manual M-36, Rev 24 – 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

7.9. NERC Reliability Standards

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



PJM 2018 RTO Wide Black Start RFP Level 1 Response

Company Name: _____

Unit Name: _____

Unit Address: _____

Unit Market ID: _____

Unit ICAP: _____

Type of Unit (CT, CC, Steam, etc.): _____

Interconnection Voltage Level: _____

Inteconnected Swyd Name: _____

TO Zone (if known): _____

Contact Name: _____

Contact Address: _____

Contact Email: _____

Contact Phone: _____

Primary Fuel: _____

Secondary Fuel (if applicable): _____

If oil fired, oil storage on site? YES NO

If gas fired, firm gas transportation? YES NO

Proposed black start MW: _____

Unit minimum load (under current air permit): _____

Emission limitations for operation below minimum (e.g., start-up time to reach air permit compliance): _____

For Combined Cycle (CC) Units Only

Simple Cycle available? YES NO

Steam bypass available? YES NO

Percent of CT Output allowed by steam bypass: _____

Please send all 2018 RTO Wide Black Start RFP Level 1 Responses to BlackStart@pjm.com