

## **Black Start**

### **General Description of the Service and National Grid Procurement and Requirements**

#### **1. Introduction**

This document provides a summary of the service of Black Start as set out in the generic Black Start contract terms. Where there is any conflict between this document and the service terms, the service terms shall take precedence.

This document is intended as a guide to the Black Start service terms, which will reside in a Commercial Services Agreement as Clause 4.

#### **2. Service description**

Black Start is the procedure to recover from a total or partial shutdown of the GB Transmission System which has caused an extensive loss of supplies. This entails isolated power stations being started individually and gradually being reconnected to other power stations and substations in order to form an interconnected system again.

In general, all power stations need an electrical supply to start up: under normal operation this supply would come from the GB Transmission System or Distribution System; under emergency conditions Black Start stations receive this electrical supply from small auxiliary generating plant located on-site. Not all power stations have, or are required to have, this Black Start capability. Black Start capability is usually a consideration when the plant is being built, although National Grid has procured Black Start service where the facility has been retrofitted.

#### **3. Background to Black Start Requirements/Why is it needed?**

The likelihood of a total or partial system shut-down occurring is considered remote. However, it is the case that should a total or partial shut-down occur anywhere on the GB Transmission System, contingency arrangements must be in place to enable a timely and orderly restoration of supplies.

The need to contract for Black Start at an individual location will largely be driven by current arrangements at other nearby power stations, the expected longevity of such contracts and the implications involved in improving system restoration.

#### **4. Major Technical Requirements**

Irrespective of the type of plant installed to provide a Black Start service, the following technical capabilities are some of those required:

- The ability to start up the main generating plant (at least one unit/module) of the power station from shutdown without the use of external power supplies, and be ready to energise part of the GB Transmission System or, if appropriate, the Distribution System within two hours of instruction from National Grid;
- The capability to accept instantaneous loading of demand blocks, ideally in the range 35 to 50 MW, and controlling frequency and voltage levels within acceptable limits during the block loading process (under these conditions, frequency can be within the range 47.5 to 52 Hz);
- The ability to provide at least three sequential Black Starts, to allow for possible tripping of the Transmission/Distribution System(s) during the re- instatement period or trips during the stations Black Start starting sequence itself;

- Back-up fuel supplies (e.g. distillate fuel), if appropriate, to enable the power station to run for a minimum duration, ideally in the range 3 to 7 days, following a Black Start instruction;
- Barring and jacking facilities such that all generating units can be safely shutdown without the need of external supplies;
- The ability to maintain a high service availability on both the main and auxiliary generating plant (typically 90%); and
- The reactive capability to charge the immediate Transmission/Distribution System(s). This capability will depend on the local system configuration, but generating plant connected at 400kV or 275kV with a capability of at least 100MVAR leading (as measured at the commercial interface) should almost invariably meet this requirement. The generator must also be capable of withstanding the magnetic inrush and transient voltages associated with this charging duty.

## 5. Overview of Black Start Contractually

### a. Introduction

Black Start is a Part 2 System Ancillary Service, which is a necessary service required from and agreed with some generators to meet National Grid's Black Start restoration strategy. The service can only be provided by BM participants.

### b. National Grid requirement and procurement

For a new connection, National Grid will indicate its potential requirement for a Black Start service at a new power station during the connection application process, prior to construction. Black Start will become an agenda item on the connection issues meeting(s) whereby the commercial and technical considerations for the service can be discussed. A draft set of generic Black Start terms will be provided to the User as background of the more detailed and applicable contract terms etc.

For an existing station, National Grid will contact the potential provider to declare National Grid's interest in a future service and invite response. Note this does not preclude the provider approaching National Grid in the first instance to offer the potential for a Black Start service. A bilateral meeting will then be held with the provider covering the same agenda and outcome as for a new connection.

For the avoidance of doubt, Black Start will be procured on a bilateral basis to meet the future requirements of National Grid's Black Start strategy. National Grid may discuss the provision of a Black Start service with one or more potential provider at the same time to ensure the most economic and efficient solution.

### c. Payment Structure

There is a suite of payment forms that National Grid will make as part of the service, some of which may not be applicable in all instances depending on type, age, status of plant etc.

#### i. Availability Payments

National Grid will, where a service provider makes the Black Start service available, pay for the availability on a £ / settlement period basis.

#### ii. Exercise Price

Where an auxiliary unit is called upon for a Black Start test, then National Grid shall pay an agreed amount by reference to the

exercise price (£/MWh) and the metered MWh output of the auxiliary unit during the test.

**iii. Contribution Sums**

Where the installation or refurbishment of capital assets at a power station would return a valuable Black Start service, National Grid may choose to contribute towards the providers costs and it will carry this forward through a number of mechanisms as described below under part e and f.

**d. Term**

The contract term will be determined by the circumstances at the time. National Grid expects a long term contract where contribution sums are applicable with all agreement renewals set to ensure competition.

**e. New provider/new asset**

**i. Feasibility study**

Where National Grid believes a power station may be able to provide a valuable Black Start service, then it may agree to provide a capped contribution towards a feasibility study that will cover for example the installation, technical capabilities and cost of installing Black Start capability at the site.

**ii. Commissioning Assessment**

Following the successful completion by the power station of the Grid Code compliance testing, it will then follow that the power station will carry out a Commissioning Assessment to prove the Black Start capability of the power station. The Commissioning Assessment consists of two parts. The first is to test the resilience and capability of the auxiliary unit. The second part of the test will be to carry out the full Black Start test that may also require a remote synchronisation test. Where the provider passes the Black Start test then the service shall be deemed commissioned and the service commencement date shall be applied. Should a provider fail three successive Commissioning Assessments, National Grid may serve written notice on the provider to terminate the provisions of the Black Start agreement with all capital contribution sums refunded to National Grid.

**iii. Contribution Sums**

As mentioned above, National Grid may provide contributory costs for the provision of assets that would return a valuable Black Start service. For a new provider these will be in the form of profiled contribution payments. These will be paid at agreed milestones within the commissioning stages of the commissioning schedule.

**f. Black Start renewal terms**

**i. Contribution Sums**

Where a Black Start provider advises National Grid that the assets required for the provision of Black Start are in need of refurbishment, National Grid may, but is not obliged to, agree to provide a contribution towards the cost of the refurbishment. The work shall be carried out to an agreed timetable of works and National Grid will have rights to test the station for Black Start capability following completion of the works. All work is expected to be completed within the first 24 months of the contract term and within 12 months of the work starting as with the expectation that it will be a long term contract (c10 years); National Grid expects a reasonable return of service for the provision of the costs. National Grid will only make the payments firm on receipt of valid invoices to prove the work and expenditure

has taken place. National Grid also reserves the right to request further evidence to ascertain to its satisfaction that the works have been completed e.g. this may include a site inspection.

National Grid may provide contribution sums via two mechanisms, with the choice being made on which is appropriate based upon the circumstance. These are defined as Up Front and Profiled payments.

#### **Up Front Contribution Sums –**

- Where a provider is able to firmly identify and cost refurbishment works required on Black Start assets, then National Grid may provide a fixed sum to the Black Start provider to enable them to carry out the works.
- The work is expected to be completed within the first 24months of the contract term and within 12months of the works starting. Failure to do so will trigger a refund mechanism whereby the provider will refund all of the capital allocated to it back to National Grid.
- To verify works have taken place, the provider will be expected to provide evidence through the form of a valid invoice and/or another format acceptable to National Grid that the works have taken place within 3 months of the indicative completion date from the Black Start agreement. Failure to provide the evidence will see a refunding of the up front sum to National Grid on a pro rata basis over the next 6 month period.
- Where the actual costs of the works accumulate to a minimum of 10% less than the initial sum paid by National Grid, then the provider will repay to National Grid the difference in costs between the initial and final sums.

#### **Profiled Contribution Sums –**

- Where a provider is unable to firmly identify and schedule refurbishment works before an agreement becomes live and/or where the works are of many parts that cannot be delivered within 12months of works starting, then National Grid may provide contribution sums to the provider after the associated works have been completed.
- The agreed refurbishment works timetable will contain details of when the work is scheduled to be completed with agreed costs for the work that National Grid will contribute towards.
- The generator will provide proof to National Grid through form of valid invoices that works have been completed. National Grid will validate the invoice against the refurbishment works timetable and make the appropriate payment as required.

Once refurbishment work has been completed then the Black Start station will be treated similarly to a new station in that the station will be expected to be tested for Black Start capability. There will be a limit of 3 successive Black Start test failures before National Grid may request a refund of the capital payments and consider terminating the Black Start agreement.

## **6. Service Monitoring**

Black Start is a vital service for the restoration of the GB electricity transmission, which is seen as a prime responsibility for National Grid and any contracted Black Start station.

Therefore in order to confirm that National Grid is paying for an available and deliverable service, the following measures are in place:

**a. Black Start Test**

National Grid may give the generator an instruction that it wishes to carry out a Black Start test in a manner pursuant to Grid Code OC5. OC5 governs the procedure for a Black Start test for National Grid and the generator. While National Grid may enter discussions with a generator to arrange a convenient date for a Black Start test, OC5 makes provisions for National Grid to advise the generator that it will carry out a test at the station with a minimum notice of 7 days.

The purpose of the test is for the station to demonstrate to National Grid that it has the capability to provide a Black Start service. While OC5 makes provision for the number of Black Start tests it can carry out at a station within a calendar year, National Grid would expect to carry out a full Black Start test at a station once every 2 calendar years.

National Grid and the generator shall agree the parameters for the Black Start test before the date of the arranged Black Start test. The parameters shall comprise the matters necessary for the carrying out of a Black Start test and shall include for example proposed start and end time for the test, proposed running profile, Maximum Export Limit etc.

Once the test is complete, National Grid will notify the station whether it has passed or failed the test. National Grid will also provide feedback on the stations procedures and practices during the test. During the test National Grid may issue Bid Offer Acceptances to the test unit to meet the profile of the test procedure.

Should a station fail a Black Start test, the Black Start contract terms include National Grid rights to recoup availability payments until a test is passed. Where applicable, should a generator fail a third successive Black Start test, National Grid reserves the right to terminate the agreement. However, National Grid will meet with the Generator to discuss the reasons for the successive Black Start failures. Where there is reasonable belief that the Black Start capability of the plant within an agreed reasonable length of time, then National Grid may agree to a further test to prove the stations Black Start capability.

**i. Assurance visit**

The Generator shall permit National Grid to carry out an assurance visit, not more than once in any calendar year, to ensure National Grid is reasonably satisfied that the Power Station has the appropriate documentation, technical and training procedures in place expected of a Black Start station. The visit is fundamentally a desk top exercise at the station to compliment a Black Start test and is an opportunity for both parties to agree any areas for development.

**ii. Bid/offer prices during test**

National Grid believes the purpose of the Black Start test is to test the technical aspects of the Black Start agreement and not a commercial opportunity for National Grid and the Generator, therefore reasonable bid/offer prices are agreed in advance of test as part of the Indicative Black Start Test Parameters.

**b. Remote synchronisation test**

Each Black Start station shall be required to undertake a remote synchronisation test once ever two years. The test will require the station to energise from a dead a local busbar, circuit(s), transformer(s) and a remote

busbar and then synchronise onto a live busbar that is already synchronised to the GB Transmission System.

**c. Reproving and/or Capability assessment**

Where National Grid has reasonable grounds to believe that a Black Start station does not have Black Start capability then it can carry out a capability assessment. The assessment shall be discussed and agreed with the generator and in each case will have regard to the nature and extent by which National Grid bases its opinion that the station hasn't got Black Start capability.

Where a station is notified or determined that it does not have Black Start capability, at a point when the Generator considers that the capability is restored, National Grid can conduct a reproving assessment in order to verify that the capability is restored. The assessment shall be discussed and agreed with the generator and in each case will have regard to the nature and extent by which National Grid bases its opinion that the station hasn't got Black Start capability.

**d. Inspections**

National Grid can, with not less than 24hr notice, verify the capability of Black Start at a power station through a station inspection. The inspection shall be carried out without undue interference with the normal operation of the Black Start plant.

**e. Unavailability**

Where a Black Start station is unavailable to provide Black Start it will advise National Grid and availability payments will cease until such time that the station redeclares its availability. Settlement periods where the power station is unavailable will be accrued and utilised in the annual assessment of unavailability as mentioned below.

**f. Annual assessment of availability**

From the service commencement date of the Black Start agreement, National Grid will assess annually the availability of Black Start at a station over the preceding 12 month period. If the station has been available for less than 90% of the time then National Grid can recoup any contribution sums paid to the generator and/or discuss and agree with the Generator an appropriate reduction in the availability payments. Where a Generator has been available for less than 85% the availability payments made to the generator during the assessment period shall be adjusted accordingly to reflect the reduced level of service.

Where a generator provides National Grid with reasonable notice of a minimum of 3 months that the station will be unavailable for Black Start and National Grid agrees to that the unavailability then the period of unavailability will not accrue against the annual assessment. Further still, for periods of unavailability agreed with National Grid through the refurbishment works timetable, then the agreed periods of unavailability will not accrue against the annual assessment of availability.

## **7. Agreement Renewal**

Not later than 12 months before the expiry of a Black Start agreement, National Grid and the provider shall meet to discuss whether the provisions of the agreement shall be extended for a further agreed period and if so the duration and terms of the extension.

## **8. Further Information**

Further information regarding Black Start can found on National Grid's website at:  
<https://www.nationalgrid.com/uk/Electricity/Balancing/services/systemsecurity/blackstart/>

If you have any queries over the service then please contact your account manager or  
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