

Black Start

Project Development - Feasibility Assessment Process

Background

Black Start (BS) project development for National Grid Electricity System Operator (NGESO) takes the form of a phased, two stage feasibility process.

The **Stage 1 Feasibility (F1)** requires a potential BS Service Provider to assess the capability of its main generating units or equipment to provide the BS Service, together with some preliminary work to consider possible solutions. It allows the project to terminate at an early stage should the main plant be deemed inappropriate for provision of a BS Service. The objective is to give enough information and confidence that the plant can meet the Technical Requirements and that a decision can be taken about moving to a full design stage.

If the outcome of **F1** is a decision to progress to a full design stage, then NGESO will instruct the tenderer to proceed to scoping a **Stage 2 Feasibility (F2)**. The aim of **F2** is to provide a comprehensive and robust technical and commercial evaluation of the proposed service to enable progression to a contractual negotiation or tender. Important to highlight that the scope of works for the **F2** must be reviewed and agreed between NGESO and the potential BS Service Provider before any work should start on the **F2** itself.

The outcome of **F1** and **F2** are dedicated reports (F1 Report, F2 Report). Both reports should be prepared using dedicated templates, which will be provided when NGESO request Expressions of Interest. Where a section requires a format, details will be provided within the template. Each report should provide sufficient confidence in the capability of the Service Provider to support a decision to continue with the feasibility process.

Stage 1 Feasibility, F1

The objectives of **F1** are to:

1. Confirm ability to deliver the BS Service in alignment with the minimum Technical Requirements.
2. Identify cost effective options for provision of an auxiliary power source to enable the provision of the BS Service – BS Auxiliary Unit(s).
3. Provide indicative project timescales for the development, construction and/or commissioning of the BS Plant.
4. Source data required for F2 network study modelling with neighbouring sites.

1. Confirm ability to deliver the BS Service in alignment with the minimum Technical Requirements

Key generic capabilities of the BS Service are given in the “Technical Requirements & Assessment Criteria” document.

The **F1** should include details of, but is not limited to, the following (if applicable):

- a. Expected time to connect, identifying start up sequence.
- b. Reactive capability at various loading points.
- c. Expected Block loading (BL) profile to achieve the contracted output (Active Power Contracted).
- d. Identification of any constraints in the start-up / BL process (hold points, max time at Full Speed No Load/low load levels, critical load points, etc.).

- e. Effect of warmth states on the time to connect and BL capability.
- f. Ability of the Service to meet 90% availability.
- g. Summary of site control room and site arrangements, resilience and telecoms.
Difference(s) in characteristics between individual modules (if any).
- h. If an Interconnector, identify any network studies required where the BS operating mode of the equipment differs from that used for the connection studies.

Note: On behalf of the potential provider, the ESO will engage with potential secondary Stations for the site being assessed in **F1** to understand the availability of Torsional Shaft Data for any Subsynchronous Torsional Interaction studies required as part of **F2**. This may include scoping within the indicative programme for monitoring to be installed to create the required dataset.

2. Identify cost effective options for provision of an auxiliary power source to enable the provision of the BS Service – BS Auxiliary Unit(s)

The study should include an initial assessment of the sizing requirement for the BS Auxiliary Unit(s), together with a preliminary assessment of any possible options to meet this requirement:

- Any existing Unit(s)
- New Unit(s)

This will depend on the specific requirements and options available at the BS Plant in question.

The study should make initial considerations as to the Environmental, Civil and Geological factors around the proposal.

3. Provide indicative project timescales for the development, construction and/or commissioning of the BS Plant

F1 Report should include indicative completion times for each step and option.

Stage 2 Feasibility, F2

Prerequisites

Prior to commencement of an F2 Study and associated F2 Report, a scope of works for delivering the report (including costs and programme) must be delivered and approved by NGENSO.

Note: Where data for the network studies is required from secondary stations, the potential BS Provider will make the request for suitable data (e.g. Subsynchronous Torsion Interaction – shaft data) via the NGENSO. Any costs in retrieving the data set need to be scoped as part of the F2 Study sanction process, and be included within the scope.

Study and Report

The objectives of **F2** are to:

1. Confirm technical capability, detail, and how will the BS Service be delivered.
2. Provide an Implementation Strategy.
3. Develop network modelling to ensure the BS Service will not cause any impact or damage to third party plant or equipment, where the service is provided in an alternative operating mode.
4. Provide a commercial offer for the BS Service.

1. Confirm capability and detail how will the BS Service be delivered

It is anticipated that the Original Equipment Manufacturer (OEM) will be consulted at this stage to provide assurance of any stated capability, with appropriate engineering analysis being evidenced. Confirmation of capability should be to a sufficient level to agree a contract for delivery of a BS Service.

As a guide, the **F2 Report** should include but not be limited to the following content and can be different for the specifics of each individual project:

- a. Confirmation of Capability (above that explored under the F1 Study and backed up with physical or simulated evidence):
 - i. BS capability, operation and control of the equipment/Plant, confirmed by the OEM.
 - ii. Start-up Power Requirements / profile with any peak requirements.
 - iii. Typical Time to Connect and start-up sequence in BS mode (if variable, e.g. warmth state, detail accordingly).
 - iv. Block loading profile, and requirements to achieve the Minimum Stable Operating Level. Any variation in Block Loading capability due to equipment status, output level or energy/fuel supplies.
 - v. Identification of any timing constraints in the start-up or Block Loading process, specific hold points, maximum durations at low load levels, critical load points.
 - vi. Resilience of Supply (BS Service and BS Auxiliary Unit(s)).
 - vii. Reactive capability at various loading points, including initial energisation (c0MW).
 - viii. Ability to meet 90% availability requirement – assessed over typical maintenance cycle and merit order where appropriate.
 - ix. Any differences between modules/ poles/ or units.
 - x. OEM reference list for similar main plant/equipment undertaking BS provision.
- b. BS Auxiliary Unit(s) Capability
 - i. Capability to start without external supplies and provide sufficient power output to enable the delivery of the contracted BS Service.
 - ii. Governor investigations as necessary.
 - iii. Start-up times, reliability and availability.

- iv. Fuel supplies and durations.
- v. Auxiliary Single Line Diagram.
- c. BS Operation**
 - i. Conceptual design, control philosophy, supporting study work and any physical testing requirements to confirm capability. This should consider the capability of neighbouring sites likely to undertake Power System Synchronisation of Power Islands.
 - ii. Control room and Plant staffing summary and review to achieve the 24h availability of the service.
 - iii. Systems' resilience review noting Telecommunication and systems' resilience to a blackout event, and their physical location.
- d. BS Equipment Schedules – Existing and new**
 - i. Existing to include assessment of fitness for purpose and any modifications required.
 - ii. New to include general specifications and scope.
 - iii. Civil installations required.
 - iv. Balance of Plant General Arrangements.
 - v. Single Line Diagrams.

Typically includes Auxiliary generation and starting equipment, electrical interconnections, fuel system, Main and Aux control systems, protection – energising and synchronising systems.

2. Provide an Implementation Strategy

- Consents
- Purchasing
- Installation
- Commissioning
- Programme
- Outage Requirements
- Operation and Maintenance Strategy

3. Any network modelling to ensure the BS service will not cause any impact or damage to third party plant or equipment, where the service is provided in an alternative operating mode

If applicable.

4. Provide a commercial offer for the BS Service

Capital Cost Estimates Recovery of capital costs will be agreed on an open book basis. Full and detailed breakdowns of all costs should be provided here, and NGENSO reserves the right to employ consultants to evaluate the designs and cost structures as part of the tender.

- Project Development.
- Main Equipment.
- Construction.
- Monthly Availability Fee.
- Service Readiness strategy (Commercially viable runs, preparedness capability, etc.)