nationalgridESO

Technical Requirements & Assessment Criteria

Executive summary

Each potential Black Start (BS) Service Provider will have a different impact on Great Britain (GB)'s restoration, depending on individual characteristics and network location. Detailed in this document are the required capabilities needed from BS Service Providers, along with information about how these will be valued and how will the tender be assessed.

What's inside?

1. Technical Requirements – These are the minimum requirements that a provider will need to be able to meet – a provider doesn't need to have all of these at the time of tendering, but during the feasibility and tender process they should ensure their tendered solution meets these.
2. Assessment Criteria – The overall assessment will be weighted 70:30 (Commercial:Technical), this is because providers that meet the minimum criteria will provide an acceptable level of service, but we will still value technical capability that contributes to a faster restoration.

1. Technical Requirements

The provider must be able to meet the techncial requirements at one point of delivery.

Requirement	Minimum	Definition	Rationale
Time to Connect	≤ 2h	Time taken to start-up the BS Plant from shutdown without the use of external power supplies, and to energise part of the Network, within two hours of receiving an instruction from the Electricity System Operator (ESO).	As per the Grid Code requirement (OC9.4.5.1).
Service Availability	≥ 90%	The ability to deliver the contracted BS Service over 90% of a year. Note: It is the responsibility of the Provider to demonstrate its service availability. By submitting a tender, the provider commits to ensuring availability at least 90% of each year of the service.	BS Service Providers are expected to have a high BS service availability so that the ESO we can rely on being able to use them contract in the instance of a Black Start, which could happen at any time.

Voltage Control	Existent	Ability to control voltage level within acceptable limits during energisation/block loading (±10%).	During a Black Start event, a BS Service Provider will need to maintain voltage (within limits) when creating, maintaining and expanding a power island.
Frequency Control	Existent	Ability to manage frequency level when block loading (47.5Hz – 52Hz).	During a Black Start event, a BS Service Provider will need to maintain frequency within limits when creating, maintaining and expanding a power island.
Resilience of Supply, BS Service	≥ 10h	When instructed to BS, the minimum time the Provider will deliver the contracted service.	Long-term restoration.
Resilience of Supply, BS Auxiliary Unit(s)	≥ 72h	Run continuously at the output required to support / deliver the contracted BS Service for a minimum of 3 days.	Long-term restoration.
Block Loading Size	≥ 20MW	Capability to accept instantaneous loading of demand blocks.	The restoration approach for GB under the current BS Strategy is a top-down approach. During a Black Start event, the provider must be able to match the DNO's ability to segregate and switch the Distribution Network remotely. , 20 MW blocks will be manageable for DNOs, but still enables an efficient restoration. We have relaxed this requirement from our previous requirements, to allow more providers to participate and to reduce volatility in the power islands. This size will also be sufficient to provide start up supplies to a conventional non-Black Start station.
Reactive Capability	≥ 100MVAr Leading	Ability to energise part of the network, managing Voltage with Leading or lagging capability whilst active power is zero.	The restoration approach for GB's restoration under the current BS Strategy follows a top-down approach. This means that providers must be able to re-energise parts of the National Electricity Transmission System (NETS), with no load. The higher the reactive capability of a provider, the more quickly access to demand can be achieved.
Sequential Black Starts	≥ 3	Ability to perform at least three sequential start-ups.	To allow for possible tripping of the Transmission or Distribution Networks during the re-instatement period, or trips during the BS Service Provider's own starting sequence.
Short-circuit level (SCL) (following the start of a system disturbance)	For t ≤ 80ms: $I \geq \frac{240\ [\mathrm{MVA}]}{\sqrt{3} \cdot U}$ [kA] For t > 80ms: $I \geq \frac{100\ [\mathrm{MVA}]}{\sqrt{3} \cdot U}$ [kA] U ≡ connection voltage [kV]	Injection of reactive current during a disturbance.	The higher the SCL, the more robustly voltage and voltage angle movement will be contained across larger network and load energisation, allowing a Power Island to be developed faster. That this can be demonstrated from Fault Ride Through test evidence, or in the case of a synchronous generator, Grid code DRC schedule1 modelling data being provided as an alternative.

Inertia Value	≥800 MVA.s	Stored rotating energy in the system (real or virtual).	More Inertia provided, larger active power imbalances may be managed across re-energisation, enabling larger demand blocks and generation that is not synchronous to be restored earlier than would otherwise be possible.

2. Type of Services to Procure

A potential BS Service Provider must be able to provide all of the minimum technical requirements listed above. The potential BS Service Provider may achieve this through adaptations proposed in the Feasibility Study, or by contracting with other parties if they cannot meet all of the above themselves.

If a potential provider has a limitation on one of the technical requirements (where network or DNO factors may accommodate a reduced capability), but can meet the others, we will allow Expressions of Interest to be submitted, and where possible will assess whether a provider could contribute, but it will be entirely at the discretion of the ESO to confirm whether a provider not meeting all of the requirements will be eligible to participate.

3. Assessment Criteria

We are proposing to assess the tender submissions in line with the assessment criteria outlined below. The technical elements have a range of sub-criteria that make up each element, and the rationale for these is explained in section 3.1 – 3.5 below.

Commercial assessment will be based on cost per Settlement Period, based on 87648 SPs (based on a 5 year contract including one leap year), however, at tender submission, a full breakdown of all submitted costs will be required, and the ESO will reserve the right to employ a third party to verify and challenge the costs associated with designs.

Technical 30%	Minimum requirements	Pass/Fail
	Connection to Network	10%
	Power Output	35%
	Resilience of Supply	30%
	Contribution to System Stability	15%
	Contribution to Restoration Time	10%
Commercial 70%	Total costs £/Settlement Period (87,648 SPs)	100%

3.1 Connection to Network (10%)

The restoration under the current BS Strategy for GB follows a top-down approach: re-energisation of the NETS followed by restoration of demand. The point at, and way in which, a potential provider is connected has an impact on the speed and resilience of restoration.

Transmission connected providers are able to progress with the energisation of the NETS without having to energise (part) of a Distribution Network first. This also simplifies the initial stages of restoration and allows for all of the reactive capability of those providers to be used in the expansion of the NETS.

Where a BS Service Provider has more than one connection onto the NETS, that increases the likelihood of availability of that specific BS Service Provider in a under a Black Start event.

Resilience is also affected by geographical locations, and diversification of technologies.

	Score (%)	Comments
Transmission Connected	3	Consistent with the top-down restoration approach for GB under current BS Strategy.
Distribution Connected	0	
Multiple connections to the Network	2	To value the avoidance of a single point of failure.
Single connection to the Network	0	
Other BS Service Provider(s) in the same Substation	(Y) 0% (N) 3%	Assessed against current provision.
Different Technology within a BS Zone	(Y) 2% (N) 0%	Technology meaning fuel (water, wind, coal, gas, diesel, etc.). Assessed against current provision.

3.2 Power Output (35%)

A higher active and reactive capabililty will support a faster restoration.

	MVAr	Score (%)
Reactive Capability (MVAr > 0, MW = 0)	≥ 100	5
	≥ 150	10
	≥ 200	15

	MW	Score (%)
Active Capability	≤ 100	2
	100 < P ≤ 200	5
	200 < P ≤ 350	10
	350 < P ≤ 500	15
	> 500	20

3.3 Resilience of Supply (30%)

After a shutdown the ESO will work to restore demand as quickly as possible. Returning to a normal system operation will not resume for a while after the event , so the ability of BS Service Providers to contribute to the later stages of restoration will be valued.

	Time (hours)	Score (%)
BS Service at Contracted Power Output **(20%)**	= 10	2
	10 < P ≤ 72	5
	72 < P ≤ 120	10
	120 < P ≤ 168	15
	> 168	20

	Time (hours)	Score (%)
BS Auxiliary Unit(s) **(10%)**	72 < t ≤ 120	2
	120 < t ≤ 168	5
	> 168	10

3.4 Contribution to System Stability (15%)

Throughout restoration and particularly during block loading, BS Service Providers will need to manage and be able to withstand larger frequency deviations than normal within their power island (47.5Hz – 52Hz). Providers that can contribute to inertia of the power island will reduce the risk of trips/restarts. Also throughout restoration, the higher the Short-Circuit Level the more robustly voltage and voltage angle movement will be contained across larger network and load energisation, allowing a black start island to be developed faster.

3.4.1 Short-Circuit Level

t≤80ms following the start of a system disturbance

kA	Score (%)
$I \geq \frac{240\ [\mathrm{MVA}]}{\sqrt{3}\cdot U}$	2
$I \geq \frac{360\ [\mathrm{MVA}]}{\sqrt{3}\cdot U}$	3
$I \geq \frac{480\ [\mathrm{MVA}]}{\sqrt{3}\cdot U}$	4

t>80ms following the start of a system disturbance

kA	Score (%)
$I \geq \frac{100\ [\mathrm{MVA}]}{\sqrt{3}\cdot U}$	1
$I \geq \frac{150\ [\mathrm{MVA}]}{\sqrt{3}\cdot U}$	2
$I \geq \frac{200\ [\mathrm{MVA}]}{\sqrt{3}\cdot U}$	3

U≡ connection voltage [kV]

3.4.2 Contribution to Inertia

MVA.s	Score (%)
≥800	2
≥1200	5
≥1600	8

3.5 Contribution to Restoration Time (10%)

The ESO's plan, as defined under the current BS Strategy, is to achieve an average Restoration Time across the year of 24 hours to restore 60% of national demand. To assess that Restoration Time a model has been developed by the ESO (validated by BEIS and Ofgem) and is the tool used to monitor BS performance.

The ESO is considering further developments in the model to accommodate individual contributions from BS Service Providers to Zonal Restoration Times.