ELEXON

Issue Report

Issue 100 'Assessing BSC Black Start processes to support NGESO's Distributed ReStart project'

Contents

1.	Summary	2
2.	Background	3
3.	Issue Group's Discussions	11
4.	Conclusions	14
Appendix 1: Issue Group Membership		16

Contact

Paul Wheeler

020 7380 4209

Paul.Wheeler@elexon.co.uk

BSC.change@-elexon.co.uk

About This Document

You can find the definitions of the terms and acronyms used in this document in the BSC Glossary[1].

This document is the Issue 100 Group's Report to the BSC Panel. Elexon will table this report at the Panel's meeting on 11 May 2023.

There are two parts to this document:

- This is the main document. It provides details of the Issue Group's discussions and proposed solutions to the highlighted issue and contains details of the Workgroup's membership.
- Attachment A contains the Issue 100 Proposal Form.

[1] https://www.elexon.co.uk/glossary/?show=all

1. Summary

Issue 100[2] was raised by National Grid Electricity System Operator (NGESO) on 5 April 2022 to assess BSC Black Start processes to support NGESO's Distributed ReStart project.

Background

NGESO's Distributed ReStart[3] project seeks to enable distribution connected Plants to participate in an updated version of Electricity System Restoration[4] (currently defined as Black Start in the BSC). This will broaden the range of providers who can offer the service, the networks it can be provided from and the situations in which these providers may be utilised.

The BSC only considers Black Start as being provided by the Lead Party of a Balancing Mechanism Unit (BM Unit), and so the terms describing Black Start instructions and fuel compensation relate to Lead Parties. This will be outdated when assets within a BM Unit not operated by the Lead Party of the BM Unit will be able to provide the service following NGESO's project. The Issue 100 Proposer envisaged that the BSC would provide a single and consistent place for describing compensation. Therefore, if it doesn't cover assets within a BM Unit then this may be an issue.

Throughout this Issue Report, reference is made to National Grid Electricity System Operator (NGESO) and National Electricity Transmission System Operator (NETSO). The terms are used interchangeably.

Conclusions

Issue 100 was paused pending the outcome of a subgroup of Grid Code (GC) Modification GC0156: Facilitating the Implementation of the Electricity System Restoration Standard (ESRS)[5] to avoid duplication of effort and discussion in the Issue 100 Workgroup and GC0156 subgroup meetings due to overlaps in the remit of both groups.

NGESO confirmed they were happy for Issue 100 to be closed without any further Workgroup meetings.

NGESO raised BSC Modification P451 'Updating BSC Black Start provisions and compensation arrangements to align with NGESO's new approach to System Restoration'[6] on 1 March 2023.

Not sure where to start?

We suggest reading the following sections:

- Have 5 minutes? Read section 1
- Have 15 minutes? Read sections 1 and 4
- Have 30 minutes? Read all sections
- Have longer? Read all sections and the annexes and attachments

[2] https://www.elexon.co.uk/smg-issue/issue-100/
[3] https://www.nationalgrideso.com/future-energy/projects/distributed-restart
[4] https://www.nationalgrideso.com/industry-information/balancing-services/system-security-services/restoration-services
[5] https://www.nationalgrideso.com/industry-information/codes/grid-code-old/modifications/gc0156-facilitating-implementation
[6] https://www.elexon.co.uk/mod-proposal/p451/

2. Background

NGESO raised Issue 100 ‘Assessing BSC Black Start processes to support NGESO’s Distributed ReStart project’ on 5 April 2022. The original purpose of Issue 100 was to consider whether the BSC should be amended to allow providers of new Distribution Restoration services to claim Black Start compensation under the BSC.

It was originally intended to support progression of Grid Code Modification GC0148: Implementation of EU Emergency and Restoration Code Phase II[7], which NGESO raised in July 2020. GC0148, among other things, is looking at how the Grid Code and Distribution Code could be updated to facilitate the implementation of Distribution Restoration. NGESO and industry are also discussing potential change to System Operator Transmission Owner Code (STC) provisions to facilitate the implementation of Distribution Restoration. The working assumption is that Distribution Restoration would be a ‘type’ of Electricity System Restoration and so the two terms can effectively be used interchangeably. However, the GC0156: Facilitating the Implementation of the ESRS Workgroup concluded in May 2022 (after its own consultation and NGESO’s raising of Issue 100) that Distributed ReStart requirements should instead be considered as part of GC0156. This was on the basis that it sat better within the framework of ESRS[8] and was not an obligation of the EU Emergency and Restoration Code[9].

In July 2022, NGESO asked Elexon to put Issue 100 on hold pending the outcome of the GC0156 Markets and Funding Mechanisms subgroup (see Annex 4)[10]. The subgroup recommended that a Modification should be raised to expand the BSC’s compensation to contracted Distributed Energy Resources (DERs). They did not recommend expanding this to other non-contracted DERs, which was originally considered by Issue 100. As the original scope of Issue 100 is no longer relevant and has been superseded by P451, NGESO (as Proposer of Issue 100) has agreed that Issue 100 can be closed.

What is NGESO’s Distributed ReStart project?

Distributed ReStart[11] is a project exploring how DERs (distribution connected Plant) many of which are solar, wind and hydro, can be used to help restore power to the transmission network in the unlikely event of a blackout, i.e., provide an Electricity System Restoration/Black Start service.

This will broaden the range of providers who can offer the service, the networks it can be provided from and the situations in which these providers may be utilised.

Distribution Restoration will be part of the wider Electricity System Restoration Standard (ESRS) which needs to be in place by 31 December 2026.

[7] https://www.nationalgrideso.com/industry-information/codes/gc/modifications/gc0148-implementation-eu-emergency-and-restoration-code
[8] https://www.gov.uk/government/publications/introducing-a-new-electricity-system-restoration-standard
[9] https://www.entsoe.eu/network_codes/er/
[10] https://www.nationalgrideso.com/document/271701/download
[11] https://www.nationalgrideso.com/future-energy/projects/distributed-restart

What is the Electricity System Restoration Standard (ESRS)?

Black Start is the process used to restore power in the event of a Total Shutdown or Partial Shutdown of the National Electricity Transmission System, as described in Operating Code No. 9 (OC9)[12] of the Grid Code.

In April 2021, the Department for Business, Energy and Industrial Strategy (BEIS) (now Department for Energy Security and Net Zero (DESNZ, formed on 7 February 2023)) released a policy statement[13] setting out the need to introduce a legally binding target for the restoration of electricity supplies in the event of a National Electricity Transmission System (NETS) failure. This policy is called the Electricity System Restoration Standard (ESRS) and requires NGESO to be capable, by the end of 2026, of restoring 60% of demand (all regions) within 24 hours and 100% of Great Britain (GB) demand within 5 days.

The related BEIS and Ofgem initiated licence modification decisions[14] were implemented on 19 October 2021. These modifications include introducing the definition of "restoration services" in Standard Condition C1 and amending the definition of Balancing Services to include "Restoration Services" replacing all references to "Black Start" with "Electricity System Restoration" in the Electricity Transmission Licence, including in the ESO's Special Licence Conditions, to align the licence terminology with BEIS's policy. Grid Code modification GC0156 has been established to address these issues from a Grid Code perspective.

Current Restoration Service

The current restoration service is procured from Power Stations that have the capability to start main blocks of generation onsite, without reliance on external power supplies. During a shutdown, the service requires the provider to start up its main generator(s), carry out initial energisation of sections of the NETS and distribution network, and support sufficient demand to create and control a stable 'power island'.

The contracted generator may be required to provide start up supplies to other Power Stations as the system restoration progresses, and will eventually be required to synchronise to other power islands.

Key to providing a Black Start service is ability to start up without taking power directly from transmission/distribution networks. However, as the obligation to provide Black Start capability lies with NGESO, there is a limited case for generators to install this capability in their designs for the plant, unless they have contracted with the ESO to provide this capability.

Also, as a number of the stations that historically have had Black Start capability (and may have had it built into the design for the stations) are now coming to the end of their expected life, the energy industry is approaching a period where a larger scale of investment is required to replace this Black Start capability.

[12] https://www.nationalgrideso.com/document/33831/download
[13] https://www.gov.uk/government/publications/introducing-a-new-electricity-system-restoration-standard/introducing-a-new-electricity-system-restoration-standard-policy-statement
[14] https://www.ofgem.gov.uk/sites/default/files/2021-08/Decision%20on%20licence%20modifications%20to%20facilitate%20the%20introduction%20of%20an%20Electricity%20System%20Restoration%20Standard.pdf

Given the rate at which the energy landscape is evolving, it is prudent to ensure that where investment is necessary to ensure capability, Black Start should be future-proofed as far as possible. This should take into account that the number of large thermal generators connected to the Transmission System has decreased and is likely to continue to do so, meaning the pool from which Black Start capability is significantly dropping off.

What is the BSC Issue?

The BSC considers Black Start as being provided by the Lead Party of a BMU and so the terms describing Black Start instructions and fuel compensation relate to Lead Parties. This will be outdated when assets within a BM Unit not operated by the Lead Party of the BM Unit will be able to provide the service following NGESO's project. The Issue 100 Proposer envisaged that the BSC would provide a single and consistent place for describing compensation. Therefore, if it doesn't cover assets within a BM Unit there is a potential issue.

The Issue 100 Workgroup was formed to consider any BSC impacts and whether any changes to the BSC, Code Subsidiary Documents (CSDs), (Balancing and Settlement Code Procedures (BSCPs), etc.) or BSC systems are required, to reflect a new approach to:

- How Distribution and Transmission connected service providers should be compensated for any fuel used following a Black Start instruction; and
- The role Distribution System Operators (DSOs) and Distributed Energy Resources should play in the end-to-end Black Start process, including Metering System Identifiers (MSIDs) also registered within a Virtual Lead Party's (VLP) Secondary BM Unit.

Having considered these points, the Proposer was seeking a recommendation from the Issue Group on the changes that should be made to the BSC and to any other Codes to give effect to these changes.

Related Grid Code Modifications

Related Grid Code Modifications		
Reference	Title	Brief description
GC0148	Implementation of EU Emergency and Restoration Code Phase II	Completes the GB implementation of the network code on electricity emergency and restoration (NCER)
GC0156	Facilitating the Implementation of the Electricity System Restoration Standard	Clarifies the requirements on Connection Use of System (CUSC) parties, Restoration Service Providers (RSPs) and Distribution Network Operators taking part in restoration activities of

		their obligations so that NGESO can satisfy the new ESO Licence obligation

The scope of these two Modifications, which are being progressed through the Grid Code Modification process, is wider than just embedding Distributed ReStart into the Grid Code. GC0156 is due to be submitted to Ofgem by June 2023 and Workgroup meetings are currently taking place on a monthly basis with seven workstreams in total.

Existing Black Start arrangements

What is Black Start?

Black Start is the process used to restore power in the event of a Total or Partial Shutdown of the NETS.

Where are Black Start provisions described?

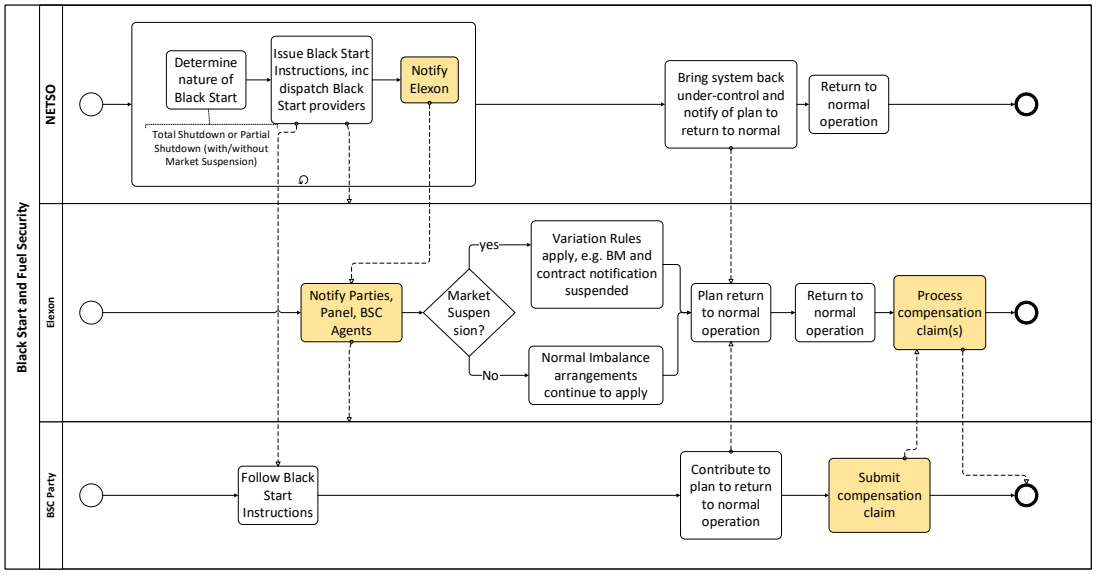
- Grid Code Operating Code (OC) 9 describes operationally how the National Electricity Transmission System Operator (NETSO) will restore the Transmission System, with support from Black Start Service Providers
- BSC Section G3 'Contingencies'[15] and BSCP201 'Black Start and Fuel Security Contingency Provisions and Claims Processes'[16] describes consequential actions managed under the BSC i.e. rules for communicating details of when Black Start Periods begin and end, market suspension and subsequent claims for compensation
- Restoration Services contracts that support the over-arching Grid Code requirements. Where the NETSO procures Black Start services these are typically covered by dedicated contracts between the provider and the NETSO

How does Black Start work?

This flow diagram illustrates the end to end processes should the NETSO use Black Start to recover some or all of the Transmission System.

This provided context for Issue 100, as the scope of Issue 100 focussed on some elements within the process only e.g. communications and compensation arrangements. The highlighted yellow boxes show a touchpoint with Elexon (as the Balancing and Settlement Code Company (BSCCo)) as part of the process.

[15] https://bscdocs.elexon.co.uk/bsc/bsc-section-g-contingencies#section-g-3
[16] https://bscdocs.elexon.co.uk/bsc-procedures/bscp201-black-start-and-fuel-security-contingency-provisions-and-claims-processes



As part of monitoring the Transmission System continuously, the NETSO will determine whether it is a Partial or Total Shutdown they need to manage and issue Black Start Instructions to providers as appropriate.

The NETSO must notify Elexon of the start of a Black Start and all instructions to Users (affected by the Black Start), i.e. Black Start Instructions, are treated as Emergency Instructions.

Not all Black Start events result in a Market Suspension – i.e. Partial Shutdowns only trigger suspension if certain criteria are met. The NETSO must monitor the situation every 15 minutes to determine if Suspension criteria has been met.

Market Suspension requires BSC arrangements to be varied in some key ways:

- no contracts
- credit calculations varied (Credit Assessment Energy Indebtedness (CEI) and Metered Energy Indebtedness (MEI) are set to 0)

The NETSO and Elexon/BSC Panel will make plans to return to normal operation and assuming market conditions and events align to this plan, this ends the Black Start event and opens the doors to Parties making claims for compensation.

Existing Black Start Compensation arrangements

BSC Parties whose BMU(s) are affected by a Black Start Instruction may submit claims to the BSC Panel's Claims Committee for 'Avoidable Costs' (defined by BSC Section G2).

These may be made up to 20 Working Days (WDs) following the end of the Black Start event (unless the BSC Panel grants the Party an extension).

What are 'Avoidable Costs'?

Avoidable Costs are described in the BSC by the following provisions:

Section G 'Contingencies'

'… the Panel shall determine, in its opinion, what is the amount of the ***net costs of operating the BM Unit which would not have been incurred but for****:*

(a) the relevant changes in Exports and/or Imports: or

(b) ***a black start instruction****.'*

'G 2.1.3 For the purposes of the Code, the "Avoidable Costs" shall be the amount determined by the Panel under paragraph 2.1.2 (which may for the avoidance of doubt be a negative amount, in a case where net costs were saved or revenues earned).'

What are 'Black Start Instructions'?

Black Start Instructions are described in the BSC by the following provisions:

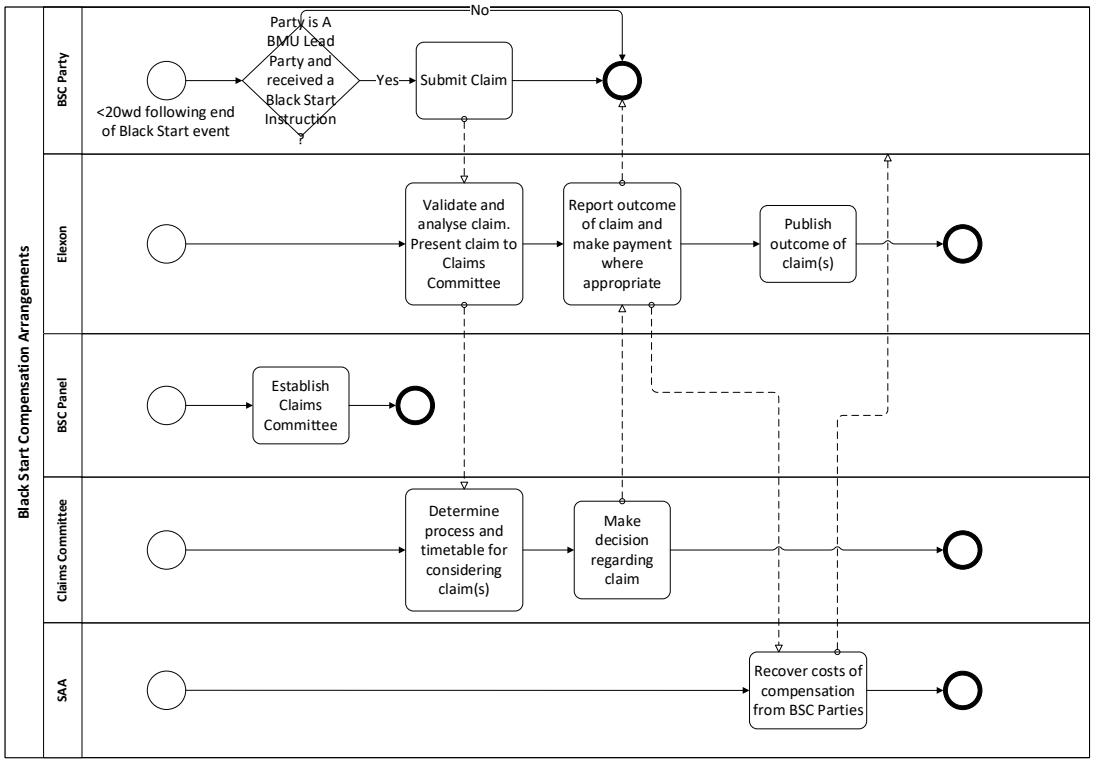
'G 3.3.1C For the purposes of this paragraph 3.3, a "black start instruction" is:

(a) in relation to any Settlement Period(s) which fall within both a Black Start Period and a Market Suspension Period, an instruction given by the NETSO pursuant to OC9.4.7.4, BC2.7 or BC2.9 of the Grid Code; ***[i.e. any instruction by NETSO to any User]*** *or*

*(b) in relation to any Settlement Period(s) which fall within a Black Start Period but not within a Market Suspension Period, an instruction given by the NETSO pursuant to BC2.9.1.2(e)(i) of the Grid Code. [****i.e. instructions by NETSO to those affected/subject of an 'invoked Local Joint Restoration Plan'****]'*

Existing Compensation Arrangements

This flow diagram illustrates the existing Black Start Compensation arrangements:

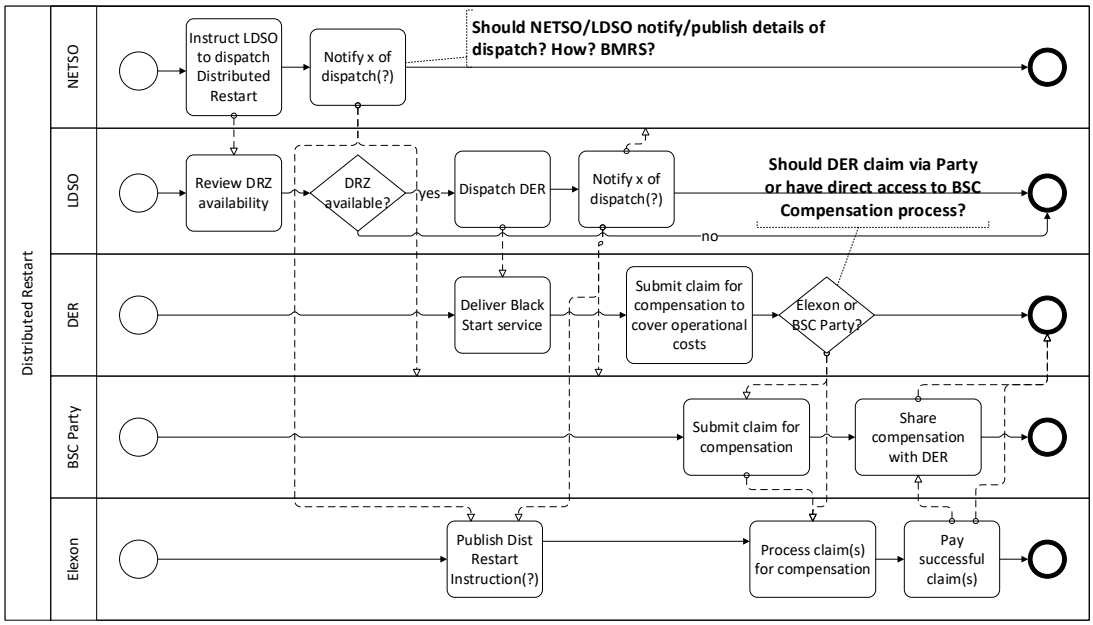


How could Distributed ReStart work in the BSC arrangements?

'Distribution Restoration' will be provided by Distributed Energy Resources (DERs) who will be contracted as part of a feasible Distribution Restoration Zone (DRZ) consisting of a self-starting generator.

DERs are expected to be providers that are registered within a Supplier's BMU and operated by non-BSC Parties. Licensed Distribution System Operators (LDSOs) are responsible for monitoring DRZs and dispatching them should the NETSO instruct the LDSO to provide Distribution Restoration.

The following diagram shows an initial view presented to the Workgroup as to how Distributed ReStart could work in the BSC arrangements, with specific questions in bold for consideration and discussion:


Distributed Restart
NETSO
LDSO
DER
BSC Party
Elexon
Instruct LDSO to dispatch Distributed Restart
Notify x of dispatch(?)
Should NETSO/LDSO notify/publish details of dispatch? How? BMRS?
Review DRZ availability
DRZ available?
yes
Dispatch DER
Notify x of dispatch(?)
Should DER claim via Party or have direct access to BSC Compensation process?
no
Deliver Black Start service
Submit claim for compensation to cover operational costs
Elexon or BSC Party?
Submit claim for compensation
Share compensation with DER
Publish Dist Restart Instruction(?)
Process claim(s) for compensation
Pay successful claim(s)

3. Issue Group's Discussions

The first Issue 100 Workgroup meeting[17] was held on 24 June 2022 to set the scene with the background to the existing Black Start arrangements and also the Distributed ReStart project and the associated BSC considerations on the impact to BSC documents, systems and processes.

Areas for discussion and Terms of Reference

Below is a summary of the Terms of Reference and key areas for discussion by the Issue Group:

Areas for discussion and Terms of Reference	
Terms of Reference Area	Key points to consider
How (existing) compensation arrangements should apply	• Where the DER is not a BSC Party and the plant is not in a dedicated BMU? • Where the service is provided by a technology type which does not use fuel, or if it is provided by storage (battery or pumped hydro) which would expend stored energy?
What are the compensation options?	• Do nothing – there is no issue – i.e. Distributed ReStart providers are already compensated by virtue of their contracts and so there are no avoidable costs to claim. • Do nothing – Lead Parties can already make claims and may include DER costs? • Allow (specific) non-Parties to make claims • Compensation is paid by another means
The role of LDSOs, DERs in the End to End Black Start Process	• Communications/Interfaces between NETSO, LDSOs and DERs (and BSC Parties?) – also where DERs registered by Virtual Lead Parties • Sharing of information relating to (Distributed ReStart) Black Start Instructions • Publication of information relating to (Distributed ReStart) Black Start Instructions • How will Distributed Restart be 'dispatched'? • Is there a need for the BSC to describe these interfaces? • Who and how should information about dispatched Distributed Restart be published? If at all? • Should Distributed Restart be reported to Elexon like other Balancing Services so they can be included in System Price calculation

[17] https://www.elexon.co.uk/meeting/issue-100-workgroup-1/

	(as BSAD) and accounted for in Parties' Imbalance calculations (as ABSVD)?

Issue Group meeting discussions

The Workgroup agreed that the BSC would need to be updated to reflect updates in both the Grid Code and the Distribution Code.

A Workgroup Member questioned whether the arrangements also cover "brown-outs" i.e. not a blackout but system issues with frequency and/or voltage ("the lights are on, but flickering") e.g. local issues in London in August 2019, and whether this falls into Total and/or Partial Shutdown. Following the meeting, Elexon confirmed their view, which is the same as NGESO's view, that a 'brown out' would not meet the current Grid Code definition of Black Start.

A Workgroup Member suggested that interactions with the Capacity Market[18] (CM) will need to be considered, as the rules state that in a Stress Event the CM provider should run. However, if the network is down or unavailable due to a Black Start event and the CM provider does not run when they are required during the CM Stress Event then they will attract CM Penalty Charges. Therefore settling CM Penalty Charges may become a pressing matter that means that Black Start compensation needs to expedited, e.g. by allowing interim payments. There was discussion on whether interim payments are allowed under the current process and if not this could be considered under Distributed ReStart. Interactions with the Capacity Market was also considered as a follow-up action, and the position of both Elexon and NGESO was confirmed (See Post Workgroup meeting actions section below).

The Workgroup discussed what may be considered as Avoidable Costs for DERs. A Workgroup Member noted that it may be dependent on the technology. Another Workgroup Member explained that the burden is on the claimant and that the wording of claims for Black Start was written such that it was broad to allow claims to be considered.

The Workgroup discussed the need for validation and assurance to ensure that a claim is valid i.e. linked to an instruction and also not claimed by both the DER and the Supplier. This may be supported by ensuring that Black Start Instructions are reported like other Balancing Services and so included in Applicable Balancing Services Volume Data (ABSVD).

Post Workgroup meeting actions

Elexon shared a document, Results of actions from Issue 100 Workgroup meeting 1[19], with the Workgroup to discharge the actions taken away at the first meeting.

Although the Issue 100 Workgroup meetings were paused, Elexon continued to engage in other industry meetings, attending the GC0156 Markets and Funding Mechanism subgroup and also bilateral meetings with NGESO and responding to the GC0156 and CMP398 consultations.

[18] https://www.gov.uk/government/publications/capacity-market-rules
[19] https://www.elexon.co.uk/documents/change/issues/51-100/issue-100-workgroup-1-actions-update/

As Issue 100 was paused after the first Workgroup meeting, Elexon shared a note to the GC0156 subgroup on BSC compensation and imbalances[20]. This note discharged an action on Elexon, from the GC0156 Markets and Funding Mechanisms Subgroup, to explain how the BSC calculates imbalance settlement during a black start. To give context to the answer, it explained how the BSC's market suspension and compensation arrangements work during a black start, how they interact with the rules in the Grid Code and the CUSC and how they interact with imbalance charges.

[20] https://www.elexon.co.uk/documents/change/issues/51-100/note-to-gc0156-subgroup-on-bsc-compensation-and-imbalances/

4. Conclusions

After the first Issue 100 Workgroup meeting, the Proposer agreed to pause the work of Issue 100 pending the outcome of the Markets and Funding mechanism subgroup of Grid Code Modification GC0156: Facilitating the Implementation of the Electricity System Restoration Standard.

Elexon responded to the GC0156 Workgroup Consultation on 20 December 2022 to highlight the potential BSC implications, including seeking NGESO's confirmation that Issue 100 can be closed – since it no longer reflects its latest thinking on the intended BSC changes.

Elexon also responded to the CUSC Modification Proposal CMP398: GC0156 Cost Recovery mechanism for CUSC Parties Workgroup Consultation on 10 January 2023, to highlight the potential interactions between the CMP398 solution and the BSC's existing process for Black Start compensation claims.

The consultation responses were published on the Issue 100 webpage on the Elexon website and also on Elexon's response to industry consultations page[21] on Elexon's corporate website and are available below:

- Elexon's GC0156 consultation response:

  Issue 100 webpage[22]

  Elexon's response to industry consultations webpage[23]

- Elexon's CMP398 consultation response:

  Issue 100 webpage[24]

  Elexon's response to industry consultations webpage[25]

Issue 100 was paused pending the outcome of a subgroup of Grid Code (GC) Modification GC0156: Facilitating the Implementation of the Electricity System Restoration Standard (ESRS), for efficiency and to avoid duplication of effort and discussion in the Issue 100 Workgroup and GC0156 subgroup meetings.

NGESO confirmed they were happy for Issue 100 to be closed without any further Workgroup meetings.

NGESO raised BSC Modification P451 'Updating BSC Black Start provisions and compensation arrangements to align with NGESO's new approach to System Restoration'

[21] https://www.elexon.com/what-we-do/consultations/
[22] https://www.elexon.co.uk/documents/change/issues/51-100/elexon-response-to-gc0156-workgroup-consultation/
[23] https://www.elexon.com/2022/12/20/elexons-response-to-national-grid-eso-gc0156-workgroup-consultation/
[24] https://www.elexon.co.uk/documents/change/issues/51-100/elexon-response-to-cmp398-workgroup-consultation/
[25] https://www.elexon.com/2023/01/10/elexons-response-to-the-cmp398-workgroup-consultation/

on 1 March 2023. The P451 Initial Written Assessment[26] was presented to the BSC Panel at its meeting on 9 March 2023.

The P451 Workgroup will consider the following Terms of Reference:

- Who is eligible, why and for what costs?
- How does Elexon recoup the amount paid out for BSC Black Start compensation claims?
- How will implementation of the Grid Code and BSC changes be aligned?

[26] https://www.elexon.co.uk/documents/change/modifications/p451-p500/p451-initial-written-assessment/

Appendix 1: Issue Group Membership

Issue Group membership and attendance

Issue 100 Group Attendance		
Name	Organisation	24 Jun 22
Chris Arnold	Elexon *(Chair)*	✓
Paul Wheeler	Elexon *(Lead Analyst)*	✓
Nicholas Rubin	Elexon *(Design Authority)*	✓
Richard Baker	Elexon *(SME)*	✓
Kenneth Doyle	NGESO *(Proposer)*	✓
Roop Phull	NGESO	✓
Neha Gupta	NGESO	✓
Sade Adenola	NGESO	✓
Andrew Colley	SSE	✓
Lauren Jauss	RWE	✓
Lisa Waters	Waters Wye Associates	✓
Priyanka Mohapatra	ScottishPower Renewables	✓
Sharan Kaur	Peak Gen Power Limited	✓