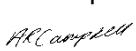
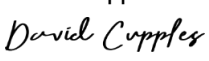
Electricity System Restoration (ESR)

ED2 Engineering Justification Paper Addendum

ED2-NLR(A)-SPEN-001-RES-EJP-ADD

Issue	Date	Comments
Issue 0.1	Aug 2022	Internal Draft for Review
Issue 0.2	Aug 2022	Internal Draft with Comments Addressed
Issue 1.0	Aug 2022	First Issue - Draft Determination Response

Scheme Name	Electricity System Restoration (ESR)		
Primary Investment Driver	Network Resilience, Electricity System Restoration		
Activity	Electricity System Restoration (ESR)		
Reference	ED2-NLR(A)-SPEN-001-RES-ADD		
Output Type	Electricity System Resilience; site compliance		
Cost	**SPM -** £2.265m	**SPD -** £1.175m	
Delivery Year	2023-2028		
Reporting Table	CV12		
Outputs included in ED1	Yes/No		
Business Plan Section	Ensure a Safe and Reliable Electricity Supply		
Spend Apportionment	**ED1**	**ED2**	**ED3**
	£m	**£3.440m**	**£m**

	Proposed by	**Endorsed by**	**Approved by**
Name	Ralph Eyre-Walker	Alex Campbell	David Cupples
Signature			
Date	23 08.2022	23.08.2022	23.08 2022

1 Purpose

This addendum has been prepared to provide additional information and justification to ED2-NLR(A)-SPEN-001-RES-EJP Electricity System Restoration (ESR) EJP following receipt of RIIO-ED2 Draft Determination The content of this addendum is in response to comments and feedback provided by Ofgem as to the "Partial Justification" status of the EJP The purpose of this document is to support Ofgem's assessment for Final Determination including supporting any associated impact on engineering adjustments within Ofgem's financial modelling

2 Ofgem Comments & Feedback

2.1 RIIO-ED2 Draft Determinations SPEN Annex

Ofgem Comment Not listed.

2.2 SQ Process

Following the receipt of Draft Determination, SPEN submitted SQs including 'SPEN_DD_016 – EJP Clarification' which contains detail relevant to this EJP The relevant content of the SQ has been included below for reference

SPEN Submitted SQ_DD_016 (25/07/2022)

ED2-NLR(A)-SPEN-001-RES-EJP Electricity System Restoration (ESR)

"The needs case for some form of investment is clear, and is driven by legislation. The volume derivation for the core sites is clear. However, SPEN's identification of high-priority sites may be inaccurate, which leads to a risk in the efficient delivery of the proposed volumes."

Would providing additional information on the methodology behind identifying high priority sites, along with an assessment of the risks and mitigation actions, reduce Ofgem's concerns about delivery of proposed volumes?

Please note: ESR EJP is listed as partially justified in "Engineering EJP Overview_SPEN1", but does not appear in SPEN Annex Table 26. Can Ofgem please confirm their Draft Determination appraisal of this paper?

Ofgem Response to SQ_DD_016 (08/08/2022)

ED2 NLR(A)-SPEN-001 RES-EJP Electricity System Restoration (ESR)

We confirm that we have reviewed this EJP and we consider the EJP to be 'partially justified' We were not satisfied SPEN provided sufficient information regarding the methodology behind identifying core / high-priority sites, along with SPEN's assessment of the risks and mitigation actions, We noted that

there was not sufficient evidence to convince us that the proposed delivery would align to industry requirements as the applicable modifications to the technical codes are yet to be implemented. Should SPEN provide supplementary evidence in support of the above, we will review those submissions as part of consultation

2.3 Bi-Lateral Feedback

None.

2.4 Any Other Ofgem Feedback

From "Engineering EJP Overview_SPEN1" spreadsheet:

Ofgem Comment Partially Justified. The needs case for some form of investment is clear, and is driven by legislation. The volume derivation for the core sites is clear However, SPEN's identification of high-priority sites may be inaccurate, which leads to a risk in the efficient delivery of the proposed volumes.

3 Additional Justification

3.1 Summary of any SQs from Draft Submission

Ofgem submitted a SQ SPEN-004 on 20/12/21 requesting further explanation of volumes reported within RIIO-ED1. SPEN submitted a response by the 12/01/22 deadline with explanation of the work reported to date.

This SQ has been reproduced in full within "Section 4: Appendices" for reference.

3 2 Our Response

The scope of this paper is the proposed baseline allowance for ESR protection resilience. Baseline allowance for physical site security and telecommunications resilience are out of scope and included within other EJPs.

Resilience of protection systems involves ensuring that local protection equipment will be operational in the event of a nationwide black out, to enable the network to be safely re-energised. All substations have battery supplies installed for this purpose, as any re-energisation event has the same requirement. The key difference in an ESR scenario is the length of time for which the backup power supplies are needed prior to re-energisation of the network

We recognise that the modifications to the technical codes, as proposed within the new ESR standard, are yet to be implemented. Our Cost Benefit Analysis (CBA[1]) considered the impact of this proposal and the cost implications of either building resilience to meet the proposed standard from the outset (five days); or building resilience according to the existing version of ENA G91 (three days) and updating this resilience should the technical codes be updated in the near future.

As detailed in our response to SQ004 (reproduced in Section 4 of this Addendum), during RIIO-ED1, we have progressed investments that were least sensitive to these potential changes. This includes activity that is non-reportable by volumes, such as inspection and maintenance work to identify requirements for Electricity System Restoration resilience. For EHV substations, depending upon standing load, if five-day resilience could be achieved cost efficiently then this work has been completed when aligned with other substation works. This has been reported by number of sites made resilient (row 149 CV12 reporting tables).

As set out in Section 4 of the EJP, the investment plan for RIIO-ED2 has considered the balance between the need to build resilience, and the ongoing uncertainty of the length of time for which the resilience is required.

The two scenarios considered were:

- Build resilience for three days as per ENA G91
    - This is the lowest cost option if the requirement is not changed to five days
    - This is a high-cost option should the requirement be changed to five days within RIIO ED2, as any battery systems installed to meet the three day requirement would need to be replaced/uprated prior to end-of-life in order to meet the new requirement
- Build resilience for five days as per the proposed ESR Standard
    - This is a higher cost option than building resilience for three days, however the increment in cost is less significant when compared with the wholesale replacement of battery systems prior to end-of-life (should the requirement be changed to five days within RIIO ED2)
    - This meets both standards (i.e., either three- or five day resilience) from the outset

The aim that was set for the optioneering process was to identify the most appropriate approach to mitigate the risk of investing in either a solution that is over-specified, or a solution that could soon become obsolete. Through this process, the balance of this risk vs cost demonstrated the five-day

[1] ED2-NLR(A)-SPEN-001-RES-CBA - Electricity System Restoration (ESR) - Issue 2

resilience approach to be the most favourable option and therefore we believe this justifies the proposed approach, as detailed in Section 5 of the EJP and within the accompanying CBA For reference, the outcome of the CBA for each option is reproduced below in Table 1

Table 1: Short list of options which have been costed within the CBA workbook (ED2-NLR(A)-SPEN-001 RES-CBA Electricity System Restoration (ESR) Issue 2)

Option no.	Options considered	Decision	Comment	NPVs based on payback periods				
				10 yrs	20 yrs	30 yrs	45 yrs	Whole Life NPV
Baseline	Costed Baseline - Install Generation at all core/critical sites							
1	Option 1 - maintain previous policy of three days resilience	Rejected	Balanced against risk of future policy change repeat investment within ED2.	£1.63	£0.80	(£0.36)	(£0.24)	(£0.94)
2	Option 2 - proceed with new policy of five days resilience (Do Minimum)	Adopted	Reduced risk of future policy change, with increase in battery cost.	£2.71	£2.43	£1.71	£2.30	£1.86

Sensitivity analysis set out in Section 6.2.1 of the EJP further supported this by demonstrating that this option remains the most favourable for a ±10% variation in battery prices and this option also carries the lowest carbon cost as set out within Section 8.5 of the EJP.

The strategy is to build resilience for five days without power for all substations. As set out in Section 2 of the EJP, this can be achieved by a number of different approaches For the majority of EHV substations, this can be achieved by installing DC load disconnection schemes (Black Start Controllers) to enable power to critical protection equipment for the resilience period using the existing battery power supply systems.

The proposed initial approach taken to identify Core/Critical EHV substation sites, documented within our SUB-01-022 "SPD/SPM Substation Black Start Resilience Strategy and Policy" document was:

1 Customer Service and Network Planning and Regulation (NP&R) to determine the list of core distribution substation sites for 5 days resilience

2. In lieu of further analysis, a working understanding of core sites includes:
   - All Grid Supply Points (GSPs), Grid (132kV), and
   - Strategic EHV substations (network security or critical supplies i.e. dense urban areas, Hospitals, EAC etc.)

The outcomes from each stage of the above process were:

1. Our Customer Service and NP&R teams identified that for the SPM network, Local Joint Restoration Plans (LJRPs) are fundamental to the network re-energisation process in an ESR scenario. NGET, as GB System Operator, have overall responsibility for ESR, however they delegate this responsibility via LJRPs. Once this duty is delegated to SP Energy Networks the SP Energy Networks CEO has overall responsibility for ESR procedures and restoration within the guidelines set out in the LJRP. The outcome of this assessment was that all EHV substations named within the associated LJRPs should be identified as Core/Critical substations.

2 In addition to identifying GSP and 132kV substations as Core/Critical due to their importance to the network, both SPM and SPD maintain a Protected Substation List (PSL) of Strategic EHV substations. These substations provide power to customers with a higher level of requirement, such as network security or critical supplies (i.e. dense urban areas, Hospitals, EAC etc.). The outcome of this assessment was that all EHV substations named within the PSLs should be identified as Core/Critical substations.

The above process identified all the Core/Critical EHV substations on the network. Due to the higher criticality of these sites, the proposal is that the battery systems be upgraded at all of these sites to achieve the proposed resilience level without the need to disconnect non critical supplies This will expediate the full re-energisation of these substations should an ESR event occur

4 Appendix

The content of this appendix has been redacted.