Resilience – Personnel Communications

Engineering Justification Paper

**Resilience – Personnel Communications
Engineering Justification Paper**

1. Executive Summary

This paper relates to the provision of telephony and radio communications for SHE Transmission substations and key operation staff, for both routine and emergency situations.

Communication between our staff is essential for Safe and Secure Network Operations (a strategic theme of our RIIO-T2 Business Plan); between substations, our control centre and staff on the ground at any location and at all times.

This ability is currently provided by traditional public switched telephone network (PSTN) telephony, provided by BT over copper circuits, supported in some areas by Voice over Internet Protocol (VoIP) and Personal Mobile Radios (PMRs). However, BT have committed to withdrawing the PSTN by 2025 and alternative means of communication is, therefore, required.

We propose to deliver this through the implementation of:

- 95 Personal/Portable PMRs and associated training.
- 129 Fixed PMRs and associated training.
- VOTN infrastructure and equipment at 162 sites.

This will enhance our ability to operate not only for business as usual but also in the event of a major system breakdown or blackstart. This project will be delivered within the RIIO-T2 period (by 31st March 2026) at a cost of £1.93m and is required to ensure the ongoing resilience of the SHE Transmission Network.

This scheme is not flagged as eligible for early or late competition due to it being under Ofgem's £50m and £100m thresholds respectively.

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Name of Scheme/Programme	Resilience – Personnel Communications
Primary Investment Driver	Resilience
Scheme reference/ mechanism or category	SHNLT2042
Output references/type	NLRT2SH2042
Cost	£1.93m
Delivery Year	RIIO-T2
Reporting Table	C2.12_Black_Start
Outputs included in RIIO T1 Business Plan	No

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2. Introduction

This Engineering Justification Paper sets out our plans to enhance our personnel communications during the RIIO-T2 period (April 2021 to March 2026).

The Engineering Justification Paper is structured as follows:

Section 3:   Need

This section provides an explanation of the need for the planned works. It provides evidence of the primary and, where applicable, secondary drivers for undertaking the planned works. Where appropriate it provides background information and/or process outputs that generate or support the "need".

Section 4:   Optioneering

This section presents all the options considered to address the "need" that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for Detailed Analysis in Section 5.

Section 5:   Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. Where appropriate the results of Cost Benefit Analysis are discussed and together with supporting objective and engineering judgement contribute toward the identification of a selected option. The section continues by setting out the costs for the selected option.

Section 6:   Conclusion

This section provides summary detail of the selected option. It sets out the scope and outputs, costs and timing of investment and where applicable other key supporting information.

Section 7:   Price Control Deliverables and Ring Fencing
This section provides a view of whether the proposed scheme should be ring-fenced or subject to other funding mechanisms.

Section 8:   Outputs included in RIIO-T1 Business Plan

This section identifies if some or all the outputs were included in the RIIO-T1 Business Plan and provides explanation and justification as to why such outputs are planned to be undertaken in the RIIO-T2 period.

3.   Need

Communication between our staff and between sites is essential for the safe operation of the network. This includes between our control centres to our substations, between substations, and to staff on the ground at any location across our network. This is especially true when acting in response to faults or more severe region wide disruption including a black start event.

3.1.   Redundancy

In the modern world a wide variety of methods are available for communicating. In particular, mobile telephony & wireless data gives tools to the public and business that allow communication and sharing of data from anywhere. However, the backbone to all of these services is electricity. Many of these systems are not designed with resilience in mind and will be unavailable either immediately, or very shortly after, a network outage or disruption. As an operator responsible for "keeping the lights on", we can make use of these technologies to improve our business performance, but we cannot rely on them solely as a means to continuing operating during a network event.

3.2.   Network Obsolescence

Historically, most of our substations sites utilise traditional public switched telephone network (PSTN) telephony, provided by BT over copper circuits. This has given us good levels of resilience as the PSTN network is designed to continue operating during power outages over several days. However, due to its age and technical obsolescence, BT have indicated that this PSTN service will be decommissioned by 2025 at the latest, which means an alternative solution is required.

3.3.   VoIP Technology

We now routinely equip our newer substations with Voice-over-IP (VoIP) telephony delivered through the SSE Group corporate IT network. This gives us modern & effective communications linked into our corporate network, however it does have its disadvantages.

Firstly, in terms of resilience VoIP services are dependent on supplies both at the end-point (i.e. the phone itself) plus the servers used for operating the system. Our central corporate IT infrastructure is not designed to operate without power over the length of times that could be experienced during a UK wide black start event, which could result in a loss of site communications. Improving this centrally would be a relatively inefficient solution as these servers operate for the entire SSE Group, a system several times larger than that required for essential operations.

Secondly, as it is interconnected with our corporate IT network there is a risk that any cyber-attack on our network could interfere with our VoIP telephony and disrupt communications to our sites. The operational technology network is designed to be significantly more secure than the corporate network, and so placing a new standalone system within the Operational Technology Network

(OTN). This is more practical and cost-effective than attempting to improve the security across our entire corporate network. We design our control systems so that in an absolute worst case-scenario we can revert to operating without our corporate IT network. Our existing VoIP system does not fit within that business continuity plan.

3.4. Remote Communications during Network Events

Depending on the nature of any network event, mobile phone masts may suffer from a loss of supply and therefore networks will not be accessible. During severe weather events, most operational staff will be working on overhead lines and therefore will not be able to utilise OTN within substations. Therefore, an alternative means of communications will be required for operational staff.

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4. Optioneering

This section presents all the options considered to address the "need" that is described in Section 3. Each option considered here is either discounted at this Optioneering stage with supporting reasoning provided or is taken forward for detailed analysis in Section 5.

When reviewing our options in this area, we produced a three-tier approach to our development (in addition to a "Do Nothing" option:

- ***Minimum Requirements***

  - The bare minimum required to "keep the lights on" & maintain legal/regulatory compliance

- ***Responsible Operator***

  - A more resilient network for longer term customer benefit

- ***Progressive Network Enabler***

  - An adaptable, sustainable and flexible network providing enhanced value to current and future customers

In this workstream, "Do Nothing", "Minimum Requirements", and "Responsible Operator" options are considered.

The scope, risks and benefits of each of these is laid out below.

4.1. Do Nothing

This option will entail continued reliance on existing PTSN circuits, which will not be available after 2025. If no action was taken in this area over the course of RIIO-T2, we would significantly limit our ability to communicate with operational staff in the field during a system event.

On this basis, this option has not been progressed to Detailed Analysis.

NOT PROGRESSED TO DETAILED ANALYSIS

4.2. Minimum Requirements

The scope for the Minimum Requirements option is the wider deployment of VoIP over the Operational Technology Network, or VOTN.

VOTN is a new standalone VoIP system which will be delivered over our Operational Technology Network. The OTN will be reinforced and rolled out to the vast majority of our sites under T2BP-JPS-0006, Transmission Communication Upgrade. This is intended to give us the advantages of modern

VoIP telephony for day to day operations, whilst having the necessary resilience of services in the background delivered by OTN. This will give the necessary levels of autonomy for the system to handle major events such as black start and place the system within our OTN network behind additional levels of IT security.

This option addresses the majority of concerns raised in Section 3. However, this option does have its limitations, as it does not cover operational staff when they are not at a fixed site.

On this basis, this option has been progressed to Detailed Analysis.

PROGRESSED TO DETAILED ANALYSIS

4.3.   Responsible Operator

In addition to the scope of works described in Section 4.2, this option addresses the need to provide resilient communications for operational staff when not at a fixed site, through the provision of Portable Mobile Radios (PMRs) on our existing SSE telecoms network.

This will provide an additional option for site communications as a fall-back strategy in the event of normal systems being disrupted. It also provides a resilient communications option for staff in the field out-with any of our fixed sites who are otherwise dependent on mobile telephony or travel to a fixed location.

SSE already owns and operates its own PMR network, accessed by SHE Transmission through a service agreement. This radio network has been designed as a fall-back communications system for both fixed sites and also field staff. Xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx xxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxxx.

In 2013, SSEN experienced widespread storms and freak weather which interrupted supplies across the Argyll area for a duration of several days. The PMR system remained operational throughout, allowing for a co-ordinated and efficient response in restoring power to customers. Other more routine communication methods such as mobile telephony failed rapidly due to loss of power supplies, and indeed the PMR system proved to be more resilient than the fall-back communications used by other agencies including the emergency services. This experience proves the potential benefits to SHE Transmission, should a similar or black start event occur in future.

The PMR network is a low cost but reliable solution, meeting the requirements of personnel communication in a Black Start situation, meeting the current resilience standard of at least 72 hours. The infrastructure provides widespread coverage across our network and support contracts are already in place, and so additional devices, with refresher training would be the only likely requirement. It is not proposed to further extend the coverage of the existing PMR network, which would be significantly more expensive.

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Key operational staff, including those needed for Black Start restoration have been identified, and will be provided with a personal PMR. In addition, fixed PMRs should be installed in all substations with coverage which do not currently have one. Fixed PMRs are required in our substations to ensure coverage while working indoors, as well as giving PMR access to other staff working on site.

On this basis, this option has been progressed to Detailed Analysis.

PROGRESSED TO DETAILED ANALYSIS

A summary of the above optioneering is shown in Table 1, below.

	Do Nothing	Minimum Requirements	Responsible Operator
Remove reliance on PSTN system	✗	✓	✓
Use of VOTN	✗	✓	✓
PMR coverage at substations	✗	✓	✓
Full staff PMR coverage	✗	✗	✓
Partial Blackstart capability	✗	✓	✓
Full blackstart capbility	✗	✗	✓

Table 1 - Optioneering Summary

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5. Detailed Analysis

This section considers in more detail each of the options taken forward from the Optioneering section. It examines three comparative factors in order to determine the preferred option:

- Risk,
- Stakeholder Requirements, and
- Cost.

5.1. Risk and Benefit Analysis

Due to the nature of this project, risks and benefits involved are not easily quantifiable and are not suitable for traditional Cost Benefit Analysis.

In order to demonstrate the benefits of delivering this project, we have carried out a Risk and Benefit Analysis. For each option taken forward to Detailed Analysis, it looks at the existing risks, the likelihood of these risks being realised, and the severity should that happen. The likelihood and severity combine to give an overall Unmitigated Risk Rating.

Mitigation actions delivered by each option are then identified, and the likelihood and severity are reappraised, resulting in a Mitigated Risk Rating.

This exercise was carried out for the Personnel Communications proposals. As can be seen in

Risk ID	Risk Title	Risk	Unmitigated Overall Risk Rating	Minimum Requirements Mitigated Overall Risk Rating	Responsible Operator Mitigated Overall Risk Rating
1	PTSN Withdrawal	BT plan to withdraw PTSN by 2025	Severe	Medium	Medium
2	Network Events	Loss of mobile phone signal in a network event would not allow us to communicate with staff at remote locations	Severe	Severe	Medium
3	VoIP Technology - Black Start	IT infrastructure is not designed to operate without power over the length of times that could be experienced during a UK wide black start event, which could result in a loss of site communications	Severe	Medium	Medium

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4	VoIP technology - Cyber Security	Any attack on our corporate IT network could interfere with VoIP telephony and disrupt communications with our sites	Severe	Medium	Medium
		OVERALL	Severe	High	Medium

Table 2, the Unmitigated Risk Rating is "Severe". Once all the mitigations are taken into account, the Mitigated Risk Rating falls to "High" for Minimum Requirements and "Medium" for the Responsible Operator Option. Therefore, there is some additional risk benefit is delivered by the Responsible Operator option. The full Risk & Benefit Analysis is contained within Appendix A.

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Risk ID	Risk Title	Risk	Unmitigated Overall Risk Rating	Minimum Requirements — Mitigated Overall Risk Rating	Responsible Operator — Mitigated Overall Risk Rating
1	PTSN Withdrawal	BT plan to withdraw PTSN by 2025	Severe	Medium	Medium
2	Network Events	Loss of mobile phone signal in a network event would not allow us to communicate with staff at remote locations	Severe	Severe	Medium
3	VoIP Technology - Black Start	IT infrastructure is not designed to operate without power over the length of times that could be experienced during a UK wide black start event, which could result in a loss of site communications	Severe	Medium	Medium
4	VoIP technology - Cyber Security	Any attack on our corporate IT network could interfere with VoIP telephony and disrupt communications with our sites	Severe	Medium	Medium
	OVERALL		Severe	High	Medium

Table 2 - Risk and Benefit Analysis Results

5.2.   Stakeholder Engagement

Consultation with stakeholders at our Stakeholder Engagement event "Operating a Resilient and Reliable Network" indicated support for proactively improving resilience. There were no specific questions in this area, so stakeholders did not vote on it as part of the table exercises but, overall, the response from stakeholders indicated that resilience in our activities would be favourable.

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5.3.   Costs – Minimum Requirements

Costs for this option are forecast at £1.16m over the course of the RIIO-T2 price control, as shown in Table 3.

	Unit Cost (£k)	Quantity	Cost (£k)
VOTN (site)	█	162	█
VOTN (infrastructure)		1	█
On Costs			█
Risk & Contingency			█
Total Cost			1,160

Table 3 - Forecast Costs for Minimum Requirements Option

5.4.   Costs – Responsible Operator

Costs for this option are forecast at £1.93m over the course of the RIIO-T2 price control, as shown in Table 4. It is understood there will be no additional service costs when expanding the number of PMRs as this service contract covers the existing infrastructure which would still be utilised for communication. Costs for PMR training are included due to the limited user experience in recent years.

	Unit Cost (£k)	Quantity	Cost (£k)
Personal/Portable PMR	█	95	█
Fixed PMR	█	129	█
PMR Training	█	10	█
PMR Roll-out		1	█
VOTN (Site)	█	162	█
VOTN (infrastructure)		1	█
On Costs			█
Risk & Contingency			█
Total Cost			1,926

Table 4 - Forecast Costs for Responsible Operator Option

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5.5.   Proposed Solution

We have examined each of the options in terms of three comparative factors:

- Cost
- Risk Reduction
- Stakeholder Requirements

and have determined through this analysis that the "Responsible Operator" option is to be preferred, as it delivers improved performance and greater risk reduction to the "Minimum Requirements" option and aligns with Stakeholder Requirements.

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6. Conclusion

Communicating with our operational staff is vital to the safe operation of our network. It enables us to coordinate responses to emergency events and provide consumers with a more effective service. However, the withdrawal of the existing PTSN requires us to deploy our own diverse, resilient communications system.

An optioneering assessment took place which investigated two options, both of which were taken forward for detailed analysis.

Taking account of that detailed analysis, the preferred option is the Responsible Operator option, which will deliver:

- 95 Personal/Portable PMRs and associated training,
- 129 Fixed PMRs and associated training,
- VOTN infrastructure and equipment at 162 sites.

This will enhance our ability to operate not only for business as usual but also in the event of a major system breakdown or blackstart. This project will cover the whole course of the RIIO-T2 price control and costs are forecast to be £1.93m.

This scheme is not flagged as eligible for early or late competition due to it being under Ofgem's £50m and £100m thresholds respectively.

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7. Price Control Deliverables and Ring Fencing

As set out in our Regulatory Framework paper (section 1.12 and Appendix 3) we support a key principle from Citizens Advice – one that guarantees delivery of outcomes equivalent to the funding received - to ensure that RIIO-T2 really deliver for consumers. At the project level this means that if we don't deliver the output, or a materially equivalent outputs, we commit to returning the ex-ante allowance for the output not delivered.

This means that if the funding for Resilience – Personnel Communications should be ring-fenced and if it does not go ahead, we will return the allowances of £1.93m in full (minus any justified preconstruction expenditure).

It also means that we commit to delivering the output specified above for the costs of £1.93m. If we do not deliver the output, or a materially equivalent output, we commit to returning a proportion of the ex-ante allowance. The detailed methodology should be decided at when developing the Close Out methodologies but should apply the same principles of uncertainty mechanisms - that any under delivery should be material.

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8.   Outputs included in RIIO-T1 Plans

There are no outputs associated with this scheme included in our RIIO-T1 plans.

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Appendix A

Project Risk & Benefit Matrix - Minimum Requirements										
Risk ID	Risk Title	Risk	Unmitigated Risk Likelihood	Unmitigated Risk Impact	Unmitigated Overall Risk Rating	Mitigation Action	Mitigated Risk Likelihood	Mitigated Risk Impact	Mitigated Overall Risk Rating	Benefits
1	PTSN Withdrawal	BT plan to withdraw PTSN by 2025	Almost Certain	Catastrophic	Severe	Wider deployment of VoIP as part of a resilient comms network	Almost Never	Major	Medium	Necessary resilience of services/autonomy
2	Network Events	Loss of mobile phone signal in a network event would not allow us to communicate with staff at remote locations	Almost Certain	Major	Severe		Almost Certain	Major	Severe	
3	VoIP Technology – Black Start	IT infrastructure is not designed to operate without power over the length of times that could be experienced during a UK wide black start event, which could result in a loss of site communications	Unlikely	Catastrophic	Severe	Wider deployment of VOTN as part of a resilient comms network	Almost Never	Major	Medium	Necessary resilience of services/autonomy
4	VoIP technology – Cyber Security	Any attack on our corporate IT network could interfere with VoIP telephony and disrupt communications with our sites	Unlikely	Catastrophic	Severe	Wider deployment of VOTN as part of a resilient comms network	Almost Never	Major	Medium	Necessary resilience of services/autonomy

Figure 1 - Risk & Benefit Matrix – Minimum Requirements

Project Risk & Benefit Matrix - Responsible Operator										
Risk ID	Risk Title	Risk	Unmitigated Risk Likelihood	Unmitigated Risk Impact	Unmitigated Overall Risk Rating	Mitigation Action	Mitigated Risk Likelihood	Mitigated Risk Impact	Mitigated Overall Risk Rating	Benefits
1	PTSN Withdrawal	BT plan to withdraw PTSN by 2025	Almost Certain	Catastrophic	Severe	Wider deployment of VoIP as part of a resilient comms network	Almost Never	Major	Medium	Necessary resilience of services/autonomy
2	Network Events	Loss of mobile phone signal in a network event would not allow us to communicate with staff at remote locations	Almost Certain	Major	Severe	Introduction of new PMRs	Almost Never	Major	Medium	Contact with Operational Staff at all times; no reliance on the corporate IT network.
3	VoIP Technology – Black Start	IT infrastructure is not designed to operate without power over the length of times that could be experienced during a UK wide black start event, which could result in a loss of site communications	Unlikely	Catastrophic	Severe	Wider deployment of VOTN as part of a resilient comms network	Almost Never	Major	Medium	Necessary resilience of services/autonomy
4	VoIP technology – Cyber Security	Any attack on our corporate IT network could interfere with VoIP telephony and disrupt communications with our sites	Unlikely	Catastrophic	Severe	Wider deployment of VOTN as part of a resilient comms network	Almost Never	Major	Medium	Necessary resilience of services/autonomy

Figure 2 - Risk & Benefit Matrix – Responsible Operator

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Unmitigated Likelihood

		Almost Never	Hardly Ever	Unlikely	Possible	Likely	Almost Certain
Unmitigated Impact	Catastrophic	High	High	Severe ③ ④	Severe	Severe	Severe ①
	Severe	Medium	High	High	Severe	Severe	Severe
	Major	Medium	Medium	High	High	Severe	Severe ②
	Serious	Low	Medium	Medium	High	High	Severe
	Minor	Low	Low	Medium	Medium	High	High
	Incidental	Low	Low	Low	Medium	Medium	Medium

Mitigated Likelihood
(Responsible Operator)

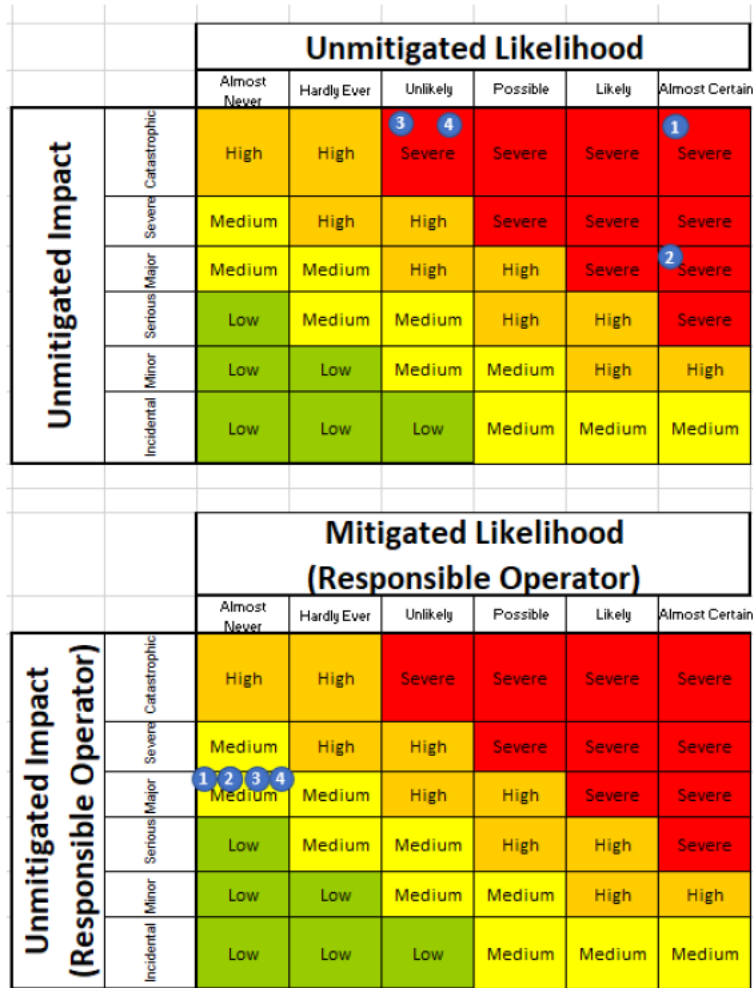|		Almost Never	Hardly Ever	Unlikely	Possible	Likely	Almost Certain
Unmitigated Impact (Responsible Operator)	Catastrophic	High	High	Severe	Severe	Severe	Severe
	Severe	Medium	High	High	Severe	Severe	Severe
	Major	Medium ① ② ③ ④	Medium	High	High	Severe	Severe
	Serious	Low	Medium	Medium	High	High	Severe
	Minor	Low	Low	Medium	Medium	High	High
	Incidental	Low	Low	Low	Medium	Medium	Medium

Figure 3 - Risk Heat Maps for Preferred Option