

# Physical Site Security Engineering Justification Paper



**Engineering Justification Paper**  
**Physical Site Security****1 Executive Summary**

This Engineering Justification paper sets out the need for an increase in physical site security due to SHE Transmission's ongoing commitment to the Electricity Safety, Quality and Continuity Regulations 2002 (ESQCR), as well as continued concern over the security of our sites from potentially malicious actors and the impact it might have on the safety and reliability of the network.

Our proposals are supported by feedback from stakeholder roadshows and discussions with government agencies such as BEIS.

We propose to undertake the following scope of work during the RIIO-T2 period:

- Install CCTV and alarms at 35 Substation and Cable Sealing End compounds where none exist and upgrade 20 obsolete systems.
- A quantity of 23 substations with chain-link fencing will be upgraded to palisade complete with new safety signage.
- Anti-Climbing Devices (ACDs) on circa 1000 towers over 67 circuits to be upgraded to fully comply with the Energy Networks Association Technical Specification (ENA TS 43-90) and SHE Transmission Specification SP-NET-OHL-516.

The cost to deliver the above option is £9.59m. This above project estimate is based on previous expenditure for similar tasks and would be delivered as an ongoing roll-out of project works through the T2 period.

Upon project delivery there are several benefits relating to the RIIO-T2 business goals which have been listed below:

- Prevent access for "bad actors".
- Improved Safety Outcomes.
- Maintaining network reliability.

All of these benefits contribute to our goal to aim for 100% transmission network reliability for homes and businesses.

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	Transmission Physical Site Security
Primary Investment Driver	Resilience
Scheme reference/ mechanism or category	SHNLT2033
Output references/type	NLRT2SH2033
Cost	£9.59m
Delivery Year	2021 - 2026
Reporting Table	C2.24 Legal & Safety
Outputs included in RIIO T1 Business Plan	No

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**Engineering Justification Paper  
Transmission Site Security****2 Introduction**

This Engineering Justification Paper sets out our plans to enhance physical site security 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.

**Section 9: References**

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### 3 Need

We currently own and operate 146 substation and cable sealing end compounds (CSE). We also manage and maintain around 8,500 Overhead line towers and 2,900 wooden poles. We have a legal obligation to comply with the Electricity Safety, Quality and Continuity Regulation 2002 to continually undertake risk assessments on all our overhead lines and substations. These risk assessments analyse the use of the surrounding land, history of vandalism or trespass, the security in place at the site, and additional hazards (i.e., exposed copper earthing, network data port) to determine the risk of that site, in order that we can have sufficient risk mitigation in place. Additionally, during times of heightened risk, there is an increased potential for bad actors to attempt access to our substations.

#### 3.1 Unauthorised Access Detection

CCTV and Alarm Systems are key in detecting any unauthorised presence on our sites, whether that may be "bad actors" or curious children. 35 substations on our network currently have no CCTV and alarm systems in place. Another 20 substations have systems which are ageing and are obsolete or nearing obsolescence. These 55 sites will need to be addressed in order to ensure the security of our assets and the safety of the public.

#### 3.2 Unauthorised Access Deterrent

23 substations within our network are currently protected by chain-link fencing. This is not compliant with Energy Networks Association guidance on the security of Substations, therefore it is no longer an acceptable standard and does not provide sufficient deterrent to unauthorised persons. This lack of suitable deterrent could result in injury to persons, damage to our plant or malicious interference that could cause severe network disruption including prolonged power cuts. It is not weather resilient and is not resilient to rust and corrosion.

#### 3.3 ENATS 43-90

In RIIO-T1, we have only been upgrading Anti-Climbing Devices on steel lattice towers as part of larger capital works or where a defect has been identified and this approach is compliant with legislation.

However, the Energy Network Association (ENA)'s Publication, "Technical Specification 43-90 Anti-Climbing Measures and Safety Signs for Overhead (Issue 6)" recommends more proactive action and advises a selection of three types of ACD depending on the results of a risk assessment. For RIIO-T2, we have identified 67 circuits on our network which contain towers that do not meet this new standard.

It should be noted that this work is required in addition to that covered by the Physical Security Upgrade Programme (PSUP).



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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

### 4.1 Do Nothing

The option to “Do Nothing” would require no intervention during RIIO-T2. However, the following concerns remain unaddressed:

- Substations with no CCTV and alarm Systems
- Substations with ageing/obsolete CCTV and alarm systems
- Substations with poor/ageing fencing
- Tower lines with obsolete anti-climbing devices

On this basis, this option has not been progressed to detailed analysis.

**NOT PROGRESSED TO DETAILED ANALYSIS**



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### 4.2 Minimum Requirements

The Minimum Requirements approach for Physical Site Security involves the upgrading of 20 CCTV and alarm Systems which are ageing and/or obsolete. However, the following concerns remain unaddressed:

- Substations with no CCTV and alarm Systems
- Substations with poor/ageing fencing
- Tower lines with obsolete anti-climbing devices

On this basis, this option has not been progressed to detailed analysis.

**NOT PROGRESSED TO DETAILED ANALYSIS**

### 4.3 Responsible Operator

This approach includes the upgrades discussed in 4.2. Additionally, the Responsible Operator approach also comprises the replacement of chain-link fencing with palisade fencing at 23 sites. The benefits of this new fencing are:

- Compliance with the Energy Networks Association Guidance Engineering Report (ER) 2 on the security of Substations
- Difficult to climb due to a lack of footholds.
- Strong visual deterrent.
- Strong and durable construction with high rust and corrosion resistance.
- Palisade fencing is resistant to extreme weather and does not require regular maintenance work or repairs.

Details of the 23 substations involved can be found in Appendix A.

Further, the Responsible Operator approach includes work required on circa 1000 towers across 67 circuits on our network. In order to bring them in line with ENATS 43-90.

The benefits of undertaking all this work are:

- Protection of our assets minimises outage risks and provide enhanced safety to members of the public.
- This option, along with the previous work packages would give improved coverage and protection with the Alarm Receiving Centre (ARC) giving 24/7 support.

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- This option will provide increased deterrence, detection and delay.

More details can be found in Appendix B. However, whilst upgrading old CCTV systems improves the current situation, this option still leaves a number of existing sites without CCTV coverage. The risk associated with this option is that it does not cover all SHE Transmission substations.

On this basis, this option has been progressed to detailed analysis.

**PROGRESSED TO DETAILED ANALYSIS**

#### 4.4 Progressive Network Enabler

This option would extend the scope of works outlined under Responsible Operator to ensure that the remaining 35 substation sites, without CCTV and alarms are so equipped. More details can be found in Appendix C.

Benefits of completing this include giving full coverage and protection with the Alarm Receiving Centre (ARC) giving 24/7 support.

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	Progressive Network Enabler
Replace existing obsolete alarms / CCTV	✗	✓	✓	✓
Alarms at all substations	✗	✗	✗	✓
CCTV at all substations	✗	✗	✗	✓
Palisade Fencing at all substations	✗	✗	✓	✓
ENATS 43-90 compliance on OH Lines	✗	✗	✓	✓

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;
- 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 the delivery of each option are then identified for each risk, and the likelihood and severity are reappraised, resulting in a Mitigated Risk Rating. This exercise was carried out for the Physical Site Security proposals. As can be seen in Table 2, the Unmitigated Risk Rating is "High". Once all the mitigations are taken into account, the Mitigated Risk Rating falls to "Medium" for Progressive Network Enabler but remains at "High" for Responsible Operator. Therefore, the Progressive Network Enabler option offers an improved Risk Reduction. The full Risk & Benefit Analysis is contained within Appendix D.

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Risk ID	Risk Title	Risk	Unmitigated Overall Risk Rating	Responsible Operator	Progressive Network Enabler
				Mitigated Overall Risk Rating	Mitigated Overall Risk Rating
1	CCTV & Alarms	Some Sites have no CCTV and Alarms and therefore there is no real deterrent. Additionally, some existing CCTV systems are ageing and are obsolete. Lack of good CCTV could allow unauthorised access	Severe	High	Medium
2	Fencing	23 substations currently protected with chain link fencing which does not offer sufficient deterrent. Could encourage unauthorised access	Severe	High	High
3	ENATS 43-90	Circa 1000 towers not up to current standards. In the short term could encourage unauthorised access. In the longer term this may pose a compliance issue.	Severe	Medium	Medium
<b>OVERALL</b>			<b>Severe</b>	<b>High</b>	<b>Medium</b>

Table 2 - Risk and Benefit Analysis Results

## 5.2 Stakeholder Engagement

On 5 March 2019, SHE Transmission hosted a stakeholder workshop, aimed at gathering feedback from its stakeholders on its approach to network resilience and reliability for the RIIO-T2 plan. A total of 46 stakeholders attended the workshop, representing 31 organisations.

Stakeholders were asked to identify their preferred option for the RIIO-T2 Business plan, without an awareness of the costs (exercise 1). At the end of the workshop, once stakeholders had visited and discussed all four topics, they were asked to complete another voting exercise (exercise 2), this time with knowledge of the cost implications.

The results of the voting exercises are shown in Figure 1.



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Figure 1 - Stakeholder Feedback

Stakeholder Feedback clearly showed that fencing upgrades only would not be sufficient, but that CCTV and alarm improvements should be made at all substations.

### 5.3 Costs – Responsible Operator

In addition to the CCTV upgrades, this approach will include palisade fencing upgrades. Improvements to chain-link fencing is required at the substations detailed in Appendix A. This option will also allow for the upgrade of ACDs on 67 circuits, further information on these circuits is contained in Appendix B. Costs for this approach are forecast at £8.82m, as shown in Table .

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**5.4 Costs - Progressive Network Enabler**

In addition to the works described above, this option will expand the upgrade of CCTV and alarms to all substations. Costs for this approach are forecast at £9.59m as shown in Table Table 3.

	Responsible Operator (£m)	Progressive Network Enabler (£m)
CCTV/Alarms		
Palisade Upgrades		
ACD Upgrades		
On Costs		
Risk		
<b>Total</b>	<b>8.82</b>	<b>9.59</b>

Table 3 - Option Costs

**5.5 Proposed Solution**

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

- Cost;
- Risk Reduction;
- Stakeholder Requirements.

The preferred option is "Progressive Network Enabler" as it delivers greater risk reduction at a modest cost increase compared to the other option. It also aligns with our Stakeholder Requirements.

**Engineering Justification Paper  
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This Engineering Justification Paper sets out the need for improvements to Site Security Enhancements to continue ongoing compliance with SHE Transmission's ongoing commitment to the "Electricity Safety, Quality and Continuity Regulation 2002" (ESQCR) and protecting our assets from malicious interference.

The paper investigated several different security enhancements and determined that there was an opportunity to perform a significant upgrade to individual site and tower security with the additions and enhancements to the CCTV / Alarm systems, and the chain link fencing at substation sites and ENATS compliance requirements on the circa 1000 towers on the network.

During the detailed analysis review, specific sites and towers were outlined for upgrade works including the lengths of palisade required and the number of towers required for ENATS compliance upgrades.

The preferred option is the "Progressive Network Enabler" option, which consists of:

- Upgrading all CCTV and alarm systems at 20 substations.
- Installing CCTV and alarms at 35 additional substations, where none currently exists.
- Upgrading fencing at 23 sites.
- Upgrade ACDs on circa 1000 towers across 67 circuits

The cost analysis for this project stands at £9.59m. This cost is based on previous expenditure for similar tasks. It will be delivered over the course of the RIIO-T2 price control period.

The project will deliver the following associated benefits relating to our RIIO-T2 business goals:

- **Improved Safety:** Whilst recognising that the incident rate is low, investment in site security will ensure that the safety of the public is maintained.
- **Maintaining network reliability:** Reducing the possibility of theft of vital materials and the malicious damage of our equipment will ensure reliability of the network is maintained by preventing possible supply interruptions, supporting the goal to aim for "100% transmission network reliability for homes and businesses" as outlined in the "Network for Net Zero" Business plan.

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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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 physical site security should be ring-fenced and if it does not go ahead, we will return the allowances of £9.59m in full (minus any justified preconstruction expenditure).

It also means that we commit to delivering physical site security for the costs of £9.59m. If we do not deliver the output outlined above, 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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**9 References**

- Electricity Safety, Quality and Continuity Regulations 2002 (ESOCR)
- Energy Networks Association Technical Specification (ENATS 43-90)
- SHE Transmission Specification SP-NET-OHL-516
- SHE Transmission ESOCR procedure PR-PS-311

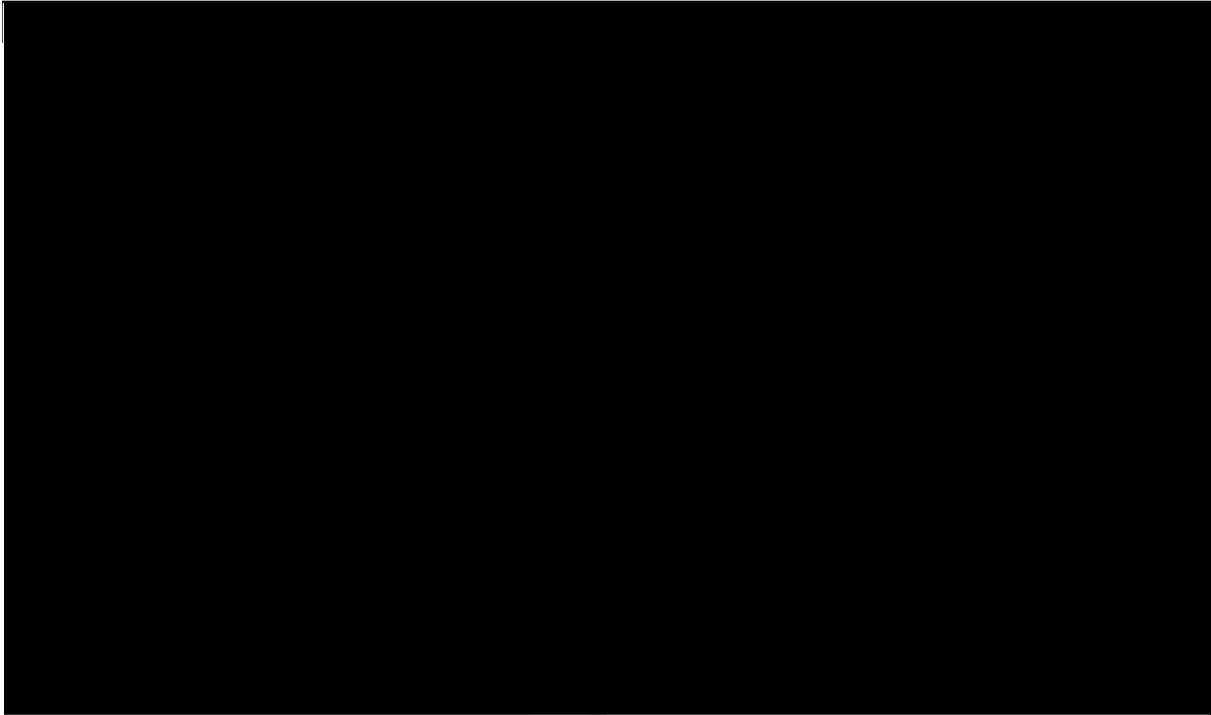
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**Appendix A**

Palisade fencing upgrades to chain-link fencing is required at the following 23 substations.



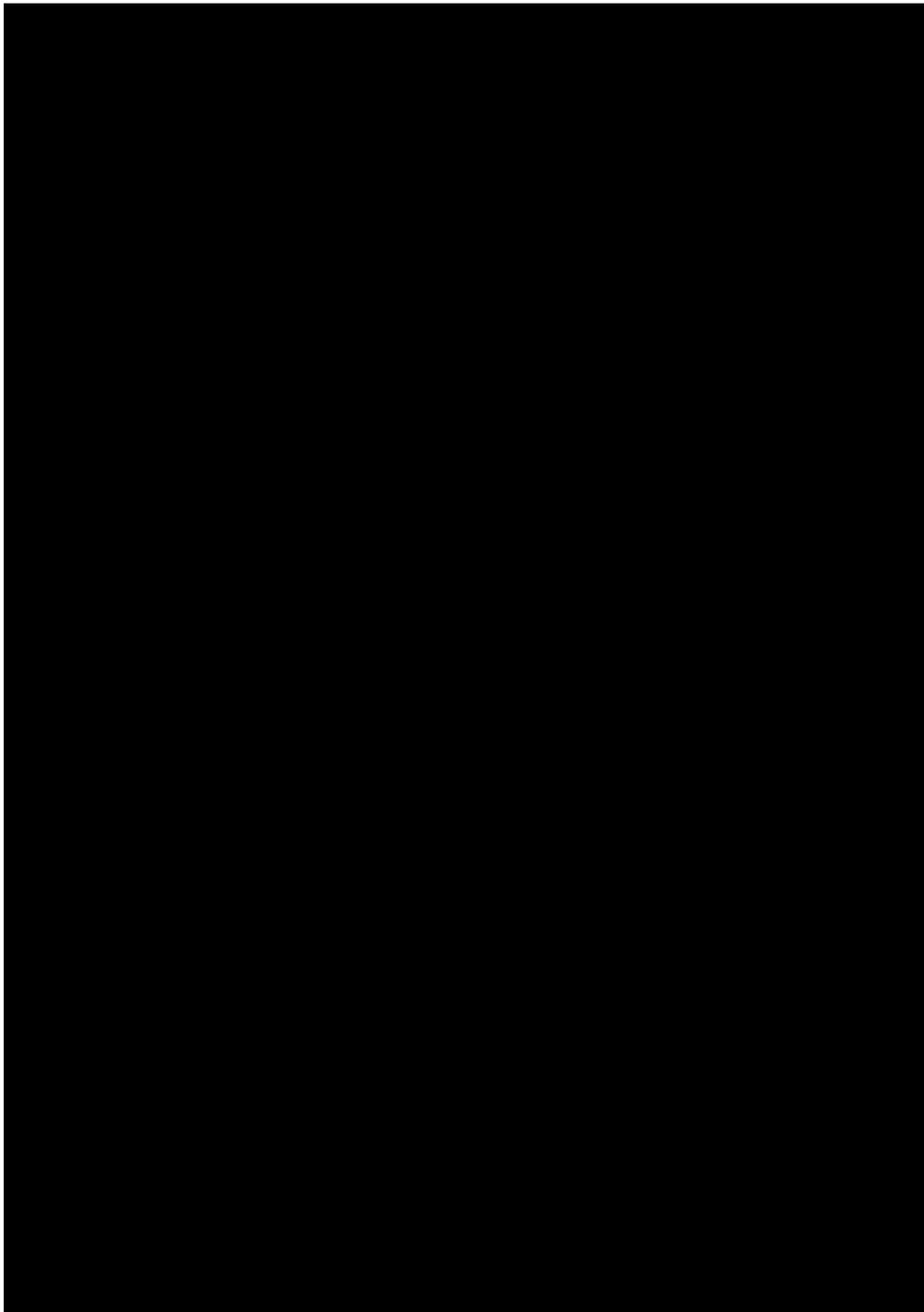
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**Appendix B**

The following towers require full upgrading to fully comply with the Energy Networks Association Technical Specification (ENATS 43-90) and SHE Transmission Specification SP-NET-OHL-516.

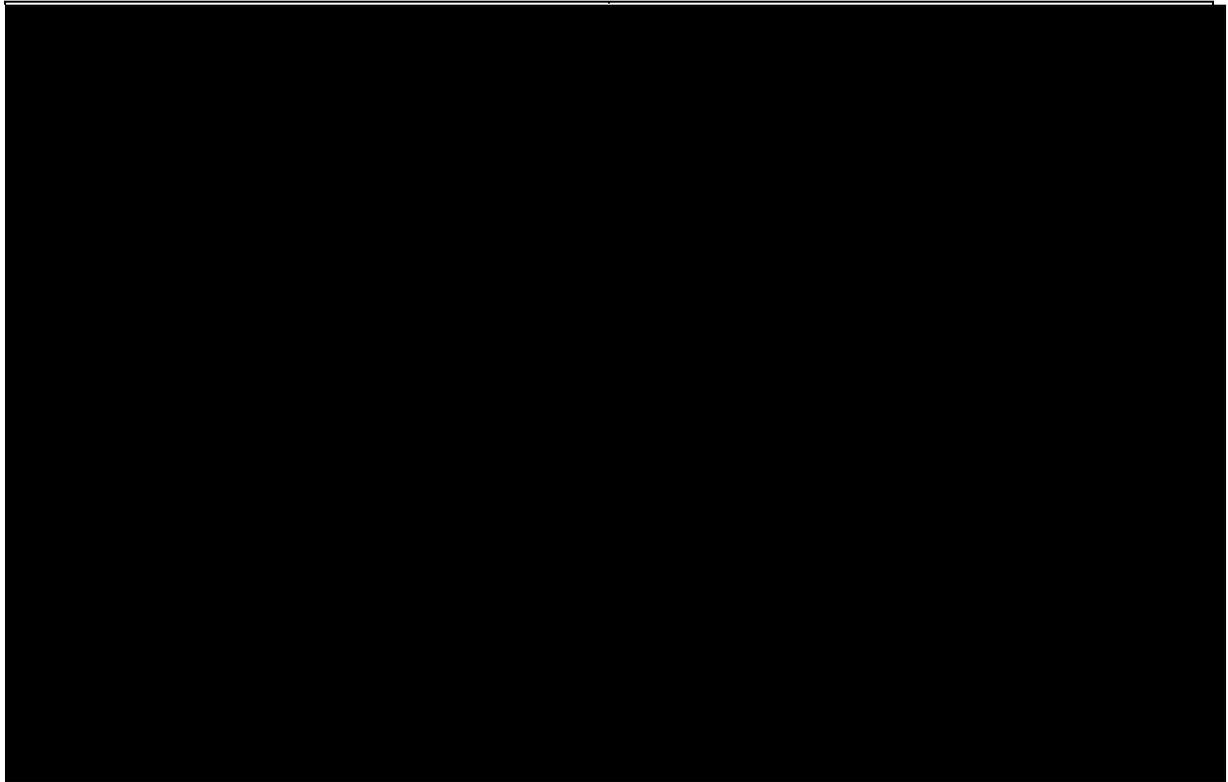




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**Appendix C**

The following 35 sites currently contain no CCTV or alarm systems



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**Appendix D**

**Project Risk and 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	CCTV & Alarms	Some Sites have no CCTV and Alarms and there is no real deterrent. Additionally, some existing CCTV systems are ageing and are obsolete. Lack of good CCTV could encourage ingress	Possible	Severe	Severe	Install/upgrade CCTV alarm systems	Unlikely	Severe	High	Improves deterrent/detection of unauthorised access
2	Fencing	27 substations currently protected with chain link fencing which does not offer sufficient deterrent. Could encourage ingress	Possible	Severe	Severe	Upgrade fencing to pallsade	Hardly Ever	Severe	High	Increased deterrent
3	ENATS 43-30	1000 towers not up to current standards. In the short term could encourage ingress. In the longer term this may pose a compliance issue.	Possible	Severe	Severe	Upgrade ACDs	Almost Never	Severe	Medium	Increased deterrent to ingress. Longer term compliance

Figure 2 - Risk & Benefit Matrix – Responsible Operator

**Project Risk and Benefit Matrix - Progressive Network Enabler**

Risk ID	Risk Title	Risk	Unmitigated Risk Likelihood	Unmitigated Risk Severity	Unmitigated Overall Risk Rating	Mitigation Action	Mitigated Risk Likelihood	Mitigated Risk Severity	Mitigated Overall Risk Rating	Benefits
1	CCTV & Alarms	Some Sites have no CCTV and Alarms and there is no real deterrent. Additionally, some existing CCTV systems are ageing and are obsolete. Lack of good CCTV could encourage ingress	Possible	Severe	Severe	Install/upgrade CCTV alarm systems; install new CCTV where it doesn't exist	Almost Never	Severe	Medium	Improves deterrent/detection of unauthorised access
2	Fencing	27 substations currently protected with chain link fencing which does not offer sufficient deterrent. Could encourage ingress	Possible	Severe	Severe	Upgrade fencing to pallsade	Hardly Ever	Severe	High	Increased deterrent
3	ENATS 43-30	1000 towers not up to current standards. In the short term could encourage ingress. In the longer term this may pose a compliance issue.	Possible	Severe	Severe	Upgrade ACDs	Almost Never	Severe	Medium	Increased deterrent to ingress. Longer term compliance

Figure 3 - Risk & Benefit Matrix – Progressive Network Enabler

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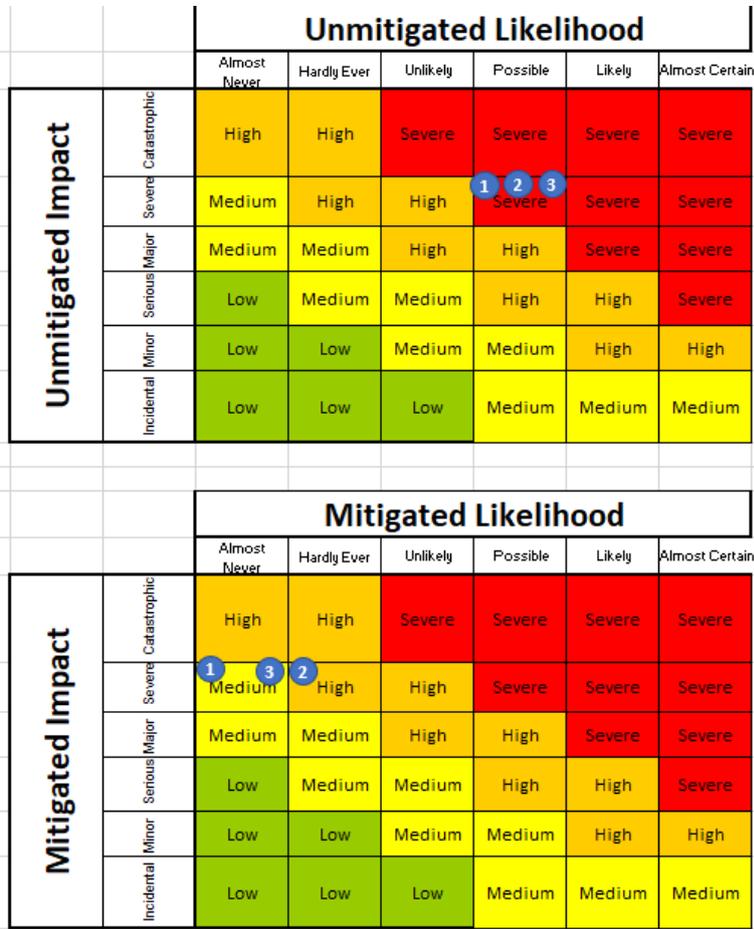


Figure 4 - Risk Heat Maps for Preferred Option