The Great Grid Upgrade

Sea Link

Preliminary Environmental Information Report

Volume: 2

Part 3 Kent Onshore Scheme

Appendix 3.10.C Kent Preliminary Operational Noise Assessment

Version A

October 2023

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Sea Link
Document control

Document Properties	
Organisation	Atkins
Author	Atkins
Approved by	Atkins
Title	Volume 2, Part 3 Kent Onshore Scheme, Appendix 3.10.C Kent Preliminary Operational Noise Assessment
Data Classification	Public

Version History

Date	Version	Status	Description / Changes
24/10/2023	A	FINAL	First issue

3.10.C Kent Preliminary Operational Noise Assessment

3.10.C.1 Introduction

3.10.C.1.1 This appendix presents results of the operational noise assessment conducted as part of the Kent Onshore Scheme. The assessment considers the potential effects of operational noise from the proposed Minster Converter Station and Substation at nearby noise sensitive receptors (NSR).

3.10.C.1.2 The assessment draws on the findings of noise survey data detailed in **Volume 2, Appendix 3.10.A: Kent Noise Survey Data**.

3.10.C.2 Assessment Methodology

3.10.C.2.1 The assessment of operational noise has been conducted in accordance with British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound (BS 4142) (Ref 3.10.C.1). The assessment methodology was discussed and agreed with the environmental health department of Thanet District Council.

3.10.C.2.2 BS 4142 is used to assess the potential significance of effects by comparing the 'rating sound level' of an industrial source to the typically representative ‘background sound level’ at the location of nearby NSR. Certain acoustic features can increase the potential for a sound to attract attention, and therefore increase its relative significance than that expected from a simple comparison between the specific sound level and the background sound level. In particular, BS 4142 identifies noise that contains audible tonality, impulsivity and/or intermittency and recommends that a correction be added to the specific sound level. The specific sound level along with any applicable correction is referred to as the 'rating level'. It should be noted that the penalties can be additive (i.e., if they have a combination of tonal (e.g. whistling or humming), impulsive (e.g. hammering or banging), and intermittent (e.g. regularly turning on and off) acoustic characters).

3.10.C.2.3 Where tonality is audible at a receptor a penalty of between 0 and 6 dB may be applied. Subjectively, a 2 dB penalty may be applied where a tone is just perceptible, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible.

3.10.C.2.4 The greater the difference between the rating level and the background sound level; the greater the likelihood of complaints. The assessment criteria given by BS 4142 are as follows:

- A difference of +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of +5 dB could be an indication of an adverse impact, depending on the context.

3.10.C.2.5 The lower the rating level is relative to the measured background sound level, the less likely it is that there will be an adverse impact. Where the rating level does not exceed

the background sound level, this is an indication of the specific sound source having a low impact (in BS 4142 terminology), depending on the context.

3.10.C.2.6 The assessment should also consider the context of the sound. Where the initial estimate of the impact needs to be modified due to the context, all pertinent factors should be considered, including:

- the absolute level of the sound;
- the character and level of the residual sound compared to the character and level of the specific sound; and
- the sensitivity of the receptor, including whether dwellings already incorporate design measures that secure good internal and/or outdoor conditions, such as: façade insulation treatment, ventilation and/or cooling that will reduce the need to have windows open to provide rapid or purge ventilation and acoustic screening.

3.10.C.2.7 With regards to the absolute level of the sound, BS 4142 states that where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background, particularly at night. Guidance in this matter is provided by the Association of Noise Consultants (ANC) BS 4142:2014+A1:2019 Technical Note, 2020 (Ref 3.10.C.2) and BS 8233:2014 Guidance on sound insulation and noise reduction for buildings (BS 8233) (Ref 3.10.C.3).

3.10.C.2.8 The noise rating level will be compared to the background sound level to magnitude of impact. The magnitude of impact of operational noise is determined against the criteria detailed in Table 3.10.C.1.

Table 3.10.C.1 Magnitude of impact of operational noise

Magnitude	Comparison of sound rating level and background sound level
Large	Rating level ≥ 10dB above the background sound level (significant observed adverse effect level (SOAEL))
Medium	Rating level between 5 and 9 dB above background sound level (lowest observed adverse effect level (LOAEL))
Small	Rating level between 0 and 4 dB above background sound level
Negligible	Rating level below background sound level

3.10.C.2.9 Although the above criteria will be used to assess the magnitude of impact, it is standard practice to aim for a sound rating level not to exceed the background sound level, such that the impact is ‘low’ (as defined in BS 4142), or negligible in terms of the impact magnitude definition defined in Table 3.10.C.1 above. Additionally, the local authority aim is for the rating level to be at least 5 dB below the background sound level, where feasible.

3.10.C.2.10 Consideration, will also be taken of context, as defined in BS 4142, for the final determination of significance; in particular, absolute noise levels.

3.10.C.2.11 Taking account of the guidance provided by BS 4142, the ANC Technical Note, BS 8233, and Planning Practice Guidance for Noise (PPGN) (Ref 3.10.C.4), where

background sound levels are ‘low’ (less than about 30 dB L_{A90}), the SOAEL is defined as follows:

- SOAEL: rating level >34 dB $L_{Ar,Tr}$ or ≥10 dB above the background sound level, whichever is higher.

3.10.C.3 Baseline Data

Introduction

3.10.C.3.1 This section details the baseline information used within the preliminary operation noise assessment.

3.10.C.3.2 The proposed Minster Converter Station and Substation location, study area, NSR locations, and noise survey location, are shown in Image 3.10.C.1.

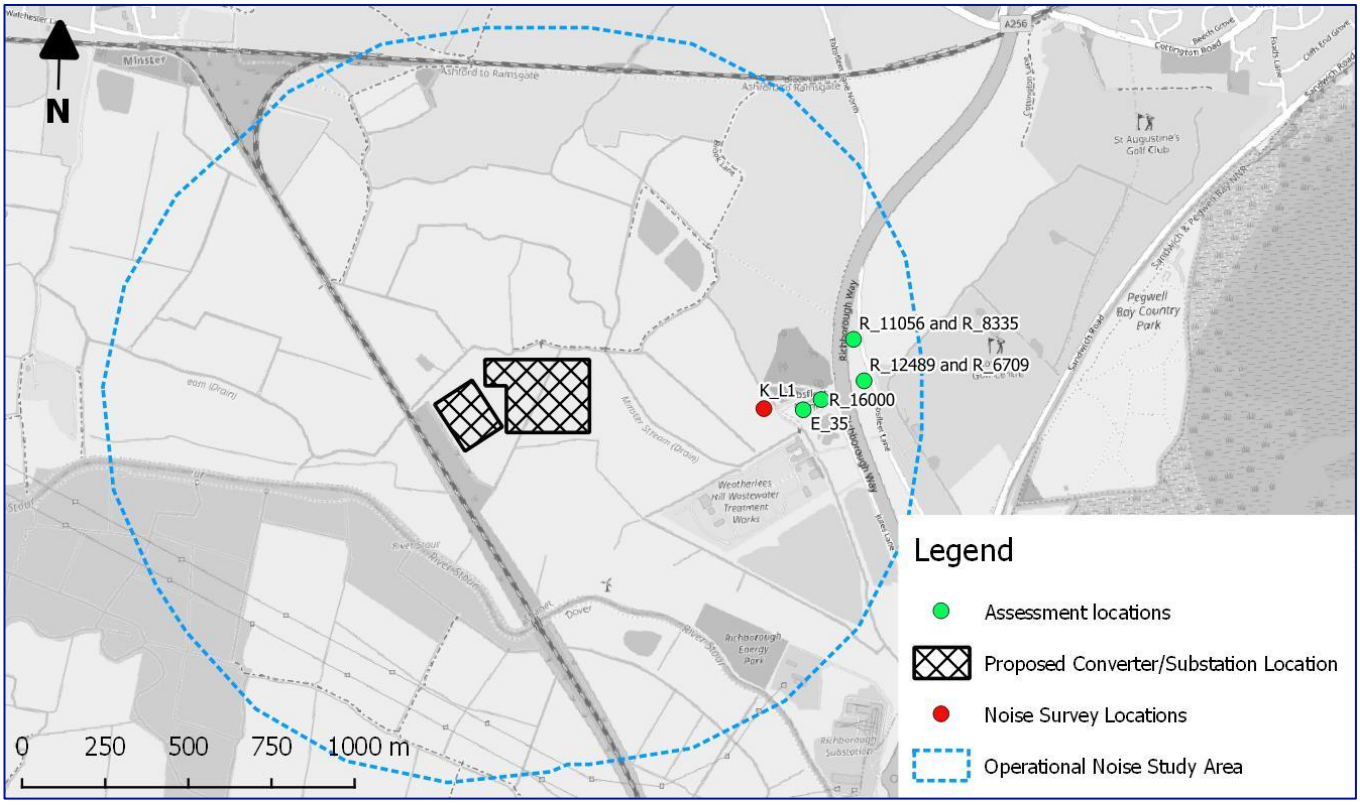

Image 3.10.C.1 Kent Onshore Scheme operational noise baseline information

Study Area

3.10.C.3.3 The proposed study area for operational noise effects from substations, based on guidance from ISO 9613-2 ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation (ISO 9613-2) (Ref 3.10.C.5), would include NSR within 1km of the Minster Converter Station and Substation, with a particular focus on the nearest NSR.

Noise Sensitive Receptors

3.10.C.3.4 The nearest NSR are located approximately 650m to the east of the proposed converter station site. These include one residential receptor (R_16000) and one

educational establishment (E_35). Additionally, there are four further residential NSR (R_11056, R_8335, R_12489, and R_6709) approximately 800m to the east.

Measured Noise Levels

3.10.C.3.5 The operational noise assessment has been informed by noise survey data obtained from a location representative of nearby NSR. A background noise level survey was conducted at a location representative of the nearby NSR, as detailed in Image 3.10.C.1. The survey duration was eight days in June 2023. Details of the baseline survey are presented in **Volume 2, Appendix 3.10.A: Kent Noise Survey Data**.

3.10.C.3.6 The sound level meter measured a range of parameters including the following:

- $L_{Aeq,T}$ – The A-weighted equivalent continuous sound pressure level over the measurement period T, representative of the 'average' sound pressure level over a given period, in this case 15 minutes;
- $L_{AFmax,T}$ –the maximum A-weighted noise level during the sample period, measured using a fast time weighting; and
- $L_{A90,T}$ – The A-weighted noise level that is exceeded for 90% of the measurement period, and is usually regarded as a descriptor of the background noise level.

3.10.C.3.7 A summary of the measured sound levels is provided in Table 3.10.C.2.

Table 3.10.C.2 Summary of measured sound levels – K_L1

Time period	**Survey location**	**Average sound level, dB $L_{Aeq,15min}$**	**Maximum sound level, dB $L_{AFmax,15min}$**
Day	Range: 34 - 73 Average: 50	Range: 41 - 97 Typical: 60	Range: 31 - 49 Average: 37 Mode: 38
Night	Range: 29 - 63 Average: 48	Range: 34 - 84 Typical: 47	Range: 27 – 42 Average: 32 Mode: 29

Representative Background Sound Levels

3.10.C.3.8 Table 3.10.C.3 presents a summary of representative background sound levels during daytime and night-time periods at the survey location for use in the operational noise assessment.

Table 3.10.C.3 Summary of representative background sound levels

Monitoring location	**Representative background sound level, dB L_{A90}**	
	Daytime	**Night-time**
K_L1	35	29

3.10.C.3.9 The representative background sound levels were agreed with the environmental health department of Thanet District Council.

3.10.C.3.10 Based on the representative background sound levels presented in Table 3.10.C.4, the following affect level criteria are applied.

Table 3.10.C.4 Affect level criteria based on representative background sound levels

Monitoring location	Time period	Affect level for noise rating level, dB $L_{Ar,Tr}$		
		Local authority Aim	LOAEL	SOAEL
K_L1	Day	≤30	40	45
	Night	≤24	34	39

3.10.C.4 Operational Noise Assessment

Operational Plant Sound Level Data

3.10.C.4.1 An indicative 3D view of the proposed Minster Converter Station and Minster Substation is shown in Image 3.10.C.2. The location of the transformers is identified as these are the main sources of noise from the Minster Converter Station.

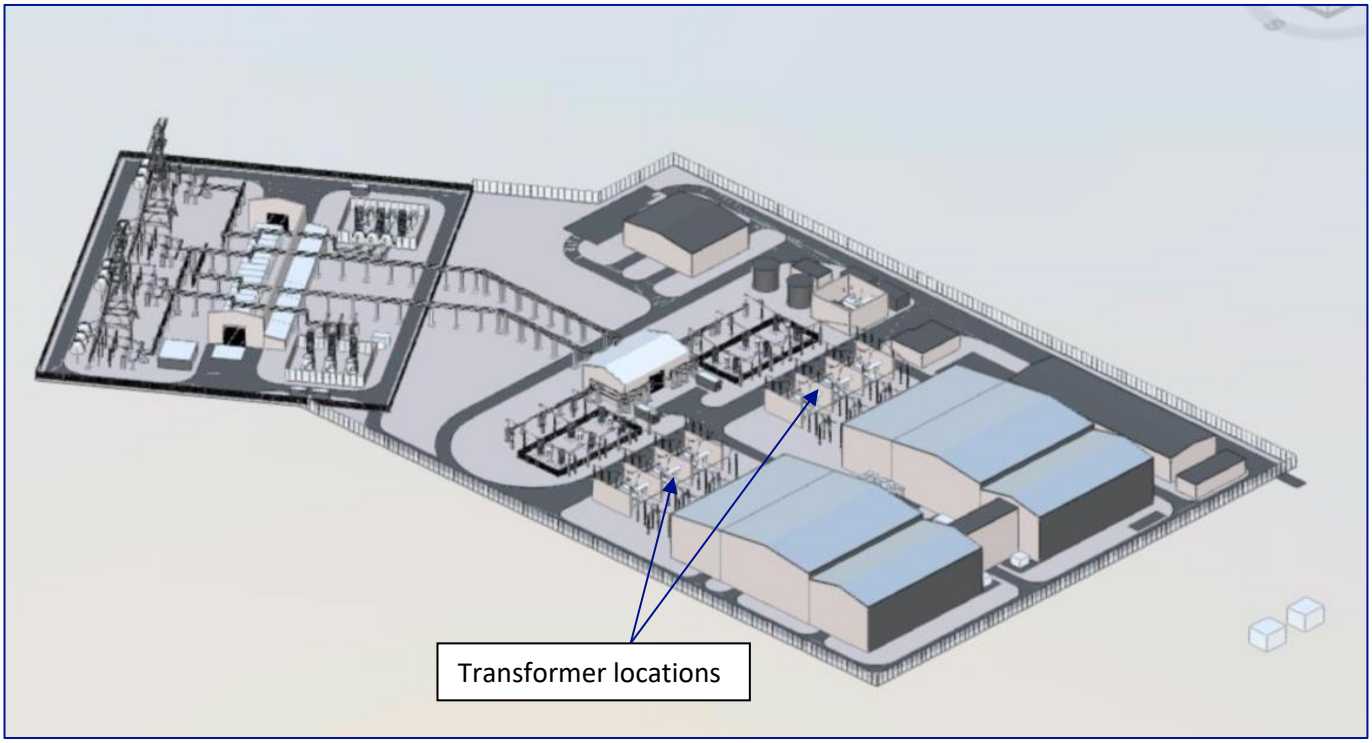

Image 3.10.C.2 Indicative 3D view of Proposed Minster Converter Station and Substation

3.10.C.4.2 Table 3.10.C.5 presents indicative operational sound levels from proposed Minster Converter Station and Substation plant.

Table 3.10.C.5 Indicative Minster Converter Station and Substation plant sound data

Plant item	Number of	Source of information	Sound power level dBA	Sound power, dB, at octave band centre frequency, Hz							
				63	125	250	500	1k	2k	4k	8k
Substation:											
400kV Harmonic Filter	6	East Anglia One North and East Anglia Two	82	82	43	79	44	76	74	17	13
Converter Station:											
Reactor Hall	2	Building envelope would be designed to sufficiently control noise egress.									
Valve Hall	2										
DC Hall	2										
Valve Cooler Fans	Two sets	Celtic Interconnector Project / New England Clean Power Link	89	96	91	88	88	84	81	72	62
Transformer (355MVA 1-PH)	6	Interconnexion France-Angleterre (IFA)	106	-	-	-	-	-	-	-	-
Transformer cooling	6	Celtic Interconnector Project/ New England Clean Power Link	90	96	92	89	89	84	82	72	62
400kV PLC Filter (AC Filter) (Reactor)	6	Celtic Interconnector Project/ New England Clean Power Link	80	68	85	82	81	63	58	62	54
Air Handling Unit (AHU)	4 sets	Interconnexion France-Angleterre (IFA)	85	-	-	-	-	-	-	-	-

Operational Sound Propagation Modelling (Without Mitigation)

3.10.C.4.3 Specific sound levels at nearby NSR due to the proposed Minster Converter Station and Minster Substation plant have been predicted via computer noise modelling using SoundPlan software (version 8.2). The model calculates noise levels in accordance with the methodology described in ISO 9613-2 (Ref 3.10C.5). The resultant noise levels at nearby NSR are presented in Table 3.10.C.6.

Table 3.10.C.6 Resultant specific noise levels at NSR (without mitigation)

NSR location	Resultant specific sound level, dB L_{Aeq}
R_12489 and R_6709	32
R_11056 and R_8335	34
R_16000	33
E_35	34

BS 4142 Assessment (Without Mitigation)

3.10.C.4.4 The results of the BS 4142 assessment at the worst affected receptor are presented in Table 3.10.C.7.

Table 3.10.C.7 Indicative BS 4142 assessment (without mitigation)

Parameter	Value		BS 4142 clause	Commentary
	Daytime	Night-time		
Background sound level, dB L_{A90}	35	29	8.1	Representative background sound level at nearby receptors based on measured noise data
Specific sound level, dB $L_{Aeq,T}$	34	34	7.3	Calculated via noise model based on indicative plant data.
Acoustic feature correction, dB	6	6	9.2	Assumed potential tonal audibility at receptor as worst-case. In practice likely to be less.
Sound rating level, dB $L_{Ar,T}$	40	40	9	Sum of specific sound level and acoustic corrections.
Difference in rating noise level relative to	+5	+11	11	

Parameter	Value		BS 4142 clause	Commentary
	Daytime	Night-time		
background sound level, dB				
Assessment Outcome	Medium magnitude impact, depending on context. Above LOAEL.	Large magnitude impact, depending on context. Above SOAEL.	11	Context The context is a relatively low specific noise level in a mixed rural and industrial area, below existing average levels of ambient noise during both daytime and night-time periods (50 dB $L_{Aeq,16h}$) and 48 dB $L_{Aeq,8h}$, respectively). However, the specific noise level exceeds the significant observed adverse effect level (SOAEL) during night-time periods. Outcome – Likely **Significant Effect**
Uncertainty			10	Uncertainty has been minimised through the use of noise survey data over a suitable representative period. Main uncertainty from the use of indicative plant noise data, although this is based on plant at similar sites. Likely worst-case acoustic character correction applied for tonality. In practice likely to be lower. Uncertainty unlikely to affect the outcome of the assessment. However, this assessment is indicative based on

Parameter	Value		BS 4142 clause	Commentary
	Daytime	Night-time		
				available plant noise data and further studies would be conducted as the design progresses.

Notes:

BS 4142 Clause refers to the corresponding clause in BS 4142 relating to that aspect of the assessment.

3.10.C.4.5 The assessment indicates that without mitigation, there is a potential significant adverse effect at worst affect NSR due to operational noise from the proposed Minster Converter Station and Substation. Mitigation is therefore required to avoid significant adverse effects and reduce and minimise adverse effects.

3.10.C.5 Mitigation

Introduction

3.10.C.5.1 The outcome of the initial assessment indicates that there is the potential for significant adverse effects without mitigation. Indicative plant data, based on plant used on similar projects, has been used in the assessment. The ongoing design must therefore follow the mitigation hierarchy to reduce noise levels. This section details the noise mitigation options that may be considered as part of the ongoing design.

Source Contribution

3.10.C.5.2 Table 3.10.C.8 details the contribution of noise from each type of plant item type at the worst affected NSR.

Table 3.10.C.8 Plant sound level contribution

Plant item	Contribution to resultant noise level, dB L_{Aeq}	Contribution to resultant noise level
PLC Capacitors	9	Negligible
PLC Reactors	6	Negligible
Harmonic Filters	4	Negligible
Transformer Cooling	9	Negligible
Valve Cooler Fans	8	Negligible
Air Handling Units	-1	Negligible
Converter Transformers	34	Dominant source

3.10.C.5.3 The results indicate the main source of noise is from Minster Converter Station transformers. The contribution from other plant items is negligible.

Mitigation Options

3.10.C.5.4 The initial consideration would be mitigation of source through plant selection and siting, followed by consideration of plant specific attenuation, such as enclosures. Standard transformer enclosures used by National Grid Electricity Transmission plc (National Grid) are capable of reducing noise levels by 20 dB.

Residual Assessment

Operational sound propagation modelling (with mitigation)

3.10.C.5.5 The resultant noise levels at NSR with mitigation in the form of transformer enclosures providing 20 dB attenuation are presented in Table 3.10.C.9.

Table 3.10.C.9 Resultant specific noise levels at NSR (with mitigation)

NSR location	Resultant specific sound level, dB L_{Aeq}
R_12489 and R_6709	16
R_11056 and R_8335	17
R_16000	16
E_35	17

BS 4142 assessment (with mitigation)

3.10.C.5.6 The results of the BS 4142 assessment at the worst affected receptor are presented in Table 3.10.C.10.

Table 3.10.C.10 Indicative BS 4142 assessment (with mitigation)

Parameter	Value		BS 4142 clause	Commentary
	Daytime	Night-time		
Background sound level, dB L_{A90}	35	29	8.1	Representative background sound level at nearby receptors based on measured noise data.
Specific sound level, dB $L_{Aeq,T}$	17	17	7.3	Calculated via noise model based on indicative plant data.
Acoustic feature correction, dB	6	6	9.2	Assumed potential tonal audibility at receptor as worst-case. In practice likely to be less.

Parameter	Value		BS 4142 clause	Commentary
	Daytime	Night-time		
Sound rating level, dB $L_{Ar,T}$	23	23	9	Sum of specific sound level and acoustic corrections.
Difference in rating noise level relative to background sound level, dB	-12	-6	11	
Assessment Outcome	Negligible magnitude impact, depending on context. Below LOAEL and local authority aim.	Negligible magnitude impact, depending on context. Below LOAEL and local authority aim.	11	Context The context is a low specific noise level in a mixed rural and industrial area, below existing average levels of ambient noise during both daytime and night-time periods. Additionally, the specific noise level does not exceed LOAEL or the local authority aim during daytime or night-time periods. Outcome – Likely to be **Not Significant**
Uncertainty			10	Uncertainty has been minimised through the use of noise survey data over a suitable representative period. Main uncertainty from the use of indicative plant noise data, although this is based on plant at similar sites. Likely worst-case acoustic character correction applied for tonality. In practice likely to be lower. Uncertainty is unlikely to affect the outcome of the assessment. However, this assessment is indicative based on available plant noise data and further studies would be conducted as the design progresses.

Notes:

BS 4142 Clause refers to the corresponding clause in BS 4142 relating to that aspect of the assessment.

3.10.C.5.7 The assessment indicates that with suitable mitigation, the impact of operational noise from the proposed Minster Converter Station and Substation would be negligible magnitude at nearby NSR during both daytime and night-time periods. Operational noise from the proposed Minster Converter Station and Substation would therefore likely be **not significant**. Additionally, the desired local authority aim of a noise rating level 5dB below the background sound level at nearby NSR is achievable, subject to further design.

3.10.C.6 Conclusions

3.10.C.6.1 This appendix presents results of the operational noise assessment conducted as part of the Kent Onshore Scheme. The assessment considers the potential effects of operational noise from the proposed Minster Converter Station and Minster Substation at nearby NSR.

3.10.C.6.2 The assessment has been conducted in accordance with current guidance and good practice. The assessment draws on noise survey data, and indicative operational plant noise data.

3.10.C.6.3 The assessment indicates that without mitigation and based on the indicative plant data, there are potential significant adverse effects at nearby NSR due to operational noise.

3.10.C.6.4 Outline mitigation proposals have been highlighted, including plant selection and transformer noise enclosures. Based on the indicative transformers being contained with standard national grid noise enclosures, the impact of operational noise from the proposed Minster Converter Station and Substation would be negligible magnitude at nearby NSR. The effect of operational noise would therefore likely be **not significant**. Additionally, the desired local authority aim of a noise rating level 5dB below the background sound level at nearby NSR is achievable during both daytime and night-time periods, subject to further design.

3.10.C.6.5 The assessment is based on indicate plant noise data and it is anticipated that further assessment would be conducted as the design progresses.

3.10.C.7 References

Ref 3.10.C.1 British Standard Institution. (2019). British Standard 4142:2014+A1:2019. Methods for rating and assessing industrial and commercial sound.

Ref 3.10.C.2 Association of Noise Consultants. (2020). British Standard 4142:2014+A1:2019 Technical Note Version 1.0.

Ref 3.10.C.3 British Standard Institution. (2014). British Standard 8233:2014 Guidance on sound insulation and noise reduction for buildings.

Ref 3.10.C.4 hm Government. (2019). Planning Practice Guidance for Noise. [online]. Available at: https://www.gov.uk/guidance/noise--2 [Accessed 11 July 2023]

Ref 3.10.C.5 International Organisation for Standardization. (1996). ISO 9613-2 ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation.

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National Grid plc
National Grid House,
Warwick Technology Park,
Gallows Hill, Warwick.
CV34 6DA United Kingdom

Registered in England and Wales
No. 4031152
nationalgrid.com