

The Great Grid Upgrade

Chesterfield to Willington

Preliminary Environmental Information Report

Volume 3: Appendix 14D Overhead Line Operational Noise Assessment

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14D. Overhead Line Operational Noise Assessment

14D.1 Introduction

Overview

- 14D.1.1 This appendix has been produced to accompany **Chapter 14 Noise and Vibration in Volume 1** of the Preliminary Environmental Information Report (PEIR) for the Chesterfield to Willington Project (the Project). It outlines the data sources, assumptions and methodologies used to assess the potential noise impacts arising from the operation of the proposed new 400 kV overhead line on noise sensitive receptors (NSRs).
- 14D.1.2 The data, assumptions and results presented in this appendix are preliminary and subject to evolution in the ongoing design. A revision of the assessment will be presented in the Environmental Statement (ES).

14D.2 Technical Guidance

- 14D.2.1 The screening and assessment of overhead line noise uses the guidance and Standards listed in **Table 14D.1**.

Table 14D.1: Technical guidance and policy used in assessment of overhead line noise

Guidance Reference	Summary
BS 4142 (Ref 14D.1)	BS 4142 describes methods for rating and assessing sound of an industrial nature (using outdoor sound levels), such as from factories, industrial premises, or fixed installations affecting people who might be inside or outside a dwelling.
National Grid Policy Statement PS(T)134 (Ref 14D.3)	This document applies to environmental noise due to the operation of new overhead lines, reconductoring, diversion and uprating projects for overhead lines operated at 275 kV and 400 kV. The policy describes a three-tier assessment process and sets noise impact criteria taking into account worst-case wet noise (Tier 1), wet noise and dry noise in combination (Tier 2), and dry noise and wet noise separately following the principles of BS 4142 (Tier 3).
National Grid Technical Report TR(E)564 (Ref 14D.4)	This document introduces the need for a clear policy stance on acceptable noise levels from overhead lines and explains how the noise criteria presented in PS(T)134 were developed, taking into account the UK noise policy context and UK national and international guidance, including World Health Organization guidelines and evidence for health effects.

Guidance Reference	Summary
National Grid Technical Guidance Note TGN(E)322 (Ref 14D.4)	This document provides guidance on the practical implementation of PS(T)134. The policy suite allows for noise impact (and hence significance of effect) to be reported according to the specific requirements of an Environmental Impact Assessment submitted as part of a development consent order application.

14D.3 Overhead Line Operational Noise

Purpose of the Initial Overhead Line Noise Assessment

- 14D.3.1 For overhead lines, noise is usually generated by a mechanism called corona discharge. Most transmission line conductors are designed to operate below the threshold at which corona discharge is predicted to occur in dry conditions with uncontaminated conductors, so usually operate quietly in dry weather conditions. However, noise can sometimes occur in dry conditions, where it is referred to as 'dry noise'; it is normally described as a crackle.
- 14D.3.2 The highest noise levels generated in operation for overhead lines generally occur during rainfall or humid conditions. Noise generated under these circumstances is referred to as 'wet noise' which is generally described as a crackle, but which can be accompanied by a tonal 'hum'.
- 14D.3.3 The tonal hum which sometimes occurs during wet weather conditions is typically more perceptible than crackle alone. Consequently, wet noise is tolerated at lower sound pressure levels than dry noise, as stated in TGN(E)322. It should be noted that neither wet noise nor dry noise would occur all the time.
- 14D.3.4 The overhead line noise assessment process follows the three-tier approach from PS(T)134 based on predicted noise source levels and receptor distance. If predicted noise levels fail the Tier 1 test, a Tier 2 screening exercise is undertaken and if the Tier 2 test suggests that adverse impact is possible at a receptor, then a Tier 3 assessment is undertaken. The three-tier approach comprises the following steps designed to screen receptors out of further assessment where there would be no adverse impact:
- Tier 1: A primary screening step based on 'worst-case' absolute wet noise effects and the pre-determined assessment criteria set out in PS(T)134, reproduced in **Table 14D.2**.
 - Tier 2: A further screening step based on combined absolute wet noise and dry noise effects and recalculated assessment criteria. This step takes account of the fact that wet noise occurs during periods of wet weather and therefore does not occur all the time.
 - Tier 3: Full assessment following the principles of BS 4142 for both wet noise and dry noise. Aligning with the guidance within BS 4142, PS(T)134, Operational Audible Noise Policy for Overhead Lines applies a +3 dB character correction to dry noise to account for the subjective 'crackle', whereas a +6 dB character correction is applied to predicted wet noise levels to account for the tonal 'hum' from the audible noise during worst case wet weather conditions.

- 14D.3.5 National Grid Technical Report TR(E)564 explains the reasoning behind the noise criteria set out in PS(T)134. The overhead line noise criteria have been set taking account of the UK policy context and evidence from multiple sources, including the World Health Organization and BS 4142, for noise and associated health impacts. The criteria have been developed by National Grid based on health impact data associated with the night-time period. The night-time period is considered more sensitive than the daytime, as background sound levels are normally lower, and people are trying to sleep.
- 14D.3.6 For the assessment of wet noise, knowledge of typical rainfall rates based on Meteorological Office data for the Project location is required. Miller curves are used to estimate the background noise level due to the effect of rainfall.
- 14D.3.7 This appendix reports the initial (Tier 1) wet overhead line noise screening for the Project, which has been produced to support the PEIR. It determines the potential extent of adverse impacts arising from the operation of the overhead line to identify where further Tier 2 and Tier 3 assessments will be undertaken.
- 14D.3.8 The Tier 1 (wet noise) screening has been carried out against the relevant criteria presented in PS(T)134. For residential receptors the threshold of an adverse impact at night is 40 dB(A). As wet noise may include an audible 'hum', a 6 dB penalty is applied, reducing the criterion to 34 dB(A). This is based on the guidance in BS 4142 and is a cautious approach as tonal hum may not be clearly perceptible and may not be present for the full duration that rainfall occurs.
- 14D.3.9 Vulnerable groups such as healthcare receptors are assessed to criteria 5 dB lower than residential receptors, whereas the criteria for schools and hotels is 5 dB higher than for residential receptors.

14D.4 Methodology

Overhead Line Noise Methodology

- 14D.4.1 PS(T)134 describes methods for predicting the environmental impact at receptors due to audible noise caused by new, reconducted, diverted or uprated overhead lines. The method uses internationally recognised line noise prediction methodology to calculate noise emission levels based on operating voltage, conductor design and pylon geometry. At this stage, preliminary predictions of overhead line noise have been carried out at NSRs along the proposed route alignment and the results have been assessed against the Tier 1 criteria presented in **Table 14D.2**.

Table 14D.2: Tier 1 noise screening criteria

Receptor	No Adverse Impact Screened Out	Further Assessment Necessary Screened Out Tier 2 Assessment Required
Vulnerable groups	< 29 dB(A)	≥ 29 dB(A)
Residential	< 34 dB(A)	≥ 34 dB(A)
Schools and hotels	< 39 dB(A)	≥ 39 dB(A)

- 14D.4.2 For the ES, further assessment will be undertaken. The Tier 2 screening, where required, will determine whether the combined wet and dry noise impact is acceptable. Where the Tier 2 assessment suggests that there may be the potential for an adverse impact, a Tier 3 assessment is required.
- 14D.4.3 A Tier 2 screening exercise requires recalculation of the predicted noise level at the façade of the NSR, accounting for the duration of wet and dry weather and recalculation of the noise criteria.
- 14D.4.4 The predicted noise levels for a Tier 2 screening exercise will be calculated according to guidance provided in TGN(E)322. The Tier 2 criteria are based upon the logarithmic addition of dry and wet noise, taking account of the percentage of time that dry and wet noise will be likely to occur. TGN(E)322 presents the combined noise criteria to be used in Tier 2 assessments, shown in **Table 14D.3**.

Table 14D.3: Tier 2 noise screening criteria

Use	Rainfall (Annual Average Wet Hours)	No Adverse Impact dB(A)	Adverse Impact dB(A)	Significant Adverse Impact dB(A)
Vulnerable groups	450	< 31.9	31.9 – 41.9	> 41.9
	600	< 31.8	31.8 – 41.8	> 41.8
	750	< 31.8	31.8 – 41.8	> 41.8
Residential	450	< 36.9	36.9 – 46.9	> 46.9
	600	< 36.8	36.8 – 46.8	> 46.8
	750	< 36.8	36.8 – 46.8	> 46.8
Schools and hotels	450	< 41.9	41.9 – 51.9	> 51.9
	600	< 41.8	41.8 – 51.8	> 51.8
	750	< 41.8	41.8 – 51.8	> 51.8

- 14D.4.5 There is no requirement to add character correction penalties to the noise levels above, as penalties have already been considered in the setting of the criteria. A +6 dB tonal penalty has been considered in the setting of the criterion for wet noise levels, and a +3 dB character penalty has been considered for dry noise levels.
- 14D.4.6 If an adverse or significant adverse impact is identified after the Tier 2 screening exercise, a Tier 3 assessment is carried out, which takes into account background noise levels in the area of interest.
- 14D.4.7 Dry noise and wet noise would be assessed separately using two different methods based on the principles of BS 4142, as detailed in TGN(E)322.

14D.4.8 To conduct a Tier 3 dry noise assessment, an assessment in line with BS 4142 is carried out based on the assessment of impact criteria set out in BS 4142 and shown in **Table 14D.4**.

Table 14D.4: Tier 3 noise assessment criteria

Magnitude of Effect	Difference Between Rating Level and Background Level
High	≥ 10 dB
Medium	5 – 9 dB
Low	0 – 4 dB
Negligible	≤ 0 dB

Overhead Line Noise Receptors

14D.4.9 Receptor sensitivities considered in TGN(E)322 are summarised within Table 4 of the document and reproduced below as **Table 14D.5**.

Table 14D.5: TGN(E)322 Table 4: Classification of receptor sensitivity

Sensitivity	Receptor
High	Vulnerable subgroups including hospitals and pre-schools, care homes and hospices
Medium	Residential and schools
Low	Area used primarily for leisure activities, including Public Rights of Way, sites of historic or cultural importance.
Negligible	All other areas such as those used primarily for industrial or agricultural purposes.

Overhead Line Noise Significance of Effects

14D.4.10 For Tier 1 and Tier 2 assessments, the magnitude of effect categories are based on resulting noise levels at the NSR for wet noise (Tier 1) and combined dry and wet noise (Tier 2), with the significance of effect matrix from TGN(E)322 presented in **Table 14D.6**.

14D.4.11 If a Tier 3 assessment is needed, the magnitude of effect categories will be based on the difference between overhead line rating noise level and the background sound level in the area with or without the effect of noise from rainfall. The significance of effect matrix for Tier 3 assessments is presented in **Table 14D.7**.

Table 14D.6: Significance of effect matrix for Tier 1 and Tier 2 screening

Significance of Effect	Sensitivity of Receptor			
	Magnitude	High	Medium	Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Minor	Negligible
Negligible	Minor	Negligible	Negligible	Negligible
No Effect	Negligible	Negligible	Negligible	Negligible

Table 14D.7: Significance of effect matrix for Tier 3 assessment

Significance of Effect	Sensitivity of Receptor			
	Magnitude	High	Medium	Low
High	Major	Major	Moderate	Minor
Medium	Major	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Negligible	Minor	Negligible	Negligible	Negligible

14D.5 Tier 1 Overhead Line Noise Assessment

Preliminary Assessment

- 14D.5.1 At this stage, a preliminary assessment of overhead line noise has been undertaken following the methodology described above assuming a triple Araucaria conductor.
- 14D.5.2 The Tier 1 screening provides an indication of adverse impacts. Final selections of design and conductor may vary from those assumed at this stage.
- 14D.5.3 A Tier 1 screening has been undertaken, indicating the distances from the overhead line centreline (proposed route alignment) within which there may be adverse impacts and an additional investigation is required. Where NSRs fall within these distances, Tier 2 and Tier 3 assessments will be included in the ES as required. Beyond these distances, there would be no adverse impacts and therefore no further assessment would be required.
- 14D.5.4 The modelling of overhead line noise in a straight configuration has been carried out by National Grid in the EFC400 software using the Electric Power Research Institute calculation method. The calculations were carried out using 0 (zero) ground absorption, standard air absorption, composition, temperature, and pressure and downwind propagation conditions.

14D.5.5 **Table 14D.8** and **Figure 14.2 Overhead Line Noise Tier 1 Buffers** of the PEIR present the preliminary noise screening distances for Tier 1 in straight spans. This will be revisited for the ES.

Table 14D.8: Tier 1 noise screening distances

Receptor	Threshold Distance (m) from the Limits of Deviation for the Conductor for an Adverse Impact
Vulnerable Subgroups	73
Residential	27
Schools and Hotels	0

References

- Ref 14D.1 British Standards Institute (2019). BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound. [Online]. Available at: <https://landingpage.bsigroup.com/LandingPage/Standard?UPI=00000000030382132> [Accessed July 2025].
- Ref 14D.2 National Grid (2021). Policy Statement PS(T)134 - Operational Audible Noise Policy for Overhead Lines.
- Ref 14D.3 National Grid (2021). Technical Report TR(E)564 - Development of Method for Assessing the Impact of Noise from Overhead Lines (New Build, Reconductoring, Diversion and Uprating).
- Ref 14D.4 National Grid (2021). Technical Guidance Note TGN(E)322 - Operational Audible Noise Assessment Process for Overhead Lines (New Build, Reconductoring, Diversion and Uprating).

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