Scottish & Southern Electricity Networks

TRANSMISSION

Environmental Impact Assessment (EIA) Report

LT383 Alyth to Tealing Overhead Line (OHL) 400kV Upgrade

November 2024

VOLUME 2: CHAPTER 13 – NOISE AND VIBRATION

Figures (Volume 3 of this EIA Report)

There are no Figures associated with this chapter.

Appendices (Volume 4 of this EIA Report)

- Appendix 13.1 – Acoustic Terminology
- Appendix 13.2 – Calibration Certificates;
- Appendix 13.3 – NSRs;
- Appendix 13.4 – Construction Activity;
- Appendix 13.5 – Construction Noise Impact Assessment;
- Appendix 13.6 – Operational Noise Impact Assessment; and
- Appendix 13.7 – Cumulative Operational NIA.

13. NOISE AND VIBRATION

13.1 Introduction

13.1.1 This chapter considers the potential effects, including cumulative effects, of the Proposed Development on Noise and Vibration during construction and operation. The methodology will primarily focus on assessment of effects on permanent residential receptors in the study area. Where likely significant effects are predicted, appropriate mitigation measures are proposed, and the significance of predicted residual effects are assessed. This Chapter (and its associated Technical Appendices) is not intended to be read as a standalone assessment and reference should be made to the introductory chapters of this EIA Report.

13.1.2 The objectives of this chapter are to:

- describe the assessment methodology and significance criteria used in the assessment;
- identify the noise sensitive receptors in the vicinity of the Proposed Development;
- describe and define the baseline noise environment;
- identify the dominant sound sources associated with the operation and construction of the Proposed Development;
- predict the potential direct and indirect impacts on noise sensitive receptors; and
- indicate any requirements for mitigation measures, if applicable, to provide sufficient levels of protection for all noise sensitive receptors.

13.1.3 An energised electrical overhead transmission line (OHL) can be the source of an audible phenomenon known as ‘corona discharge’. This is a limited electrical breakdown of the air in the vicinity of the OHL conductors. While OHL conductors are designed and constructed to minimise corona discharge, surface irregularities such as damage, attached raindrops, insects and other types of contamination can increase local electric field strength beyond the inception level for local corona discharge at these sites. Such corona discharge can be the source of audible noise, a crackling sound accompanied sometimes by a low frequency hum. These noise levels are present in 275 kV OHLs and are more likely to be prominent in 400 kV OHLs, depending on the conductor type.

13.1.4 The highest noise levels generated by an OHL usually occur during light rain when water droplets, collecting on the surface of the conductor, can initiate corona discharge. The number of droplets that collect, and hence the amount of noise, depends on the rate of rainfall. Mist or fog can also cause corona discharge from droplets condensing on and attaching to the conductor surface. Sometimes, after a prolonged spell of dry weather, conductors can become contaminated with accumulated dust particles and other materials on which corona discharge can occur and audible noise can be generated. Later rain showers have the effect of washing the conductors clean of such debris.

13.1.5 An OHL may also produce ‘aeolian noise’. Aeolian noise is caused by wind blowing over a structure resulting in vibration that matches that the natural frequency of the structure, or vortex shedding on the surface of a structure. There is currently not a standardised method to predict this type of noise, therefore it is difficult to assess. This type of noise is usually infrequent and depends on wind velocity and direction.

13.1.6 This Chapter is necessarily technical in nature so, to assist the reader, a glossary of acoustic terminology is included in Appendix 13.1 – Acoustic Terminology (Volume 4).

13.1.7 Additional information which supports this chapter is presented in the following technical appendices (Volume 4):

- Appendix 13.2 – Calibration Certificates;
- Appendix 13.3 – NSRs;
- Appendix 13.4 – Construction Activity;

- Appendix 13.5 – Construction Noise Impact Assessment;
- Appendix 13.6 – Operational Noise Impact Assessment; and
- Appendix 13.7 – Cumulative Operational NIA.

13.2 Assessment Methodology and Significance Criteria

Scope of the Assessment

13.2.1 The scope of this assessment is to quantify the impact that may result from the construction and operational phases (including cumulative) of the Proposed Development.

13.2.2 The Proposed Development and methodology of assessment has been discussed with the Local Planning Authority Environmental Health Officer (LPA EHO).

13.2.3 The assessment of construction noise will comply with the following standards and guidance.

The Control of Pollution Act, 1974 (COPA)

13.2.4 Section 60 of the Act enables Local Authority officers to serve a notice in respect of noise nuisance from construction works, instructing the contractor to minimise nuisance to neighbouring properties through specific conditions. Section 61 of the Act provides a method by which a contractor can apply to the Local Authority for prior consent to undertake construction works in advance of their commencement. If consent is given, the application is exempt from any enforcement action under Section 60 of the same act.

British Standard 5228-1/2:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites1

13.2.5 Guidance on the prediction and assessment of noise and vibration from construction sites is provided in British Standard (BS) 5228 2009 +A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1: Noise. BS5228-1 provides recommended limits for noise from construction sites.

13.2.6 The construction noise impact assessment (CNIA) will be carried out according to the ABC method specified in Table E.1 of BS5228-1, in which noise sensitive receptors (NSRs) are classified in categories A, B or C according to their measured or estimated background noise level.

13.2.7 In line with best practice (BS 5228-1), a Construction Noise Management Plan (CNMP) will be developed by the principal contractor prior to starting construction works. The details of the CNMP will be agreed with the LPA and is expected to be secured by an appropriately worded planning condition.

13.2.8 Part 2: Vibration. BS5228-2 provides recommended limits for vibration from construction sites. The construction vibration impact assessment (CVIA) will be carried out against the guidance on effects of vibration levels specified in Table B.1 of BS5228-2. The level of vibration ranging from 0.14 mm.s-1 to 10 mm.s-1 indicates where vibration may be perceptible however acceptable, or intolerable.

Planning Advice Note (PAN) 1/2011: 'Planning and Noise'[2]

13.2.9 Published in March 2011, this document provides advice on the role of the planning system in helping to prevent and limit adverse effects of noise. Information and advice on noise assessment methods are provided in the accompanying Technical Advice Note (TAN): Assessment of Noise. Included within the PAN document and the

1 British Standard 5228: Code of practice for noise and vibration control on construction and open sites (BS 5228), BSI, 2009, amended 2014
2 Planning Advice Note: Planning and noise (PAN 1/2011, The Scottish Government , 2011

accompanying TAN are details of the legislation, technical standards, and codes of practice for specific noise issues.

13.2.10 Neither PAN 1/2011 nor the associated TAN provides specific guidance on the assessment of noise from fixed plant, but the TAN includes an example assessment scenario for 'New noisy development (including commercial and recreation) affecting a noise sensitive building', which is based on BS 4142:1997: Method for rating industrial noise affecting mixed residential and industrial areas. This British Standard has been replaced with BS 4142:2014: Methods for rating and assessing industrial and commercial sound.

13.2.11 *TGN(E)322 – Operational Audible Noise Assessment Process for Overhead Lines*

13.2.12 The National Grid has derived a procedure to assess the impact of OHL noise in both dry and rainy conditions – TGN (E) 322 – Operational Audible Noise Assessment Process for Overhead Lines. The guidance of the British Standard BS 4142: 2014 can also be used to assess the impact of the noise from a specific industrial source at NSRs.

13.2.13 The procedure requires that a series of assessments are conducted in tiers. Tier 3 requires that the background noise at NSRs within a set distance from the OHL (usually 200 m) be measured during quiet night times and in dry conditions with little wind. The nature of the ground surface around the sensitive receptors is noted so that the contribution to background noise of the surface noise attributable to the rainfall can be derived from empirically derived curves (Miller curves). The logarithmic sum of the measured background noise (BGN) and the empirically derived contribution for rainfall is adopted as the BGN level, in rainy conditions, against which to compare the predicted received noise from the OHL. Using the parameters provided in TGN(E)322 the likelihood of an adverse impact can be assessed.

13.2.14 The assessment procedure follows TGN(E)322, and has been conducted in the following stages:

- the outcome of the Tier 1 assessment will determine whether the 'worst case' wet noise impact is predicted to be acceptable, or whether further assessment is required;
- the outcome of the Tier 2 assessment will determine whether the combined wet and dry noise impact is acceptable, or whether further assessment is required;
- the outcome of the Tier 3 assessment will determine whether the noise impact is acceptable, whether the noise needs to be mitigated and minimized or whether the noise is unacceptable;
- the Tier 3 assessment takes account of:
  - existing background sound levels in the area and noise levels due to rainfall;
  - the attended collection of night-time background noise levels at NSRs, or groups of such NSRs, within at least 280 m of the centreline of the OHL during suitable dry weather conditions, before construction;
  - allowance for the effects of rainfall on BGN;
  - prediction of contribution from conductors; and
  - determination of total excess at the most likely rain rate.

13.2.15 British Standard 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound (BS 4142)[3]

British Standard 4142 describes methods for rating and assessing the following:

- sound from industrial and manufacturing processes;
- sound from fixed installations which comprise mechanical and electrical plant and equipment;
- sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and

3 British Standard 4142: Methods for rating and assessing industrial and commercial sound (BS 4142), BSI, 2014, Amended 2019

- sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/ or commercial site.

13.2.16 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

13.2.17 In accordance with the assessment methodology, the specific sound level (LAeq,T) of the noise source being assessed is corrected, by the application corrections for acoustic features, such as tonal qualities and/or distinct impulses, to give a "rating level" (LAr,Tr).The British Standard effectively compares and rates the difference between the rating level and the typical background sound level (LA90,T) in the absence of the noise source being assessed.

13.2.18 BS 4142 advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) when the noise source in question is likely to operate or is proposed to operate in the future.

13.2.19 Comparing the rating level with the background sound level, BS 4142 states:

- "typically, the greater this difference, the greater the magnitude of impact;
- a difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;
- a difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context; and
- the lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant 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, depending on the context."

BS8233:20144 and Noise Rating Curves

13.2.20 British Standard 8233:2014: Guidance on sound insulation and noise reduction for buildings provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels to occupants of an existing building.

13.2.21 The guidance provided includes appropriate internal and external noise level criteria which are applicable to dwellings exposed to steady-state external noise sources. It is stated in the British Standard that it is desirable for internal ambient noise level not to exceed the criteria set out in Table 13-1.

Table 13-1 Summary of Internal Ambient Noise Level Criteria for Dwellings from BS 8233:2014

Activity	Location	07:00 to 23:00 Hours, i.e. Daytime	23:00 to 07:00 Hours, i.e. Night time
Resting	Living Room	35 dB LAeq,16 hour	
Dining	Dining Room/Area	40 dB LAeq,16 hour	
Sleeping (daytime resting)	Bedroom	35 dB LAeq,16 hour	30 dB LAeq,8 hour

13.2.22 Noise Rating (NR) curves was developed by the International Organization for Standardization (ISO) to determine the acceptable indoor environment for hearing preservation, speech communication and annoyance. The primary standards that reference NR curves include ISO 1996-1:2016, ISO 717-1:2013, and BS 8233:2014.

4 British Standard 8233: Guidance on sound insulation and noise reduction for buildings (BS 8233), BSI, 2014

13.2.23 The noise rating curves for different sound pressure levels are plotted as acceptable sound pressure levels at different frequencies. Acceptable sound pressure level varies with the room and the use of it. Different curves are obtained for each type of use. Each curve is referenced by a NR number as set out in Table 13-2.

Table 13-2 Noise Rating Descriptions

Noise Rating	Application
NR 20	Quiet rural area for protection of amenity.
NR 25	Concert halls, broadcasting and recording studios, churches.
NR 30	Private dwellings, hospitals, theatres, cinemas, conference rooms.
NR 35	Libraries, museums, court rooms, schools, hospitals operating theatres and wards, flats, hotels, executive offices.
NR 40	Halls, corridors, cloakrooms, restaurants, night clubs, offices, shops.
NR 45	Department stores, supermarkets, canteens, general offices.
NR 50	Typing pools, offices with business machines.
NR 60	Light engineering works.
NR 70	Foundries, heavy engineering works.

13.2.24 The noise rating curve NR20 equates to a similar total noise level of 30 dB(A), and therefore is an appropriate consideration in respect to indoor noise levels as specified in BS8233.

Extent of the Study Area

13.2.25 The Study Area encompasses the area over which all desk-based and field data were gathered to inform the assessment presented in this Chapter. The Study Area comprises 52 nearby noise sensitive receptors (NSRs) in proximity to the Proposed Development. These NSRs are all within 280 m of the nearest point to the OHL. The distance of 280 m was chosen after a screening of the worst-case conductor type where any NSRs outside of 280 m would pass a Tier 1 assessment according to TGN(E)322. The main settlements within the vicinity of the OHL Route include Kirkinch, Kirkton of Auchterhouse, and Tealing. Smaller settlements, individual dwellings, and clusters of properties are also distributed along the length of the OHL Route.

Consultation Undertaken to Date

13.2.26 To inform the scope of the assessment for the Proposed Development, consultation was undertaken with the LPA. Table 13-3 summarises the responses relevant to this Chapter and provides information on where and/or how points raised have been addressed in this assessment.

Table 13-3 Summary of Consultation Undertaken

Consultee	Type of consultation	Response	Action
Angus Council	Proposed methodology and assessment approach.	General agreement on methodology from involvement in the East Coast 400 kV upgrade. Noted that change to specific OHL methodology (now TGN(E)322). Expects some consideration of internal noise impacts. Expects justification of 280 m separation distance.	An indoor assessment has been conducted against NR curve criteria, assuming a partially open window. As identified in the Scoping Report, initial screening calculations show that past 280m,, noise levels are insignificant from the proposed conductor.

Consultee	Type of consultation	Response	Action
		Notes there seems to be significant distance between some NSRs and the nearest background monitoring locations, and this should be justified.	Some properties initially identified were screened to be non-inhabited, and therefore have been removed from the assessment. Background noise measurements were conducted at locations deemed acoustically similar to all other inhabited NSRs.
Perth and Kinross Council	Proposed methodology and assessment approach.	Generally happy with the proposed methodology, however, note that whilst previous assessments; North East 400 kV Reinforcement Works (Jan 2020) and East Coast 400 kV Upgrade (Dec 2020) have included NR Curves, there is no mention of this criteria in the proposed assessment.	An indoor assessment has been conducted against NR curve criteria, assuming a partially open window.

Method of Baseline Data Collation

13.2.27 The field survey consists of free-field attended spot measurements at each noise sensitive receptor using a class-1 sound level meter. This is necessary to determine the existing noise environment and to obtain BGN levels at each location. This background noise level is used as a baseline for the operational noise impact assessment for dry and wet conditions.

13.2.28 Measurements were conducted using Rion NL-52 sound level meters (serial numbers 01265436 and 00175536) which was spot calibrated with a Rion NC-74 calibrator (serial number 34178103), before and after the measurement campaign. Calibration certificates can be found in Appendix 13.2 (Volume 4). Where the acoustic environment was stable with no transient noise sources, a 5-minute measurement was conducted as this was representative of the location during this period. If transient noise sources were present, the measurement was extended to 15-minutes as recommended by BS4142.

13.2.29 Measured parameters include the following:

- L_{Aeq} (5-minutes);
- L_{Aeq} (5-minutes) one-third octave band spectrum;
- L_{A90} (5-minutes); and
- L_{A90} (5-minutes) one-third octave band spectrum.

Assessment Modelling

Construction Noise

13.2.30 A desk-based construction noise appraisal has been prepared for the purpose of assessing the effects of the works on any nearby residents. This appraisal has been produced in line with British Standard 5228-1:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

13.2.31 The working hours of the construction activities are outlined in Table 13-4, with likely construction equipment identified in Annex C of BS 5228-1. At the time of writing, the exact start and end date of each activity is not known. Therefore, the sequence of activities is shown. The activity is analysed to determine the percentage of the construction time each piece of equipment is being used and how many are in use. Using this information, a total equivalent noise level is calculated. The dispersion of this total noise level is then modelled, accounting for distance and ground absorption.

Table 13-4 Construction Schedule

Contract Works	Proposed Working Hours
Felling (where required)	Summer (1st Mar to 31st Oct) Every day 07:30 – 19:00 (or as daylight allows) Winter (1st Nov to 28th Feb) Every day 07:30 – 17:00 (or as daylight allows)
Dismantling and Removal of Conductor	
Foundations	
Stringing of Conductor	

Construction Vibration

13.2.32 A desk-based construction vibration appraisal has been prepared for the purpose of assessing the effects of the works on any nearby residents. This appraisal has been produced in line with British Standard 5228-2:2009 +A1:2014 (BS5228), Code of Practice for Noise and Vibration Control on Construction and Open Sites.

13.2.33 BS5228-2 provides recommended limits for vibration from construction sites. The construction vibration impact assessment (CVIA) will be carried out against the guidance on effects of vibration levels specified in Table B.1 of BS5228-2. The level of vibration ranging from 0.14 mm.s-1 to 10 mm.s-1 indicates where vibration may be perceptible however acceptable, or intolerable.

13.2.34 Construction activities that induce vibration are likely to be limited to potential piling activities where required at foundations. As a worst-case assessment, all towers are assumed to require foundations works. The formulae for the prediction of groundborne vibration due to piling is taken from Table E.1 in BS5228-2.

13.2.35 Potential of heavy goods vehicle (HGV) vibration on receptors along haul roads will be predicted using the procedures in Transport and Road Research Laboratory (TRL) Research Report 246 – Traffic Induced Vibrations in Buildings.

Operational Noise

13.2.36 There are differences in assessment methods for dry and wet conditions. Dry noise is assessed by indicating the excess of rating level over background. During wet conditions, the noise output from OHLs varies according to the number and size of rain droplets accumulated on the surface of the conductors. Therefore, there is a strong relationship between the rainfall rate and the noise output from an OHL. Background noise levels also increase with rainfall rate, such that during very heavy rain, OHL noise is generally inaudible. For these reasons, an alternative noise assessment method to deal with rain-induced noise is required. The external rain-induced noise

levels are assessed using the methodology developed by National Grid and detailed in their Technical Guidance Note TGN(E)22.

13.2.37 The excess wet figure is derived by comparing the total noise to the background noise level for the appropriate Miller Curve rating at each receptor at a rain rate of 1 mm/hr.

13.2.38 The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact.

13.2.39 There is no method for the prediction or assessment of potential aeolian noise impacts. Therefore, aeolian noise is not assessed within this chapter. However, the impacts of such noise should be anticipated and mitigated in the design of the Proposed Development.

Determining Sensitivity of Receptors

13.2.40 The sensitivity of the NSR is estimated in its current state prior to any change implied by the Proposed Development. The level of sensitivity is determined according to existing regulations and guidance, societal value, and vulnerability for the change. By the combination of the assessed value of these three components, the NSRs' sensitivity can be classified as Low, Medium or High (Table 13-5). A negligible category is not included, as such a receptor would be an unoccupied or unused area, which is not a defined receptor.

Table 13-5 Evaluation of Receptor Sensitivity

Level of Sensitivity	Definition
Low	The receptor has minor societal value, low vulnerability for the change and no existing regulations and guidance. Even a receptor which has major or moderate societal value may have low sensitivity if it is not liable to be influenced by the Proposed Development. Area used primarily for leisure activities, including recreational routes, sites of historic or cultural importance.
Medium	The receptor has moderate value to society, its vulnerability for the change is medium, regulation may set reference values or recommendations, and it may be in a conservation program. Even a receptor which has major societal value may have medium sensitivity if it has low vulnerability, and is not liable to be influenced by the Proposed Development.
High	Legislation strictly conserves the receptor, or it is very valuable to society, or very liable to be harmed by the Project development. Vulnerable subgroups including hospitals, pre-schools, care homes, and hospices.

13.2.41 Prior to detailed assessment, all NSRs considered in this assessment are assumed to be residential in nature with a quiet baseline noise environment. Therefore, the sensitivity is assumed as Medium unless otherwise specified.

Determining Magnitude of Impact

Construction

13.2.42 The noise criteria provided for the ABC method detailed in BS 5228-1 are shown in

13.2.43

13.2.44 Table 13-6.

Table 13-6 Construction Noise Impact Assessment Criteria

Assessment category and threshold value period	Threshold value, LAeq (dB)		
	Category A	Category B	Category C
Night-time	45	50	55
Evenings and weekends	55	60	65
Daytime and Saturdays	65	70	75

13.2.45 Night-time is defined as between 23:00 and 07:00. Evenings and weekends are defined as 19:00 – 23:00 on weekdays, 13:00 – 23:00 on Saturdays and 07:00 – 23:00 on Sundays. Daytime is defined to be 07:00 – 19:00 on weekdays and 07:00 – 13:00 on Saturdays.

13.2.46 The NSR is defined as Category A if the ambient noise levels (rounded to the nearest 5 dB) are less than those stated for Category A. This is true for the Study Area and therefore the Proposed Development will be assessed to Category A thresholds.

13.2.47 From the outlined construction schedule, work is expected 7 days a week. It is likely that the majority of construction works will occur during daytime periods, however, may extend into evening and weekends.. It is not known what activities within each phase will take place at what times, therefore, all activities within each phase are assumed to take place in the evening. Therefore, the 55 dB(A) limit has been adopted in this case to ensure a conservative assessment takes place.

13.2.48 With a noise limit of 55 dB(A) identified from BS-5228-1, the following magnitude of impact at receptors can be determined from Table 13-7.

Table 13-7 Construction Noise - Magnitude of Impact at Receptors

Magnitude of Impact	Construction Noise Level (dB(A))
High	> 60
Medium	56 to 60
Low	BGN to 55
Negligible	< BGN

13.2.49 Excess over the 55 dB criteria will result in ***Medium*** impact magnitude. Excess of 5 dB or more over the noise limit will result in ***High*** impact magnitude.

13.2.50 Criteria for construction vibration due to access tracks and foundation works are taken from Table B.1 in BS5228-2 and shown in Table 13-8. Vibration is measured as peak particle velocity (PPV).

Table 13-8 Construction Vibration Impact Assessment Criteria

Impact Magnitude	Vibration Level, Peak Particle Velocity (PPV)	Effect
Negligible	<0.3 mm·s^{-1}	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
Low	>0.3 mm·s^{-1}	Vibration might be just perceptible in residential environments.
Medium	>1.0 mm·s^{-1}	It is likely that vibration of this level in residential environments will cause complaints but can be tolerated if prior warning and explanation have been given to residents.
High	>10 mm·s^{-1}	Vibration is likely to be intolerable for any more than a very brief exposure to this level in most building environments.

13.2.51 Excess over the 10 mm·s^{-1} criteria will result in ***High*** impact magnitude. Construction vibration between the 1 mm·s^{-1} and 10 mm·s^{-1} threshold will result in ***Medium*** impact magnitude. Below 1 mm·s^{-1} will result in ***Low*** impact magnitude.

Operational

13.2.52 The magnitude of an impact at a given receptor can be interpreted as the degree of alteration that is undergone by the receptor as a consequence of the impact. Magnitude criteria can be quantitative using standards such as BS 4142. As reported in the table below, the impact magnitude is worked out on a case-by-case basis for each NSR and classified as **Negligible**, **Low**, **Medium**, or **High**.

13.2.53 Information from the rating level, the background sound level, and the stated impacts from a BS4142 assessment have been converted into representative impact magnitudes, detailed in Table 13-9:

Table 13-9 BS4142 Impact Magnitude

Impact Magnitude	Definition	TGN(E)322 Tier 3 Criteria for Magnitude of Impact (Difference between OHL Rating Noise Level and Background Sound Level)
Negligible	Impact to the receptor is immeasurable, undetectable or within the range of normal natural background variation.	≤ 0 dB
Low	The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is	0 to 4 dB

Impact Magnitude	Definition	TGN(E)322 Tier 3 Criteria for Magnitude of Impact (Difference between OHL Rating Noise Level and Background Sound Level)
	an indication of the specific sound source having a low impact, depending on the context	
Medium	A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.	5 to 9 dB
High	A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.	≥ 10 dB

Determining Significance of Effect

13.2.54 After assessing the sensitivity of the NSR in its baseline state, and then the impact magnitude of the noise likely to affect the NSR, an estimate of the effect significance can be derived by applying a calculation matrix (Table 13-10).

13.2.55 The measure of significance is the key output of the impact assessment process and drives the requirement for mitigation measures to be applied during operation to offset or reduce potential project generated effects.

13.2.56 The evaluation of effect significance shall be performed by following a conservative approach to account for potential uncertainties affecting baseline data. Resulting effects of ***Moderate*** and ***Major*** impacts are considered ***significant*** under the EIA Regulations and require mitgation.

Table 13-10 Evaluation of the Effect Significance.

		Sensitivity				
		Very High	**High**	**Medium**	**Low**	**Negligible**
Magnitude	**Major**	**Major**	**Major**	**Moderate**	**Moderate**	Minor
	Moderate	**Major**	**Moderate**	**Moderate**	Minor	Negligible
	Minor	**Moderate**	**Moderate**	Minor	Negligible	Negligible
	Negligible	Minor	Minor	Negligible	Negligible	Negligible

Limitations and Assumptions

13.2.57 Estimated noise emissions from the Proposed Development's construction noise activities and plant items have been based on previous projects of a similar nature. This assessment considers conservative assumptions with the aim to produce a worst-case assessment. The assumptions include a direct path from source to receiver with no screening or change in terrain level. The ground factor is assumed as a mix of both hard and soft terrain. The assessment assumes equipment is producing the maximum sound power level for the entire time it is assumed as operational according to the construction schedule in Appendix 13.4 (Volume 4). In practice, noise levels during construction would be expected to be lower than the assessment details.

13.2.58 There will be periods just after rainfall or during mist conditions where there is some noise emission from the OHL, although these levels are less than those during rain. These periods are not accounted for in the

assessment. The number of droplets, and hence the noise level, will depend primarily on the rate of rainfall. Historical studies determined that hum inception typically occurs at a rainfall rate of approximately 1 mm/hr.

13.2.59 There is always a degree of uncertainty when conducting assessments on developments in the planning stage. These uncertainties occur in calculation, rounding, and baseline levels used. Assumptions include a flat terrain between OHL centreline and NSR. In Tier 1 and 2 of the TGN(E)322 assessment, no acoustic absorption due to the ground is included to ensure a worst-case assessment. The calculation for OHL conductor noise uses the Electric Power Research Institute (EPRI)[5] method of calculation which assumes a moderately aged conductor, which is appropriate for the assessment of the Proposed Development for the lifetime of its operation.

13.2.60 The assessments are based on information available at the time of publication, any changes to design or specification of the Proposed Development that may lead to increased adverse effects would require re-assessment.

13.2.61 The perception and impact of noise may also be subjective. As a result, although an assessment has been made to outlined standards and guidance, there cannot be an absolute guarantee that complaints will not be received.

13.2.62 Whilst some information gaps have been identified,, it is considered that there is sufficient information to enable an informed decision to be taken in relation to the identification and assessment of likely significant environmental effects on noise and vibration.

13.3 Sensitive Receptors

13.3.1 Potential noise sensitive receptors were processed from AddressBase data. In conducting calculations according to the EPRI method, recommended by the TGN(E)322, an overhead line passes a Tier 1 assessment of TGN(E)322 if the wet noise falls below 34 dB(A) at that receptor. At time of screening for NSRs, the conductor type was not known, only a choice of three conductors. It was calculated that the wet noise from the noisiest of three, triple Oslo, is predicted to produce 34 dB(A) of wet noise up to a distance of 260 m. Adding a buffer of 20 m, for variances in property size, addresses up to 280 m of the proposed alignment were considered as receptors. Triple Upas and Triple Eagle were the other two conductors. Both are predicted to produce 34 dB(A) at 210 m. The conductor that has been selected for the Proposed Development is Triple Upas, and therefore the screening distance of 280m is considered conservative.

13.3.2 There are 52 noise sensitive receptors identified within 280 m of the centreline of the existing overhead line. These are detailed in Appendix 13.3 (Volume 4).

13.3.3 In areas of a high concentration of receptors, measurement locations were selected which were deemed to be representative of the relevant surrounding area. These are often in residential areas with densely populated houses that have a shared acoustic environment. The background noise measurements are used in a Tier 3 assessment.

13.4 Baseline Conditions

13.4.1 Noise monitoring has been conducted in the vicinity of the Proposed Development to determine the existing prevailing noise environment. To determine the BGN at each location, free-field attended spot measurements were conducted at the nearby NSRs between 23:00 and 03:00 on the nights of 23rd April 2024, 24th April 2024, 1st May 2024, 2nd May 2024, 12th June 2024, and 17th June 2024.

13.4.2 In general, the BGN data is relatively low at night in areas far from busy motorways such as the A90. The results of baseline noise survey show that NSRs in vicinity of the Proposed Development have a noise environment

[5] EPRI AC Transmission Line Reference Book – 200 kV and Above, Third Edition, Final Report, 2005, Electrical Power Research Institute

quantified between 17 – 39 dB L_{A90} during night periods. The noise environment of NSRs close to the A94 is dominated by traffic noise. Where this traffic noise is not audible, background noise levels drop to a considerably low level.

13.4.3 It is not expected that there will be a significant change to future baseline noise levels than those measured in this study.

13.5 Issues Scoped Out

13.5.1 There are no known vibrational issues associated with the operation of the Proposed Development at nearby NSRs. Therefore, vibration due to operation is not expected to adversely impact receptors and has not been assessed further.

13.5.2 Any operational maintenance works required will be short-term and intermittent and are not expected to give rise to significant effects relating to noise and vibration. Therefore, noise from operational maintenance is not expected to adversely impact receptors and has not been assessed further.

13.6 Assessment of Effects, Mitigation and Residual Effects

13.6.1 Potential significant effects that may result from the construction and operational phases (including cumulative) and of the Proposed Development include:

- effects of construction noise on the surrounding area and on NSRs including effects of static and quasi-static construction noise from construction plant, such as excavators, dump trucks and cranes; and
- operational effects of noise from the Proposed Development on NSRs, mainly noise from corona discharge in wet conditions and the potential for aeolian noise in windy conditions.

Mitigation by Design

13.6.2 Aeolian noise is caused by wind blowing through the conductors and/or structures. This type of noise is usually infrequent and depends on wind velocity and direction. Wind must blow steadily and perpendicular to the lines to set up an aeolian vibration, which can produce resonance if the frequency of the vibration matches the natural frequency of the line. Dampers can be attached to the lines to minimise aeolian noise. It must be ensured that no components are used that have a known history to produce high aeolian noise.

Construction Phase

13.6.3 It is expected that construction works are likely to occur during the daytime and evening and weekends as shown in the CEMP. It is not known what activities will take place during the daytime and evenings. It is therefore assumed all activities can take place in the evening to ensure a worst-case assessment. Therefore, the 55 dB limit has been adopted in this case to ensure a conservative assessment takes place. Excess over the 55 dB criteria will result in ***High*** impact magnitude. The 65 dB limit will also be assessed in case the majority of activities take place in the daytime.

13.6.4 At the time of writing, the equipment expected to be used has not been supplied. Equipment from projects of a similar nature have been assumed, in sequential construction phases.

13.6.5 To calculate the potential construction noise levels from the work sites for the Proposed Development, information about the proposed construction activities is needed. The Principal Contractor will be responsible for developing the detailed construction methodology and associated plant requirements following contract award, however, Appendix 13.4 (Volume 4) shows plant activities, assumed plant items, their assumed quantities, their assumed utilisation, and associated noise levels at a distance of 10 m, taken from BS 5228 and based on worst case construction activities at a similar overhead line construction site (proposed Coire Glas 400 kV OHL). By combining the items' noise levels ($L_{A,eq}$ at 10 m (dB)) with the amount of time each will be running (utilisation) and

their quantity, the total equivalent noise can be calculated for each row. These are then logarithmically summed to give a total value for the construction noise at 10 m. To ensure a worst-case assessment, it has been assumed that all works within the phases will take place simultaneously. The noise due to vehicle movements on access tracks has also been considered. The construction schedule states there is a maximum of eight vehicle movements per day (six light and two heavy) during construction. Over an 8 hour working day it can be considered that there is an average of one vehicle on access tracks per hour during the proposed construction working hours.. The Principal Contractor is also responsible for implementing a traffic management plan, especially in the case this average changes.

13.6.6 The total equivalent noise level at 10 m for each activity can be used in a propagation calculation to find the specific noise at each receptor.

13.6.7 This attenuation has been calculated over mixed hard and soft ground to the F.2.3.2 method in BS 5228. Given the dominance of soft ground in the area surrounding the Proposed Development, this is slightly conservative. The effects of barriers or topographical screening have not been considered as a conservative approach.

13.6.8 Detailed results shown in Appendix 13.4 (Volume 4), a summary of results are presented in Table 13-11.

Table 13-11 Summary of Construction Noise Results

Phase	Receptors in excess (55 dB Limit)	Receptors in Excess (65 dB limit)
Felling	50	19
Dismantling and Removal of Conductor	17	0
Foundations	38	1
Stringing of Conductor	0	0

13.6.9 For the felling phase, noise at 50 out of 52 NSRs are above the 55 dB noise limit, 41 NSRs result in ***High*** impact. 19 NSRs exceed the 65 dB limit if the felling were to take place in day time hours, with only 2 NSRs resulting in ***High*** impact. The distance is considered from the NSR property centre to the nearest felling buffer. Felling activities will vary in time spent, with some areas expected to be very short term. When a Construction Noise Management Plan (CNMP) is created, the time expected to fell trees in each area should be specified to assess the severity of the construction noise.

13.6.10 Noise at 17 of 52 NSRs are above the 55 dB limit for the dismantling and removal of conductor phase, with 3 NSRs rated as ***High*** impact. If completed in the daytime, then there are no limit breaches.

13.6.11 For the foundations phase, it is predicted 38 of the 52 NSRs are above the 55 dB limit. With 15 NSRs resulting in ***High*** impact. If completed in the daytime, then construction noise at one NSR is predicted to be above the 65 dB limit (NSR 48) resulting in ***Medium*** impact. The construction schedule indicates that foundations works will take place 'where required'. Therefore, when a detailed CNMP is established, it should be made clear which towers foundations works are necessary. The distance is currently assumed to be from the nearest tower to each receptor.

13.6.12 For the stringing, noise at all NSRs is predicted to be below the 55 dB limit.

13.6.13 Therefore, prior to the mitigation measures, construction noise is assessed as ***High*** impact, on a ***Medium*** sensitivity receptor, causing a ***Major*** effect which is **significant** in EIA terms. This is therefore due to the 55 dB limit breaches at three of the assumed phases (felling, dismantling and removal of conductor, foundations).

13.6.14 Construction activities associated with vibration are largely unknown at time of writing, therefore, the worst-case parameters will be assumed for vibration due to foundation excavation and piling taking place at Tower 654 and

impacting the closest receptor to the tower (NSR 48 at 77 metres from the nearest tower). If the assessment passes at the closest receptor, it will pass at all others. The parameters that affect resultant vibration from piling, v_{res}, are shown in Table 13-12.

Table 13-12 Groundborne Vibration Parameters from Mechanised Construction Works

Vibration Parameter	Range
Maximum amplitude of drum vibration, in millimetres (mm)	Between 0.4 and 1.72 mm
Pile toe depth, in metres (m)	Between 1 and 27 m
Vibrating roller drum width, in metres (m)	Between 0.75 and 2.2 m
Number of vibrating drums	1 or 2
Slope distance from the pile toe or tunnel crown, in metres (m)	Depends on distance between source and receiver and pile toe depth
Nominal hammer energy, in joules (J)	Between 1.5 and 85 kJ
Potential energy of a raised tamper, in joules (J)	Between 1 and 12 MJ
Distance measured along the ground surface, in m	77 metres for closest NSR 48

13.6.15 Table 13-13 shows the worst-case results of the groundborne vibration due to piling. Vibratory compaction, percussive piling, and vibratory piling have been calculated in the case these activities will take place.

Table 13-13 Groundborne Vibration Results from Foundation Works at Tower 654 on NSR 48 – Gates of Nevay

Vibration Operation	Resultant PPV (mms^{-1})	Magnitude of Impact
Vibratory Compaction (Steady State)	0.35	Low
Vibratory Compaction (Start Up and Run Down)	0.83	Low
Percussive Piling	0.16	Negligible
Vibratory Piling	0.14	Negligible

13.6.16 All impacts for potential vibration works have been assessed as ***Low or Negligible***. In the worst case, the vibration might be just perceptible in residential environments, therefore, the significance of effect for construction vibration is **minor** and **not significant**.

13.6.17 Vibration due to traffic on access routes has been assessed. Vehicle movements are not known at time of writing. Therefore, it assumed one heavy goods vehicle is passing by the NSRs per hour. Groundborne vibration arises primarily from the interaction of vehicle tires with irregularities in the road surface, such as potholes, cracks, or bumps. In this case, the road defect is a 5 mm depression, which could amplify groundborne vibrations. However,

it is important to consider the condition of the road surface, ground conditions, and vehicle characteristics when evaluating the magnitude of impact.

13.6.18 In this case, with a vehicle traveling at an assumed maximum 60 km/h over a 5 mm road defect, at a distance of 22 metres from NSR 51, it is expected that the resultant PPV at NSR 51 is 0.13 $mm.s^{-1}$, indicating ***negligible*** impact. Therefore, the significance of effect for construction traffic vibration is **negligible** and **not significant**.

Mitigation During Construction

13.6.19 If works are to be conducted in the evenings, the 55 dB limit is breached at a majority of the NSRs for most of the construction phases, as shown in Appendix 13.5 (Volume 4).

13.6.20 Due to the assessment being performed on assumed information at this stage, a detailed construction noise assessment with a Construction Noise Management Plan (CNMP), in accordance with the guidance and procedures outlined in BS 5228-1, will need to be conducted by the Principal Contractor. The CNMP is expected to be embedded within the Construction Environmental Management Plan (CEMP). Procedures will include:

- minimising the noise as much as is reasonably practicable at source;
- attenuation of noise propagation by the addition of acoustic absorptive screens or barriers within the site;
- carrying out identified high noise level activities at a time when they are least likely to cause a nuisance to residents; and
- providing advance notice of unavoidable periods of high noise levels to residents.

13.6.21 In order to maintain low impact on the noise environment, consideration will be given to attenuation of construction noise at source by means of the following:

- giving due consideration to the effect of noise, in selection of construction methods;
- avoidance of vehicles waiting or queuing, particularly on public highways or in residential areas with their engines running;
- scheduling of deliveries to arrive during daytime hours only. Care should be taken to minimise noise while unloading delivery vehicles. Delivery vehicles should follow routes that minimise use of residential roads;
- ensure plant and equipment are regularly and properly maintained. All plant should be situated to sufficiently minimise noise impact at nearby properties;
- fit and maintain silencers to plant, machinery, and vehicles where appropriate and necessary;
- operate plant and equipment in modes of operation that minimise noise, and power down plant when not in use;
- use electrically powered plant rather than diesel or petrol driven, where this is practicable; and
- working typically not to take place outside of hours defined in the construction schedule.

13.6.22 Consideration will be given to the attenuation of construction noise in the transmission path by means of the following:

- locate plant and equipment liable to create noise as far from noise sensitive receptors as is reasonably practicable or use natural land topography to reduce line of sight noise transmission;
- noise screens, hoardings and barriers should be erected where appropriate and necessary to shield high-noise level activities; and
- provide lined acoustic enclosures for equipment such as portable generators.

13.6.23 It is expected that the detailed construction noise assessment and CNMP will address any remaining predicted noise excess, and should be conducted prior to the commencement of any construction works.

Residual Construction Noise Effects

13.6.24 There is the potential for ***significant*** impact during construction due to noise. The information used in this assessment may not be accurate to the equipment actual equipment used on site, therefore, this assessment is required to be reviewed and updated as necessary by the Principal Contractor once the specifics are known. It is expected that with the implementation of a CNMP any remaining impacts can be eliminated. Therefore, it is predicted that construction noise would result in ***minor*** impact at worst and therefore is ***not significant***.

Operational Phase

13.6.25 The corona-induced audible noise of the OHL in rainfall has been calculated using the EPRI[6] method as recommended in TGN(E)322. Information of the triple Upas conductor has been supplied for this calculation. The external rain-induced noise levels will be assessed using the TGN(E)322 methodology developed by National Grid, which is recommended by the Department of Energy & Climate Change for the assessment of rain induced noise.

13.6.26 During wet conditions, the noise output from OHLs varies according to the number and size of rain droplets accumulated on the surface of the conductors. Therefore, there is a strong relationship between the rainfall rate and the noise output from an OHL. Background noise levels also increase with rainfall rate, such that during very heavy rain noise is generally inaudible. For these reasons, an alternative noise assessment method to deal with rain-induced noise is required.

13.6.27 In the TGN(E)322 method, where the tiered system screens out receptors of low wet noise in Tier 1 and if necessary, assesses the combined wet and dry noise in Tier 2. If Tier 3 is required, the total noise is assessed at a worst-case rain rate of 1 mm/hr to provide the excess above the wet background noise.

13.6.28 In a Tier 3 assessment, the excess wet figure is compared against a BGN level calculated through the addition of dry BGN levels and predicted noise due to rainfall according to the Miller curve value for that specific NSR. Miller curve descriptions are provided in Table 13-14.

Table 13-14 Miller Curve Description

Miller Curve	Description
R-1	Essentially bare, porous ground (that is ploughed field or snow-covered ground), no standing puddles or water. Relatively small-leafed ground cover vegetation, such as grass lawn, meadow, hayfield shortly after mowing, field of small-leaf plants.
R-2	Non-porous, hard, bare ground or pavement, falling raindrops splash on thin layers of puddles of collected water; or in or beside wooded area of deciduous trees without leaves or with only small leaves; or in or beside wooded area of coniferous trees or evergreens having needles rather than leaves; or thin-leafed ground cover of crop, such as hay, clover, or grain.
R-3	A few small, fully leafed deciduous trees 15 to 30 m or a few large, fully leafed trees 30 to 90 m distance.
R-4	Large area of fully leafed trees or large-leafed crops or vegetation, such as corn starting 15 to 30 m distance.
R-5	Large area of fully leafed trees or large-leafed crops or vegetation surrounding the area of interest.

[6] EPRI AC Transmission Line Reference Book – 200 kV and Above, Third Edition, Final Report, 2005, Electrical Power Research Institute

13.6.29 All receptors are of ***Medium*** sensitivity. As shown in Appendix 13.6 (Volume 4), for the Tier 1 assessment, the wet noise at each location is predicted to be between 32 and 43 dB. Also detailed is the distance from the NSRs to the nearest point on the existing line.

13.6.30 Audible noise from the wet overhead line falls below 34 dB for 12 receptors. This results in ***Negligible*** magnitude of impact at these NSRs and therefore ***not significant***.

13.6.31 40 NSRs are required to proceed to a Tier 2 assessment. This stage assesses the proportion of time the area is raining or is dry and calculates a 'combined' wet and dry noise. Dry noise is assumed to be 25 dB less than wet noise. Table 2 of TGN(E)322 provides criteria on various rainfall. Historical rain data in the region has been used to calculate the mean annual wet hours from the period of 01/06/2014 to 31/05/2024. If combined noise is above 36.8 dBA, NSRs will proceed to a Tier 3 assessment. The results of this assessment are also shown in Appendix 13.6 (Volume 4).

13.6.32 The Tier 2 assessment for the remaining 40 NSRs indicates no excess above 36.8 dB for combined noise, therefore no NSRs proceed to tier 3. The results of the assessment predict ***minor*** impact, and ***not significant***.

Internal Noise Assessment

13.6.33 According to Table 4 of BS8233, the indoor ambient noise levels in the night time should not exceed 30 dB $L_{Aeq,8hr}$. In addition, octave band levels should meet an NR20 rating for night time and NR25 rating for daytime.

13.6.34 The external noise levels and spectra have been considered at each receptor. An external to internal noise calculation has been performed on the basis of a partially open window for the nearest receptors. If noise rating limits are met at the closest receptors, then the limits will be met at all other receptors. The small element parameter level difference (Dn,e) has been assumed from NANR116: Sound Insulation through Ventilated Domestic Windows. The level difference values are taken from a window opening of 200k mm^2 Table 13-15**.**

Table 13-15 Level Difference Through a Partially Open Window NANR116

Opening Size	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	Dn,e
200k (mm^2)	20	14	14	16	14	17	19	16

13.6.35 The results of the internal noise assessment for the existing site are presented in Table 13-16.

Table 13-16 Predicted Internal Noise Levels

NSR	External Noise Level (dB(A))	Level (dB(Z))							
		63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	Total (dB(A))
NR 25	--	55	44	35	29	25	22	20	-
NR 20	-	51	39	31	24	20	17	14	-
NSR 48	45.5	10.9	17.2	26.7	12.0	16.2	15.6	14.5	23.0

13.6.36 The results above show that for the Proposed Development, the internal noise level at the closest NSRs meet the 30 dB limit as well as falling below the NR 20 and NR 25 curves, therefore it is predicted that the internal noise level at all NSRs meet the 30 dB limit and NR curves.

13.6.37 Prior to mitigation, the internal noise levels at NSR 48 are assessed as ***Minor*** and ***not significant***.

Mitigation During Operation

13.6.38 The proposed conductor type, Triple Upas, has the potential to produce high noise in wet conditions. The assessment indicates that all of the NSRs pass a Tier 2 assessment, this is due to the limited time in which it rains within the Study Area.

13.6.39 It is recommended that the principal of 'as low as reasonably practicable' (ALARP) is applied to reduce noise levels at source. Conductors produce the highest noise when new, which may increase noise levels during the initial phase of operation, and due to the environmental factor of the assessment there may be times where the Proposed Development has more or less impact than predicted. Mitigation in the form of artificially aging the conductor by method of bead blasting will assist in reducing the noise level at source. Applying a hydrophilic coating will also assist in reducing wet noise effects to a minimum.

Residual Operational Noise Effects

13.6.40 The assessment predicts 12 NSRs with ***negligible*** impact and 40 NSRs with ***Minor*** impacts. Additional mitigation using the ALARP principal is recommended due to the nature of noise generation from an OHL being dependant on the environment. The outcome of the assessment predicts that residual noise would be ***minor*** and ***not significant***.

Schedule of Mitigation

13.6.41 Table 13-17 summarises the Noise and Vibration mitigation measures required for the Proposed Development.

Table 13-17 Summary of Noise and Vibration Mitigation Measures

Mitigation Item	Location	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Potential Monitoring Requirements
NV-1	Proposed Development	By Design, prior to construction	Attaching dampers to conductors at both ends near tower structure	To minimise aeolian noise caused by incident wind		Aeolian noise can be monitored continuously in a long-term survey as this phenomenon is infrequent and difficult to predict
NV-2	Proposed Development	During construction	Construction Noise Management Plan (CNMP)	To reduce noise impact.	Principal Contractor will update schedule	Compliance during evening hours to ensure 55 dB limit is met

Mitigation Item	Location	Timing of Measure	Description	Mitigation Purpose/ Objective	Specific Consultation or Approval Required	Potential Monitoring Requirements
NV-3	Proposed Development	During Operation	Aging the conductor by method of beadblasting or applying hydrophilic coating	To reduce the noise to 'as low as reasonably practicable' (ALARP)		Compliance measurements is recommended to ensure effective noise reduction from unmitigated source levels

Cumulative Effects

13.6.42 Table 13-18 presents the summary of cumulative effects from associated SSENT developments.

Table 13-18 Intra Developments (Associated SSENT Developments)

Development	Location	Description	Status	Residual Significant Effects (if known)/ information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
Tealing -Westfield 275 kV OHL upgrade	Tealing-Westfield/ Glenrothes	Upgrade of approximately 38 km of an existing 275 kV OHL between Tower 182 (west of Tealing Substation) and the licence boundary with Scottish Power Energy Networks (SPEN) (Westfield/ Glenrothes) (midspan between Towers 66 and 65) to enable operation at 400 kV.	EIAR in preparation (alongside the EIAR for the Proposed Development	N/A	Cumulative noise with the proposed upgraded Tealing to Westfield 400 kV OHL has been considered. The Proposed Development and the Tealing to Westfield OHL are 1.6 km apart at the nearest point. Cumulative noise is predicted to be negligible and therefore not significant.	N/A
Emmock (Tealing) substation	Near Emmock Road, Tealing	Construction of a new 400 kV substation in Tealing to enable connection of the new 400 kV OHL between Kintore and Tealing (see below).	Scoping Report submitted Scoping Report submitted 2/7/24 Angus Council Planning Portal Link:	Not available	Tealing Substation is a source of noise in the Study Area associated with the Proposed Development. The Proposed Development is assessed for worst-case noise in wet conditions. In these conditions, the background noise is raised due to rainfall, therefore, operational noise from Tealing Substation will be less prominent and likely to have a negligible impact on NSRs when considered cumulatively with the operational noise from the Proposed	N/A

Development	Location	Description	Status	Residual Significant Effects (if known)/ information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
			24/00431/EIASCO		Development. Receptors that are within 500 metres of the Proposed Development are at least 2 km from Tealing Substation. These cumulative receptors are unlikely to exceed wet background noise with contributions from Tealing Substation and the Proposed Development. The worst-case noise effects of Tealing Substation are assessed in dry conditions, where noise from the Proposed Development is negligible. Therefore cumulative noise in dry and wet conditions is not significant.	
Kintore- Tealing 400 kV Connection	Kintore- Tealing	Construction of a new 400 kV OHL between Kintore and Tealing. This would require two new substations to be constructed, one at Fetteresso (known as Hurlie), and one north of Dundee near Tealing (Emmock Substation as above) to enable future connections and export route to areas of demand.	In Preparation – no screening or scoping submitted. Consultation documents available	Not available.	The East Coast 400 kV OHL is a potential source of cumulative noise. Triple Upas are conductors used for the cumulative analysis. Receptors were considered where noise from the East Coast 400 kV OHL line could cause cumulative impact with the Proposed Development. As a Tier 1 assessment which compares noise to a 34 dBA limit, receptors were assessed where the combination of wet noise from the triple Upas of East Coast 400 kV OHL and the Triple Upas of the Proposed Development reaches 34 dB(A) is 290 m. There are two NSRs that are within this range. Results are shown in Appendix 13.7 (Volume 4). At Haughend Farm Cottage, the	N/A

Development	Location	Description	Status	Residual Significant Effects (if known)/ information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
					noise from the existing East Coast 400 kV OHL is 40 dB, which would already exceed 34 dB(A) without contributions from the Proposed Development. The addition of the Proposed Development increases the level by 1 dB, which is not a perceptible change. A 3 dB increase would be considered a perceptible change in noise level. After a Tier 2 assessment, no adverse impact is indicated at either NSR (Haughend Farm Cottage and Haughend Farm). Cumulative noise from the East Coast 400 kV OHL is therefore deemed as not significant.	
Alyth-Tealing OHL Tealing Emmock substation tie-ins and associated tower dismantling	Tealing	Construction of a new OHL originating at some point on the existing OHL between Tower 680 and Tower 682, connecting to the new Tealing (Emmock) substation. This will enable the removal of approximately 1.5 km of redundant OHL between Tower 682 and the existing Tealing Substation.	In Preparation – no screening or scoping submitted.	Not available	The noise from the proposed OHLs has been estimated at each NSR, and the total cumulative noise predicted from existing OHLs. Four NSRs have shown to require further analysis. All other NSRs predict negligible impact. Balnuith/ Seventeen Acres shows potential impact, being under 200 m from the East Emmock-Tealing tie back. Noise in wet conditions from this OHL span is predicted to exceed 34 dB(A), which is the Tier 1 criteria of a National Grid TGN(E)322 assessment of OHL operational noise. A Tier 2 assessment considers the	N/A

Development	Location	Description	Status	Residual Significant Effects (if known)/ information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
					combination of wet and dry noise dependent on the likelihood of rainfall. Upon further inspection of the noise contribution, a large proportion of wet noise contribution comes from the existing Tealing-Kintore 275 kV OHL. Tier 2 assessment of the OHL noise at this NSR shows that dry noise is low enough for there to be no adverse impacts expected. Noise from the proposed East TT and West TT Emmock-Tealing tie backs is negligible. The three other NSRs are situated in Jeanfield (Jeanfield Farm, Jeanfield Steadings, Jeanfield Farmhouse). An evaluation of worst-case noise contributions has been performed for existing and proposed OHLs. All noise impacts at these locations are predicted to be dominated by the noise from the Tealing-Westfield 400 kV OHL upgrade, which will be assessed separately. NSRs at Jeanfield will not be impacted by tie-ins, tiebacks, or diversions and therefore predicted impact is negligible. Operational noise has been assessed and any potential significant effects identified would result from cumulative noise from existing or proposed future OHLs. Operational noise from the tie ins, tie backs and temporary diversions is predicted to	

Development	Location	Description	Status	Residual Significant Effects (if known)/ information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
					be negligible. Therefore, no significant effects are likely for operational noise.	

13.6.43 Table 13-19 presents the summary of cumulative effects from associated SSENT developments.

Table 13-19 Inter Developments (Other SSENT and 3rd Party Developments)

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
Fithie Energy Park BESS	Land to the north-west of Tealing Substation	Construction and Operation of up to 1400 MW battery energy storage system (BESS) and associated infrastructure	Screening Report submitted ECU00005034	Not available.	The construction of the BESS site has the potential to have a cumulative noise impact due to the equipment and increased traffic. If the construction works are coincidental, once a contractor has been appointed, a detailed CNMP must be updated to include working times, activities and a schedule. There is the	None.

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
					potential for activities that are associated with the construction of the BESS site that take place concurrently to raise the noise above either the 65 dB daytime noise limit or the 55 dB evening and weekend limit at the Alyth-Tealing OHL NSRs. Therefore, it is possible for cumulative construction noise to result in major effect which is significant. Cumulative construction noise is required to be controlled through an updated assessment by the Principal Contractor, and a CNMP. Therefore, with the appropriate mitigation, residual effects are likely to be minor and not significant. The battery storage containers will be fitted with air conditioning units and the operation of the facility, as a whole, may create noise. While recognising there are other noise generating uses in the vicinity of the site, there are a small number of properties which may be adversely affected by noise from the development. Worst-case results from the proposed BESS site will occur in dry conditions, which is where the OHL noise is at a minimum. In wet conditions, the OHL noise is elevated. In these conditions, the background noise is increased due to the rainfall, which would make the effects of the other developments such as the BESS	

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
					development less likely to have an impact on the relevant receptors. The site is approximately 2 km from the OHL, where NSRs relevant to the BESS site will have negligible impacts from the OHL. Therefore, cumulative impacts due to the Battery Energy Storage System would be low and considered to have negligible impact.	
Ark Hill Wind Farm Extension	Approximately 2.5 km north-east of Alyth-Tealing	Extension of Ark Hill Wind Farm consisting of the erection of 4 wind turbines measuring a maximum height of 89.5 m (to blade tip) with a rotor diameter of 71 m, the formation of access tracks and associated hardstanding areas, set down areas, construction compound, electrical substation and borrow pit	Application validated 21/10/2021, awaiting decision Angus Council reference: 21/00765/EIAL EIA required, supporting documents include: • Hydrology; • Noise;	Not available.	Cumulative construction noise as above. The Ark Hill Wind Farm Extension is over 2.5 km from the nearest Alyth-Tealing NSR and deemed to have negligible impact over the distance noise will propagate (assuming this development meets its own noise limit criteria). Therefore, no significant cumulative effects are predicted.	None.

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
			• Ecology/ ornithology; • Traffic and transport; and • Cultural heritage.			
Balnuith Farm BESS (Tealing)	Balnuith Farm, Tealing, DD4 0RE	The construction and operation of a battery energy storage facility for the storage of up to a 249 MW of electricity together with associated infrastructure, substation, security fencing, CCTV, security lighting and landscaping.	Screening Opinion issued 06/09/2023 ECU00004803	Not available.	Cumulative construction noise as above. Cumulative operational noise as above. The site is 2 km from the OHL, where NSRs relevant to the BESS site will have negligible impacts from the OHL. Therefore, cumulative impacts due to the Battery Energy Storage System would be low and considered to have negligible impact.	None.
Myreton BESS	Land to the south of Tealing Substation	A proposed battery energy storage system with an installed capacity of around 750 MW	Screening Report submitted ECU00005053	Not available.	Cumulative construction noise as above. Cumulative operational noise as above. The site is 2 km from the OHL, where NSRs relevant to the BESS site will have negligible impacts from the OHL. Therefore, cumulative impacts due to the Battery Energy Storage System would be low and considered to have negligible impact.	None.

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
Muir of Pert Energy Storage Facility	Muir of Pert Farm, Tealing, Dundee DD4 0QL	Energy storage facility up to 50 MW, compound of equipment, access, fencing, security cameras, landscaping, tree planting, demolition of derelict buildings and other associated works	Proposal of Application and EIA Screening Request submitted. Proposal of Application Notice (PAN) Approved Subject to Conditions 12/7/2023 Angus Council Planning Portal Link: 23/00442/PAN Request for Screening submitted and determined EIA not required 11/7/2023 Angus Council Planning Portal Link: 23/00479/EIASCR	Not available.	Cumulative construction noise as above. Cumulative operational noise as above. The site is 3 km from the OHL, where NSRs relevant to the site will have negligible impacts from the OHL. Therefore, cumulative impacts due to the Energy Storage System would be low and considered to have negligible impact	None.

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
Moatmill Bridge Tealing Energy Storage Facility	Land at Moatmill Bridge, Tealing	Energy storage facility up to 50 MW, compound of equipment, meter building, fencing, security cameras, new belt of native trees and landscaping	Proposal of Application submitted. Proposal of Application Notice (PAN) Approved Subject to Conditions 3/5/23 Angus Council Planning Portal Link: 23/00254/PAN	Not available.	Cumulative construction noise as above. Cumulative operational noise as above. The site is 3 km from the OHL, where NSRs relevant to the site will have negligible impacts from the OHL. Therefore, cumulative impacts due to the Energy Storage System would be low and considered to have negligible impact	None.
Tealing Solar Energy Park	Near Duntrune, DD4 0PR	Application for Installation of a solar energy park of approximately 100 MW and all associated infrastructure.	Application submitted 17th November 2023. EIA not required.	No EIA completed, however from assessment completed, significant effects are considered unlikely.	Cumulative construction noise as above. Cumulative operational noise as above. The site is 4 km from the OHL, where NSRs relevant to the site will have negligible impacts from the OHL. Therefore, cumulative impacts due to the Energy Park would be low and considered to have negligible impact	None.
Tealing Battery Energy Storage Farm	Land to the north-east of Gagie Home	Application for Installation of an 80 MW Battery Energy		Tealing Battery Energy Storage Farm	Land to the north-east of Gagie Home Farm, Duntrune, DD4 OPR	Application for Installation of an 80 MW Battery Energy Storage

Development	Location	Description	Status	Residual Significant Effects (if known) / information from any available sources on likely significant effects	Cumulative Assessment	Additional Mitigation
	Farm, Duntrune, DD4 OPR	Storage Facility (BESS) and associated infrastructure.				Facility (BESS) and associated infrastructure.

13.7 Summary

13.7.1 This chapter has considered the potential noise effects that could arise due to the Proposed Development during the construction and operational phases at the closest NSRs. The assessment has taken account of applicable planning policy and current guidance.

13.7.2 A desk-based construction noise assessment, in line with BS 5228, has been prepared for the purpose of assessing the effects of the works on any nearby residents. NSRs in the vicinity fall under Category A, and if construction takes place in the evenings and weekends working hours, noise is predicted to be above the 55 dB limit at the noise sensitive receptors during the felling at 50 NSRs, the foundations at 38 NSRs, and dismantling works at 17 NSRs and is therefore predicted to result in ***Major (significant)*** impact without mitigation.

13.7.3 The construction noise assessment is based on assumed information at this stage, and should be updated with information from the Principal Contractor. Mitigation in the form of the implementation of a robust Construction Noise Management Plan (CNMP) to detail the duration of felling and dismantling activities and location of foundations will ensure residual construction noise of the Proposed Development will have ***minor*** (***not significant***) impact on nearby NSRs.

13.7.4 Operational noise has been assessed to TGN(E)322, BS4142, and BS8233 standards. The results of the tiered TGN(E)322 assessment predict ***minor*** impacts which is ***not significant***. Mitigation is not required as all NSRs pass the Tier 2 assessment, however due to the nature of OHL noise generation the principal of ALARP should be applied to reduce the noise at source to as low as possible. Artificially ageing the proposed conductor using bead blasting is recommended.

13.7.5 An internal noise assessment was conducted for the operational noise from the Proposed Development, according to BS-8233. This concluded that noise is below 30 dB inside the property and is below NR 20 and NR 25 curves. This is an indication of ***Minor*** impact which is ***not significant***.

13.7.6 Mitigation measures that are recommended using the principle of ALARP include aging the conductor span by beadblasting, or, treating the conductor span near the NSR with a hydrophilic coating.

13.7.7 Cumulative noise has been considered from existing operational noise from nearby OHLs such as East Coast 400 kV OHL. Any receptors that can potentially be affected by the Proposed Development already experience wet noise impacts that would fail a Tier 3 TGN(E)322 assessment. The Proposed Development will increase noise but not make a perceptible change in level. Receptors pass a Tier 2 TGN(E)322 assessment thus deeming cumulative noise ***not significant***. This is also the case for cumulative noise from nearby substations.

13.7.8 Upon completion of the Proposed Development, compliance measurements are recommended to ensure operational noise emissions meet noise limits and that the emissions are in agreement with the levels predicted in this chapter.