7. Noise and Vibration

Non-Technical Summary

7.1. An assessment of the effects of noise due to the Proposed Development of five turbines up to 149.9 meters (m) and change in turbine model and associated increase in crane hardstanding has been undertaken.

7.2. The proposed crane hardstanding changes do not require additional plant to that which would be required for the construction of the Consented Development. As such, there is no reasonable prospect of significant noise effect arising from the proposed crane hardstanding changes. Noise from construction remains subject to best practice noise management methods which are secured through the extant Planning Conditions for the Consented Development.

7.3. During operation, wind turbines can generate noise from the machinery housed within the turbine and from the movement of blades through the air. Modern turbines are designed to minimise noise and the extant Planning Conditions for the Consented Development are used to ensure compliance with specified noise limits.

7.4. The assessment has been undertaken in accordance with the recommendations of ETSU-R-97, the method of assessing wind turbine noise recommended by Government guidance, and following the current best practice methods described in the Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise' , as endorsed by the Scottish Government. It has been shown that noise due to the Proposed Development would comply with the noise limits set out by the Planning Conditions for the Consented Development.

7.5. Noise produced during decommissioning of the Proposed Development is likely to be of a similar nature to that during construction, although the duration of decommissioning will be shorter than that of construction. Any legislation, guidance or best practice relevant at the time of decommissioning would be complied with.

Introduction

7.6. The Applicant received a planning permission for Lochluichart Wind Farm Extension II, a 5-turbine scheme together with associated infrastructure, on 1st July 2020 from THC (the 'Consented Development'). This new application is to increase the tip height of the Consented Development turbines to 149.9m. All the turbines and associated infrastructure will remain in the same locations for this new application (hereafter known as the 'Proposed Development') as they do for the Consented Development.

7.7. This Chapter address the potential effects of the proposed change in turbine model, resulting in an increase in the crane hardstanding size the Proposed Development pursuant to the Consented Development in terms of noise and vibration. It supplements Chapter 8: Noise of the EIA Report 2019 (EIA Report 2019 for the Consented Development), and Chapter 8: Noise of the 2019

Supplementary Information ('SI', 2019) and should be read in conjunction with both documents.

7.8. The principles of the EIA Report 2019 remain valid and appropriate and therefore have not been reassessed, unless otherwise stated.

7.9. Key conclusions of the EIA Report 2019 in relation to noise were:

- Application of good practice measures to manage construction noise, as described at Paragraph 8.93 of the EIA Report 2019, will ensure that effects are minimised as far as is reasonably practicable and that the construction process is operated in compliance with the relevant legislation; and
- Levels of operational noise were predicted to be compliant with the requirements of ETSU-R-97 and The Highland Council (THC) based upon noise limits derived in accordance with ETSU-R-97 and the recommendations of the Good Practice Guidance (GPG).

Legislation, Policy and Guidance

7.10. There is no change to Legislation, Policy and Guidance relating to noise from that described in the EIA Report 2019 and SI 2019.

Assessment Methodology and significance Criteria

7.11. An increase in the size of the crane hardstanding is proposed as part of the Proposed Development, in order to accommodate a larger rotor diameter turbine.

7.12. Construction noise was considered in the EIA Report 2019, and found to be acceptable, subject to best practice noise management methods which are secured through the Consented Development's extant Planning Conditions.

7.13. The proposed hardstanding changes do not involve the construction of additional hardstanding in new locations, or require additional plant to that which would be required for the construction of the Consented Development. As such, there is no reasonable prospect of significant noise effect arising from the proposed hardstanding changes; construction noise effects have therefore been scoped out of further consideration.

7.14. Operational noise has been assessed as per the assessment methodology applied in the EIA Report 2019. Noise due to the operation of the Consented Development is controlled through Planning Condition 18 of the extant planning permission, as specified in Table 7.1.

Table 7.1: Consented Noise Limits

Receptor	Standardised 10 m Wind Speed, ms^{-1}								
	4	5	6	7	8	9	10	11	12
	Noise Limit, dB, $L_{A90,10min}$								
Aultguish Inn	24.5	27.8	30.7	31.1	31.1	31.1	31.1	31.1	31.1

Responses and Consultation

7.15. A Scoping Report was submitted in September 2020. This report noted that noise due to the operation of the Proposed Development is, and will continue to be, controlled through the noise limits presented in Condition 18 of the extant planning permission for the Consented Development, and as such, the rotor modification would be assessed against the consented noise limit.

7.16. In THC's Scoping Opinion, the Environmental Health Officer (EHO) agreed to scope out further background monitoring for operational noise. Likewise, no update was required for construction noise.

Baseline Conditions

7.17. There is no change to the baseline conditions reported in the EIA Report 2019.

Assessment of Potential Effects

7.18. The GPG notes that most sites at planning stage will not have selected a preferred turbine, therefore a candidate turbine representative of a range of turbines should be selected to provide appropriate noise levels. Once noise levels have been predicted at the potentially affected properties, compliance with noise limits can be assessed and design advice provided if compliance with the limits is considered unlikely.

7.19. The Nordex N133 4.8-Megawatt (MW) wind turbine has been selected as a candidate turbine for this assessment, being representative of the turbine type likely to be selected for construction of the Proposed Development. This is a different candidate model to the EIA Report 2019.

7.20. This assessment assumes the turbines are fitted with serrated trailing edge (STE) blades and operates at full power (Mode 0) at all times. The manufacturer's noise emission documentation excludes any margin for uncertainty, and as such an additional 2 dB has been included in the sound power levels in this assessment, as detailed in Table 7.2.

Table 7.2: Manufacturer's Noise Emission Data – Nordex N133, 4.8 MW, 83 m hub height

	Standardised 10 m Wind Speed, ms^{-1}								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Sound Power Level, dB(A)								
Sound Power Level, dB L_{WA}	94.2	99.7	103.9	104.5	104.5	104.5	104.5	104.5	104.5
Sound Power Level, dB L_{WA} inc. 2 dB allowance for uncertainty	96.2	101.7	105.9	106.5	106.5	106.5	106.5	106.5	106.5

7.21 The octave-band frequency spectrum for the maximum sound power level is detailed in Table 7.3.

Table 7.3: Octave Band Spectra

	Octave-band Centre Frequency, f, Hz							
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**
	Sound Power Level, dB(A)							
Sound Power Level, dB LWA	88.9	94.6	96.9	97.7	99.5	100.0	97.7	87.1
Sound Power Level, dB L_{WA} Scaled to 106.5 dB(A)	89.4	95.1	97.4	98.2	100.0	100.5	98.2	87.6

7.22. As with the majority of modern wind turbines, the Nordex N133 4.8 MW is not considered to be tonal or impulsive. Therefore, no additions for such effects are required. Notwithstanding this, a warranty will be sought from the manufacturer of the turbine ultimately selected for construction, confirming that the turbine is free from tonal / impulsive characteristics.

7.23. Table 7.4 details the predicted noise immission levels due to the Proposed Development. Predictions have been undertaken according to the methodology detailed in the Operational Noise Assessment Methodology section of the 2018 EIA Report.

Table 7.4: Predicted Noise Levels due to the Proposed Development

Receptor	**Standardised 10 m Wind Speed, ms^{-1}**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Noise Limit, dB, $L_{A90,10min}$								
Aultguish Inn	16.7	22.2	26.4	27.0	27.0	27.0	27.0	27.0	27.0

7.24. Table 7.5 details the difference (margin) between the predicted noise levels due to the Proposed Development (Table 7.4) and the consented noise limits presented in Table 7.1. A negative margin indicates that the predicted noise level is below the noise limit.

Table 7.5: Margins between Predicted Noise Levels and Apportioned Noise Limits

Receptor	**Standardised 10 m Wind Speed, ms^{-1}**								
	4	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
	Margin, dB								
Aultguish Inn	-7.8	-5.6	-4.3	-4.1	-4.1	-4.1	-4.1	-4.1	-4.1

7.25. As can be seen from Table 7.5, noise levels due to the operation of the Proposed Development are complaint with the consented noise limits.

Assessment of Cumulative Effects

7.26. The noise limit in the Planning Conditions for the Consented Development apply to the Proposed Development in isolation. As such, demonstrating compliance with the existing planning condition ensures that the effects are no greater than already consented, thereby negating the requirement to undertake a further assessment of cumulative operational effects.

Mitigation Measures and Residual Effects

Construction Noise

7.27. There is no change to the construction noise mitigation and residual effects presented in the EIA Report 2019.

Operational Noise

7.28. There is no change to the operational noise mitigation and residual effects presented in the EIA Report 2019.

Summary

7.29. An assessment of operational noise effects associated with the Proposed Development has been carried out, taking account of an alternative turbine type, due to the increase in tip height. Operational noise has been assessed against the noise limits specified in the extant Planning Conditions for the Consented Development, and in line with current best practice. It has been shown that the Proposed Development remains compliant with the extant noise limits, and is therefore acceptable in terms of noise.

7.30. With regard to construction effects, the proposed hardstanding changes do not involve the construction of additional hardstanding in new locations, or require additional plant to that which would be required for the construction of the Consented Development. As such, there is no reasonable prospect of significant noise effect arising from the proposed hardstanding changes. Noise from construction remains subject to best practice noise management methods which are secured through the extant Planning Conditions.

References

ETSU-R-97 (1996) The Assessment and Rating of Noise from Wind Farms [Online] Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/49869/ETSU_Full_copy__Searchable_.pdf (Accessed 13/11/20)

Institute of Acoustics (2013) A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise [Online] Available at: https://www.ioa.org.uk/sites/default/files/IOA%20Good%20Practice%20Guide%20on%20Wind%20Turbine%20Noise%20-%20May%202013.pdf (Accessed 13/11/20)