Clune Wind Farm

Technical Appendix

Review of Acoustic Assessment Against ARWTN

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Date	29th September 2026
Ref	047070003134-2003938996-6368

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1 Introduction

This Technical Appendix provides a review of the acoustic assessment[1] submitted to the Energy Consents Unit (ECU) on 3 March 2025 in support of the proposed Clune Wind Farm (ECU Reference: 00005038). The assessment was prepared in accordance with ETSU-R-97[2] and the Institute of Acoustics (IOA) Good Practice Guide[3] (GPG), reflecting the guidance and policy framework applicable at the time of assessment.

Since completion of the assessment, the Department for Energy Security and Net Zero (DESNZ) has published the Assessment and Rating of Wind Turbine Noise[4] (ARWTN) in June 2026, which formally replaces ETSU-R-97. ARWTN states that references to ETSU-R-97 within planning policy should be interpreted as references to the updated guidance.

Accordingly, this review has been undertaken to assess the alignment of the acoustic assessment and associated draft planning conditions with ARWTN. The review considers whether the assessment methodology, operational noise limits and compliance provisions remain consistent with the updated guidance, and whether the conclusions of the original assessment remain unchanged. The review has focused on the following matters:

- reviewing the methodology of the acoustic assessment against ARWTN;
- confirming that the adopted noise limits and assessment criteria remain compliant with the updated guidance;
- reviewing the assessment results against ARWTN terminology and assessment criteria, where relevant;
- determining whether the adoption of ARWTN affects the findings and conclusions of the assessment; and
- reviewing the key changes between ETSU-R-97 and ARWTN in terms of the acoustic assessment.

2 Assessment & Rating of Wind Turbine Noise (ARWTN)

ARWTN retains the fundamental assessment principles established by ETSU-R-97 and the associated IOA GPG, whilst introducing a revised framework based on three interrelated concepts: Lower Limiting Values (LLVs), Total Noise Assessment Criteria (TNAC) and Site-Specific Noise Limits (SSNLs). Together, these parameters form the basis for assessing cumulative operational wind turbine noise and establishing appropriate operational noise limits for individual wind energy developments.

- LLVs represent the minimum acceptable noise criteria within the assessment framework and apply where existing background sound levels are considered to be relatively low. ARWTN

[1] Clune Wind Farm - Environmental Impact Assessment Report - Volume 1 - Chapter 11 Acoustic and Vibration Assessment

[2] Department of Trade and Industry (DTI) (1996) ETSU-R-97 The Assessment and Rating of Noise from Wind Farms.

[3] Institute of Acoustics (2013), A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise.

[4] Department for Energy Security and Net Zero (DESNZ) (2026). Assessment and Rating of Wind Turbine Noise (ARWTN).

specifies a daytime LLV within the range 35 to 40 dB L_{A90} and a fixed night-time LLV of 43 dB L_{A90}. The selection of an appropriate daytime LLV should have regard to factors (in a cumulative context if relevant) including the generating capacity of the wind farm, the number and proximity of neighbouring noise-sensitive properties, and the anticipated duration and level of exposure to wind turbine noise. ARWTN further notes that the selection of the daytime LLV should be considered within the national context of the project, recognising that the appropriate LLV may vary between developments depending on factors such as the generating potential of the proposed development and the specific site circumstances.

- TNAC define the acceptable cumulative rated wind turbine noise level arising from all relevant wind energy developments at a receptor location. The TNAC are derived as the greater of the applicable LLV or 5 dB above the typical background sound level. In this respect, the TNAC perform a similar function to the cumulative noise limits established under ETSU-R-97 and provide the benchmark against which cumulative operational noise levels are assessed.
- SSNLs apply solely to the Proposed Development and are derived where compliance with the applicable TNAC has been demonstrated. Unlike the TNAC, which relate to cumulative wind turbine noise from all relevant developments, SSNLs provide the basis for operational noise limits that may be secured through a planning condition. ARWTN states that SSNLs should generally follow the profile of the TNAC and should not normally be set substantially higher than the predicted noise levels of the Proposed Development at wind speeds where the turbines reach their maximum sound power output. The application of SSNLs also allows an appropriate degree of acoustic headroom to be retained for existing, consented or future wind energy developments where required. ARWTN further recognises that, in certain circumstances, a single SSNL applicable across a range of wind speeds may be appropriate, particularly where the applicable LLV is achieved across the assessed wind speed range. This approach provides a straightforward basis for operational noise control whilst ensuring compliance with the TNAC and the overall objectives of ARWTN.

Although ARWTN was published after the Scottish Government's Onshore Wind Policy Statement 2022[5] and is therefore not specifically referenced within current Scottish planning policy, the Policy Statement notes that "…*until such time as new guidance is produced , ETSU-R-97 should continue to be followed".* As new guidance has now been published, a review of the operational noise impact assessment has been undertaken in accordance with ARWTN.

3 Implications for the Acoustic Assessment

A review of the acoustic assessment has been undertaken to determine whether the publication of ARWTN affects the assessment methodology, operational noise limits, assessment conclusions or associated draft planning conditions.

The original assessment was prepared in accordance with ETSU-R-97 and the IOA GPG using a simplified fixed-limit assessment approach agreed with Highland Council's Environmental Health

[5] Scottish Government (December 2022). Onshore Wind: Policy Statement 2022

Officer (EHO). It was agreed that a baseline background noise survey was not required and that cumulative wind turbine noise would be assessed against a composite standard of 35 dB L_{A90} during the daytime and 38 dB L_{A90} during the night-time, or up to 5 dB above background noise levels for standardised 10 m height wind speeds up to 12 m/s, whichever is the greater. Existing, consented and proposed wind farms were assumed to operate at, or close to, their consented noise limits, providing a conservative basis for the cumulative assessment.

The assessment demonstrated compliance with the adopted daytime and night-time cumulative limits at all assessed residential receptors and for all wind speeds. Minimum compliance margins of 3.4 dB during the daytime and 3.9 dB during the night-time were achieved, despite the inclusion of the 2 dB uncertainty correction recommended by the IOA GPG. Predicted cumulative noise levels remained below the adopted limits at all properties, with maximum levels generally no greater than 34 dB L_{A90}.

ARWTN introduces revised terminology and a more structured framework for deriving operational noise limits. However, the fundamental principles of the assessment remain unchanged, namely the assessment of operational cumulative wind turbine noise levels against objective criteria intended to protect residential amenity. The approach adopted within the original assessment is therefore broadly consistent with the principles of ARWTN.

The assessment includes consideration of cumulative operational noise from existing, consented and proposed wind farm developments. Although undertaken in accordance with ETSU-R-97, the approach is broadly consistent with the cumulative assessment principles set out in ARWTN. Compliance with the adopted noise limits was demonstrated for both isolative and cumulative scenarios. In addition, the original assessment concluded that the ETSU-R-97 requirements would still be met if the resultant cumulative noise levels from the existing, planned, consented and under-construction wind farms considered were 3 dB higher than assumed in the assessment. This demonstrates that the assessment conclusions are robust and not dependent upon marginal compliance with the adopted limits.

The operational noise levels predictions were derived using the ISO 9613-2[6] standard together with assumptions and adjustments recommended by the IOA GPG. These methods remain consistent with established UK wind farm noise assessment practice and there is no indication that adoption of ARWTN would materially affect the predicted noise levels reported in the assessment.

ARWTN also includes procedures for addressing tonal characteristics and elevated amplitude modulation (EAM) where these occur during operation. Such matters are principally addressed through operational compliance and investigation procedures rather than the prediction

[6] Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation, International Organisation for Standardisation, ISO 9613-2:1996

assessment process. As the submitted assessment relates to the prediction of operational noise levels and no evidence has been identified to suggest that these characteristics would materially influence the assessment outcome, tonality and EAM are not considered likely to affect the conclusions of the assessment.

A review of the assessment results indicates that adoption of ARWTN would be unlikely to materially alter the conclusions of the original assessment. Predicted cumulative noise levels would remain below the ARWTN daytime and night-time limits at all receptors, the reported margins of compliance are substantial, and the assessment incorporates additional conservatism through the treatment of uncertainty and cumulative effects. Accordingly, ARWTN primarily affects the derivation and presentation of the assessment criteria rather than the assessment conclusions themselves.

Although ARWTN would not materially affect the conclusions of the acoustic assessment, a review of the associated draft planning conditions indicates that they would likely differ if prepared in accordance with ARWTN. The submitted conditions were prepared using the ETSU-R-97/IOA GPG compliance framework and include fixed daytime and night-time noise limits, operational monitoring requirements, complaint investigation procedures and objective compliance assessment methodologies. ARWTN introduces additional requirements relating to the assessment of amplitude modulation (AM), which are not reflected in the submitted planning conditions. In addition, derivation of SSNLs in accordance with ARWTN could result in different limit values from those currently proposed. However, the review indicates that the Proposed Development would comply with the resulting SSNLs and therefore the overall conclusions of the acoustic assessment would remain unchanged.

4 Conclusion

The review has identified no evidence to suggest that application of ARWTN would materially change the conclusions of the original assessment. Whilst ARWTN introduces revised terminology and an updated framework for the derivation and presentation of assessment criteria, the approach of the submitted acoustic assessment remains broadly consistent with the principles of the updated guidance. The assessment demonstrates compliance with the adopted operational noise limits at all assessed receptors, incorporates conservative assumptions regarding cumulative operation and prediction uncertainty, and identifies significant margins of compliance at all assessed residential properties.

Although a formal reassessment under ARWTN would require consideration of the updated assessment framework, there is no indication that this would materially affect the predicted operational noise levels or the overall acceptability of the Proposed Development.

Accordingly, the publication of ARWTN does not materially affect the findings of the acoustic assessment and the original conclusion, that the Proposed Development would not give rise to significant operational noise effects, remains unchanged.