

Appendix 29.1

Noise Assessment



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Subject: Proposed Dounreay Offshore Wind Farm - Noise Assessment

Introduction

The purpose of this memo is to address the comments made by Highland Council Environmental Health Department on the operational turbine noise relating to the planning application for the proposed Dounreay Offshore Wind Farm¹.

Information Request

Highland Council Environmental Health Department have requested a simple noise assessment using the maximum sound power levels and the distance to the nearest receptors, to demonstrate that noise levels will be below the permitted limits.

Methodology

For the purpose of this assessment the 'Working Group Recommendation' as outlined in the Institute of Acoustics, Supplementary Guidance Note (SGN) 6² has been implemented. Although the SGN states that it does not cover noise propagation for offshore wind farms (Section 1.2.2), the Working Group does recommend that "where a body of water is at least 700 m in extent (or the turbine is offshore), the following formula should be used" (Section 2.2):

$$L = L_s - 20\text{Log}(r) - 11 + 3 - \Delta L_a + 10\log\left(\frac{r}{700}\right)$$

The above equation is derived from research conducted by the Swedish Energy Agency³, which investigated the Swedish propagation model by making sound propagation measurements over the sea with application to wind turbine noise. It should be noted that this propagation model gives significantly more conservative results than ISO 9613-2 over hard ground.

L is the sound pressure level at the observer, L_s is the turbine sound power level, ΔL_a is the integrated frequency dependent absorption coefficient, a function of r, and r is the distance from turbine hub to the observer. The second term on the right reflects spherical spreading and the final term corrects for cylindrical spreading beyond 700 metres. Therefore in this assessment the above equation has been used to calculate the predicted noise levels at the nearest residential receptors, as it is deemed to be closest to what there is to 'best practice' at this time.

¹ Highland Council, 15/02035/PREAPP "Dounreay Tri Offshore Wind Farm. Construction and operation of a floating Offshore Wind Farm approximately 9 KM off Dounreay, consisting of three turbines of between 5 to 10MW each", email correspondence, R Fraser, 07/09/2016

² A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Supplementary Guidance Note 6: Noise Propagation Over Water for On-shore Wind Turbines, Institute of Acoustics, July 2014

³ "Long-Range Sound Propagation over the Sea with Application to Wind Turbine Noise", Final report for the Swedish Energy Agency project 21597-3, TRITA-AVE 2007:22 ISSN 1651-7660, Mathieu Boué

Assessment of Acoustic Impact

As the proposed project is a floating offshore wind farm the position of the turbines are variable, however the most conservative assumption on proximity to the coast is approximately 6km and the proposed coordinates are shown in Table 1. Although the candidate turbine has not been decided upon, it is likely that it will have a maximum sound power level of 112 dB(A). The maximum turbine sound power and assumed octave band levels are as detailed in Table 2.

Table 1: Location of Proposed Turbines

Turbines	Coordinates	
	X (m)	Y (m)
T1	290227	972770
T2	295227	972694

Table 2: Assumed Octave Band Sound Power Level Data for Candidate Turbine

Octave Band (Hz)	A-Weighted Sound Power Level, dB(A)
63	93.7
125	102.4
250	105.5
500	106.0
1000	105.5
2000	103.7
4000	97.1
8000	79.2
OVERALL	112.0

The nearest onshore receptors are shown in Table 2 and include a property in Reay (H3) which is the closest settlement to the offshore site. Two other isolated properties which are closer to the proposed development are also included in the assessment. The locations of the turbines and nearest receptors are shown in Figure 1.

Table 3: Location of Nearest Receptors

House ID	Coordinates		Nearest Turbine	Distance (m)
	X (m)	Y (m)		
H1	295742	966092	T2	6623
H2	297373	965761	T2	7259
H3	297172	965323	T2	7624

Table 4 shows the predicted L_{A90} noise immission levels at the nearest residential properties calculated from the operation of the proposed wind farm. Figure 1 shows an isobel (i.e. noise contour) plot for the proposed site. Such plots are useful for evaluating the noise 'footprint' of a given development.

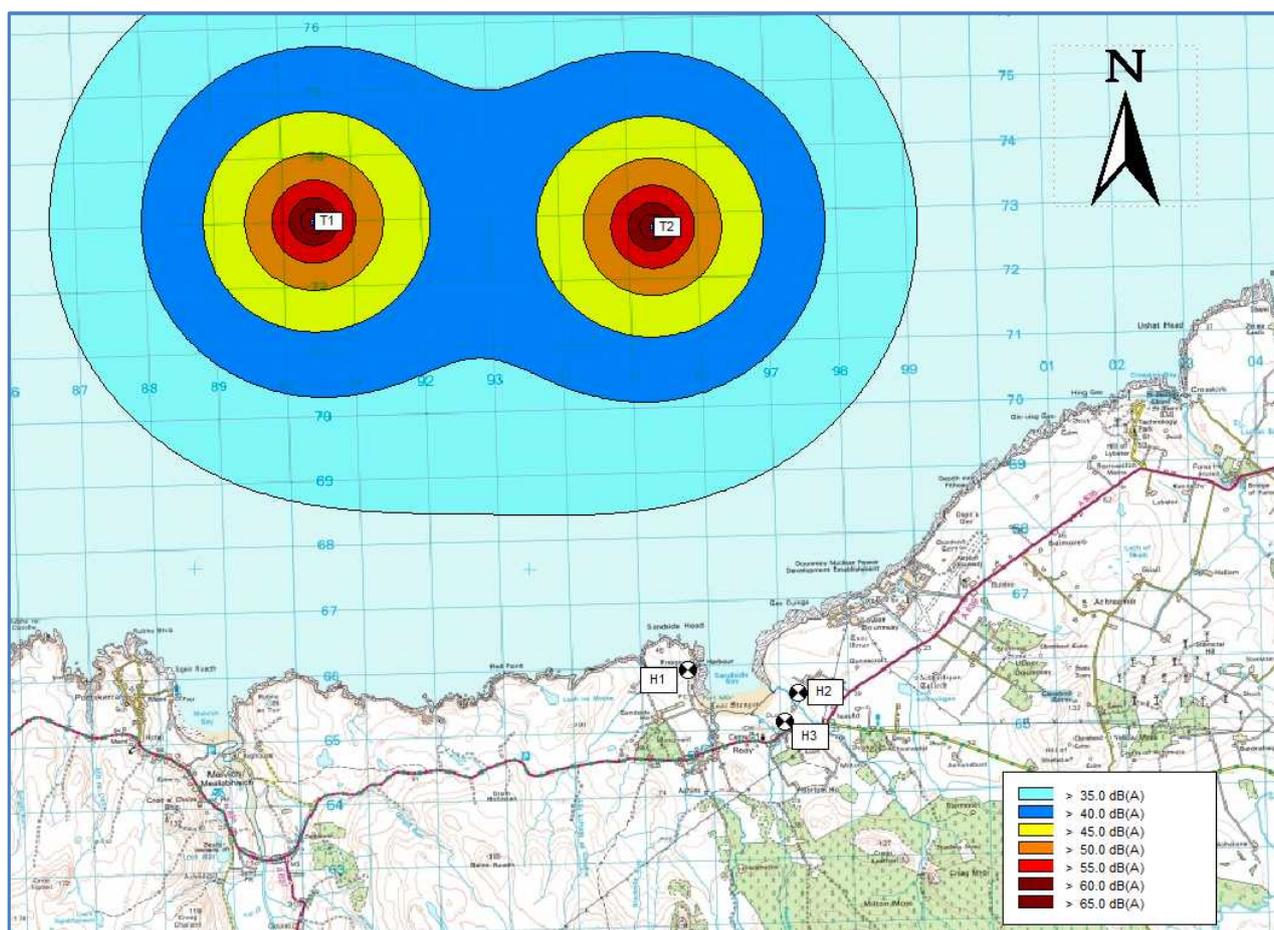
Table 4: Predicted Noise Levels at Nearest Residential Properties dB(A)

House ID	Predicted Noise Levels, L _{A90} dB(A)
H1	30.4
H2	29.4
H3	29.1

The ‘permitted limits’ as specified by Highland Council are assumed to be the minimum daytime lower limit of 35 dB(A) L_{A90} recommended by ETSU-R-97⁴, the relevant guidance for the assessment and rating of noise from wind farms in the UK. This is consistent with the limits of other consented offshore wind farm projects which border Highland Council.

Predicted noise levels at all of the nearest residential properties are below 35 dB(A) L_{A90}, with a minimum margin of -4.6 dB(A) at property H1.

Figure 1: Predicted Noise Footprint for Douneay Offshore Wind Farm



⁴ ‘The Assessment and Rating of Noise from Wind Farms’, The Working Group on Noise from Wind Turbines, ETSU Report for the DTI, ETSUR-97

Summary

The acoustic impact for the operation of the proposed Dounreay Offshore Wind Farm on nearby residential properties has been assessed in accordance with the guidance on wind farm noise for onshore installations as issued in the DTI publication “The Assessment and Rating of Noise from Wind Farms”, otherwise known as ETSU-R-97, and Institute of Acoustics Good Practice Guide (IoA GPG), as recommended for use by relevant planning policy.

Operational noise levels were predicted using a noise propagation model, the proposed wind farm layout and assumed turbine emission data. The predicted noise levels are within the permitted noise limits. The proposed wind farm therefore complies with the relevant guidance on wind farm noise and the impact on the amenity of the nearest residential properties would be regarded as acceptable.