

**RWE Renewables UK Dogger Bank  
South (West) Limited**

**RWE Renewables UK Dogger Bank  
South (East) Limited**

# **Dogger Bank South Offshore Wind Farms**

**Environmental Statement**

**Volume 7**

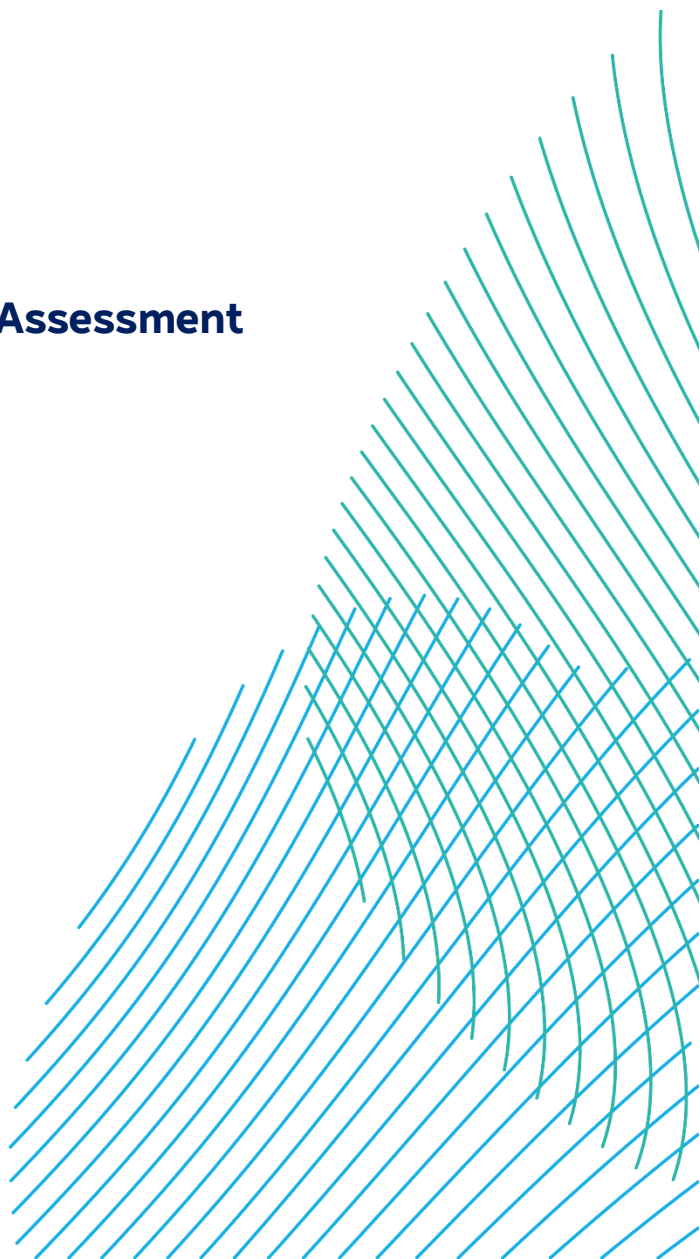
**Appendix 25-5 Operational Noise Assessment**

**June 2024**

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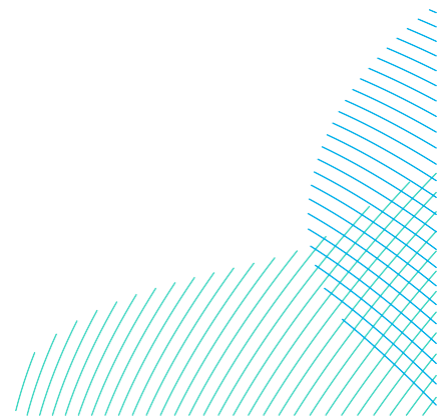
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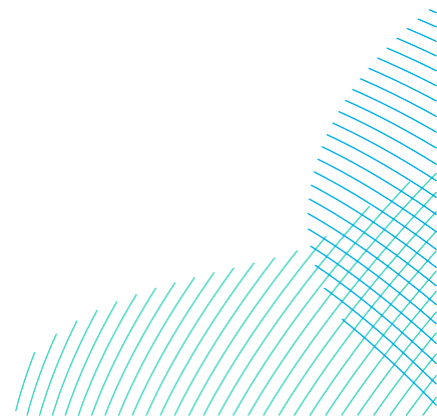
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## Glossary

Term	Definition
A weighting	The human ear does not respond uniformly to different frequencies. “A” weighting is commonly used to simulate the frequency response of the human ear.
Ambient / residual sound level, LAeq,T	The ambient sound level is the equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background sound level, LA90,T	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels
Decibel	The range of the audible sound pressure is approximately $2 \times 10^{-5}$ Pa to 200Pa. Using decibel notation presents this range in a more manageable form, 0dB to 140dB. A decibel is 10 times the logarithmic ratio of a sound level to a standard reference level.
L <sub>Aeq,T</sub> – equivalent continuous A-weighted sound pressure level	The L <sub>Aeq,T</sub> is the value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, T = t <sub>2</sub> – t <sub>1</sub> , has the same mean-squared sound pressure as a sound that varies with time.
Onshore Converter Stations	A compound containing electrical equipment required to transform and stabilise electricity generated by the Projects so that it can be connected to the electricity transmission network. There will be one Onshore Converter Station for each Project.
Onshore Substation Zone	Parcel of land within the Onshore Development Area where the Onshore Converter Station infrastructure (including the haul roads, Temporary Construction Compounds and associated cable routing) would be located.

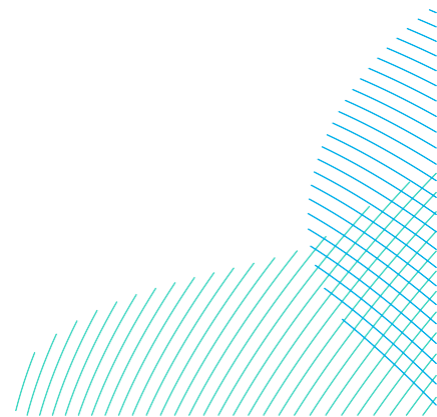


Term	Definition
Residual sound level, LAeq,T	The residual sound level is the ambient sound remaining at the assessment location when the specific sound source (sound source being assessed) is suppressed to such a degree that it does not contribute to the ambient sound.



## Acronyms

Term	Definition
BS	British Standard
BSI	British Standards Institution
dB	Decibel
DBS	Dogger Bank South
DCO	Development Consent Order
m	Meters
NSR	Noise Sensitive Receptor
UK	United Kingdom



## 25.5 Operational Noise Assessment

### 25.5.1 Introduction

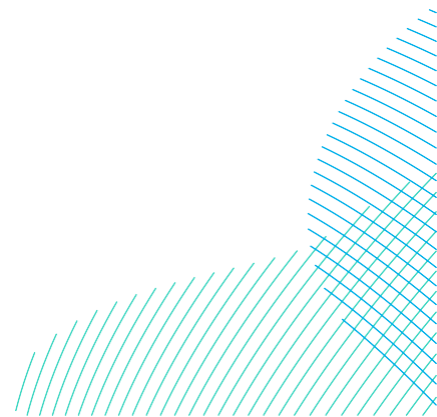
1. This appendix provides additional technical information regarding the operational noise assessment, to accompany **Volume 7, Chapter 25 Noise (application ref: 7.25)**. This appendix details the approach undertaken for the Onshore Development Area operational noise assessment including assumptions, operational noise predictions and their associated magnitude of impact. This assessment considers the impact of operational noise from the Onshore Converter Stations.

### 25.5.2 NSR Locations

2. **Table 25-5-1** shows the NSR locations scoped in for the operational noise assessment (Impact 6 in **Volume 7, Chapter 25 Noise (application ref: 7.25)**). NSRs have been scoped in if they are within 500m of the Onshore Converter Stations.

Table 25-5-1 Construction Noise NSR Locations

NSR Identifier	Coordinates		Classification	Sensitivity
	X	Y		
R39	502021	437000	Residential	Medium
R40	502448	437129	Residential	Medium
R42	502509	436990	Residential	Medium
R43	502533	436485	Residential	Medium
R57	502159	436035	Residential	Medium
R66	502558	436638	Residential	Medium
R67	502572	436762	Residential	Medium

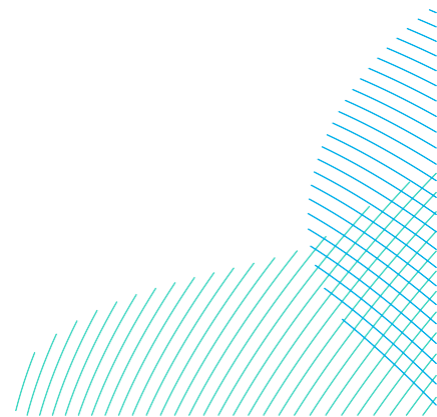


## 25.5.3 Operational Noise Assessment Assumptions

3. Two scenarios for the Onshore Converter Stations site layout were considered in the operational noise assessment:
  - Projects In Isolation: 1no. converter station operating on the eastern footprint of the Onshore Substation Zone.
  - Projects built Concurrently or Sequentially: 2no. converter stations operating at the same time, on the eastern and western footprint of the Onshore Substation Zone.
4. Operational noise sources that were included in the noise model are presented in **Table 25-5-2**. This also identifies the number of items of plant / equipment per Onshore Converter Station. All data presented in this appendix are presented as broadband noise levels, however all calculations have included spectral data which is based on previous RWE project data.

Table 25-5-2 Details of Assumed Operational Plant Per Onshore Converter Station

Equipment	Quantity	Main unit sound power level dB(A)	Cooler sound power level dB(A)
Converter Transformer	6 + 1	93*	88
HVDC valve cooler RBP	2	N/A	90
Harmonic Filter	6	85	N/A
AHU (Air Handling Units) for halls	2x6 areas	85^	N/A
AHU for service building	2x1 area	65^	N/A
Discharge resistors	3 areas	N/A	N/A
Reactor inside reactor/DC hall	1	90 (internal)	N/A
Valve inside valve hall	1	80 (internal)	N/A





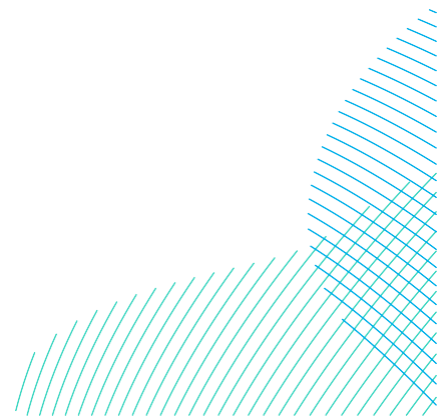
Equipment	Quantity	Main unit sound power level dB(A)	Cooler sound power level dB(A)
<p>* -20dB correction applied as assumed to be fully enclosed with a roof. Noise enclosures are normally made up of sound absorbing, heavy-duty, modular, prefabricated panels made of materials such as sheet metal or other dense material.</p> <p>^ A range of values was provided for AHUs, the highest level of this range has been used to provide a worst case.</p>			

## 25.5.4 Noise Modelling Assumptions

5. The predictions were undertaken using CadnaA 3D modelling software. The following parameters were assigned to all noise models:
  - Free-field noise levels were predicted at the entire building façade (i.e. all around the building) at heights of 1.5m and 4m.
  - Hard ground absorption,  $G=0$ , for the Onshore Substation Zone and soft ground absorption,  $G=1$ , assumed everywhere else to be representative of ground of the surrounding areas;
  - Two orders of reflection;
  - Buildings are reflecting (smooth, non-structured facade); and
  - ISO 9613 calculation methodology.

## 25.5.5 Predicted Operational Noise Levels

6. Predicted operational noise levels at NSRs from the 1no. Onshore Converter Station on the eastern footprint of the Onshore Substation Zone (i.e. In Isolation Scenario) are presented in **Table 25-5-3** and **Table 25-5-4**.
7. Predicted operational noise levels at NSRs from the 2no. Onshore Converter Stations (operating simultaneously) on the eastern footprint and western footprint of the Onshore Substation Zone (i.e. Sequential/Concurrent Scenario) are presented in **Table 25-5-5** and **Table 25-5-6**.



8. The magnitude of impact assessment is presented alongside the predicted noise levels to provide context to the results. The magnitude of impact criteria are set out in **Volume 7, Chapter 25 Noise (application ref: 7.25)**, and are based on BS4142 and WHO NNG guidance; these criteria have been agreed with the Environmental Health Officer at East Riding of Yorkshire Council.
9. The magnitude of impact is based on a predicted level of operational noise sources based on the BS4142 (rating level compared to background sound level) and NNG (absolute night-time sound levels) guidance. For the assessment of operational noise during night-time, the higher of the two assessment criteria has been used to identify impacts. For example if the background sound level is 45dB  $L_{A90}$  the threshold for a low impact is equal to 45dB  $L_{Ar,Tr}$  ( $L_{Ar,Tr}$  is the Rating Level) not 40dB  $L_{Aeq,8hrs(23:00-07:00)}$ . Conversely, if the background sound level is 35dB  $L_{A90}$  the threshold for a low impact is equal to 40dB  $L_{Aeq,8hrs(23:00-07:00)}$  not 35dB  $L_{Ar,Tr}$ .
10. It is important to note that the assessment of effects (rather than magnitude of impact) is presented within **Volume 7, Chapter 25 Noise (application ref: 7.25)**. In addition to the magnitude of impact, the assessment of effects considers factors such as receptor sensitivity, activity duration and the nature of the existing sound climate.
11. At R39 a +2 dB BS4142 character correction has been included, as a worst case as there is potential that there may be a “tone which is just perceptible at the noise receptor” as some of the equipment contributing to the predicted noise levels at this NSR may be tonal in nature (e.g. harmonic filters).
12. This correction has not been applied at the other receptors where specific noise levels are lower and the main contributors to the predicted noise level are broadband in nature (e.g. air handling units).

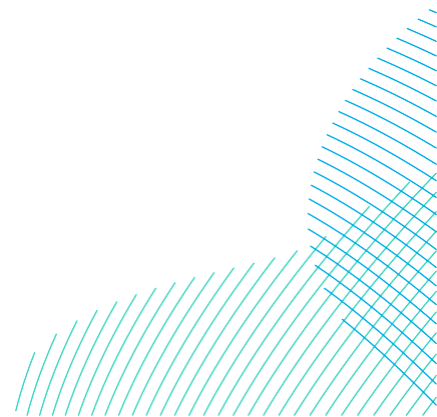


Table 25-5-3 Predicted Operational Daytime Noise Levels (Projects In Isolation)

NSR	Predicted noise level, dB $L_{Aeq,T}$	Background sound level, dB $L_{A90,T}$	Acoustic feature correction	Rating Level, dB $L_{Ar,T}$	Difference between rating level and background sound level, dB	Magnitude of Impact (BS4142)
<b>Daytime, 07:00 - 23:00, T=15min</b>						
R39	34	45	+2	36	-9	<b>Negligible</b>
R40	29	53	0	29	-24	<b>No impact</b>
R42	30	53	0	30	-23	<b>No impact</b>
R43	28	53	0	28	-25	<b>No impact</b>
R57	30	44	0	30	-14	<b>No impact</b>
R66	31	53	0	31	-22	<b>No impact</b>
R67	32	53	0	32	-20	<b>No impact</b>

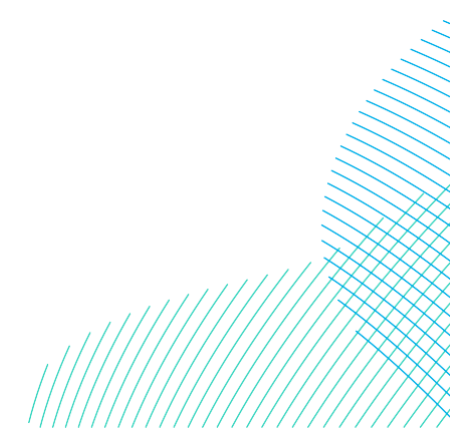


Table 25-5-4 Predicted Operational Night-time Noise Levels (Projects In Isolation)

NSR	Predicted noise level, dB $L_{Aeq,T}$	Background sound level, dB $L_{A90,T}$	Acoustic feature correction	Rating Level, dB $L_{Ar,T}$	Difference between rating level and background sound level, dB	Magnitude of Impact (BS4142)	Magnitude of Impact (Absolute night-time noise)
<b>Night-time, 23:00 – 07:00, T=15min*</b>							
R39	34	31	+2	36	+5	Medium	<b>Negligible</b>
R40	29	30	0	29	-1	Negligible	<b>No Impact</b>
R42	30	30	0	30	0	Negligible	<b>Negligible</b>
R43	28	30	0	28	-2	Negligible	<b>No Impact</b>
R57	30	26	0	30	+4	Low	<b>Negligible</b>
R66	31	30	0	31	+1	Low	<b>Negligible</b>
R67	32	30	0	32	+2	Low	<b>Negligible</b>
Impact magnitude used to identify noise effects highlighted in <b>bold</b> – refer to paragraph 9 for more information.							
*For the absolute night-time noise T = 8hrs, 23:00 – 07:00. Note that a worst-case 8 hours has been assumed, which is equivalent to a worst-case 15 minutes.							

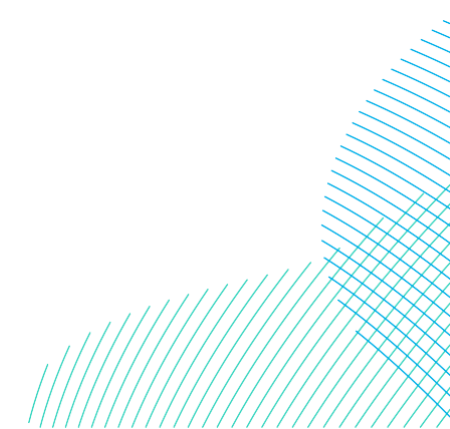


Table 25-5-5 Predicted Operational Daytime Noise Levels (Projects Sequentially or Concurrently)

NSR	Predicted noise level, dB $L_{Aeq,T}$	Background sound level, dB $L_{A90,T}$	Acoustic feature correction	Rating Level, dB $L_{Ar,T}$	Difference between rating level and background sound level, dB	Magnitude of Impact (BS4142)
<b>Daytime, 07:00 - 23:00, T=15min</b>						
R39	36	45	+2	38	-7	<b>Negligible</b>
R40	31	53	0	31	-22	<b>No impact</b>
R42	31	53	0	31	-22	<b>No impact</b>
R43	29	53	0	29	-20	<b>No impact</b>
R57	31	44	0	31	-13	<b>No impact</b>
R66	31	53	0	31	-22	<b>No impact</b>
R67	33	53	0	33	-20	<b>No impact</b>

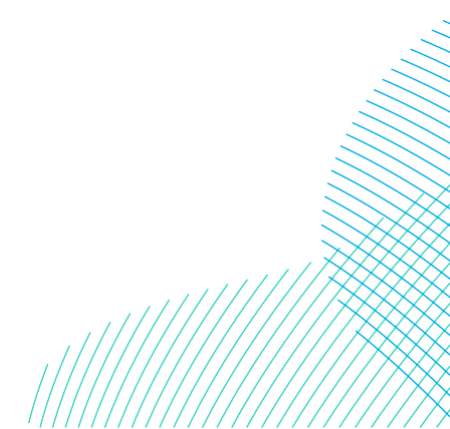
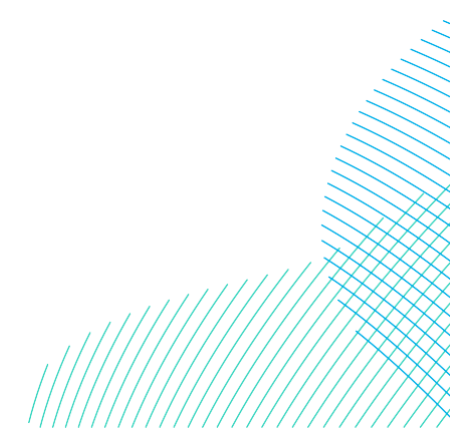


Table 25-5-6 Predicted Operational Night-time Noise Levels (Projects Sequentially or Concurrently)

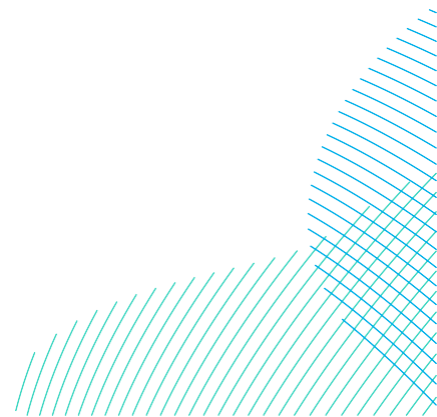
NSR	Predicted noise level, dB L <sub>Aeq,T</sub>	Background sound level, dB L <sub>A90,T</sub>	Acoustic feature correction	Rating Level, dB L <sub>Ar,T</sub>	Difference between rating level and background sound level, dB	Magnitude of Impact (BS4142)	Magnitude of Impact (Absolute night-time noise)
<b>Night-time, 23:00 - 07:00, T=15min*</b>							
R39	36	31	+2	38	+7	Medium	<b>Negligible</b>
R40	31	30	0	31	+1	Low	<b>Negligible</b>
R42	31	30	0	31	+1	Low	<b>Negligible</b>
R43	29	30	0	29	+1	Low	<b>No Impact</b>
R57	31	26	0	31	+5	Medium	<b>Negligible</b>
R66	31	30	0	31	+1	Low	<b>Negligible</b>
R67	33	30	0	33	+3	Low	<b>Negligible</b>
Impact magnitude used to identify noise effects highlighted in <b>bold</b> – refer to paragraph 9 for more information.							
*For the absolute night-time noise T = 8hrs, 23:00 - 07:00. Note that a worst-case 8 hours has been assumed, which is equivalent to a worst-case 15 minutes.							



## References

BSI (2019) BS 4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound. BSI, London.

World Health Organization (2009). Night Noise Guidelines for Europe.



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