Triton offshore wind farm

Impact of new seismic survey SSV on underwater noise prognosis OX2 AB

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Introduction

An underwater noise prognosis was previously carried out by NIRAS, for seismic survey activities related to the offshore wind farm project: Triton, in the Swedish part of the Baltic Sea, south of Ystad, detailed in the report "OX2 Triton Seismic Survey – Underwater Noise Technical Report" dated 16-06-2021. The prognosis was carried out using the best available knowledge on underwater noise emission from an airgun, sparker and Innomar source at the time of writing. For the sparker and Innomar source however, the amount of reliable information was however very limited, and as a result thereof, the source models for these sources were implemented very conservatively, so as to not underestimate any potential impact on marine mammals.

Comparison of new measurements with prognosis

In a new Sound Source Verification (SSV) measurement by (Pace, Robinson, Lumsden, & Martin, 2021), the underwater noise emission from the sparker and Innomar sources was studied in detail. The report was published by Danish Energy Agency, and is available at: https://ens.dk/sites/ens.dk/files/Vindenergi/underwater_sound_sources_characterisation_study-nordsoeen_2021.pdf.

The specific sources included in the study, were the GSO 360 sparker – comparable in build, function and energy output to the GeoSource 200-400 used in the previous underwater noise prognosis, as well as the Innomar medium 100, the same model proposed by OX2, and used in the prognosis.

The new study directly measured, and calculated the impact ranges for the sparker and Innomar based on the newest threshold metrics for harbour porpoise avoidance behaviour criteria, $SPL_{RMS,125ms,VHF} = 100\ dB\ re.\ 1\ \mu Pa$ (Tougaard J, 2015).

In the prognosis by NIRAS, impact ranges for harbour porpoise avoidance behaviour were conservatively calculated to be up to ~6.6 km for the sparker, and up to ~3.4 km for the Innomar. In the measurements from 2021, distances were found to be ~2.2 km for the sparker and ~730 m for the Innomar.

Before comparing these values, it is important to recognize that there are differences in the sound propagation between the North Sea and the Baltic Sea, due to differences in the environmental parameters: salinity, temperature and sound speed. The differences in salinity between the two areas are substantial, with significantly lower overall salinity in the Baltic Sea (~15 ppm) compared to the North Sea (~35 ppm), and with significant variations with depth (~7 ppm – ~28 ppm). This could result in a significant increase in sound propagation, especially at very high frequencies, such as those produced by the Innomar (~100 kHz). When examining the differences over depth, the North Sea has very similar salinity and temperature throughout the water column, resulting in an iso-velocity sound speed profile, resulting in uniform sound propagation throughout the water column.

At Triton however, the water column is less well-mixed, resulting in an upward refracting sound speed profile in winter months, "pushing" sound waves towards the sea surface to a greater degree than would an iso-velocity profile. This results in less interaction with the seabed, and thereby, greater sound propagation and increased impact ranges. This holds true especially with higher frequencies, such as for the Innomar, less so for the sparker. For the Triton area, the same conditions apply in the summer months, however with higher overall water temperature.

It is expected that the differences in the winter month environmental conditions can result in increased impact ranges compared to those measured in the North Sea. With the significantly lower salinity, and an upward refracting sound speed profile, sparker impact ranges could extent to, but are unlikely to exceed, 3 km distance for avoidance behaviour criteria. For the Innomar, impact ranges beyond 2 km are considered unlikely.

Summary

In summary, the new measurements from (Pace, Robinson, Lumsden, & Martin, 2021), combined with the knowledge of differences in sound propagation between the measurement site and Triton, indicates that the current prognosis of impact ranges for avoidance behaviour in harbour porpoise for seismic survey activities at Triton, are very conservative.

Based on the new measurements, it is considered likely, that actual impact ranges for avoidance behaviour in harbour porpoise will not exceed 3 km distance for the sparker, and 2 km for the Innomar.

Best regards,

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