Noise mitigation in German offshore wind construction since 2014 – practical experience and influence of pile driving on harbour porpoise

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Summary
During offshore wind farm construction, steel foundations are usually driven into the sea floor by means of noise generating pile driving, which bears the risk to negatively affect the hearing and natural behaviour of marine mammals. In Germany, a key species in this context is the harbour porpoise (*Phocoena phocoena*), the only resident cetacean species known to regularly reproduce in German waters.
In 2008, German regulators introduced a noise level of max. 160 dB SEL05 at 750 m distance to the piling location as precautionary measure. Since 2010 the German offshore industry made significant effort to comply with this German threshold during pile driving activities. Noise measurements together with parallel monitoring of the abundance and behavior of harbour porpoise now opens the possibility to analyze the efficiency of the German noise threshold.

1. German offshore projects 2010-2016

The first German offshore projects, constructed from 2010 -2013 could not always reliably meet the threshold by means of technical measures available, but from 2014 onwards further offshore wind farms which were built in the German North Sea and Baltic Sea used highly improved noise mitigation systems (NMS) and were able to comply with the German threshold.

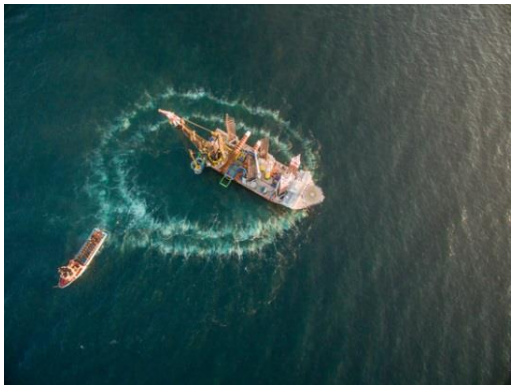

Fig. 1: Double Bubble Curtain noise mitigation system (photo © Vattenfall)

2. Development and application of NMS

The presentation will provide an overview of the development of NMS systems and their application. Furthermore, data will be presented comparing the efficiency of the systems in projects constructed prior 2014 and after 2014. This will be done by using examples from the following offshore wind farms: Arkona, Borkum Riffgrund 1, Gode Wind 01, Gode Wind 02, Nordergründe, Nordsee One, Riffgat, Sandbank, Trianel, Veja Mate, Wikinger in comparison to first implemented NMS generation in Meerwind Süd|Ost, Global Tech I, Nordsee Ost, DanTysk, EnBW Baltic 2, Borkum Riffgrund 1, Amrumbank West and Butendiek.

2.1 Underwater noise R&D

Additionally, further results will be given of the study “Effects of offshore pile driving on harbour porpoise abundance in the German Bight” published in 2016 by the Working group “Noise Mitigation” (“Arbeitskreis (AK) Schallschutz”) of the Offshore Forum Windenergie (OfW). This study examined the influence of the first generation of NMS used 2010 - 2013 in German North Sea offshore wind projects on marine mammals. The results show that there are only local and temporary effects and no effect on population level on marine mammals.

Finally, a preview of an extended study, started in 2017 by the Arbeitsgemeinschaft Offshore-Windenergie e. V. (AGOW) Working group “Umweltschutz”, the successor of the “AK Schallschutz”, will be given. This study examines windfarms built in the years 2014 to 2016 which met the German threshold to a high degree, also in comparison to the first generation of NMS used. Noise measurements together with parallel monitoring of the abundance and behavior of harbour porpoise now opens the possibility to analyze the efficiency of the German noise threshold.

3. References

1] Miriam J. Brandt et al. prepared for Offshore Forum Windenergie (Germany) “Effects of offshore pile driving on harbour porpoise abundance in the German Bight” project data from 2010 to 2013 (GESCHA 1)”, June 2016