Marine Management Organisation

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Harriet Thomas
Innogy Renewables UK Ltd
(by email only)

Our reference: DCO/2013/00011

11 December 2018

Dear Harriet,

RE: REQUEST TO INCREASE HAMMER ENERGY FOR SOFIA OFFSHORE WIND FARM (SOWF) (FORMERLY DOGGER BANK TEESSIDE A&B).

Thank you for submitting your request to increase the maximum hammer energy for foundation installation at SOWF to 5,500kJ. This request was originally submitted to the Marine Management Organisation (MMO) on 15 June 2018, and following continued engagement between the MMO was accompanied by the supporting documentation listed in table 1 of the Statement of Common Ground (SoCG) which was agreed with the MMO on 20 November 2018, and the updated noise modelling which was provided in Appendix A to the (SoCG), The MMO has reviewed the request and the supporting documentation in consultation with its technical advisors at the Centre for Environment, Fisheries and Aquaculture Science (Cefas) and has the following comments to make, outlined below.

Furthermore, the MMO acknowledges that as part of the discussions around this request, specific questions were submitted to the MMO via email on 31 October 2018, regarding methods for modelling underwater noise (UWN) impacts on fish. A summary of these questions and the response is provided in Appendix A.

1. Marine Mammals

1.1. The MMO is satisfied that SOWF has adequately demonstrated there will be no significant change in impact for marine mammals from what was assessed in the original Environmental Statement (ES).

2. Fish

The following comments provided in the section are made in specific reference to the updated noise modelling provided in Appendix A to the SoCG:

2.1. Major Comments

2.1.1. The MMO maintains its position that the 186 dB SELcum threshold, as per the Popper et al. (2014) criteria, for assessing the onset of Temporary Threshold Shift (TTS) should not be used as a substitute for assessing behaviour.

2.1.2. The MMO welcomes the updated modelling that was provided in Appendix A to the SoCG that modelled predicted impact ranges for TTS based on a stationary receptor. This was provided response to MMO's comments set out in point 8 of Appendix B to the SoCG. The MMO acknowledges SOWF's position that a stationary fish model is not representative of how an active fish such as herring is likely to respond if disturbed. However, in the absence of empirical scientific evidence to support the assumption that a fleeing response to noise occurs in fish, the MMO considers it appropriate to adopt the precautionary principle and undertake modelling based on a stationary receptor.

2.1.3. The MMO acknowledges that a direct comparison cannot be made between the updated modelling and original modelling used to inform the Environmental Statement (ES), due to the different metrics and impact criteria. Nonetheless, using the updated modelling, the MMO considers that the updated impact ranges for fish predicted for a 5,500 kJ hammer energy scenario are greater than those ranges predicted within the ES, as the potential effects can be expected at much larger distances than what was originally predicted.

2.1.4. The impact ranges presented in Figure 1 of the SoCG predict that effects of noise and vibration will extend to the outer areas of broad-scale habitat for herring spawning, based on Coull *et al.* (1998).

2.1.5. However, by taking an evidence based approach using 10 years of International Herring Larvae Surveys (IHLS) data, herring larvae are shown to be in their highest concentrations further west, towards Flamborough Head.

2.1.6. Using the modelled data presented in Appendix A to the SoCG, the distance between the closest point of predicted impact range and the higher concentrations of herring larvae is approximately 20-30km. The MMO considers that the distance offers gravid herring and their eggs and larvae some additional buffer against potential impacts of noise at the SOWF. However, MMO also recognises that herring spawning grounds can be recolonised over time, and the exact locations for herring spawning change year on year, so there is potential for spawning activity to extend eastwards towards SOWF.

2.1.7. Consequently, the MMO does not agree that the impact of underwater noise is negligible, and that impacts to gravid herring and their eggs and larvae are still possible. However, the MMO does consider that the supporting information adequately demonstrates that the risk of a significant impact is unlikely to be high, and is therefore is content that the increased hammer energy of 5,500kj

can be used in the construction method statement.

2.2. **Minor comments**

2.2.1. It would be useful if the MMO is informed of the results of underwater noise monitoring using the 5,500kJ hammer energy on commencement of piling events at the Sofia OWF site, so that comparisons between results and the modelled predictions could be made.

2.2.2. The MMO recognises that the applicant has provided modelling in Appendix A based on a stationary receptor due to lack of evidence available to support a fleeing response in fish, however MMO notes that the impact on eggs and larvae has also been considered, which would also be considered as stationary receptors.

2.2.3. The MMO also notes that an assumption that fish will flee if disturbed overlooks biological drivers including spawning and migration which result in a necessity to spawn at a certain time or in a particular location.

Conclusion

Based on the updated modelling based on a stationary fish receptor, and having regard to best available evidence to consider the impact on spawning herring at Flamborough Head, the MMO considers that the risk of a significant impact is sufficiently low that a maximum hammer energy of 5,500 kJ can be used in the construction method statement.

Yours sincerely,

[redacted]

Adam Suleiman
Marine Licensing Case Officer

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Appendix A

Questions raised by Innogy on underwater noise assessments on fish receptors

The questions below were raised during a teleconference on 7 November 2018 with Innogy discussing the modelling that would be required to support the request to increase the maximum hammer energy to a maximum of 5,500kJ, following concerns that were raised by the MMO regarding the likely impacts on spawning fish, and following a request to model impacts based on a stationary receptor.

During the call, Innogy agreed to explore the option to undertake collaborative work with Cefas to develop realistic parameters for modelling the impact ranges of underwater Nosie on fish.

On the basis of this, Innogy have asked the following questions.

- Can CEFAS clarify the objective of the proposed methodology? For example, are they aiming to provide threshold underwater noise levels for TTS and behaviour specific to piling to use in assessments (currently not available with the Popper et al (2014) criteria as TTS values for piling are based on seismic airgun studies and there are no threshold values for behaviour)? Are they proposing a different approach?

- What specifically are Cefas concerned about that isn't already provided for (lethal / injury / behaviour)? We do have the relevant information for injury and damage to eggs and larvae through latest Popper et al 2014 report. More recently data on disturbance on sensitive species (herring) from air guns has been used to define behavioural effects in some cases.

- We note that CEFAS has identified that modelling using a stationary receptor should be undertaken if no evidence can be provided for fish fleeing speeds. However, we consider that modelling for a stationary receptor would provide over-precautionary unrealistic output and as such an approach is likely to require bespoke computational modelling (with associated cost and time implications) based on agreement of parameters and this would require further research and discussion to progress. How do CEFAS see this modelling approach being appropriately defined and what input is required from developers as part of the model development?

- What is the evidence to suggest that this approach is better than the existing approaches taken? Is it 'better science'?

- Are Cefas seeking to undertake specific experiments relevant to piling within UK waters to provide greater empirical basis for informing threshold assumptions?

- Are Cefas seeking to identify a useful metric that aids in identifying the proportion of individuals that may react but for which habituation or context may limit duration and/or extent of effect…some sort of measure that takes account of species sensitivity…or a contour that identifies likely strong avoidance reaction by all individuals?

- What is going to be the starting point for this – previous thresholds (e.g. McCauley et al 2000, Popper et al 2014) or will it be a completely new start?

- How will the known differences in fish reactions when engaged in specific activities be taken into account (there are plenty of studies already show that fish are less responsive to noise/vessels when spawning or feeding than if they are just swimming around)?

- Is it going to be a fixed threshold or will they attempt to define dose response curves?

- Which species are the focus of the study?

- What information would be needed from the Developer to conduct the assessment?

If Cefas are developing the methodology, once the method has been drafted, will interested parties (including industry) be able to comment again? Will it be peer reviewed?

MMO Response

Major Comments

1. Cefas are not currently developing any new methodology for modelling underwater noise impact on fish. Cefas do not currently have any plans to undertake specific experiments relevant to piling within UK waters. Nor is Cefas currently seeking to identify a useful metric that aids in identifying the proportion of individuals that may react but for which habituation or context may limit duration and/or extent of effect.

2. The primary concern is that the underwater noise modelling for fish is based on a fleeing, rather than a stationary receptor. It is recognised that fish will likely respond to a loud noise source, and reactions have been observed such as schooling more closely or moving to the bottom of the water column, burying in substrate. Hawkins et al. (2014) for example, report changes in density of fish within a school, or a depth change in pelagic species in response to noise (percussive pile driving playback).

3. However, the responses highlighted in point 2 do not provide evidence to support fleeing (which, under the current assumptions in the assessment, requires a receptor to flee directly and consistently from the source over the large effect distances predicted). In the absence of evidence to support the fleeing assumption, the MMO cannot be confident that modelling that assumes a fleeing response will

not produce unrealistically small impact ranges. Given this uncertainty, the MMO considers that modelling should be based on a static receptor.

4. Furthermore, consideration should also be given to eggs and larvae which are vulnerable to barotrauma and have reduced mobility, and developmental effects have also been observed (see Hastings and Popper, 2005).

5. MMO acknowledges the developer's position that modelling for a stationary receptor would provide over-precautionary unrealistic output, and that a more realistic model is likely to require bespoke computational modelling (with associated cost and time implications) based on agreement of new parameters. The MMO advises that as the modelling based on a static receptor has now been reviewed and accepted, further development of such a model is not required for this project.

6. The MMO acknowledges there may be some potential in the future to develop bespoke modelling, as scientific understanding of fish responses to noise and the implications of any responses to noise advances. This may indeed take into account factors such as behavioural responses and dosage dependency, depending on the evidence available. Until such a time, it is recommended that modelling is undertaken based on a stationary receptor.

7. The MMO previously discussed the potential for assessing potential behavioural effects for fish, by providing the received levels of single pulse Sound Exposure Level (for example, at a particular spawning ground or habitat of concern) based on the worst-case scenario. An assessment can then be made on the potential risk of impact, with reference to the peer-reviewed literature.