Comments and suggestions on the Natura 2000 Appropriate Assessment, Operational Lifetime Extension, Horns Rev 1 - Vattenfall/Ørsted

Scientific note from DCE – Danish Centre for Environment and Energy

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Front page photo: Sortænder på have nær en havvindmøllepark på Horns Rev. Photo: Kent Olsen.

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Contents

Comments and suggestions on the Natura 2000 Appropriate Assessment, Operational Lifetime Extension, Horns Rev 1 - Vattenfall/Ørsted **2**

1 Preamble and background **4**

2 Strategic issues that need to be addressed by the Appropriate Assessment **5**

2.1 Purpose and scope 5
2.2 Methods applied 6
2.3 Omissions 7
2.4 Mitigation 10

3 Conclusions **11**

1 Preamble and background

An Appropriate Assessment (AA) is a legally required process under the EU Habitats Directive (92/43/EEC) to evaluate the potential impact of plans and projects in designated areas, specifically Special Areas of Conservation (SACs) and Special Protection Areas (SPAs), which together form the Natura 2000 network. The assessment determines if a plan or project is likely to have a significant effect on the conservation objectives of these areas and, if so, whether mitigation measures can be implemented to avoid or minimise adverse effects. The conservation objectives specifically relate to those species and habitats identified of interest within each SPA and SAC.

In this case, an AA is required to support an application for a 15-year extension to the operational lifetime of the Horns Rev 1 offshore wind farm (hereafter HR1). HR1 became operational in December 2002, predating the designation of SPA F113 *Sydlige Nordsø* in 2004, covering an area southwest of the Horns Rev area down to the border with German territorial waters. With a revision of SPAs in 2023, the SPA F113 was enlarged, extending the area to the north and east to cover the entire Horns Rev area. SPA F113 and Natura 2000 area N246 have the same boundaries and covers the identical area to SAC H255 (which is protected for Common Seal *Phoca vitulina,* Grey Seal *Halichoerus grypus* and Harbour Porpoise *Phocoena phocoena*, as well as the habitat type marine sand banks) within which HR1 is currently situated. Under Article 6(3) of the Habitats Directive, any plan or project where an adverse effect on the designated species or habitats within a Natura 2000 area (SPA or SAC), alone or in combination with other plans or projects, cannot be ruled out, must be subjected to an AA regardless of whether the area is within or outside the project boundary:

"*Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public.*"

Hence, the need to appraise the effects on SAC H255 and SPA F113 in the current AA.

This document, prepared by the Department of Ecoscience, Aarhus University, provides an assessment, including comments and suggestions for improvement of the AA draft prepared in late July 2025 by Vattenfall/Ørsted (co-owners and operators of HR1) for submission to the relevant authorities in support of the application to extend the lifespan of HR1.

2 Strategic issues that need to be addressed by the Appropriate Assessment

The core function of an AA in this present case is to determine if a potential permission to continue producing electricity from HR1 will have a significant effect on the conservation objectives of both the SPA F113 within which it is situated and the adjacent SAC H255, which together constitute the Natura 2000 area N246 *Sydlige Nordsø*.

2.1 Purpose and scope

It is, therefore, essential that an AA contains not just a description of the legal framework (sections 5.1-5.4 of the Vattenfall/Ørsted draft), but also a detailed explanation of the conservation objectives for these two elements of N246, which includes the birds, sea mammals and habitats that these areas are designated to protect. This is also relevant to establish the framework necessary to structure and systematically address the potential effects of the 15-year extension to the operation of HR1 on each of the features of interest.

For these reasons, it would be useful early on to insert a section outlining the purpose and scope of the AA. This section, for instance, needs to establish that those species and habitats which are named in the designations of the SPA and SAC are those which will be specifically addressed in the AA. This AA should also include some assessment of how the current conservation objectives for the site concerning the species and habitats within the SPA and SAC (*i.e.* not just bird species) are being achieved and how this may or may not be compromised by an extension to the active lifetime of HR I. The current draft simply lists species as "Designation basis" in Table 5-1 without a contextual trail to explain the rationale behind their inclusion and the exclusion of other species. This must include a brief explanation that the species and habitats named in the designation of the SPA and SAC are those interests that are legally required to be assessed in the AA. Having established this as the scope for the AA, it is important to determine how the SPA and SAC currently achieve those aims as a basis for assessing how the extension to the operating lifetime of HR I may or may not affect the designated interests, even if one or more features are unlikely to be affected. Ideally, there should be explicit conservation objectives set for each qualifying interest feature in area-specific guidance and Natura-2000 documentation. An AA needs to address all eventualities in this respect. In particular, the AA ought to undertake a full assessment of the detected effects from the construction of HR1 based on post-construction monitoring and experiences concerning (in this case) avian distribution and abundance, flightlines and survival, in relation to those under pre-construction conditions. This assessment provides the basis for predicting the continued effects should the operating licence be extended for the 15-year extension.

The narrative would gain considerable benefit from outlining how the authors intend to go about the AA, given that in this case, HR1 offers the unique opportunity of providing 25 years of pre- and post-construction data that provides a historical archive upon which to base specific evidence for the presence or absence of effects to complement what is known in the literature. This explanation would also be of great assistance in both setting the scene and providing a context and structure for the unfolding AA. It would also be valuable to describe the ongoing operational activity (*e.g.* the recent past, current

and future predicted levels and frequency of maintenance traffic along their access navigation corridors and in and around the wind farms), so that avian effects observed in the past can be measured against the present and projected levels of disturbance from this source.

In establishing the scope for the AA, it is essential to at least explain the reasons why some key features of N246 are not addressed in the current draft (for instance Grey Seal, and Harbour Porpoise , as well as sandbank features), even if the effects are considered to be benign, an AA still needs to be comprehensive.

It would also be extremely helpful to establish the very many ways in which HR1 and its extended lifetime will impact upon the identified features of interest of N246. For instance, the current formulation concentrates entirely upon displacement of the three avian species (divers *Gavia* spp., Common Scoter *Melanitta nigra* and Little Gull *Hydrocoloeus minutus*) that are features of interest of the designation, *i.e.* a detectable change in bird distributions comparing the pre-construction with post-construction. However, HR1 could continue to affect the three avian species through other mechanisms, such as impeding their flight movements, collision rates (with turbine blades, towers and other infrastructure), and potentially affecting their body condition, which affects fitness (*i.e.* reproductive success and/or survival). These aspects each need to be considered in isolation and presented in full in the AA, even if they can be shown not to have effects or if it is not possible to demonstrate such effects.

2.2 Methods applied

Having established the purpose, objectives and scope of the AA, it is important to establish a method of addressing each, which will produce convincing results that will establish that the construction of HR1 had no effects on the species and habitats concerned and therefore whether the extension of the permit to operate will or will not have effects on the conservation objective set for each qualifying interest. Currently, there is no such methods section that links the AA aims to how such an assessment is intended to be carried out. This should be structured in a way that can convince the licensing authorities that this is the case. For instance, where there is doubt about the ability of current techniques to convincingly detect the displacement of Little Gulls or divers from HR1 due to the relatively low densities of birds present, it would be desirable to undertake a power analysis to determine whether or not the information at hand can detect a displacement effect. This should be extended to the other species as well.

2.3 Omissions

There is a broad consensus that offshore wind farms influence bird populations through five principal mechanisms. These include (i) disturbance, (ii) displacement, (iii) barrier effects to migration, (iv) attraction and (v) collision mortality. Although not all these categories may be relevant to the HR1 AA, it makes sense to address each of these categories (if only briefly) to satisfy the requirements of a full AA. It is also important to then consider these effects in the context of other wind farm developments and other pressures on the focal species/populations in an assessment of (vi) cumulative effects.

i. Disturbance

In the draft, no attention is paid to a range of disturbance activities associated with the functioning of HR1 and their current potential or measured effects on the features of interest, for instance, maintenance activity on turbines and maintenance traffic to and from, in and around the windfarm. Such disturbances have multiple effects, including displacement of feeding and resting birds and mammals from their favoured distribution, causing cessation of feeding and enhancing energy expenditure, the latter of which potentially affects the fitness of individuals. To defend the continued operational activity of HR1, the AA must identify and describe the full range of potential effects of all activities associated with those operations, together with some assurance that these will not change in the future, or if they do, mitigation measures should be recommended.

While the frequency and nature of the maintenance traffic associated with the HR1 turbines may not change in the future, it is important to establish in some way two facets of the current existing levels of activity. Firstly, the current frequency of ship and helicopter maintenance traffic associated with HR1 and how this may have changed over time (*e.g.* do older turbines require more frequent maintenance?). Secondly, to project future levels of disturbance to potential bird numbers in the area, currently monitored effects of the existing levels of such traffic need to be presented to establish their continued effects in the coming 15 years. Such traffic does not just affect avian distributions within the HR1 footprint, but along the routes out through the SPA/SAC from the shore-based facilities out to and back from the offshore turbines concerned. In this context, some evaluation of the current levels of traffic needs to be presented with regard to key features, such as disturbance and displacement of features of interest, such as Grey Seals, Harbour Porpoises, divers, Common Scoter and Little Gulls.

ii. Physical and effective (displacement) habitat loss

Although physical habitat loss will have had a one-off impact on the environment of HR1, it should at least be considered and dismissed if appropriate. Displacement (caused by the apparent behavioural response of birds that show a collective reticence not to come nearer than a certain distance to post-construction turbines) is a central element for the critical species concerned. Both physical and effective habitat loss have the same net effect of reducing the potential area along the flyway for which such areas are being exploited (feeding areas, safe roosting sites, etc.). This loss needs to be reviewed in the light of how close to carrying capacity a population might be, because if all the feeding opportunities for a population along its migratory corridor are being used to their fullest extent, loss of some of this resource will have the potential to reduce overall population size.

Displacement is tackled within the draft AA with reference to previously cited studies that either did not detect displacement effects or only detected small displacement effects on birds from HR1. This is not strictly the case. These same studies showed a clear displacement of divers and common scoter in response to the construction and operation of HR2, so there are demonstrable effects on these species at the nearest offshore wind farm to HR1. It was conspicuous that the low concentrations of divers observed in the vicinity of HR1 have always shown high levels of variability, and that common scoter only became more numerous in the offshore areas of Horns Rev after its construction. These are factors which undoubtedly affect the ability of those studies to detect significant displacement effects at HR1 that were evident in relation to HR2. Hence, while the results of these studies may be valid, they cannot be used definitively as evidence that there was (or is) no displacement effect. This constitutes a classic error of logic; the absence of evidence does not necessarily equate to evidence of absence. The lack of detection of an effect could very likely result from sample sizes that are too small and/or variable to detect displacement in a system showing great natural variation. This situation is highly likely to be the case in species such as divers, Common Scoter and Little Gull. Therefore, to justifiably claim that there is no displacement effect, the existing analyses need to be supported by some form of power analysis. While we recognize that a power analysis would be quite demanding to conduct on the analyses referred to here, if this is not feasible for the referenced studies, there remains the need to evaluate the uncertainty of the parameter estimates critically, recognizing that even this may not be adequate to confirm the lack of displacement.

iii. Barrier effects

Currently, barrier effects are not mentioned at all in the AA draft. However, it is well known that many migrating and otherwise flying species show avoidance behaviour to lines of wind turbines in the open sea, including studies of the featured species at HR1. Such responses can greatly reduce the probability of collision risk, while potentially extending flight distance, so while not always relevant, this ought to be included in an AA.

iv. Attraction

Also not currently included in the AA draft, many bird species are attracted to offshore turbines, and this should at least be mentioned, if only to dismiss it as not relevant to the species featured in the designation of the SPA/SAC.

v. Collision risk

Because of the emotive human response to the deaths of birds and the immediate contribution to mortality in any demographic exploration of the impacts of offshore wind farms, the subject of avian collisions with wind turbines comes high on the list of effect parameters under the spotlight for post-construction assessments of the effects of wind farms on bird populations. While the collision risk is likely to be small at HR1 due to the behaviour of the key species concerned and the low densities of birds within the wind farm, this still should be given full adequate treatment within the AA.

vi. Cumulative effects

While the structuring of the text treatment into sections on the effects of the continued operation of HR1 and the cumulative and in-combination effects is extremely helpful, the latter needs to be wide-ranging and exhaustive. This means not just reviewing the potential effects of other offshore wind farms already constructed in the vicinity of HR1 and those that will come during the coming 15 years, but also the combined effects of other major pressures on the flyway populations concerned. These include those from other marine development projects, such as fishery, shipping, dredging, mineral extraction and other activities in the North Sea area in general and along the flyway corridors of the key species in particular, as well as macroenvironmental effects such as the many facets of climate change. These will all have cumulative effects on the potential carrying capacity of the near and flyway environment, and hence the fitness of individuals from the populations concerned that need to be considered. In this context, there ought to be some attempt to address whether density dependence is operating in these populations in such a way that loss and degradation in habitat quality might ultimately result in reduced individual fitness from such reductions in carrying capacity. Ideally, a population viability analysis (PVA) or similar model could helpfully support such an assessment of the sensitivity of species to such change and address the relative sensitivity of the populations involved of the key species of interest in the AA. This is especially important because both divers and Common Scoters are relatively long-lived birds; hence, any population effects from loss of reproductive output (due, for instance, to effects of displacement on the development of their body condition outside the breeding season) are likely only to be manifest in the longer term. In the United Kingdom, PVAs are a requirement for addressing impacts on key species in offshore wind farm AAs.

There is an online tool to carry out PVAs given the input parameters:

https://github.com/naturalengland/Seabird_PVA_Tool/tree/master/Documentation

As well as guidelines for their use:

https://publications.naturalengland.org.uk/publication/4926995073073152

and worked examples:

https://www.frontiersin.org/journals/marine-science/articles/10.3389/fmars.2025.1539143/full

While it is essential that the AA be evidence-led based on experiences from HR1 and the monitoring data flowing from the surrounding areas before and since the construction, there should still be a more rigorous review of experiences from other offshore wind farms to enlighten predicted effects from the extension of the operational life of HR1. At present, there is relatively little referenced information from the large and growing body of literature on experiences from other such projects that could be used to improve the AA.

2.4 Mitigation

The draft AA does not put forward any form of mitigation measures but concentrates upon trying to convince the reader that adverse effects on the integrity of the system can be ruled out. In the absence of robust analyses to convincingly show that this is the case, it would seem desirable under all circumstances to offer some form of mitigation measures. Ideally, this could take the form of an unfolding adaptive system, identifying key potential effects and the mitigation mechanisms envisioned to minimise these effects if evident. Such an adaptive system requires the upgrading or initiation of monitoring surveillance sufficient to attain statistical power for adjudging key potential effects (such as the degree of current displacement effects) where these are currently subject to disagreement or lack of clarity in detection. This might also include creative suggestions on seasonal restrictions on activities known to be disturbing to the three species that are features of interest at those times of year when there are most birds present or when the species are most vulnerable. If monitoring suggests adverse effects from HR1 over the time of the extension, there ought perhaps to be provision for adoption of an adaptive management plan to deal with such eventualities.

3 Conclusions

There needs to be a more reasoned and nuanced conclusion from the material presented on whether the project (alone and in combination with other threats) will have adverse effects on the integrity of the SPA and SAC. Throughout an AA exercise, it is important to remember that while an environmental impact assessment (EIA) is expected to establish in advance that a given activity is unlikely to have a significant adverse effect on its surroundings, an AA must, based on post-construction evidence and/or experiences, actually document whether this is or is not the case. Where uncertainties remain (*i.e.* case unproven), the precautionary principle ought to be always invoked.