North Sea Advisory Council

NSAC Advice Ref.03-1718

NSAC engagement with TenneT proposal for a North Sea Wind Power Hub

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Executive summary

While recognising the necessity to deploy renewable energy projects, both onshore and offshore, industry and eNGO members of NSAC have significant concerns about the TenneT proposal for development of a potential North Sea Wind Power Hub.

In this paper we address a variety of the technical issues raised by the proposal and its promotion as a sustainable and biodiversity-enhancing project for the North Sea in general and the Dogger Bank in particular.

Moreover, from the perspective of marine spatial planning, we have concerns about the relationship of this particular proposal to the overall planned and rapid escalation on an unprecedented scale of wind-generated renewable energy in the wider North Sea region.

The fundamental spatial planning stage on a North Sea-wide basis, of which the potential siting of the North Sea Wind Power Hub is but a part, is a critical overarching priority from the NSAC's perspective, and one which has so far received insufficient attention. The NSAC calls for synergistic planning for windfarms to the extent possible.

Given the depth and breadth of our concerns and the urgent need for dialogue and transparency, our **key message** to TenneT is a request to increase its level of stakeholder engagement and consultation with NSAC, not just for the North Sea Wind Power proposal but for any future large-scale grid development by TenneT in the North Sea.

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1.0 Introduction

1.1 The NSAC has a long-standing interest in, and engagement with, the offshore renewable energy industry. Given the wide spatial deployment of renewable wind energy, with cabling typically straddling EEZs of North Sea Member States, the trans-boundary remit of NSAC makes it well placed to address this offshore activity.

1.2 In this regard we have engaged over several years with Forewind's proposals for the UK part of the Dogger Bank, mainly from the perspective of the fishing sector members of NSAC. In addition, Forewind representatives have participated in NSAC focus group meetings tasked with advising on fishery management measures for the Dogger Bank SACs.

1.3 The NSAC is not opposed to the deployment of offshore wind-generated renewable energy, which we accept as necessary to build a low carbon economy and meet emission reduction targets in compliance with the 2015 Paris Agreement on Climate Change commitments. However, we are concerned that decisions do not necessarily take into account all of the relevant considerations. In particular, not all ecological and social risks of the current, rapid and largescale development of offshore wind are taken into account sufficiently and in line with the legal requirements. Also, the net effect towards low carbon should be taken into account, i.e. consideration needs to be given to the extent to which the combined emissions related to the construction, operation and maintenance of the offshore renewable energy infrastructure detract from the positive effects of the low carbon energy generated.

1.4 To put this issue into perspective, according to an Ecofys 2017 report, at North Sea-wide level 9GW has been installed so far with a requirement for 180GW to meet the Paris Agreement. From the UK perspective alone the recent and expected future rate of offshore renewable energy development is unprecedented: to date 5.1GW of offshore wind have been deployed in UK waters, equivalent to 1,472 operating turbines, with a further 12GW of capacity consented but not yet built. Overall this amounts to a third of global offshore wind capacity[1].

In the case of the Netherlands, according to a scenario study report by the National Dutch planning agency PBL (Matthijsen, J. et al. 2018)[2], the current suggested planning for 2023-2030 (scenario 3) envisages an increase of 1GW wind power per year; however, to meet renewable energy targets it may be necessary to add annually at least 2GW (scenario 4). If Tennet should be involved in constructing the grid and other infrastructure needed to meet either of these highly challenging scenarios, wherever in the North Sea, NSAC would like to be consulted at an early stage.

[1] http://www.gwec.net/wp-content/uploads/2017/05/Global-Offshore-2016-and-Beyond.pdf

[2] *De toekomst van de Noordzee. De Noordzee in 2030 en 2050: een scenariostudie*, Den Haag: PBL.

1.5 Marine development, especially on this scale, must be deployed in strict accordance with best practice marine spatial planning and the relevant legal requirements to minimise impacts on commercial fisheries and marine ecosystems. Without the necessary full stakeholder consultation and engagement to address this, there will be a heightened risk of conflict between the users of the North Sea, particularly if there is a perception by stakeholders that renewable energy will always be prioritised over other uses due to international climate change commitments.

1.6 This position paper highlights the known areas of potential conflict arising from the proposal by TenneT to establish a North Sea Wind Power Hub, possibly on the Dogger Bank. The issues we raise reflect concerns of both the fishing sector and the eNGOs who comprise the 'Other Interests Group' of the NSAC. Our comments variously address the sum elements of the hub and spoke model (island, surrounding wind turbines, cabling) but in most respects, have relevance also for any other proposed large-scale grid development by TenneT in the North Sea.

1.7 On the basis of the potential impacts of the North Sea Wind Power Hub and any related renewable energy projects in the North Sea, we urge TenneT to intensify efforts to conduct a transparent process with proper and timely engagement with NSAC and other stakeholders.

2.0 Legal framework and impact assessments

2.1 The hub and spoke development must comply with EU environmental legislation (Birds Directive, the Habitats Directive, and Marine Strategy Framework Directive (MSFD) and the Marine Spatial Planning Directive). International legislation and multilateral environment agreements (MEAs) have placed considerable emphasis on avoiding potentially damaging effects of renewable energy developments. Under the Paris Agreement the EU has committed to maintain environmental integrity when taking measures to reduce greenhouse gas emissions, with particular reference to biodiversity. The Commission has issued a guidance document[3] to help developers to comply with the Nature Directives.

2.2 The assessment must take account of *in-combination* and *cumulative* effects of existing and proposed development in the context of the current, already degraded condition of the North Sea[4]. This aspect of assessment is not one we have hitherto seen adequately emphasised by TenneT.

2.3 As an example of the need for in-combination effects to be properly evaluated and incorporated into assessments, displacement of any fishing activity by a hub and spoke development could have knock-on effects on the benthic pressures generated and ecological implications far beyond the initial footprint of the development. It is therefore an imperative that both fisheries and environmental impacts are assessed

[3] European Commission (2011) Wind energy developments and Natura 2000. http://ec.europa.eu/environment/nature/natura2000/management/docs/Wind_farms.pdf
[4] http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52014DC0097

thoroughly so that the most appropriate sites are given consideration for any new development.

2.4 Where the proposed site covers a Natura 2000 area, and it cannot be excluded that the plan or project is likely to have a significant effect on the site, an Appropriate Assessment (AA), in accordance with Article 6 of the Habitats Directive, should be carried out for the proposed development. This Appropriate Assessment should be carried out in such a manner that gives certainty on the effects of the project on the site, taking account of cumulative effects, which arise from combination with other plans or projects. An assessment will not be an Appropriate Assessment if it lacks rigour, is incomplete, or contains imprecise findings and conclusions.

2.5 In the event that the Appropriate Assessment finds that the project will have an adverse effect, it can only be carried out if it is established that there are imperative reasons of overriding public interested and no alternative solutions. If that is the case, compensatory measures must be taken to offset the negative effects of the plan or project so that the overall ecological coherence of the Natura 2000 Network is maintained.

2.6 Irrespective of whether there is potential impact on species and habitats under the Nature Directives, triggering the process outlined above, the proposed development should be screened, in line with the requirements of the Environmental Impact Assessment (EIA) Directive,[5] to determine whether or not significant environmental effects are likely. This process should apply suitable selection criteria[6]. Comprehensive EIAs must be undertaken for the proposed development in all its infrastructure aspects for which the screening process indicates a need (i.e. significant effects on the environment are likely).

3.0 Environmental issues related to the siting of the potential development

3.1 While the potential location of a North Sea Wind Power Hub is still speculative, the fishing industry members of NSAC have concerns about possible locations on the Dogger Bank and within the Dutch Coastal Zone (IJmuiden Ver). In addition, eNGO members of the NSAC have particular concerns about the implications of siting such a development in or near the Dogger Bank's complex of adjoining Natura 2000 areas.

3.2 The Dogger Bank is the largest submerged sandbank in the North Sea (approximately 25,000 km2[7]) and a highly productive centre of biodiversity, including commercially valuable fish species. It straddles the offshore waters of the UK, Netherlands, Germany and Denmark, all of which except Denmark have, under the EU Habitats Directive, designated Natura 2000 sites on the Dogger Bank for the

[5] European Union Directive 2011/92/EU, as amended by Directive 2014/52/EU on the assessment of the effects of certain public and private Projects on the environment.
[6] In particular by reference to the selection criteria set out in Article III of Directive 85/337/EEC on the 'Assessment of certain public and private projects on the environment', as amended by Directive 2014/52/EU).
[7] Van Moorsel, G.W.N.M. (2011), 'Species and habitats of the international Dogger Bank', Ecosub, Doorn, p. 21.

restoration of habitat H1110 ('Sandbanks which are slightly covered by sea water all the time').

3.3 The UK, Netherlands and Germany governments have assessed the Dogger Bank habitat H1110 and its biological communities to be in *unfavourable condition*. The conservation objectives of the national Natura 2000 sites on the Dogger Bank are, respectively: to improve the quality of the habitat (NL); restore the habitat to favourable condition (UK); conservation and restoration of a favourable conservation status of the habitat type (1110) including its typical and threatened communities and species (GER).

3.4 Article 6 of the Habitats Directive requires that competent national authorities can only agree to the plan or project after having ascertained that it will not have an adverse effect on the integrity of the site concerned or its attainment of, or maintenance at, a favourable conservation status.

3.5 In this regard, NSAC is concerned about statements and presentations by TenneT, and by those contracted to undertake EIAs of the potential development of a North Sea Wind Power Hub in the region, that the hub and spoke structure could 'enhance' biodiversity on the Dogger Bank through the introduction of new habitat features. The NSAC is of the view that the focus for managing the Dogger Bank sites must instead be on restoration and maintenance of the protected qualifying features for which the sites are designated, in line with the Habitats Directive. In addition, there is a risk that artificially introduced diversification and habitat alteration could constitute an adverse effect on site integrity.

3.6 Overall, the NSAC is concerned that a number of potential ecological risks are not adequately taken into account. These include indirect food web effects, attraction of birds with high collision risk, effects of underwater sound on fish (larvae) and invertebrates, and electromagnetic fields around cables. (**See Annex for details**). It is also important to note also that most of these effects have been insufficiently studied for offshore renewable developments, such that quantifying the magnitude of effects, and the implications for populations, are currently extremely challenging and largely based on unvalidated modelling techniques. Significant investment into further research on these issues is urgently required, and assessments should apply the precautionary principle where there is uncertainty.

4.0 Fisheries issues related to siting of the potential development

4.1 Under the EU SEA Directive[8], a strategic environmental assessment is mandatory for plans or programmes prepared for (*inter alia*) marine energy developments, and which set the framework for future development consent of projects listed in the EIA Directive or which have been determined to require an assessment under the Habitats Directive.

[8] Directive 2001/42/EC on the assessment of the effects of certain plans or programmes on the environment.

4.2 A fundamental first step in SEA should be a comparison of the potential competing and complementary uses of any potential site. SEA should identify and take account of areas of productive fishing grounds, taking account of the fleet activity of all relevant Member States operating in the region.

4.3 The absence of analysis of robust, high resolution information on fisheries activity compared with the structured and detailed advice for other uses of the marine environment could result in fisheries being disadvantaged. A standard protocol for site investigations should be developed, including:

- evidence of fisheries costs and earnings pre-development, at an appropriate resolution (e.g. spatial and temporal patterns, qualifying / reference periods)
- consideration of areas that are less likely to disrupt or impact significant fishing grounds
- analysis of the ability of fishing activities to operate in the vicinity of the proposed development and suitable measures to minimise disruption and promote co-existence
- ground rules for surveying sites for fisheries resources
- post-construction monitoring of sites
- the use of reference fleets to validate scientific information on the site.

4.4 A TenneT presentation[9] suggested that the hard substrate introduced by the hub (outer ring of an atoll design) and spoke structures could 'result in higher biodiversity, e.g. fish', and could favour fishing activity by creating a 'less disturbed area, higher biomass, larger fish, come back[sic] of sharks and rays'. NSAC would like to see documentation in support of these claims which we suspect are speculative.

4.5 The NSAC disputes the presumption that offshore wind farms serve as refugia for fish and induce higher fish densities. The necessary long-term studies to support this claim are lacking. In the most recent published study[10], the monopile hard substrate did attract a number of species (notably edible crab *Cancer pagurus* and cod) known to prefer hard substrate. However, the authors' overall conclusion (Abstract) was that '*The wind farm structures had limited effect on the aggregation level* [of the fish] *compared to season or weather conditions*'.

4.6 NSAC industry members regard submarine power transmission cables as a key concern for the safety of fishing activity. With the multiplicity of potential new wind developments in the region, 100,000 kilometres of cables and pipelines and 4,000 surface and subsea structures already lie off the coast of the UK and northern Europe.). Cables present safety risks to vessels where the snagging of fishing gear can lead to gear damage, potential capsizing and loss of life. Damage to windfarm infrastructure can also prove very costly to offshore operators[11]. The fishing industry is working widely to minimise risks by developing best practice guidance, and

[9] TenneT (2017) International NGO Consultation: Joint fact finding process on North Sea Wind Power Hub. Brussels, 14 Nov 2017. Powerpoint presentation.

[10] Van Hal, R., Griffioen, A.B. and van Keeken, O.A. (2017) Changes in fish communities on a small spatial scale, an effect of increased habitat complexity by an offshore windfarm. *Marine Environmental Research* 126, 26-36.

[11] http://www.seafish.org/about-seafish/news-and-events/news/animations-show-dangers-of-subsea-hazards-to-fishing

systems for warning on hazards (D. Rodmell pers comm) and avoiding damage by making otter boards and beam trawls as 'cable friendly' as possible by mounting 'hoops' and assuring smooth surfaces (W. Visser, pers comm). Reducing risks most effectively is dependent, however, upon good collaboration with developers and operators.

4.7 Although NSAC would expect a commitment to cable burial as a way of minimising risk, a strategic approach should be taken to plan routes to avoid areas where burial is difficult or the risk of future exposure is high, while also aiming to limit the extent of cabling required so that risk is minimised. This also applies to inter-array cabling in individual windfarms where fishing has access. (**See Annex for potential environmental impacts of cabling**).

5. Conclusions

5.1 NSAC members, both industry and eNGOs, have significant concerns about the development not just of a potential North Sea Wind Power Hub but, from the perspective of marine spatial planning, the planned escalation of wind-generated renewable energy envisaged by TenneT and multiple other players in the wider North Sea region.

5.2 In this context, NSAC calls for synergistic planning for windfarms to the extent possible. TenneT is already moving towards matters of detailed technical mitigation, several of which raise concerns for the NSAC. However, the fundamental spatial planning stage, including the potential siting of the North Sea Wind Power Hub, is a critical overarching priority from the NSAC's perspective which has been largely overlooked.

5.3 Given the depth and breadth of our concerns and the urgent need for dialogue and transparency, our key message to TenneT is a request to increase and accelerate its level of stakeholder engagement and consultation with the NSAC. While the immediate focus of this request is the North Sea Wind Power Hub, we likewise seek NSAC stakeholder involvement in all large-scale grid development by TenneT in the North Sea.

Annex: Details of environmental and fisheries concerns

1. Opportunities for nature - or risks?

1.1 In terms of 'Opportunities for nature', TenneT (presentation to the eNGOs at the joint fact-finding meeting in Brussels, 14 Nov 2017) suggested that when '*special and extra substrate is used for scour protection, this could have a positive effect on biomass*' and this '*could lead to more food for fish, sea mammals and birds*'. According to TenneT, further positive impact on nature could derive from the shape of the island, e.g. an '*atol* sic] *or half-moon*' creating a '*large sheltered and sandy area attractive to fish and other species'*.

1.2 NSAC points out that the diet of seabirds and marine mammals in the Dogger Bank area is mainly low trophic level ('forage') fish, notably sandeel and sprats. Sandeels, by definition, live on sandbanks and the introduction of hard substrate will not, therefore, create new habitat for them; on the contrary, such development will remove some of their natural habitat.

1.3 The TenneT presentation also speculated that another potential '*opportunity for nature*' was to '*create resting areas on islands or turbines for birds with low collision risk*'. That said, TenneT concedes the knowledge gap of 'what bird species will be attracted and what will be the side effect?' In NSAC's view, it cannot be presumed that bird species attracted to infrastructure will necessarily be those with low collision risk. Various gull species, for example, may be attracted to rest or to feed on molluscs or crustaceans colonising hard substrates, or to scavenge any marine life damaged and exposed in the course of construction.

1.4 Moreover, flocking gulls could heighten the risk of airstrike if, as proposed, the hub includes a landing strip. Scrupulous retention of human waste around the hub will be vital to help prevent attraction of gulls and other scavenging seabirds to the infrastructure, and indeed such control would be best practice even were an airstrip not present.

1.5 Regarding potential impacts on birds, TenneT concedes that '*more information is needed on how different species use the sea, migration routes*'. Based on reviews by BirdLife & RSPB of the main potential detrimental effects of wind farms on birds[12] and other studies, a range of potential conflicts needs to be assessed, as follows:

a. *Displacement and disturbance* of birds from their foraging activities can occur during construction and operation of energy installations, either due to the presence of the structures themselves and/or associated infrastructure or human activity.

b. *Barrier effects* are a specific type of displacement where the wind farm displaces birds that are *commuting* (either on daily foraging trips, or between breeding, roosting or moulting areas, or on long-term migration), resulting in increased energy expenditure for birds such that they may incur one or more of the

[12] Gove B, Langston RHW *et al* (2013) Wind Farms and Birds: an updated analysis of the effects of wind farms on birds, and best practice guidance on integrated planning and impact assessment. https://wcd.coe.int/ViewDoc.jsp?id=2064209&Site=. p 3-4.

following: (a) need to consume more food (which can affect the carrying capacity of an area); (b) need to reduce energetic costs elsewhere (e.g. reduce investment in reproduction); (c) reduced survival, e.g. during migration when birds are already stretched physiologically.

c. *Collision mortality* **-** Inappropriately sited or poorly designed installations may lead to significant collision mortality for sensitive species. However, much work is needed to monitor collisions offshore in order to validate the predictions of collision risk models.

d. *Habitat destruction and alteration* occur around wind turbines but are mostly associated with grid infrastructure. This may be significant, potentially altering local oceanographic processes and food availability, with implications for trophic cascades. Effects on birds from changes in prey abundance and availability may be direct, or indirect - mediated via changes in habitats.

Of these, (a), (b) and (d) are also relevant to marine mammals.

1.6 In terms of (d), of particular importance as prey for seabirds, marine mammals and commercial fish species is the potential impact of infrastructure development on sandeel aggregations. Sandeels are essentially sedentary once they settle as adults on a sandbank and are therefore vulnerable to local depletion. The limited research of this to date[13] suggests that (i) windfarm construction may have a positive *short-term* effect on sandeel densities in the impact area; (ii) long-term effects, however, are unknown; (iii) studies conducted so far may not be applicable to high density sandeel areas such as Dogger Bank.

1.7 Some have argued that offshore windfarms may function as a *de facto* MPA for sandeel (and other fish species) by excluding commercial fishing activity. However, with sufficient spacing in turbine arrays, trawling is not necessarily excluded. The UK Maritime & Coastguard Agency (MCA), for example, insist on open access of fishing vessels to windfarm areas and consider there should be no operational safety zones more than the statutory 50m radius around each turbine (unlike Netherlands and Germany which do apply safety zones that exclude fishing activity from entire windfarm arrays).

2. Underwater noise

2.1 TenneT acknowledges the potential impacts of construction noise on marine mammals and also notes that it *'could have negative impact on fish eggs*[sic] *and larvae*' (it's not clear if this means 'fish eggs' or 'fish and their eggs').

2.2 Professor Tony Hawkins (Loughine Ltd), a leading world expert on the impacts of underwater sound on fish, made a presentation on his research to the NSAC Ecosystem Working Group meeting on Feb 22, 2018. He contends that wind farms are particularly strong noise polluters, with multiple piles for each turbine, and project construction lasting years. Sound impacts derive from ship traffic, cable laying and –

[13] http://www.int-res.com/articles/meps_oa/m458p169.pdf

most intense of all (with the exception of underwater explosions) – pile-driving. In addition, operational wind turbine columns vibrate and transfer sound pressure to the seabed.

2.3 Prof Hawkins explained that underwater sound has two components (sound pressure and particle motion) which can affect marine wildlife in various ways: Fish (especially benthic species) are more sensitive to particle motion. Sound can affect mammals, fish and invertebrates at considerable distances from the source: from masking and interrupting communication to death and injury. Pile-driving can kill fish at a short distance, have physiological effects and impair hearing at moderate distances, and have masking effects and induce behavioural change at greater distances.

3. Cabling

3.1 Exposed cabling can provide artificial substrate that attracts flora and fauna that may not be typical of the area (potentially invasive non-native species). Since this affect is confined to the cable route itself, such change is unlikely to be significant. However, possible cumulative impacts as the scale/quantity of subsea cabling continues to increase are not fully understood.

3.2 Submarine cables, particularly power transmission lines, may also have potential detrimental impacts on fish species and habitats in the form of electromagnetic fields and thermal radiation (see review by the OSPAR Commission[14]). According to Prof Hawkins, cables can affect migratory patterns of species sensitive to electromagnetic radiation such as salmon and eels, and can affect behaviour of elasmobranchs (of relevance in the central-southern North Sea).

3.3 These potential impacts have received relatively little attention in Europe compared with the USA and until environmental impacts are better understood, a precautionary approach is essential. Even in the USA[15], "investigations into electro- or magneto-sensory capabilities have been conducted for only a few marine species. While knowledge of the sensory biology of a few species within a phylogenetic group can be cautiously extrapolated to other related species, responses to anthropogenic sources of electric or magnetic fields have not been well studied. To facilitate impact analysis, future research should focus on behavioural responses to exposure to power cables at which field strengths are known." Elasmobranchs are singled out in the report as one of the taxonomic groups of interest for this kind of research.

3.4 The same study also concludes that: "Regulatory agencies should require that details of the cable design, anticipated cable depth and layout, magnetic permeability of the cable sheathing, and loading (amperes) be provided early in the permitting process to allow complete determination of EMF potentially generated by the cable. Complete information is available only for a few projects. Field measurements of magnetic fields in the vicinity of operating power cables, correlated with data on current flow, would be useful to validate model results, but also to make more informed

[14] http://qsr2010.ospar.org/media/assessments/p00437_Cables.pdf

[15] https://www.boem.gov/Environmental-Stewardship/Environmental-Studies/Pacific-Region/Studies/2011-09-EMF-Effects.aspx.

assessments of potential effects on marine organisms. Development of sensors capable of detecting AC or DC electric fields in the marine environment would be valuable to confirm that burial and sheathing are preventing emission of electric fields into the water column."