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The post-normal politics and science of wind power planning: Evidence from the Danish near-shore wind farm tender

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ABSTRACT

Post-normal science (PNS) has long advocated the inclusion of stakeholders in scientific processes where there is uncertainty, urgency and high stakes. Increasingly, however, such conditions have become recognised as the norm. Using the theoretical perspective of PNS, we examine the interactions between public objection, unstable coalition politics and uncertain environmental assessment knowledge to understand the case study of a Danish near-shore wind farm tender. In this case the original distinction made by PNS between facts, judgements, politics and science are confirmed as difficult to separate in what has been described as a condition of post-normal politics. The case, taking place within Denmark’s relatively transparent and inclusive wind power governance system, offers insights into the challenges of managing long-term environmental and energy policy objectives. However the case also demonstrates the challenges to the policy prescriptions of PNS, specifically regarding the notion of extended peer review communities (EPCs). Here we propose that the de facto condition for energy siting controversies is one of multiple, often self-organised EPCs.

1. Introduction

The need for low carbon energy system transitions is increasingly urgent, but in some ways also more feasible [1]. More urgent, given the hugely challenging climate targets implied by the Paris agreement [2,3], but also more feasible, given the opportunities offered by sharply falling renewable energy costs [4]. Yet the political will to deploy low carbon energy infrastructure at sufficient scale remains critical. While in some countries plans have been made for the deployment of such ‘green’ technical infrastructure, the last decade has also seen ongoing public objection to this at local levels, with publics drawing on a wide range of resources to voice and support their opposition [5]. More recently this has also been in association with wider populist political trends (Batel and Devine-Wright, 2018). Indeed energy transitions also provide a context in which to analyse democratic processes more generally, particularly regarding the challenge of both opening up debate but also closing it down at some point (Stirling, 2014).

Often opposition is voiced as part of Environmental Impact Assessment (EIA) processes, where members of the public can raise concerns not only via formal EIA hearing processes, but also through other less formal and citizen-led channels of information and communication. In such contexts, the distinctions between scientific facts and value-judgements can become quite unclear, with the realms of politics and science intertwined and interdependent.

While EIA assessments generally use validated methods and models, anticipating the magnitude and nature of future project impacts on special protected areas (SPA’s) inevitably involves some degree of uncertainty. This is amplified when there are substantial uncertainties over key data (such as the size of species populations), and even more so when the scientific methods involved are themselves contested. When project impacts are considered likely to be significant, for all stakeholders, including developers, policy-makers, politicians and members of the public, the stakes tend to be high and underlying values are often contested. It is not surprising in such contexts that scientific knowledge can be subject to alternative interpretations [6].

1.1. The Danish near-shore wind farm tender case study and the conceptual framework

Here we consider such a case and the implications of contested scientific knowledge for the analysis and policy aspects of energy siting controversies. More specifically, we consider the political role of the EIA and its scientific assessments in the context of Denmark’s wind power planning system. Empirically, we contribute with an extensive account of key selected events from the Danish Energy Agency (DEA) 2015–2016 350 MW multisite near-shore wind farm tender (see Fig. 1).
Conceptually, we draw on the theoretical perspective of post-normal science (PNS) [7] as an analytic policy frame that, while extensively used and in tune with democratic themes in the environmental planning literature, has also been critiqued for its idealism [8], a critique also forwarded by those sympathetic to its norms [8].

Our main conceptual contribution here is to extend existing arguments about the challenges to the extended peer communities (EPCs) proposed by PNS [8]. We do this by arguing that – in a sense – such EPCs already exist. That is, while Funtowicz and Ravetz [7] originally intended EPCs to be organised groups working to a common agenda of resolving applied policy problems with a significant scientific component, but also involving normative contestation, we can now regard the entirety of the socio-political debate relating to such problems as a form of de facto EPC. For example, as we show in the case study, here members of the wider EPC’s, consisting of project opponents and proponents, contributed with (sometimes normative) opinions and alternative interpretations of the EIAs and the EIA process, focusing especially on the direct project impact, on site adjacent special protected areas (SPAs) and on the visual wind farm impact. Thus, we argue that the role of the EIA process in this case reveals considerable challenges to realising the original ideals of PNS, particularly regarding the benefits of ‘extended peer communities’ that would build scientifically-informed, socially robust (environmental) policy, through normatively inclusive processes [7].

Accordingly, our core aim is to make several related propositions. Our propositions are: firstly, that (energy-related) EIA and associated environmental governance processes do already offer some degree of the extended peer community engagement that PNS advocates [9], and that they also offer the potential for further development in this direction. Secondly, that the wider political context in which (energy-related) EIA takes place is now post-normal in nature, and that this conditions the way in which scientific information is used. Thirdly, that the political and the scientific are intertwined in an environment where interest groups, political values and uncertain facts may overrule or reduce the efficacy of national climate-political commitments. These propositions lead us to the view that, in effect, stakeholders self-select into what can be regarded as multiple EPCs, and that these extended

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1 As Figure 1 shows that the wind farm sites selected by the DEA for the 350 MW wind farm tender are offshore coastal wind farm sites. The maximum wind farm size is up to 200 MW pr. site. The site distance from the coast is from minimum 4 kilometres to maximum 20 kilometres [21,35], and due to this (relative) coastal proximity the wind farm tender has been referred to as the near-shore wind farm tender. Figure 1 is printed with permission from the Danish Energy Agency.

2 Members of these wider project EPCs did this via multiple modes and channels of communication, official as well as unofficial. For example, some members of the EPC’s contested the EIA visualisations by providing alternative visualizations of their own, and they effectively disseminated the alternative visualizations amongst members of the public by means of an advert in a nationwide newspaper. For more details see the case study description, Section 4.
EPCs are inherently complex, incoherent and, indeed, the embodiment of contested science (perhaps for normative reasons). This is an understanding of the EPCs that differs markedly from the traditional understanding of EPCs in the PNS literature. In the case examined, the EIA evaluation, the EIA-process in itself, both involving uncertainties, and the ongoing activities of active and engaged communities and lobby groups, may also have contributed to decreasing stability in levels of political support among the parties to the Danish Energy Agreement, and all of these circumstances combined have certainly shaped a convoluted path towards the final near-shore tender agreement for wind turbines that is now in place in Denmark.

We structure the paper as follows. Section 2 provides a short introduction to PNS. Section 3 describes the methods of data collection and analysis; Section 4 describes the case in terms of themes relevant to PNS and to our propositions; and finally we conclude with thoughts on the future of environmental assessment and policy in post normal contexts.

2. Post-normal science and extended peer communities

When Funtowicz & Ravetz first introduced the concept of post-normal science nearly three decades ago, it was with the purpose of questioning the simplistic notions of science as value-free and puzzle-solving [7]. PNS is both a philosophy and a methodology that advocates structured extended peer communities, in the scientific processes where “facts are uncertain, values in dispute, stakes high and decisions urgent” [7]. In general, PNS has been used to characterise issues “involving risk and the environment” ([7,10], p. 744), and PNS is posited as relevant where facts and values are non-separable, ethics and uncertainties lingering but important [7].

Initially, Funtowicz & Ravetz argued for EPCs as a “quality assurance” or quality control in the processes of science. Furthermore, they argued that “an extension of the peer community is then not merely an ethical or political act; it can positively enrich the processes of scientific investigation. Knowledge of local conditions may determine which data are strong and relevant, and can also help to define the policy problems” [7]. Moreover, members of extended peer communities may contribute with “extended facts (...) and local knowledge” that may also embody “cultural and moral perspectives” [8]. Funtowicz & Ravetz emphasise that as scientific results derived through post-normal processes (i.e. involving extended peer communities) may well have highly political repercussions, there can be no guarantees regarding widespread acceptance of their results, and that conflicting values will still be at stake [7].

The PNS case for more inclusive decision-making accords with longstanding calls for more inclusive scientific decision-making [11], especially in cases where scientific results are applied in socially more contentious contexts. The difficulties in operationalising such a commitment are evident, however [8]. Among the issues raised by the normative and structural implications of PNS are those of uneven power and access to the institutionalised decision-making processes. This includes the potential ‘capture’ of decision-processes by parties who might have otherwise played a lesser role [8]. Moreover, in the decades since PNS was formulated, the borders and boundaries that separate scientific research contexts, external peer communities and scientific funding bodies, have, for those working on sustainability problems, been increasingly recognised as problematic [12]. In short, as the world has changed (especially through the opportunities afforded by the internet in terms of citizen communication, organisation and information access), and as the perceptions of science and scientific normality and have changed, so understandings of PNS have evolved to the point that its premises might even be axiomatic for sustainability sciences. Here the emphasis has moved from the question of whether publics and stakeholders should be involved in decision-making involving contentious science, to the consequences of so doing in various modes [13].

2.1. The governance context and the normalized state of the post-normal

The case study reflects the broader environmental governance context that Meuleman [14] refers to, encompassing not only the formally instituted actions of government, but also the less formally instituted actions and interactions within and of political, social/public, scientific and media spheres, all of which had significance for the near-shore wind farm tender. We characterise this context as post-normal in the sense that it no longer involves neat separations of different but relevant realms of activity - if this separation ever really existed [15].

Denmark is an apposite context in which to examine the interplay of environmental science, policy, public and stakeholder opinion from a post-normal science perspective. Denmark’s wind farm planning, assessment and development takes place in one of the most transparent and consensus-seeking institutional and governance contexts available internationally [4,16]. That is, in allowing for extended and unstructured extended peer communities (EPCs) to enter into the decision-making and governance realms via multiple modes of communication, the Danish governance context for EIAs and wind-power planning approaches the ideals of PNS more than most.

Thus, leaning on the case evidence, and linking these insights to the very broad notion of governance proposed by Meulen and Niestroy (ibid), we suggest that what we are witnessing here is also the praxis of post-normal politics (see also [17]): that is, political decision-making leaning on post-normal scientific facts, and, crucially, dealing with active and engaged EPCs in the context of high stakes and disputed values. Overall, we suggest that these attributes of post-normality have significant implications for environmental governance processes and decision-making relating to wind power planning and energy policy in general.

3. Methodology

The research approach is that of a case-study [18]. We use qualitative data sources related to the near-shore wind farm tender, and we focus primarily on the political negotiations and on public (largely local) contributions to that process. By means of data-triangulation, the data collection and analytical process included identifying the transfer and interaction of knowledge, arguments, project perceptions and related values from the different spheres of environmental governance [14] and science, to the public and the political realms, to news sources and to social media. The most relevant pieces of sector legislation provided the policy and legislative frame of reference.4

The case related data material is primarily drawn from the years 2015–16, and the research focus and approach is informed by the lead author’s research affiliation with a public utility company involved in the near-shore wind farm tender process. Information and knowledge gained during this time guided the collection of case material from the

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4 As we exemplify in this case study, active and resourceful project stakeholders and members of the public - displaying a diversity of project perceptions - engage themselves in the political and scientific process, in this way creating EPCs of a very heterogeneous and unstructured nature. Healy first introduced the notion of post-normal politics (PNP) in 1999, and in this paper Healy advocates the development of “shared meaning” and “institutionalization” of EPCs to facilitate an orderly EPC contribution to (post-normal) science. As we suggest here, however, this may not always be possible in the way that the PNS version of the EPCs originally intended. Please see Section 5 for the discussion of post-normal politics and post-normal science.

4 For a more detailed account of the most relevant Danish wind power policies see [58,59]. Most of the relevant legislation is found in the Renewable Energy Act (REA) – consolidated Act no. 119/2018. For offshore wind farms the impact assessment criteria are mainly integrated into Executive Order no. 1476/2010 on impact assessment of international nature protection areas and the protection of certain species for projects etc. establishing electricity producing facilities and electricity cabling offshore. All Danish legislation can be retrieved from: www.retsinformation.dk.
multiple sources of data, including newspaper articles, reports, government documents, participation in the near-shore tender public hearings and so on. In some instances this contact also provided special access to informal conversations and extended semi-structured interviews with key informants from both the public, private, political and the academic sectors.

Overall, the research approach is inductive by nature, but also hermeneutic; moving from data to theory repeatedly in order to energize case knowledge and theoretical insights [19]. While such cases do not offer generalizable insights in and of themselves, they do offer insights into the causal processes involved in particular outcomes of specific cases framed within the specificities of time, place, agency and governance issues and processes involving public contention, we would suggest that the study is illustrative of some of the common challenges involved in such processes. In this way, the case study arguably has widespread relevance.

4. The Danish near-shore wind farm tender case study

4.1. Background and overview

The 2012 broad coalition Danish Energy Agreement (EA) represents a “broad political commitment” to the ambitious national goals for greenhouse gas reductions and energy transitions. Ultimately, the EA is the complete national transition to renewable energy resources by 2050. The EA policy initiatives run until 2020 [20], and the near-shore wind farms are a part of the EA. Including near-shore wind farms in the EA (and not offshore wind farm projects further from the coast) was based on the political decision to reduce the costs of the wind farms, as the costs of wind farms generally rise with increasing distance to the coast [20,21].

In the case study description below we focus primarily on the Environmental Impact Assessments (EIA) related to the Sejerø near-shore wind farm site (see Figs. 1 and 3), but we also touch upon other key controversial topics (e.g. visual project impact) related to the near-shore wind farm tender overall. More specifically, and with this our aim of expanding and updating the original notion of EPCs from the PNS literature, we concentrate on the wider EPC activities and engagement in the process through formal and informal channels of communication (see Fig. 2 for a timeline showing key events, decisions and documents related to the near-shore wind farm tender. See also Table 1).

In the EIA assessments, and in the NATURA 2000 related Appropriate Assessments, it was particularly the Common Scoter population data and the methods used to estimate the potential wind farm project impact on the adjacent special protected areas and certain species of waterfowl that were contested among the specialists involved [22–25]. As we show, the visual impact of the wind farms was also intensely debated, and, in multiple ways, members of the extended EPCs contributed to all of these discussions [26–30].

The values at stake included significant financial investments, national energy policy, political and environmental values, and specifically (minority) public perceptions of a need to avoid change to the coastal landscape/seascape (K. [31]). Ultimately, the EIA information provided both the public and politicians with leverage against the proposed Sejerø near-shore wind farm site. While the public did not have formal decision-making power, project objectors strategically used a wide variety of communicative resources that incorporated and integrated various spheres of governance, from petitioning directly to Danish parliamentary committees, to local activities among NGOs and other lobby groups. Furthermore, as the wider case study illustrates, project stakeholders from both the political realm and from the general public strategically used a diverse source of news and media resources to communicate facts, values, ideas and ideals.

4.2. The site selection and planning process

Headed by the Danish Energy Agency (DEA)10, the multi-ministerial Offshore Committee (Havmølleudvalget, HMU) was designated the task of finding suitable locations for offshore wind farms in Danish maritime territories [21], and the multiple site screening processes enhanced the screening quality [21,32].11 In October 2012, HMU released the report:

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8 See Section 4.3 for more information on appropriate assessments.
9 All of the information/documents sent officially to parliament/to parliamentary commissions by members of the public and other parliamentary documents/information is publicly available and can be retrieved from https://www.ft.dk/da/dokumenter.
10 The Danish Energy Agency monitors and develops energy- and supply sectors in Denmark, and it is a part of the Danish Ministry of Energy, Utilities and Climate (see www.ens.dk).
11 HMU includes representatives from the Danish Maritime Authority, the Danish Nature Agency, DTU-Riso, Energinet.dk and others. HMU identified locations for Danish large-scale offshore wind farms in 1997, 2003, 2007, and these screenings were updated in 2011 [32].
“Nearshore wind farms in Denmark: Screening for offshore wind farm locations within 20 km from the coast”. This report, the Strategic Environmental Assessments (SEA) and the additional visualization reports were all in public hearings, and the material was available online [21,32,33].

After this process, in November 2012 the majority of Danish political parties agreed to the more specific details/project specifications for the near-shore wind farms (at the time 450MW in total), and through a hearing process/informal dialogue with the key stakeholders, the original 15 sites selected by HMU were reduced to the 6 tender sites [34]. Finally, in early February 2013, the then Minister of Climate and Energy asked Energinet.dk to initiate feasibility studies for the 6 selected near-shore wind farm sites, cables and transformer stations [21,33,35–37].

The rights to exploit energy from wind and water in the marine territories in the exclusive economic zone belong to the Danish State alone ([38], LBK 119/2018 §22), and the Danish Energy Agency (DEA) administers state sovereignty over these maritime territories [21]. In this role, the DEA coordinated administration and permit-related matters with other relevant authorities and sectors, a co-ordinative task they labelled the “one stop shop” [21,35]. The Danish Nature Agency (DNA) was the relevant authority for the wind-farm related technical installations on land, such as transformer stations and cables. Based on past tender experiences, the DEA chose a dialogue-based tender model characterized by transparency and open technical market dialogue. This model provided tenderers with the opportunity to negotiate and influence tender specifications, terms and conditions [35]. Accordingly, when the DEA published the then 450 MW Danish near-shore tender plan in February 2012, it emphasized that the process would be characterized by proactive knowledge dissemination and open dialogue among potential national and international developers and investors ([35–37]).

For a more detailed account of this part of the site selection process, see [34].

Energinet.dk owns, operates and develops the natural gas and electricity transmission systems in Denmark. Energinet.dk is an independent public enterprise owned by the Danish Ministry of Energy, Utilities and Climate. (see www.energinet.dk).
Table 1

<table>
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<tr>
<th>Key selected reports and EPC activities relevant for the Danish near-shore wind farm tender. Here the focus is on the EIAs/appropriate assessments and on the strategic use of different modes of communication/engagement in the process by members of the wider EPCs.</th>
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4.3. The idea phase, the EIA process and the Appropriate Assessments

From January 2014 onwards, DEA and DNA jointly initiated the idea-phase wind farm presentations with the relevant municipalities. These presentations/draft proposals described overall plans for the wind farms; they demonstrated how cables and transformer stations would be constructed and managed, and they explained environmental concerns etc.

During this time Energinet.dk also hosted public meetings providing information on anticipated project environmental impact, regulatory matters, the relevant community benefit schemes and other issues. According to the DEA, these meetings were also intended to provide citizens/project stakeholders with the opportunity to ask questions and/or voice their opinions [34,36,37,39]. As a part of what has been referred to as the political growth agreement, in July 2014 the multisite near-shore wind farm tender was reduced to a total of 350 MW (see Figs. 1 and 2). The DEA finally published the Danish near-shore tender contract notice on the 26th of February 2015 [35,36].

As there are no formal planning requirements for offshore wind farm projects, the public hearings and meetings are linked mainly to the EIA processes [34]. The EIA assessments for the near-shore wind farm tender sites included multiple public hearing processes and citizen meetings, and it more than lived up to the official requirements [40]. Overall, the EIA process included a public idea-phase and an IEA material public hearing that lasted 8 weeks. Final summary statements commenting on project complaints, project objections/remarks and explaining the resultant project changes and/or mitigation measures are compulsory and were also undertaken [36,40].

As the Sejerø Bugt near-shore wind farm site is adjacent to a NATURA 2000 site, in this case appropriate assessments were also undertaken as a part of the EIAs (see Fig. 3). Appropriate assessments are required if adverse project impact on special protected areas (SPAs) or protected species may be a project risk ([40,41] BEK 1476/2010). Appropriate assessments take into account the cumulative and adverse effects on SPAs from both existing projects and from planned future projects [42], and the planned projects are only permitted if, from a scientific point of view and without reasonable doubt, there is no project-related harm to the integrity of those adjacent SPAs and protected species ([38], LBK 119/2018 §27, §28).

The EIAs and the appropriate assessment material was publicly available, as was the material from the public information meetings, so through these means the general public had access to information on the anticipated/predicted environmental wind farm project impacts and on the relevant regulatory issues [36].

4.3.1. The EIA for the Sejerø Bugt near-shore wind farm site

In the Sejerø Bugt EIAs and in the appropriate assessments, concerns were raised regarding the possible displacement of specific bird species from this SPA, with the project impact on Common Scoter populations of particular concern. According to the EIA, at the Sejerø Bugt wind farm site the anticipated project related mortality of certain waterfowl in the adjacent NATURA 2000 site could be compensated for by other and adjacent bird populations. Bird mortality due to the Sejerø Bugt wind farm project related bird displacement was expected, but the bird mortality was not considered a significant concern for the Sejerø Bugt project in isolation. However, when considering the combined

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14 The tender specifications allowed for quite some developer freedom in project design, and so the final project layouts would not be known until after the winning tender projects were chosen. In order to complete the EIAs based on such open project specifications, the EIAs were based on the two estimated “worst-case” project scenarios, with these reflecting the maximum possible project impact within the pre-given (open) 350 MW tender criteria/specifications. These scenarios were 3 MW and 10 MW wind-turbine scenarios respectively, and the maximum total wind farm size was 200 MW per project site [43,46].

15 Appropriate assessments are required according to the goals of the Habitat Directive 92/43/EEC. Appropriate assessments are “the consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site’s structure and function and its conservation objectives” [42].
(cumulative) wind farm project impact on bird populations from both existing wind farm projects in Danish maritime waters and from other potential planned projects (including those in the near-shore wind farm tender itself), the cumulative density-dependent bird mortality and the cumulative displacement effects of Common Scoter populations and other waterfowl were assessed as potentially harmful. As a result, negative project impacts on the integrity of the NATURA 2000 site were considered likely. Thus, taking into account the precautionary principle, the cumulative principle and the uncertainties vis-à-vis bird population data, the EIA concluded that to avoid adverse impact on the particularly vulnerable Common Scoter populations at the Sejerø Bugt site, the wind farm size at that site could be a maximum 100 MW - but only if wind farms were not developed at the Smålandsfarvandet and the Sæby near-shore wind farm tender sites [43].

4.3.2. Ministry recommendations for wind farm tender changes

In September 2015, after receiving the final EIA assessments, the DEA and the Ministry of Energy, Utility and Climate published a public political brief on the EIA conclusions with ministry recommendations for the process ahead. The brief stated that to “ignore the EIA assessment conclusions would be to violate Denmark’s international directive related obligations”. It suggested two alternative possible wind farm tender scenarios: 1) postpone the tender, but possibly re-activate it in 3 years when population data on the Common Scoter and the methods for their prediction/estimate have improved; or 2) continue with the tender with its current time-plan, but with fewer sites [44].

The tender stakeholders, including the prequalified bidders, were not enthusiastic about these suggestions, and they recommended that the tender continue without further delay (personal communication).

4.3.3. Uncertain facts: new data on Common Scoter populations

When the EIA assessments were first done, the 2008 national census documenting Common Scoter populations was the most recent, and modelling estimated wintering populations at around 600,000 individuals. However, in 2015 BirdLife International estimated the wintering populations across Europe at 700,000–800,000 individuals, while in 2016 Wetlands International suggested that flyway Common Scoter populations may be up to 1.2 million individuals [22,43]. In other words, these surprising new estimates suggested that European Common Scoter populations were much larger and healthier than first anticipated.

With this new and updated bird population data the EIA assessments of the potential Sejerø Bugt near-shore wind farm impact on the Common Scoter populations were revised [22,45]: the first appropriate assessment reports [23] were followed by supplementary assessments using revised Potential Biological Removal (PBR) thresholds for the Common Scoter, and these revisions reflected recommendations by NIRAS [22,23]. The new EIA conclusions suggested that the Sejerø Bugt and Smålandsfarvandet near-shore wind farm sites in combination could account for up to 350 MW without causing adverse effects in the Common Scoter populations - if the Sejerø Bugt Site was developed on a reduced area footprint. The revised EIAs went into supplementary public hearings from December 2015 [36,45,46].

4.3.4. Methodological disputes and EPC input

As described above the bird population data available for the EIAs and the appropriate assessments were revised during the process (and thus uncertain), and among the experts themselves the assessment methods used were discussed and disputed [22,45]. On their homepage the DEA explain that “experts do not agree what method [in the EIA] is best for assessing the project risks for the [particularly vulnerable] Common Scoter.” While saying this the DEA emphasise that expert work is being done with the aim of clarifying such methodological discussions for the future, and it underscores that the “EIA conclusions are considered as legitimate in their own right” [36,45]. Among the experts involved, the discussions were mostly methodological, and the amount of work done in order to clarify these methodological disputes for the future, ordered by the DEA, is described below (see Table 1 and Fig. 2).

The first appropriate assessment reports [23] were followed by supplementary assessments that took into account the updated and more healthy Common Scoter population data from Wetlands Internatio[22,23], and these were, again, supplemented by a second opinion research note undertaken by DCE/Aarhus University [25]. Finally, based on recommendations from NIRAS, the report “Common Scoter Assessment: Smålandsfarvandet and Sejerø Bugt and offshore wind farms” was written in order to “provide an alternative assessment of scoter displacement under-pinned by the recommendations given [by NIRAS]” [22,37,45]. The experts agree that Sejerø Bugt constitutes significant foraging and roosting grounds for the Common Scoter and other bird species. This is due to relatively moderate shipping activities in the area, an ocean depth favourable for the birds and rich feeding resources in the form of mussels and snails. The area is of particular importance for the Common Scoter when they are vulnerable due to moult[25].

Despite the updated and healthier population data on Common Scoter, and despite extensive methodological evaluations, discussions and recalculations among the experts, in the end the cumulative adverse near-shore wind farm project impact on the particularly vulnerable Common Scoter populations could not be completely discounted.19

4.4. Engaged EPCs: using formal modes of communication

During the scientific assessments, among the wider EPCs as we define them here, i.e. multiple actors and project stakeholders constituting the broader socio-political project context, the near-shore wind farms (and the EIAs) were intensely debated and criticized through formal as well as informal channels of communication. Indeed, locally organised opposition groups, and thus also members of the wider project EPCs, were rapidly mobilizing, and as shown in Table 1 members of these opposition groups (and other key project stakeholders) participated pro-actively in the near-shore wind farm debate by means of creative and effective use of the multiple modes of communication and dissemination, strategically directing their arguments and perspectives at MPs, planners, decision-makers and members of the wider public (see for example [26–28,47] (see also Table 1, Fig. 2 and 4).

Exemplary of such EPC engagement via the formal modes of communication in the wider project debate is using the opportunity to present in an open parliamentary audience, a so-called ‘foretræde’. On the 11th of February 2016 the STOPVesterhavSYD opposition group did

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16 All direct quotes from the Danish sources are translated from Danish to English by the lead author.

17 Wetlands International is an NGO working for the restoration and conservation of wetlands internationally. Wetlands International manages the “The Waterbird Population Estimates (WPE) online database [providing] current and historic estimates, trends and 1% thresholds for over 800 waterbird species and 2300 biogeographic populations worldwide.” The project and the database is supported by “Environment Canada and the Ramsar Convention on Wetlands” (see http://wpe.wetlands.org).

18 Reflecting the process of science overall, such methodological discussions will continue among the experts as methods are tested, new methods are invented and novel knowledge emerges.

19 Some may argue that a relatively conservative level of precaution in and of the precautionary principle may have been applied in these assessments (confidential expert interview).

20 Foretræde: Parliamentary Committees may receive visits from citizens, organizations or experts during their meetings, offering such visitors the opportunity to present their views or perspectives on certain themes or issues. A ‘foretræde’ lasts around 15 minutes, and the Committees decide who is granted foretræde (see www.ft.dk).
exactly this, presenting their opinions of and arguments against the planned Vesterhav near-shore wind farms to the relevant parliamentary committees and MPs. The group consisted of permanent area residents associations, summerhouse owners, local town associations and industry representatives. In the presentation the group focused mainly on the potential and predicted negative impact on local tourism, the visual project impact, the (perceived) lack of local public support for the planned wind farms and the planning process.21 According to this opposition group the local municipality Mayor22 had not informed of, nor involved the broader public in, the planning process for the near-shore wind farm projects.23

On the 3rd of March 2016, the group Sejerø near-shore wind farm opposition group also presented in a parliamentary audience. Representing almost 2000 signatories, this group focused mostly on the environmental impact of the Sejerø Bugt project, and particularly on the project impact on the local population of Common Scoter. The group also focussed on and criticized the EIA process itself [27,47].

4.4.1. The Sejerø Bugt site removed from the tender

In a press release from the 10th of March 2016 (just a few days after the Sejerø Bugt opposition group parliamentary audience) the DEA announced that the entire near-shore wind farm tender is postponed for a month [36,49]. This, they explain, is due to the Sejerø Bugt near-shore wind farm site EIA results; results suggesting that adverse wind farm impact on the NATURA 2000 area adjacent to the Sejerø Bugt near-shore wind farm site, with Common Scoter on the protected species list, cannot be completely discounted. As in the DEA political brief from September 2015 (see Section 4.3.2), the press release underscores that Denmark is subject to the EU Habitats Directive. It also emphasises that NATURA 2000 regulation requires the application of the precautionary principle for the protection of SPAs if in doubt [49]. On the 15th of March 2016, the Minister officially informed the parties to the Energy Agreement about the revised EIA conclusions, and on the 15th of April 2016 the Sejerø Bugt near-shore wind farm site is officially withdrawn completely from the Danish near-shore wind farm tender. Accordingly, the site-specific EIA supplementary hearing process was stopped [36,37].

In late April 2016, the STOPVesterhavSYD near-shore wind farm opposition group sent a document with multiple arguments opposing the Vesterhav near-shore wind farms to the Energy, Utility and Climate Committee. The arguments were illustrated by near-shore wind farm visualizations; visualizations clearly manipulated in terms of turbine placement.

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While many technicalities and details of wind farm visualizations may rightly be discussed and debated, fundamental rules of proportionality subject to simple mathematical principles apply. In this case these were evidently violated. See Fig. 4.

This is the same Mayor previously criticized by the STOPVesterhavSYD near-shore wind farm opposition group.

§20 questions are questions asked by MPs regarding a public matter to a minister.

Se 2015-2016 EFK Alm. del endeligt svar på spørgsmål/final answer to question: 247, 249, 250, 51, 52, 53, 54. Source: [61]
successful outcomes in their own and differing terms.

5.1. Proposition one: EIAs and opportunities for social dialogue

Our first proposition is that the EIA, and particularly EIAs practised as part of the wider Danish wind power governance system, do offer opportunities for social dialogue, and that they have the potential to extend these. While we are not suggesting that the degree of formally instituted social dialogue in the Danish near-shore wind farm tender was necessarily adequate, we are suggesting that it was probably more extensive than in many cases outside of Denmark [16]. We have also shown that the formal opportunities for dialogue were widely complemented by many informal opportunities: the EIA science took place and was communicated in a context subject to effective, resourceful and unstructured EPCs who voiced their diverse opinions in official political briefs for politicians, in newspapers, on TV and in different social media. These EPCs not only commented on assessments linked to the EIA, but they also voiced their arguments concerning anticipated wider project implications for local community well-being generally. Arguably, all of these activities contributed the exacerbation of existing tensions between the political signatories to the Danish Energy Agreement.

The differing degrees of decision-making power possible in different forms of public dialogue have long been recognized [55]. Yet, as the idea and insights of PNS have been further developed and applied, the notions of social dialogue and extended peer review seem to have become somewhat conflated in the search for more socially robust environmental policy [56]. While social dialogue need not necessarily involve a shift in power towards publics, some degree of power sharing is implicit in the idea of peer review [7]. Here, we have discussed one of the key tenets of PNS, specifically relating to extended peer review communities, in a context in which the level of democratization around the scientific environmental evaluation of energy infrastructure is relatively well-developed. In so doing, we have also asked how much more might be expected of the EIA processes in terms of democratisation; how plausible is it to expect dissent to be constrained within the type of formally constituted EPC that PNS envisaged? We have also emphasized how times have changed in terms of the inter-relationships between science and politics more generally since the formulation of PNS. Importantly, the formal legal status of the EIA processes (and any related appropriate assessments) will give decision-making power to particular actors (i.e. experts) regardless of attempts to mitigate disputes or dissent.

Overall, one of the many challenges for potential EIA-related processes of social dialogue is that they take place in broader governance contexts that differ substantially from country to country [14]. Such diverse governance contexts may be more or less conducive in terms of structure, trust and history for mitigating or resolving disputes, all contextual variations deserving of further research.

5.2. Proposition two: PNS review processes and the extended EPCs

Our second proposition asserts the presence of a de facto extended and unstructured peer community review processes in contentious environmental decision-making contexts. This is more than an echo of the PNS call for EPCs in the scientific process; it suggests that some of the intended functions of EPCs are already being performed, but not as expected. Almost two decades ago, Healy advocated the development of “shared meaning” within extended peer communities as revolving “around the resolution, by negotiation, of uncertainty in the context of conflicting values and agendas” [17]. On the one hand, as evidence from this case study suggests, finding common ground among wind farm opponents and supporters, and for all of those different project-related opinions and priorities constituting the complex social substance of the local, may prove a major challenge. On the other hand, the various EPC activities we have seen from the local interest and opposition groups here have successfully positioned alternative forms of case evidence and value-laden arguments at the heart of near-shore wind farm decision-making process. Indeed this adds a further ‘reality-check’ to the ideals of PNS: whereas PNS envisages situations of contested views of uncertain science, equally science, scientific uncertainty and scientific contestation may often be mobilised instrumentally in environmental disputes. In other words, sometimes the object of a given scientific contestation (here, ducks) may not be the primary concern of some of those making appeals to the science.

What we are arguing here, then, is that the loosely allied network of protestors or objectors with overlapping but sometimes different interests (something we think is quite common across energy siting controversy cases) have become de facto EPCs. We say this for a number of reasons. Firstly, many, if not most, energy siting controversies involve scientific knowledge produced as part of environmental assessments. Secondly, this knowledge often involves different degrees and types of uncertainty. These may involve methodological contestation, as in the present case, and studies may raise further questions requiring new knowledge on new aspects of the case. Most fundamentally and prevalently, PNS sought - and seeks - to tackle issues of different preferences and norms in relation to a case within a scientific context, and with a dedicated EPC. While we think this a worthwhile endeavour, the point we are also making here is precisely that all of this debate is taking place anyway, but outside of the controlled or managed EPC context that PNS originally envisaged.

5.3. Proposition three: Post-normal science and post-normal politics

Our third proposition suggests that social dialogue and engagement in contentious situations may not be particularly orderly. Rather, in some cases scientific knowledge is entangled into sometimes multi-scalar political processes, with manifold actors engaging in and influencing the debates for multiple and diverse reasons and (sometimes perhaps idiosyncratic) purposes.

The case study suggests that all of these circumstances combined have shaped a convoluted path towards the final near-shore tender agreement that is now in place in Denmark: the political and scientific agreement that is now in place in Denmark: the political and scientific

unstructured EPCs that make use of (rather than contribute to) the science and decision-making process through multiple sources and modes of communication. In other words, post-normal politics is politics with high stakes and contested values; post-normal politics is dependent upon on post-normal and often instrumentalised scientific facts, and post-normal politics is informed and influenced by active and engaged heterogeneous EPCs that barely reflect the ideals of PNS. As with PNS in the scientific arena, post-normal politics may be a political norm, and increasingly so as previously different social and political realms become more ‘permeable’.

6. Conclusion

PNS is a philosophy of scientific knowledge production advocated for conditions that now seem widespread and that likely often pertain in contexts requiring EIAs, and EIAs are by definition required in situations of potentially significant environmental impact - and hence public controversy. PNS continues to engender critical interest and discussion, particularly in environmental and sustainability contexts. Generally, EIA processes provide a rather limited role for public engagement. Yet institutional governance contexts vary greatly, and oftentimes the quite narrow remit for public consultation and engagement in EIAs is and could be expanded to offer more opportunities for such social dialogue. The case study considered here related extensively public hearings and opportunities for stakeholder dialogue, reflecting the comparatively open governance context in which it took place [14,16]. While PNS can be said to require even more extensive involvement than this in terms of the affordances given to citizens and other stakeholders, the Danish case and context does offer some beneficial insights into the likely consequences of the extended peer review that PNS advocates. It also highlights some of the potential challenges. Specifically, it underscores that the EPCs envisaged in PNS may become arenas in which, to some degree, publics and stakeholders refer to the EIAs and to scientific uncertainties for their own particular and perhaps pre-existing agendas.

While we normatively view the participatory requirements of EIA processes and the policy recommendations of PNS as positive, we also take that view that controversy and dissent in energy transitions will continue to prove more the norm than the exception.

Overall, thinking on PNS helps us to understand such situations, but its main policy prescription, the inclusion of the EPCs in the scientific process, is highly challenging. Regardless of this, though, the environmental governance issues (and other issues) that energy transitions raise will continue to require political work done in conditions of post-normal politics, and they are not likely to be amenable to a simple fix. The future of sustainability science: a solutions-oriented research agenda, Sustain. (2010) 389–412, https://doi.org/10.1177/0162243910385786.


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Energy Research & Social Science 53 (2019) xxx-xxx