

DECEMBER 2019

DANISH CONTRIBUTION TO THE SEANSE PROJECT

PRE-ANALYSIS



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PROJECT NO.	DOCUMENT NO.
A118775	2.0

VERSION	DATE OF ISSUE	DESCRIPTION	PREPARED	CHECKED	APPROVED
1.0	04-12-2019	Report on Danish contribution to SEANSE CEAF	KHHI/KNRD	UKJ	KHHI

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1 Introduction

Due to an increasing number of windfarm installations in the North Sea and the evaluation of their cumulative environmental impacts, the project "Strategic Environmental Assessment North Sea Energy" (SEANSE) was established to develop a coherent approach to environmental assessments of maritime spatial plans (MSPs) for offshore wind energy among North Sea countries.

One of the assignments within the SEANSE project is to analyse the similarities and the differences between North Sea countries regarding process and methodologies for assessing the cumulative effects of offshore wind farms in the North Sea in Strategic Environment Assessments (SEA) and Environmental Impact Assessments (EIA).

The SEANSE project provide input to a Common Environmental Assessment Framework (CEAF), an instrument for assessing cumulative impacts of offshore renewable energy in the North Sea. This report is the Danish contribution to SEANSE and thus CEAF.

Denmark will be conducting the SEA of its first MSP in the first half of 2020. Therefore, Denmark will contribute to the project through a pre-analysis of conducting the SEA of the MSP based on national experiences from SEAs of the different developments of wind energy at sea from 2006 and onwards. The analysis thus draws on historic Strategic Environment Assessments (SEA) and Environmental Impact Assessments (EIA) conducted in the Danish maritime renewable energy sector.

The report will investigate how SEAs can contribute to and improve permit procedures for individual activities included in the Danish MSP and the environmental issues linked thereto.

When analysing how SEA may assists in targeting and clarifying environmental issues in exploitation and utilization of resources in the marine renewable energy sector in Denmark, the report furthermore investigates the following questions:

- > How SEAs can contribute to streamlining and improving permits for individual activities

- > How SEAs can provide guidance and control permit procedures for individual activities
- > How SEAs can contribute to securing that transboundary activities are handled with precaution

Experiences from the Danish offshore energy sector provides insights into ecological issues that were assessed in Danish SEAs (and EIAs), including:

- > Ecological issues arising from the impacts of offshore wind power,
- > The degree to which these impacts are scaled, and
- > How mitigation of impacts are measured.

Central to this pre-analysis is how cumulative impacts were and are approached. The study will take into consideration the five selected species of concern¹, when assessing and predicting the cumulative effects of all activities both within the Danish EEZ and those of neighboring countries.

As this pre-analysis shows, the procedure for granting permits for renewable offshore energy has changed during the last two decades. The Danish Energy Agency has recently issued new guidelines for completing environmental assessments for Thor offshore wind farm, adding a new SEA-stage to the existing overall structure of the permit procedure for offshore wind energy. The new procedural stage may when merged into the existing procedural structure to some extent affect the way that the SEA of the first MSP will be carried out.

Spatial planning in the maritime sectors greatly depend on the coexistence of more than one activity. Hence, several interests for use, exploitation and environmental protection are at stake and possibly conflicting. Different approaches to solving the conflicting interests, enabling cross-activities as well as how and when to conduct SEA (and EIA) have been tried, providing some basis of experience.

A frequent issue regarding SEA in the marine renewable energy sector is determining the level of detail in the environment report. When scoping an SEA report the aim is to enable the planning authority to identify the likely significant environmental impacts of the proposed plan thus optimising the plan's environmental performance. The environmental issues targeted in the plan – and possibly the Cumulative Effect Assessment (CEA) is then scoped in tune with the scoping of the SEA.

¹ The five common species of concern include: Harbour Porpoise, Black-legged kittiwake, Red-throated diver, Lesser-black-backed gull, and Common Guillemot.

2 Background

2.1 Danish SEA procedure

The SEANSE project emerged as a response to the fact that current EU legislation leaves space for different interpretations. Hence, different countries interpret the obligations differently which results in incomparable methods and approaches during the planning stage when dealing with transboundary environmental issues stemming from the same type of project activities.

The siting of offshore wind turbines in Denmark is regulated under a number of legislations e.g. the Act on Promotion of Renewable Energy and the Act on the Continental Shelf by the National Energy Agency as the competent authority. Until now the designations of off-shore windfarm sites have been pointed out in two ways. Either the Government have designated areas for tender for both coastal zone offshore wind turbines. The sites that are subjected to a tendering procedure are also subjected to an SEA before the tendering procedure is launched.

In parallel it is also possible for an applicant to apply for a permit outside designated areas - the so called "open door" projects. For open door project sites SEA is not carried out prior to application and permit procedures are initiated. This means that only 7 out of 17 coastal and offshore windfarms established (or with permit to be established) have been assessed as a part of a national plan for wind energy. The implementation of an MSP will make the SEA procedure more standardized.

The EU Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment is implemented at national level by the environmental assessment act².

When conducting a SEA three key tasks are executed:

- > Scoping procedure
- > Environmental Assessment procedure
- > Public hearing of SEA Report

The Danish SEA procedure in the renewable energy sector has historically often conducted as a two-tier assessment. The first step evaluated the compatibility of the areas of focus in the initial mapping of relevant areas in relation to the designated environmental objectives at national level as well as other conflicting interests such as defense purposes, international shipping lanes, fisheries, and sea bed mining/off-shore exploitation of hydrocarbons. The second part of the

² Lovbekendtgørelse 2018-10-25 nr. 1225 om miljøvurdering af planer og programmer og af konkrete projekter (VVM). The act also implements the EU EIA Directive.

SEA involved an assessment of the environmental impacts of the envisaged activities. This second-tier assessment is conducted on the basis of evaluation criteria and indicators identified in the scoping phase.

However, as highlighted in the below sections, the SEA procedures carried out did not in a sufficient manner target the issues of the possibility of cumulative impacts as well as target the issue of the probability of their occurrence due to the lack of a systematic framework for focussing on cumulative impacts. The environmental issues addressed in the SEAs carried out as well as the level of detail set out in the SEA has appeared to be too superficial to provide a reasonable framework for carrying out the subsequently executed EIA process.

2.2 Permit procedure for renewable offshore energy

The national procedure for establishing offshore wind turbines require three permits from the Danish Energy Agency³. The first permit is a license to carry out preliminary investigations. If preliminary investigations show that the project is compatible with any potentially conflicting interests at sea, the applicant may continue into the EIA procedure. After having carried out the EIA procedure the applicant is granted permit to implement the project. The third permit necessary to make the project operational is the production permit in which the project is given permit to deliver electricity to the grid.

The establishment of offshore wind turbines can, as mentioned previously, be the result of either a tender procedure or an open-door application procedure. The project developer must obtain all three licenses for both procedures.

2.2.1 New procedure decided by the Danish Energy Agency

The Danish Energy Agency has recently decided to introduce another SEA-stage to the overall permit procedure for establishing offshore wind turbines. Hence, it was decided that a SEA must be carried out on the detailed planning of the individual sites designated in the superior plan identifying wind turbine sites.

According to the Danish Energy Agency, the SEA on the plan for the wind farm will be conducted by Energinet⁴. In addition to the SEA Energinet will conduct several surveys and studies to provide data which is supposed to provide e.g. further knowledge on the sea bed characteristics. This data will among other

³ The three permits are required whether the establishment of the offshore wind turbines follow a tender procedure run by the Danish Energy Agency or an open-door-procedure where the project developer takes the initiative to establish an offshore wind farm.

⁴ Energinet is the Danish transmission system operator (TSO), organised as an independent public enterprise owned by the Danish Ministry of Climate and Energy. Energinet own, operate and develop the transmission systems for electricity and gas in Denmark.

also include surveys on birds, risk analysis for shipping lanes, radar conditions, fishery, noise, marine archaeology as well as the cumulative effects.

The new procedure will be implemented in the Danish offshore wind power project 'Thor offshore wind farm'⁵. According to the guideline for completing environmental assessments for Thor offshore wind farm⁶, the process is to include:

- 1 Completion of a Strategic Environmental Assessment (SEA) that meets the requirements in the Act on the Environmental Assessment of Plans and Programmes (Danish SEA Act)
- 2 Completion of additional environmental surveys and studies in addition to the requirements imposed for a SEA in order to provide critical data and information to be used in connection with final EIA approval of the specific project
- 3 An EIA of the specific project onshore from the first landfall in the beach zone and onwards to the onshore substation as well as to the 400 kV transmission grid in Idomlund
- 4 An EIA of the specific project offshore and up to the first landfall in the beach zone is to be carried out after the deadline for bidding, after a concession winner has been appointed and there is a specific project.

Energinet will be responsible to carry out points 1, 2 and 3 before the deadline for bidding. The concession winner is to complete a project-specific EIA before the offshore wind farm can be established.

By performing another SEA before entering project level assessment the SEA may provide better guidance for assessing the environmental issues and thereby contribute to streamlining and improving permits issued.

2.3 Danish SEA experience

For the purpose of providing a Danish contribution to the SEANSE project, this report will analyse the experiences from carrying out two SEAs in the nearshore and offshore energy sector within the Danish EEZ.

The construction of large-scale offshore wind farms affects both the marine environment and it restricts potential other uses of the sea area.

The processes of applying SEA in the marine renewable energy sector has on one hand resulted in an overall designation of areas reserved for renewable energy infrastructure, whereas on the other hand the overall designation and

⁵ Danish Energy Agency, September 24th 2019

⁶ Danish Energy Agency: Guidelines for completing environmental assessments for Thor offshore wind farm, dated 20th September 2019

assessment thereof has proven to be too superficial when moving from SEA directly to the project level. The main problem being that no cumulative impacts from a diverse and widespread development of wind farms at sea is captured at the most superior level of assessment, and thus cannot be assessed in a meaningful way in individual project assessments. The following subchapters will illustrate how and why different approaches to assessing the environment impacts have been conducted and evolved.

2.3.1 SEA of Locations for future offshore wind turbines 2025

As a part of the Danish government's implementation of Energy Strategy 2025, a Government Committee for location of future offshore wind turbines pointed out a number of areas for future offshore wind farms in Denmark.

The committee, which consisted of representatives from government institutions having regulatory interests in the Danish EEZ, evaluated the conflicting interests in relations to circumstances of wind, sea bed geology, transmission grids, shipping lanes, nature, landscape and exploitation of raw materials. The committee pointed out a number of areas where wind and sea bed were optimal for future offshore wind farms and where the conflicting interests were minimal. The mapping report resulted in the designation of 7 priority areas, which may contain wind turbine expansions with a total capacity of 4600 MW. This would purposely ultimately result in a production of approximately 18 TWh a year, i.e. approximately 8 % of the total energy consumption or 50 % of the electricity consumption in Denmark.

In the designation of the 7 priority areas the main objective was to ensure that the following factors were taken into account:

- > Raw materials/aggregates
- > Defence purposes
- > Fishing
- > Shipping
- > Nature protection (including Natura 2000 areas)
- > Visual impacts (only inshore locations)

The mapping of the seven areas was the first plan for area designation at sea of which a SEA was conducted (Future wind farms 2025)⁷. The plan and SEA were updated by the Danish Energy Agency in 2011⁸. Based on the report, the

⁷ Udvalget for fremtidens havmølleplaceringer (2007) Fremtidens Havmøller. April 2007

⁸ Energistyrelsen (2011) Stor-skala havmølleparker i Danmark. Opdatering af fremtidens havmølleplaceringer. April 2011

government decided to establish two wind turbine parks at sea consisting of wind turbines with a total collected capacity of 200 MW each.

Table 2-1 SEA of locations of 7 designated area for offshore windfarms (Energy Agency 2007 – Locations for future wind farms 2025).

SEA	Capacity (MW)	EIA	Permission
Djursland/Anholt	400	X	+
Horns Rev III	400	X	+
Jammerland Bugt	240	X	pending
Ringkøbing			-
Store Middelgrund			-
Krigers flak	600	X	+
Rønne Banke			-

One of these offshore wind farms is Anholt offshore wind farm. Experience drawn from the process from SEA of Locations for future offshore wind turbines 2025 to the actual offshore wind farm project stressed the need for sufficient information assessed earlier in the process to eliminate insecurities and risks.

Lack of information from pre-investigations refrained developers to bid on the public call for tenders. Pricing the bids became difficult and full of insecurities regarding factors such as optimal location and the temporal prospects of approval. Many developers therefore found the risks too big and only one bid was made by Dong Energy⁹. The risks taken by Dong Energy pushed the price of kilowatt hours twice the size of energy produced from similar wind farms.

This experience led to the development of the worst case-approach used in the process of *Locations for wind turbines in coastal waters of Denmark* as analysed below.

2.3.2 SEA of Locations for wind turbines in coastal waters of Denmark

In 2012 a screening¹⁰ of suitable areas for coastal windfarms was conducted by the Danish offshore wind farm working group (Havmølleudvalget). The plan was subjected to an SEA within a year and involved a broad public hearing.

The purpose of the designation was to identify suitable locations for future wind turbines within 20 km from the coastline. In the designation the main objective has been to ensure that the following factors were taken into account:

⁹ Today known as Ørsted

¹⁰ Havmølleudvalget (2012) Kystnære havmøller i Danmark. Screening af havmølleplaceringer indenfor 20 km fra kysten. Oktober 2012

- > Areas for raw materials dredging
- > Areas reserved for defence purposes
- > Areas for fisheries
- > Shipping lanes
- > Nature protection (including Nature 2000 areas)
- > Visual impacts

In the first step of the process 55 areas were pointed out. From these 55 areas 29 were selected for providing the best circumstances for wind production. The third step of the process called in parties of interests to seek out conflicting factors. The parties then agreed on an overall designation of 15 locations reserved for renewable energy infrastructure. EIA procedures were initiated for six of the 15 locations as part of tendering process run by Energinet taking a worst case-approach. After this, the 15 designated areas were assessed in compliance with the rules of SEA¹¹.

Table 2-2 SEA of 15 designated areas for coastal windfarms.

SEA	Capacity (MW)	EIA	Permission
Vesterhav Syd	350	X	+
Vesterhav Nord	350	X	+
Jammerbugt Syd		-	-
Jammerbugt Nord		-	-
Sæby	200	X	-
Djursland		-	-
Samsø Nord		-	-
Sejerø Bugt	100	X	-
Jammerland bugt		-	-
Smålandsfarvandet vest	350	X	-
Vejsnæs		-	-
Lillegrund		-	-
Køge Bugt		-	-
Halsnæs		-	-
Bornholm	50	X	-

The SEA provided an assessment of the likely significant impacts on the environment of developing the selected locations. The assessment of the overall designation did however prove to be too superficial when moving directly to the project level.

¹¹ Energistyrelsen (2012) Udpengning af områder til kystnære havmøller. Miljøvurderingsrapport. Udarbejdet af COWI for Havmølleudvalget og Energistyrelsen.

Only two of the areas have resulted in a bid from a developer – both from Vattenfall A/S. However, the permit to establish one of the two wind power farms (Vesterhav Syd) was quashed by the Energy Appeal Board in December 2018. A process for amending the EIA is now in development by Vattenfall A/S. A new EIA for the other wind power farm (Vesterhav Nord) is also expected to be conducted.

In the case of Vesterhav Syd and Vesterhav Nord, the worst-case EIA approach did not provide an assessment of the projects in such a manner that the project's visual impacts on the coastal scenery did not correspond to the installation pattern chosen by the developer. The EIA of Vesterhav Syd was then found inadequate when subjected to legal appeal. Even though the worst case-approach sought to eliminate the risks from uncertainties and lack of data, the EIA still became insufficient as the designed project rarely coincide with the project tendered.

To prevent the outcome where the EIA is found to be insufficient to the actual project design, two different approaches could be used in future renewable energy projects at sea. Firstly, the authority could conduct a screening¹² of the "changes" from the worst-case EIA to the actual project. This approach would however most likely result in a requirement for a new EIA and thereby trigger yet another time-consuming procedure.

As mentioned above a new approach has recently been adopted by the Danish Energy agency in the light of the Energy Appeal Board's decision on Vesterhav Syd. The additional SEA will now be conducted on the plan for the offshore wind farm before tendering the offshore wind power project. The newly introduced SEA stage is carried out on the basis of a detailed planning of the designated area in question before the area is subjected to tendering – eventually leading to an EIA of the project.

By performing another SEA before tendering the projects, the risks of uncertainties for the developer have been reduced, eventually reducing the cost of electricity from the wind turbines. By performing another SEA before entering project level the SEA could provide clearer grounds for assessing the environmental issues and thereby contribute to streamlining and improving permits issued in connection to the tendering process.

¹² Danish act on environmental assessment, Appendix 2, pt. 13a states that changes or expansions of projects included in appendix 1 and 2 of the act, which are already approved, established or under establishment can undergo a screening before determining whether an EIA is obligated.

3 Scoping the MSP and SEA jointly

The main take on the SEA process of the Danish MSP is based on an evaluation model where the assessment is carried out as a number of iterations between the proposed planning activities in the MSP and the SEA. The SEA will be scoped mainly by the frames of the MSP.

When scoping the SEA report the aim is to set out sufficient information on the draft of the plan to enable the planning authority to identify the likely, significant environmental impacts of the proposed plan thus optimising the plan's environmental performance. Hence, the SEA is conducted in parallel to formulating the plan.

Experience from conducting SEA in the maritime renewable energy sector shows that the scoping activities carried out did deliver an overall framework for assessing downstream local environmental impacts as well as provide a framework for addressing identified environmental issues related to the overall plan for developing wind energy in the off-shore area as well as in the coastal zone. However, the scoping activities lacked credible and relevant data for addressing cumulative impacts of designating several locations within the same water areas for wind farming activities. The scoping carried out thus failed to recognize the potential for cumulative impacts stemming from the plans that subsequently were adopted.

As shown in figure 2 below, the scoping of the SEA of the MSP offsets from an overall screening where conflicts and coexistence of activities and potential conflicting interests are discussed and balanced against each other. From that starting point scoping of the assessments of expected impacts – both individual and across proposed activities - are conducted. A final draft scoping report will then undergo consultation from authorities which by reason of their specific environmental responsibilities, are likely to be affected by the environmental effects of implementing the MSP¹³.

¹³ The requirement of consultations concerned authorities when deciding on scope and level of detail of the information which must be included in the environmental report is stated in the Danish environment assessment act, which implements art. 5(4) in the SEA Directive.

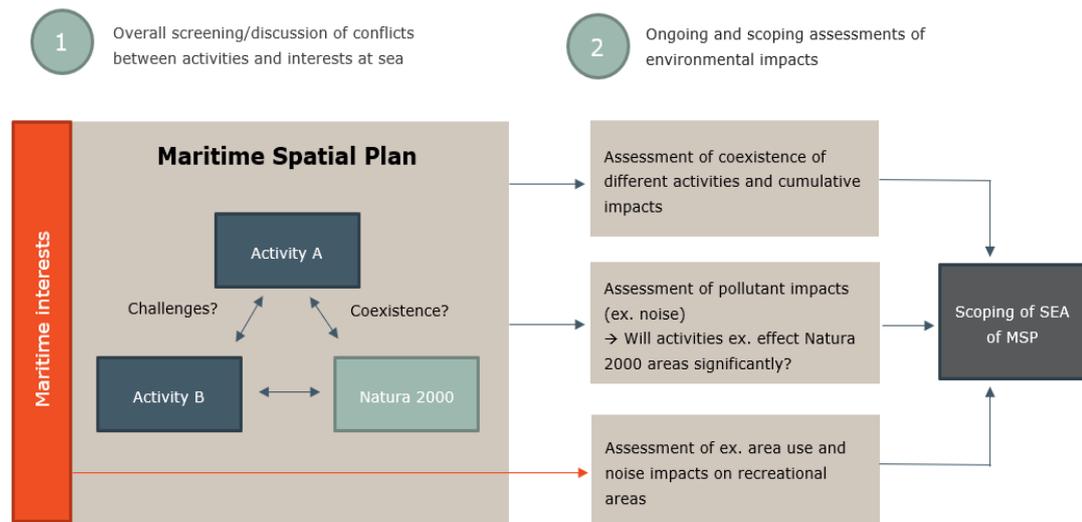


Figure 2: Scoping the SEA of the MSP

Figure 2 shows that the preparation of the MSP identifies the challenges and possibilities of coexistence of individual activities and interests which are central and conflicting as well as valuable environmental circumstances and issues. As analysed above, cross-activity impacts are to be approached in a prudent manner. In connection to this, it must be stressed that the scoping of the SEA (jointly with the MSP) shall take the cumulative effects of already existing as well as planned activities into consideration.

As this pre-analysis shows, experience from former SEAs can deliver some objectives to the MSP. A common framework would then contribute to approaching the potential impacts of wind farm development plans in the best way possible.

3.1 Level of detail

A frequent issue regarding SEA in the marine renewable energy sector is determining the level of detail in the environment assessment. The level of detail in the environment assessment is decided by the scoping report decided on the basis of the first draft plan document.

The scoping report decides the scope and level of detail and the environmental assessment and involves¹⁴:

- > Defining the environmental factors that are likely to be impacted by the proposed plan
- > Identifying and describing existing environmental objectives in other plans and programmes that are relevant to consider in the assessment

¹⁴ The basis for which elements must be considered when scoping the SEA is Annex I to the SEA-Directive

- > Defining the environmental targets for each factor likely to be impacted
- > Defining the indicators by which the impacts on the environmental factors may be describes
- > Defining the evaluation criteria employed for each potential environmental impact identified, and
- > Defining the set of data available for describing the likely environmental impacts

In addition to this, the scope of the SEA must also provide reasons for eliminating issues from further consideration. A great challenge is to determine and distinguish what level of detail is possible and what level of detail is necessary. The level of detail can eventually affect the process essentially forcing new investigations to be conducted and pushing the timeframe of the adoption or submission of the plan.

According to the Danish act on environmental assessment the environment report must include information which is reasonably required in respect to current knowledge and common assessment methods as well as in respect to the level of detail of the plan, at what stage the plan is at and if certain issues are more appropriately assessed at a different level of the process.

However, as experience has shown, the possible and necessary levels of detail from one stage to another might vary to such an extent that the interconnection in the process becomes absent. In other words: the SEA becomes too superficial. A new solution by the Danish Energy Agency contains an addition of an SEA before conducting the EIA of the specific projects.

The new procedure for approving and permitting offshore wind farms has introduced an extra layer of SEA to the permitting procedure. This extra SEA will eradicate some unassessed matters, which were not present at the earlier stage and thereby exterminate some risks for the developer, as these costs are now undertaken by Energinet. The level of detail of the SEA reflects the level of detail of the plan. In this sense, the SEA assesses the activities set out in the plan. The starting point of the scoping of the assessment and the level of detail naturally takes into account the current status and situation of the areas and interests therein effected by the plan. The effects and impacts on e.g. species caused by the strategic planning will therefore be assessed in the SEA.

The two SEAs conducted in the sector for renewable wind energy in the Danish EEZ did not explicitly include a Cumulative Effect Assessment (CEA). Cumulative effects have rather been addressed later at a project specific level. The chapter below provides an insight in how ecological impacts have been addressed in the SEAs including the cumulative effects thereof.

4 Ecological assessment in Danish SEA

Danish experience from the past two decades shows that offshore wind farms can be engineered and operated without significant damage to the marine environment and vulnerable species, when located in a prudent manner¹⁵. However, history also shows that finding the right location is subject to conflicting interests.

A robust SEA procedure will in turn reduce the risk that a future concession owner will not obtain the necessary permits but may also contribute to mitigating potential negative environmental impacts of the project.

This chapter gives insight into how the Danish offshore energy sector has addressed ecological impacts in the SEAs including the assumptions taken and how cumulative impacts have been addressed. Finally, it brings reflections on how a CEAF could influence the process and final outcomes.

The SEANSE project has compiled a list of common species of concern to start testing the approach of the Common Environmental Assessment Framework (CEAF). Emphasis in the analysis will be on these indicator species which include the following:

- > Harbour porpoise (*Phocoena phocoena*)
- > Black-legged kittiwake (*Rissa tridactyla*)
- > Lesser black-backed gull (*Larus fuscus*)
- > Red-throated diver (*Gavia stellata*)
- > Common guillemot (*Uria aalge*)

4.1.1 Methodology of ecological assessments

Until now only two SEAs have been carried out for windfarm plans in Denmark: one for designation of 7 areas for offshore wind farms and one for designation of 15 coastal wind farms (see section 2.3).

The Danish approach to SEA of coastal and offshore windfarms has until recently been restricted to a narrow approach where only location relevant impacts were assessed. The process has followed an expert judgement approach where relevant experts have been involved in pointing out and assessing a number of suitable sites for windfarms. The sites have been selected based on economy and in order to avoid internationally protected areas (Natura 2000), areas of significant natural resource interests and areas that affect maritime safety. A Government Committee consisting of representatives from relevant Danish authorities have reviewed the sites from their perspective and responsibilities.

¹⁵ Danish Energy Authority, Dong Energy, Vattenfall & Danish Forest and Nature Agency 2006: Danish Offshore Wind – Key Environmental Issues

The assessment criteria have been mainly qualitative and have not included models or other quantitative methods for the assessment of ecological impact. Though, the basic analysis for the SEA of the offshore windfarm locations (2025) was elaborated by more environmental data in an updated version¹⁶.

4.2 Stressors and receptors addressed in SEAs

SEAs of coastal and offshore windfarms have been based on a number of stressors listed in Table 4-1. The table includes the two Danish SEAs conducted for coastal and offshore wind farm plans respectively. In addition, it includes two examples of recently developed EIAs prepared for concrete projects within the areas designated in the planning that was subject to SEA.

Although temporal impacts are mentioned, the SEAs primarily evaluate permanent stressors. Underwater noise and sediment dispersal are exceptions which are mentioned as temporal stressors that may need to be mitigated.

The receptors include international protected areas (Natura 2000), flora and fauna, marine mammals (seals and harbour porpoises), migrating and resting birds, air and climate, marine archaeology and visual impacts.

Table 4-1 Ecological stressors assessed in Danish SEAs of coastal and offshore windfarms.

	SEA (Coastal)	SEA (Offshore)
Birds		
Collision risk	X	X*
Barrier effect	X	
Displacement/habitat loss		X**
Artificial reefs		
Sedimentation		
Bats		
Collision risk		
Barrier effect		
Marine mammals		
Noise disturbance	X*	X*
Displacement		X*
Barrier effect		
Sedimentation		
Artificial reefs		X*
Benthos		
Physical presence of structure	X	
Sedimentation	X	
Chemicals and other inputs	X	
Non-native species		
Electromagnetic fields/heat		

¹⁶ Energistyrelsen (2011) Stor-skala havmølleparker i Danmark. Opdatering af fremtidens havmølleplaceringer. April 2011

Artificial reefs	X	
Underwater vegetation		
Sedimentation	X	
Protected areas		
Special Protected Area (SPA)	X	X
Special Area of Conservation (SAC)	X	X
Other		

- Including *Rissa tridactyla*, *Larus fucus*
- ** *Gavia stella*
- *** Including Harbour porpoises

4.3 Impact assessment

The purpose of the two SEA's have primarily been to screen for immediate conflicts and point towards potential areas of conflicts that should be further investigated in a future EIA.

While the SEA of coastal windfarms did not include quantitative data, the SEA of the offshore windfarms has to some extent incorporated available data of birds, seabed habitats and density of harbour porpoises. However, in both SEAs, the impact assessment on species and habitats is postponed to the EIA of a concrete project.

General trends and examples of the assessments of harbour porpoises and birds are given below. Bats¹⁷ are not included in any of the existing SEAs conducted for Danish wind farms.

Porpoises

In the Danish SEAs of offshore and coastal windfarms harbour porpoises have been assessed on an overall level in relation to underwater noise and displacement. Based on experience from previous offshore windfarm projects it has been concluded that harbour porpoises will be scared away from the area during construction, but that they will return to the area shortly after construction. There are no assessments of the general fitness of the population (e.g. fecundity or calf mortality) and no assessment on cumulative impacts caused by blocking.

Quantitative data on harbour porpoises was included in the SEA of the designation of Jammerbugt offshore windfarm since it is known as an important area for harbour porpoises. Based on satellite images and the fact that three habitat areas designated to protect harbour porpoises are located close to Jammerbugt, it was assessed that the impact on harbour porpoise is moderate.

Birds

In both SEAs of coastal and offshore windfarms in Denmark, collision risk is recognised as a stressor for seabirds. Collision risk is assessed on an overall

¹⁷ Nathusius' Pipistrelle was originally on the list of common species of concern of the SEANSE project.

level by referring to scientific literature and it is generally concluded that birds are good at avoiding the turbines and that the impact is small. However, in a few cases like Rønne Banke which is known as an important migration route for birds, it is stated that an assessment of the impact of bird migration pattern should be included in the environmental impact assessment.

Displacements of birds has been assessed for designated areas known to be important resting and foraging areas for birds. One of these areas is Horns Rev III (an expansion of Horns Rev II offshore windfarm), where existing data on red-throated diver (*Gavia stellata*) is included in the SEA. In the SEA-report it is stated that red throated diver is a susceptible species in the area and that the density of the species was reduced after the development of Horns Rev II. The SEA foresees a potential negative impact on red throated diver but does not assess the magnitude of the impact. Rather it is concluded that an impact assessment of red throated diver should be carried out as a part of the environmental impact assessment of a future concrete project. Red throated diver is likewise mentioned as a susceptible species for the Ringkøbing Fjord area, but like Horns Rev, the assessment of impact is not included in the SEA. It is however listed as a requirement in a future EIA.

Another bird which has attracted major attention in the SEAs is the common scoter (*Melanitta nigra*), a duck that overwinters in Danish waters. Among the designated areas where the duck is central for the outcome of the SEA was the shallow waters south of Læsø. The designated areas were recognised as an important resting site for common scoter early in the prioritisation of areas and was in the first place taken out of the public tender due to the importance of the area for the overwintering duck. However, in 2008 new investigations from the impact on common scoter at Horns Rev I indicated that the population of common scoter was still numerous after construction of the wind farm. Based on this information, a new study was initiated by the Danish Centre of Environment (DCE) where the density of common scoters was modelled based on the food availability. The study concluded that the two sites were not comparable and a significant impact on the population was expected. Following this, Læsø was taken out of the list of prioritised areas for offshore windfarms. The neighbouring site 'Sejrø Bugt' was also recognised as an important area for the common scoter but was not taken out of the list of prioritised areas. In the EIA of Sejrø Bugt (which was conducted after a worst-case approach) it was however concluded that the impact on common scoter would be significant and the area was following taken out of the public tender.

Bats

Bats have not been considered in any of the SEAs of coastal or offshore windfarms in Denmark. However, bats (including Nathusius' pipistrelle) have been assessed in EIAs where the respective project had an impact on the species.

4.4 Cumulative impacts

Generally cumulative impacts are not assessed in the Danish SEAs since the designated areas have been placed far away from other developments.

However, in parallel to the SEA of offshore windfarms, a monitoring program was established on two demonstration windfarm projects (Horns rev I and II) to address the cumulative impacts of multiple windfarms close to each other for overwintering birds. A habitat model was developed for the purpose which was based on prey items (common mussel species). Based on the study it was concluded that there was no significant cumulative impact of the three windfarms. However, it was stated in the following EIA of Horns Rev III, that knowledge on cumulative impacts were insufficient to assess the impacts on the infauna composition and thus the impact on resting birds.

In the SEA of coastal windfarms, the only cumulative impact mentioned was the cumulative visible impact of more technical developments, including other coastal windfarms. Barrier effects, increased collision of birds etc. are in other words not considered.

Table 4-2 summarise the level of assessment of the cumulative impacts of two SEAs and two examples of the following EIAs.

Table 4-2 Cumulative impact level of windfarms assessed in two SEAs and two examples EIAs transpiring from the SEAs.

	SEA (off shore)	SEA (coastal)	EIA (Horns rev III)	Sejrø Bugt (Coastal, Sejrø Bugt)
Level 1 (the planned activity itself)				
(National) MSP				
Strategy energy plan				
Level 2 -other but equal activity				
Other offshore windfarm(s)	X	X	X	X
Transboundary	X		X	
Level 3 -Other national non-equal activities				
Harbour expansion				
Radar				X
Shipping				
Seismic research				
Aggregate dredging				
Oil and gas exploitation and development				

4.4.1 CEAF in a Danish context

Denmark has a long tradition for public participation and bottom-up decision making which also is reflected in how offshore wind farm permits has been managed in the country.

It is clear from Danish offshore windfarm history that a common environmental assessment framework (CEAF) could have avoided some of the later emerging conflicts by undertaking a more robust assessment in the early phase (at SEA level). Examples of cases where this approach would have been valuable for decision making are the impact assessments on resting birds.

However, it is important to keep in mind that an inflexible framework could as well disrupt an otherwise constructive dialogue between stakeholders. E.g. could models for bird displacement move decision making away from people and in this way "hack" rather than support transparent decision making.

The CEAF could, however, provide support for Danish decision-making by setting standards for requirements of environmental investigations at SEA level and become instrumental in assessing cumulative impacts on porpoises and birds. The level of acceptable impact (thresholds) could be integrated in the CEAF but would require broad public participation to ensure that these levels are compliance with societal needs.

5 Prudent approach to cross-activity impacts

Activities at sea are often carried out side by side. Fishing, shipping and nature protection are carried out in the same areas as production of renewable energy. This causes a cross-activity impact on the environment. The question in this chapter is: How may SEA contribute to ensure that cross-activity impacts are assessed in a prudent manner?

Experience from SEA conducted in the energy sector shows how cross-activity impacts are assessed, which environmental issues arise in this connection and how these are targeted.

When assessing the cross-activity impact, one must first take into consideration that the spatial planning on one hand will designate areas for renewable energy projects (as well as pipelines and sub-sea cables), and on the other hand, that some activities have already been mapped and planned. Regarding the first consideration, the assessment of the cumulative effects of an increasing number of renewable energy projects carried out in the North Sea is a key issue.

Wind farm development will have ecological impacts and may in cumulation repress or stop the desired development, due to unacceptable ecological impact. These impacts may in addition go against national and/or EU legislation on environmental protection and preservation.

Previous experiences show that different approaches to cross-activities have been made. When locating the future offshore wind turbines, the different parties were called in for a discussion of how the respective interests may conflict on an early stage. The parties were gathered in a commission which played a key role through the selection process.

When discussing the different interests on an early stage, targeting the possible conflict of interests become a part of the planning process. It is thereby possible to assess the cross-activity in the SEA and adjust the level of detail in the plan, where a conflict of interest occurs. When addressing the cross-activity impacts at an early stage, it is possible to subject environmental impacts to discussions regarding conflict of interests.

The experience from SEA of plans regarding locations for offshore wind turbines and wind turbines in coastal waters have shown the benefits of seeking out the conflicts of interests to set a basis of an early-stage SEA of the cross-activity impacts. The sooner the what's and how's of co-existence are approached, the better the possibility to approach the cross-activities in a prudent manner.

Moreover, as the Danish environmental assessment act states, the environmental report shall provide information on the likely significant effects on the environment of implementing the plan, including e.g. secondary, cumulative and synergistic effects. The SEA must envisage the MSP in connection to the

cumulative effects of former and current plans or programmes as well as already planned activities.

In addition, an EIA must also assess the impacts holistically in relation to the environmental capacity of the area. Thus, the EIA of a project must envisage the cumulation of environmental impacts from existing installations at sea and the area use and activities as a result of utilized and un-utilized permits and adopted plans. SEA conducted on the frameworks under which the projects are carried may then contribute to ensure that cross-activity impacts are identified.

As a conclusion to the above, prudent approach to cross-activity impacts must be made by assessing the conflicting interests on an early-stage to ensure that all significant environmental conditions and problems are within the scope of the SEA. The SEA may then take the cumulative impact of offshore wind farms and several other activities into consideration and assess them sufficiently.

Conducting a cumulative effect assessment (CEA) on the basis of a CEAF could provide a common approach to assessing the most common cumulative pressures on the ecological environment from former and current plans or programmes as well as already planned activities of all countries in the North Sea Region.

5.1 Data requirements

As shown above, SEA conducted in the energy sector assesses the environmental impact of the plan on the basis of evaluation criteria and indicators used for determining the likely environmental impact within different environmental factors.

As part of a SEA data is collected and generated and processed. The data requirements used for the assessment can include:

- > Qualitative and quantitative data on sea depths and sea bed structures.
- > Qualitative data on the location of known migration routes as well as resting and feeding areas of sea birds.
- > Qualitative data on changes in marine water quality parameters.
- > Qualitative data on areas with direct physical changes on the sea bed.
- > Qualitative data on changes in CO₂ emissions.
- > Qualitative and/or quantitative data on the extended use of renewable energy.
- > Qualitative and/or quantitative data on numbers of km² designated and/or impounded for new infrastructure at sea.

- > Qualitative and/or quantitative data on existing sub-sea cables and pipelines.
- > Qualitative and/or quantitative data on competing area interests.
- > Qualitative data on areas with known marine archaeological and cultural heritage effected by the plan.

As the MSP will determine which areas of the Danish EEZ will be designated to activities such as offshore energy, shipping, fishery, aquaculture, sea mining and environment protection towards 2030, similar data would be required to assess the plan's environmental impact.

The requirement of data from pre-investigations can be crucial for the developer of offshore renewable energy as uncertainties and risks might be too high for the developer to accept. Experiences from Anholt offshore wind farm has shown that high risks from uncertainties have a high impact on the bidding prices from developers. Knowledge from pre-investigations providing data regarding sea bed structures, sea depths and wind conditions, together with the data listed above, all have a significant impact on which data developers and other stakeholders at sea need to gather – and finance - themselves.

6 How SEA contribute to permit procedures

By identifying and assessing the environmental issues on an early stage some risks, uncertainties and terms are set to streamline the permits and improving the consistency of issuing permits. The identification of coexisting activities and the cumulative ecological effects assessed in the SEA can also provide a solid base for considerations and terms when issuing permits.

The construction of large-scale wind farms effects the marine environment and the possibilities for other users of the sea areas. To understand the effects of such projects and assess the impacts on the environment fully, a uniform and coherent evaluation system is needed among those who administrate the use of areas within the North Sea. Wind farms today are constructed at the same time in different locations and marine mammals, such as the harbour porpoise can be driven away from their feeding ground, and birds are forced to change their flight paths.

When SEAs are conducted on plans the environmental impacts of offshore wind farms are identified and knowledge gaps are likely to emerge. A common environmental assessment framework has the potential to become an instrument for dealing with the environmental impacts when identifying the environmental issues and prioritising the needs for evidence in national strategic planning and licensing procedures.

SEAs can contribute to streamlining and improving permits for individual activities by setting out the frames and thresholds for size, capacity, construction methods and surveillance requirements. By identifying environmental impacts, the SEA might ensure that permits are handled and issues on an equal basis and that cumulative effects and impacts are included in considerations on a strategic level and assessed before a permit is granted.

In addition to this SEAs can provide guidance and control permit procedures for individual activities where effects of planned activities are considered and impacts on the environment are assessed. The SEA may then provide a strategic framework to guide authorities in which environmental issues might cause significant impacts. A SEA may provide knowledge on which areas are either suited or inadequate for individual activities as well as which precautions are crucial. Hence, SEAs can provide predictability, transparency and a clearer line for permit procedures.

Employing a CEAF permit procedures may lead to considering the same methods, approaches and standards from all countries in the North Sea partners when assessing the environmental impacts.

The permitting procedure for the establishment of offshore wind turbines has been greatly inspired from the permitting procedure within the offshore oil and gas industry. This procedure has however shown itself as a misfit for the SEA

and EIA procedures. The newly revised permit procedure for offshore wind parks might close some of the gaps left for insufficiency.

A different approach for revising the permit procedure within the offshore renewable energy sector could advantageously be inspired from the SEA/EIA procedure itself. The SEA would then serve as a guide and direction to procedures for individual activities.

7 Conclusion

When identifying opportunities for multiple use of space and assessing impacts at an early stage, maritime authorities can include environmental protection into the strategic planning. It is then highly recommendable to identify and discuss the conflicts of interests at the earliest stage as possible.

Experience has shown the significance of assessing identified environmental issues on an early stage. This is crucial for determining whether an activity might have an impact or not and thereby can be permitted.

Determining the level of detail in practise is a question of allocating the costs of filling out knowledge gaps by performing new surveys and investigations. The level of detail of the SEA will reflect the level of detail of the plan.

This pre-analysis has overall concluded that SEA may assists in targeting and clarifying environmental issues in exploitation and utilization of resources in the marine renewable energy sector in Denmark, as:

- > SEAs may contribute to streamlining and improving permits for individual projects by setting standards for baseline descriptions/baseline investigations. A solid SEA should also include a process for early dialogue with stakeholders and authorities to identify subjects of controversies.
- > SEAs may also provide guidance for permit procedures for individual activities by providing clear guidelines for a future concession owner on what and how they are allowed to develop, rather than what they should investigate as a part of an EIA.
- > SEAs may, finally, contribute to securing that transboundary activities are handled with precaution by setting standards for how to involve neighbouring countries in the planning process at an early stage. The final plan should reflect the opinion of affected countries.