SHEPHERD+ WEDDERBURN

OUR REF S6152.23/CBW/CWI
YOUR REF
11 February 2025

[redacted]
National Infrastructure Planning
Temple Quay House
2 The Square
Bristol
BS1 6PN

Dear Sir

Five Estuaries Offshore Windfarm Project (the "Project")
Application Ref: EN010115
East Anglia TWO Limited's Deadline 6 Submission

We refer to the above Examination and confirm we are instructed by East Anglia TWO Limited.

1. Wake Loss

Introduction

1.1 The Applicant at Issue Specific Hearing 6 on Wednesday 22 January 2025 ("**ISH6**") presented arguments that wake effects were not encompassed within National Policy Statement EN-3 for Renewable Energy and that there was no need for the Examining Authority ("**ExA**") to effectively consider the issue. This submission responds to that position and in that context, is presented under the following topic hearings:

1.1.1 Broader context;

1.1.2 Prior consideration of wake effects;

1.1.3 The current policy framework; and

1.1.4 Conclusions.

1.2 For ease of access, the following documentation is annexed to this submission:

1.2.1 Annex 1 - British Wind Energy Association Briefing Document on Round 3;

1.2.2 Annex 2 - Submission made by Hornsea Project 1 to Deadline 1 in relation to the Examination of the Hornsea Project 2;

1.2.3 Annex 3 - Extracts from the Awel y Môr ExA report and decision;

1.2.4 Annex 4 - National Policy Statement for Renewable Energy Infrastructure (EN-3) July 2011;

1.2.5 Annex 5 - National Policy Statement for Renewable Energy Infrastructure (EN-3) published for Consultation in March 2023 (dated 2022 in the document);

1.2.6 Annex 6 – Extract from the Clean Power 2030 Action Plan;

1.2.7 Annex 7 – East Anglia Zone Plan; and

1.2.8 Annex 8 – Wake Loss Assessment

Broader Context

1.3 We note that the ExA are interested in understanding the context of the overall development of offshore wind developed through the series of Crown Estate leasing rounds. In that respect, we have annexed to this submission, a copy of a document which was prepared by the British Wind Energy Association at the time of the announcement of the third Crown Estate leasing round. This provides a useful history from the initial inception of leasing rounds and provides the initial context for Round 3.

1.4 ScottishPower Renewables ("**SPR**") and Vattenfall were awarded the rights to develop the East Anglia zone by the Crown Estate in December 2009. Subsequently, it was decided that SPR and Vattenfall would develop separate parts of the zone. In this respect, SPR were to develop the southern section of the zone with sites off Suffolk whereas Vattenfall were to develop the sites further to the north off Norfolk. Subsequent to this, SPR have brought forward and developed East Anglia ONE which is now in operation and are also currently constructing East Anglia THREE and East Anglia TWO. In 2019, SPR applied for Development Consent Orders for both East Anglia TWO ("**EA2**") and East Anglia ONE North ("**EA1N**"). Development Consent Orders in respect of those projects were granted by the Secretary of State on 31 March 2022. The projects were then subject to separate Judicial Reviews which were only completed last year. EA2 was awarded a Contract for Difference (CfD) in allocation Round 6 last year.

1.5 In terms of the development of EA2, the Crown Estate lease option was signed in February 2016 and a Scoping Opinion was issued by the Secretary of State on 20 December 2017. In comparison, Five Estuaries is part of an offshore wind extension round which commenced in 2017 but it was not until August 2019 that the Crown Estate announced the conclusion of the HRA in relation to this round and the confirmation that a number of projects would progress to the award of development rights. The agreement for lease between the Crown Estate relating to the extension of the Galloper Wind Farm (later named Five Estuaries) was not announced until September 2020. EA2 was well advanced before even an announcement was made that Five Estuaries would be proceeding as a project. Furthermore, the information available as of September 2020 was exceptionally limited other than it was likely for a wind farm in excess of 300MW.

1.6 Subsequent to the leasing round in respect of extensions, there have been further leasing rounds promoted by the Crown Estate which include leasing Round 4. Many of the consortia successful in this round are currently taking their applications through the Development Consent Order process. A new generation of proposed floating wind farms has been announced and is known as Round 5.

Prior Consideration of Wake Effects

1.7 The concept of wake loss is something that offshore wind farm developers are very experienced in having to deal with. It is one of the factors that influences design and subsequent operation of all offshore schemes. It has also been acknowledged that, when new offshore wind farms are constructed in proximity to existing wind farms, there is the potential for adverse effects to occur in respect of the existing project. As set out in our earlier written submission in response to ExQ2 GC.2.05 (REP4-073) recent evidence published by both RWE and Ørsted have confirmed the real extent of adverse interaction between offshore wind farms. This is further validated by modelling exercises which can be undertaken to project the likely impacts that might occur.

Round 3 Issues – Hornsea 2

1.8 Back in 2015, Dong (the former name of Ørsted) acquired Hornsea Project 1. Subsequent to that acquisition, an alternative party promoted Hornsea Project 2. We attach, as a document, at Annex 2 a written submission which was made on behalf of the then owners of Hornsea 1 in respect of the Examination of Hornsea 2. The full background and the context to the issues are set out in the submissions. Wake loss is dealt with in section 12 of the submissions and the implications of wake loss are set out in paragraph 12.3. This highlighted the loss of energy for downwind turbines and the consequential effect that this can have on final investment decisions and the economics associated with wind farm development. At paragraph 12.5 it is noted that there is currently still uncertainty, back in 2015, about the extent to which wake effects occur and over what distances that will happen. This is the gap that has now been filled in with the practical experience of the operational portfolios of offshore wind farms.

1.9 In section 7 of the submissions, there is a section heading up about the approach that will be taken to resolving issues, either through agreement or alternatively, in terms of the Secretary of State's decision making and the Development Consent Order. In section 7.9 of the submission the argument is advanced that the potential impacts between offshore wind farms are matters which can be properly described as "important and relevant" to the Secretary of State's decision making. In terms of section 104(2)(d) of the Planning Act 2008, there is a requirement to take into account matters which the Secretary of State thinks are both important and relevant to the decision making.

1.10 The second line of argument as to why the effects should be taken into account is the proper interpretation of Policy EN-3. In the context of this submission, this is referenced at paragraph 7.9(c) and is expanded upon by section 7.10.

1.11 It is understood that the matter was ultimately resolved through a commercial agreement. It is understood that a number of commercial agreements have been entered into to resolve wake loss issues and that has been acknowledged by the UK Government in a recent policy document which we will refer to later. The Applicant was therefore incorrect to say at ISH6 that pre-Awel Y Môr, wake effects were not considered as a planning matter and it was not assessed or addressed by previous projects. This is clearly not the case.

Awel Y Môr Extension Project

1.12 Awel Y Môr is a project also led by RWE. The project was also promoted through the extensions leasing round and is an extension to RWE's Gwynt Y Môr Offshore Wind Farm. There is information in the public domain that there is an agreement that Awel Y Môr will pay compensation for production losses. Given that position, it would not be credible for the Applicant here to argue that is difficult to evaluate or quantify wake loss. Has the Applicant entered into an agreement with the existing Galloper project regarding future production losses?

Examination

1.13 In terms of the ExA report for Awel y Môr, paragraphs 5.14.41 to 5.14.86 discuss the wake loss issues that emerged during the Examination. In the course of the Examination, the owners of Rhyl Flats Wind Farm Limited raised representations to the Examination on the grounds of wake loss. This represented a 2% loss of yield for the balance of the five-year period that the existing wind farm would operate. The Examination included a debate on the interpretation of National Policy Statement EN-3. The Applicant, through the Awel y Môr Wind Farm, disputed the applicability of EN-3 or that this was a matter which should be considered in an Examination. However, the ExA in their report rejected the Applicant's interpretation of EN-3 at paragraph 5.14.77 of its consideration of the matter and concluded that an assessment should have been undertaken by the Applicant. The ExA recommended that a requirement should be imposed to ensure that a proper assessment was undertaken of wake loss in order to mitigate the impacts of the proposed development on the Rhyl Flats Wind Farm. The ExA, at paragraph 5.14.86, acknowledged that this would create a precedent in relation to both wake loss and the requirement to mitigate its effects.

1.14 The ExA's report was finalised in June 2023. It should be noted that at that stage EN-3 from 2011 was still applicable, but that the March 2023 version of draft EN-3 had been published and is referenced in the report.

Secretary of State's Decision

1.15 The Secretary of State's decision in respect of the Awel y Môr Wind Farm was made on 19 September 2023. The decision letter again was premised on EN-3 2011, but with the draft of 2023 available as well. Again, the draft is specifically identified in paragraph 4.4 of the decision. There is express acknowledgment of the draft state of the further National Policy Statement documents. The Secretary of State determined that the draft documents were relevant and important for the purposes of the decision making.

1.16 The decision letter incorporated a specific section on wake effect and energy yield at paragraphs 4.162 to 4.166. Paragraph 4.165 specifically records the findings of the ExA in respect to the interpretation and application of EN-3. In paragraph 4.178, the decision making of the Secretary of State is clear and unambiguous in agreeing with the ExA's view that wake assessment should have been carried out to ensure that the effects on the existing wind farm were both mitigated and minimised.

Current Policy Framework

Clean Power 2030 Action Plan

1.17 In December 2024, the UK Government published the Clean Power 2030 Action Plan. It is an up to date statement of the Government's position. In the section on "Renewable and Nuclear Project Delivery" there is a page which covers the topic of wake effects. In the context of the text, it recognises the potential for larger new projects and/or larger turbines to have a greater propensity to cause wake effects. As identified, historically this had largely been resolved outside the Development Consent Order process. It then goes on to describe the Awel y Môr decision having set a precedent. Against that background, the Applicant's argument that Awel y Môr is wrongly decided runs directly in conflict with recent statements from the UK Government. The third paragraph of the case study identifies the very real concerns both for existing and future projects. On any view this is a clear indicator from the Government that this is a topic which the UK Government thinks is both important and relevant to decision making. Finally, the Government advised that it is bringing together experts to understand and build an evidence base for looking at mitigation.

1.18 It is clear from this recent statement from Government that the topic of wake loss is important and that there needs to be a resolution. In light of this statement, it is simply not credible that a current Examination should not ensure that the Secretary of State has the best and most appropriate project specific evidence available. The Applicant's attempt to avoid meaningful discussion of this matter is material and could lead to the ExA not having adequate information to report to the Secretary of State. If that occurs, it will be entirely due to the Applicant's conduct.

EN3

1.19 We have included at Annexes 4 and 5 the two versions of EN-3 which have been relevant to the consideration of prior decisions and which have been the subject matter of prior submission.

1.20 The concept of having to consider other marine users is central to the decision making for marine licensing under the Marine and Coastal Access Act 2009. Under Section 69(1)(c) in determining an application for a Marine Licence, the licensing authority has to have regard to the need to prevent interference with legitimate uses of the sea. It is therefore not surprising that the original EN-3 back in 2011 incorporated a section which dealt specifically with offshore impacts on "oil, gas and other offshore infrastructure and activities". This is contained in paragraphs 2.6.176 to 2.6.188. The general thrust of the policy sought to ensure that applicants properly took into account the impact that their project may have on other sea users through both site selection and site design. It is of note that whilst specific users were mentioned in paragraph 2.6.176, the terminology used was "*such as*". This does not produce

an exhaustive list and just illustrates the type of activity where there could be conflict. It should also be noted that back in 2011, the potential for oil and gas interface was probably more extreme than now given that at that time the UK Government was still licensing the further exploitation of oil and gas reserves.

1.21 In terms of the subsequent drafts of EN-3, both the March 2023 and the EN-3 now in force, published in November 2023, include sections dealing with other offshore infrastructure and activities. It is notable that the language at paragraphs 3.8.212 and 3.8.213 of March 2023 and paragraphs 2.8.196 and 2.8.197 of the now in force version of November 2023 include exceptionally general statements about what is being considered by other offshore infrastructure and activities. Indeed, it is clear that the change from the 2011 version to the 2023 versions is essentially that the original version included more specific language as to potential activities that could be impacted whereas the newer versions are more general in nature. Again, the thrust of the policies is that the onus is on the applicant to engage and assess the potential impact on other users using site selection and design to avoid and mitigate impacts.

1.22 Further key aspects of the in force EN-3 (November 2023) include paragraphs 2.8.261 to2.8 262 in terms of mitigation and 2.8.341 to 2.8.348 in terms of decision making. There is nothing in either of the 2023 EN-3s on mitigation and decision making which in any way is narrowly framed or suggests that impacts between offshore wind farms is somehow excluded from the consideration of the policy framework.

1.23 Perhaps the only argument for such an interpretation could be made is from paragraph 2.8.203 of the current EN-3. However, we suggest that has to be seen in the context of this being a policy section that deals with offshore wind farms and it is suggesting that if engagement is undertaken appropriately, the technology and other sea users should be capable of co-existing successfully. It does not in any way depart from the earlier general statements.

Wake Loss Assessment

1.24 Further to the ExA's Rule 17 letter dated 13 December 2024 (PD-019) requesting East Anglia TWO Limited to provide an initial wake loss assessment, we append hereto at Annex 8 said wake loss assessment. Given the lack of information in the public domain and the Applicant's unwillingness to provide information using confidentiality undertakings or disclosing the information directly to an independent third party consultant, this wake loss assessment is based on a number of assumptions including the layout of the Project and the power curves, thrust curves, height and MW of the proposed Project turbines.

1.25 The initial wake loss assessment indicates that the impacts on East Anglia TWO based on central assumptions would result in a yield loss of 1.3% with a standard deviation of 0.4%.

2. Lesser Black Backed Gull SoCG and Navigation and Shipping SoCG

2.1 Since requesting at Deadline 4 that a Statement of Common Ground ("**SoCG**") be entered into with regards to lesser black backed gull (REP4-072) and navigation and shipping (REP4-073), East Anglia TWO Limited have not had any engagement from the Applicant on these despite East Anglia TWO Limited trying to commence negotiations.

2.2 We note that the deadline for final SoCGs as per the Examination timetable was at Deadline 5, which the Applicant referred to in their response to our requests at Deadline 5 (REP5-073); however we note from the Statement of Commonality (REP5-047) that a number of SoCGs are still being negotiated and that the ExA has asked for any updates on SoCGs at this Deadline 6 and at Deadline 7. We therefore do not think that it is too late to be able to negotiate and agree a SoCG with the Applicant on these two narrow points, particularly if both parties engage efficiently in the negotiations.

Yours faithfully

For and on behalf of Shepherd and Wedderburn LLP

Annex 1 - British Wind Energy Association Briefing Document on Round 3

BWEA

Delivering the UK's wind, wave and tidal energy

www.bwea.com

What does the Round 3 announcement mean?

Briefing note on offshore wind energy

BWEA is the trade and professional body for the UK wind and marine renewables industries. Formed in 1978, and with 548 corporate members, BWEA is the leading renewable energy trade association in the UK. Wind has been the world's fastest growing renewable energy source for the last seven years, and this trend is expected to continue with falling costs of wind energy and the urgent international need to tackle CO2 emissions to prevent climate change.

Notes

1. Employment opportunities and challenges in the context of rapid industry growth, Bain and Company, 2008, www.bwea.com/pdf/publications/Bain%20Brief_Wind%20Energy%20 2008_FINAL.pdf 5.
2. BWEA State of the Industry report Oct 2008 http://www.bwea.com.pdf/publications/industry_report_08.pdf
3. http://www.carbontrust.co.uk/emerging-technologies/current-focus-areas/offshore-wind/pages/offshore-wind.aspx and http://www.energytechnologies.co.uk/Home/Technology Programmes/offshore.aspx
4. http://www.theccc.org.uk/reports/progress-reports Figure 5
5. WWF Managing Variability, 2009, http://assets.wwf.org.uk/downloads/managing__variability_report.pdf
6. Germanischer Lloyd and Garrad Hassan, 1995. Study of Offshore Wind Energy in the EC.
7. The UK Renewable Energy Strategy, July 2009. Cm 7686, www.decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/renewable/res/res.aspx

Introduction

This week marks the announcment of the winners of the third tender round for offshore wind sites in the UK. Nine development zones will be allocated to companies and consortia to start the development process. The scale of this project represents a step change for the global industry and to understand the implications we need to explore what can be delivered over the coming years and what this means in terms of jobs and opportunities for the UK.

Key facts

- UK is leading the world in the scale of offshore wind development
- Round 3 will develop across nine zones and the capacity of the leases issued is expected to be at least 25 gigawatts (GW).
- Taken together with earlier rounds of offshore wind development, Round 3 will mean over 40GW of sites are currently being brought forward.
- If just 20GW of offshore capacity is developed by 2020 it will secure up to £60 billion of private investment and could create 45,000 UK based jobs.
- Projects currently operational in the UK have a capacity of 688 MW, across 9 projects, and this represents 228 turbines. A further 1156 MW of projects are under construction.
- There are currently over 1500 MW of offshore wind installed globally. This is 1% of the 150 GW of total installed wind capacity on and offshore in the world.
- Research is underway to develop a UK-build offshore wind turbine with a capacity of 10 MW.
- The key obstacles to developing Round 3 are a lack of offshore grid connections, rising productions costs and limited existing supply chain capacity.

o The Government is currently developing a new offshore transmission network regime to manage Round 3 grid connections. The arrangements put in place must be efficient, cost effective and meet the generation timetable and scale planned in Round 3. The final arrangements put in place must be tailored further to the generation timetable and scale planned in Round 3. This should incorporate more developer choice.

o The industry is experiencing a 'cost hump' with costs roughly doubling from £1.5m per MW in early Round 1 projects to £3.1m for Round 3 – this has been driven by the falling exchange rate, historically high commodity prices and a lack of competition among manufacturers. However, falling material costs, a UK based supply chain avoiding import costs and increased competition is expected to significantly reduce costs as the industry expands. New technology and learning by doing will bring down costs as well.

o Offshore wind is currently only 1% of the world wide wind market and as such has a small supply chain, dominated by just 2 turbine manufacturers. The dramatic increase in market size represented by Round 3 is expected to attract several new players to the market helping to increase supply. We expect six manufacturer companies to be in the market by 2015. The Renewables Obligation attracts investment to the UK and is part of the driver that could create a UK offshore wind industry.

Round 3

Offshore wind is developed in a series of competitive leasing rounds. Two rounds have been completed and these projects are now being developed. At the end of 2007 the Government initiated the process for starting a third competitive round. The Crown Estate as landlord and steward of the seabed started the Round 3 process in June 2008. This week's announcement represents the conclusion of this competitive tender process.

This round was structured differently from previous leasing rounds, as tenders were put forward for nine zones of development each potentially containing multiple projects. The scale of some of these zones is much larger than anything seen before with some zones potentially yielding 10 gigawatts (GW) of projects. In total the size of Round 3 is anticipated to be at least 25 GW compared to the combined total of 8 GW from Rounds 1 and 2.

Another new feature of Round 3 is that within this process the Crown Estate will co-invest with developers, with the aim of facilitating efficient delivery of the wind farms.

Round 3 timeline	December 2007	Jan 2008 to June 2009	March 2009 to Jan 2010	January 2010	2010-12	2012-13	2013-15
Government	Round 3 process initiated	Strategic Environmental Assessment			indicative timescale		
The Crown Estate			Round 3 Tender	Round 3 winners announced			
Industry Developer					Project consenting process	Financial investment decision	Construction of wind farm
					Grid connection process		

Round 3 Offshore Wind Zones

Wind farm	Region	Estimated MW
Bristol Channel	South West	1500
Dogger Bank	North Sea	9000
Firth of Forth	Scotland	500
Hastings	South	500
Hornsea	North Sea	3000
Irish Sea	Irish Sea	5000
Moray Firth	Scotland	500
Norfolk	Southern North Sea	5000
West of Isle of Wight	South	500
Total		**25500**

Analysis of Round 3

With the Round 3 announcement industry now has the opportunity to deploy on a large scale and prove the contribution it can make to the battle against climate change, the supply of UK electricity and the creation of jobs.

The scale of Round 3 is much larger than anything that has been attempted before and in order to deliver in large quantities and on a timeframe that will make a contribution to the UK's 2020 targets, there are key factors that must be addressed to release the constraints on the expansion of the industry such as grid connections, rising costs and supply chain.

The benefits of offshore wind

The UK is already the leading market for offshore wind development in the world, with just under 700MW operational, over 1,000MW under construction and a further 3,500MW consented.
Wind developers are currently setting out plans to deliver at least 40GW of capacity offshore across all leasing rounds, this represents up to £120 billion of private sector investment.

BWEA commissioned Bain and Company to produce a report that modelled the number of jobs that could be created in the UK by the growth of wind energy[1] . In a scenario where 20 GW of offshore capacity were constructed by 2020 and 70% of the design and manufacturing took place in the UK then nearly 45,000 British jobs would be directly created, with an additional 14,000 created by onshore wind industry growth.

Table 1. Direct jobs that could be created by offshore wind

	Number of jobs
Planning & development	3,382
Design & manufacturing	20,909
Construction & installation	10,598
Operations & maintenance	6,734
Technical, financial & legal services	1,121
Total offshore	42,745
Total onshore	14,000
Total	**56,745**

There are further benefits to increasing the amount of wind energy generation in the UK. With less reliance on the import of oil and gas from other countries, then the UK becomes less vulnerable to restrictions in supply or in changing prices. With one third of the UK's existing power plants coming offline coming in the next ten years the most recent OFGEM report concludes that replacing this with fossil fuels, mainly gas, could cost consumers up to 60% more on household bills - due to fossil fuel price volatility. The report also stated that the price of oil has quadrupled over the last 10 years, and the price of coal and gas has doubled.

Supply chain

The scale of Round 3 will require a dramatic increase in manufacturing capacity for offshore wind, such as turbines, foundations, offshore electrics and installation vessels.

Building confidence is key to persuading companies to invest in increased supply chain capacity. The Government's role is central in providing a stable policy framework against which investment decisions can be made.

The UK is already beginning to see examples of new factories being built such as JDR Cable's new inter-array cable facility at Hartlepool and Skykon's investment in new capacity at their Welcon Towers subsidiary in Campbeltown. However, the size of the UK's Round 3 alone represents a step change in demand. Industry will need to dramatically increase capacity in the key supply chain constraint areas including offshore specific wind turbines, installation vessels and in manufacturing capacity for cables to link the wind farm to shore.

A major concern is whether new manufacturing facilities will actually be built in the UK close to the new market, or whether they will be based on the continent where there are already established onshore wind turbine manufacturing facilities.While onshore wind manufacturing is dominated by Denmark, Germany and Spain, as a new area of business offshore wind offers opportunites to new entrants from both overseas and the UK to emerge as market leaders in innovation and the supply of technology to create a British based supply chain.

Key to attracting this new investment is the creation of coastal manufacturing hubs, much like Aberdeen is a centre for the North Sea oil industry through the development of improved UK port to provide companies with the space and quay facilities they need – a key requirement for offshore wind construction. If offshore wind turbine manufacturers decide to locate new factories in the UK, then new opportunities will also arise for existing manufacturing companies in other sectors such as automotive and aerospace to enter the market for component supply such as gearboxes, bearings, castings and other internal components.

A solid skills base will be required to build industry. The emerging offshore wind industry can draw on the engineering excellence and maritime history of the UK; however industry will need to be

Hartlepool Harbour, JDR Cable's facility center right

mindful of potential shortages in the number of suitably qualified and experienced new candidates. Addressing the most immediate demand for installation, operation and maintenance skills will be prioritised. Support for the wind industry's efforts in developing UK wide training scheme for apprentices is central to ensuring that there is a big enough pool of skilled workers in the UK to meet demand.

Costs and technology

Offshore wind has suffered from a major 'cost hump' in the last few years, due a combination of external factors such as the falling UK exchange rate, rising commodity prices such as steel and an underdeveloped supply chain. The costs of constructing offshore wind turbines have effectively doubled from £1.5m per MW for early projects to £3m per MW currently. However, industry analysis anticipates that costs will start to fall significantly as the market expands in size, attracting new suppliers and creating a UK based supply chain.

There are currently 150,00 MW of wind farms operational worldwide, however only 1,500 of this (1%) is offshore. As such there has been little incentive for suppliers to invest in new offshore manufacturing capacity. This will change dramatically as Round 3 alone will represent an increase in global installed offshore capacity of at least 16 times. Increased competition in the turbine supply chain will reduce costs as new turbine manufacturers enter the offshore specific market which is currently dominated by two manufacturers. Industry projections are that there will be around half a dozen major manufacturers in the market by 2015.

Although the costs of installation offshore are higher than onshore, there are higher wind speeds offshore and therefore more electricity and revenue can be generated per installation. Offshore also provides an opportunity for larger machines and economies of scale from bigger wind farm projects.

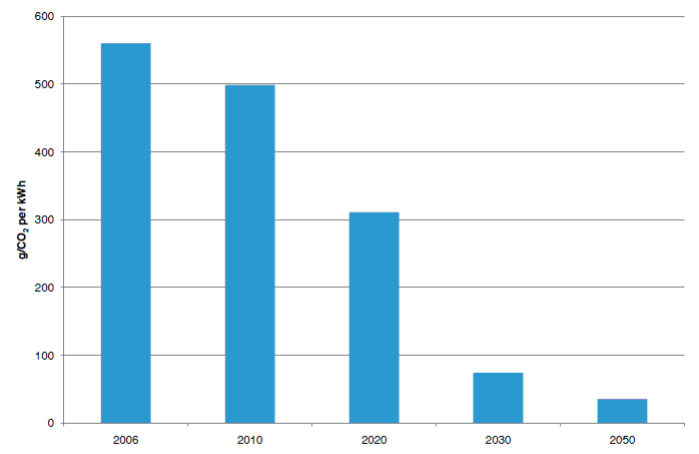
Offshore wind is still a relatively new technology. As experience is gained, costs will come down. A crucial factor in the reduction of costs will be the development of new technology. The UK already has several schemes designed to enable research into new turbines, new foundations for offshore structures and other attributes to optimise the production of electricity [2].

The Renewables Obligation supports offshore wind and creates a 'virtuous circle' where projects can deploy and so gain the experience they need to bring down costs and reduce financial support. Without this support the UK will miss the boat by not attracting companies to invest and establish a new UK industry with all the jobs and benefits that this will create.

The UK Electricity Grid

Every power station requires a connection to the electricity grid to supply customers in homes, offices and factories. The expansion of offshore wind will mean that new connections will need to be made. Currently large sections of the UK grid require replacement as this infrastructure has come to the end of its natural life; up to 60% will have to be upgraded or entirely replaced in the next 5-10 years. This creates an opportunity to rebuild the grid system for 21st century technology, which can accommodate decentralised green energy supplies, including a new offshore grid network. Work is already underway through the Government's Electricity Network Strategy Group, which consists of industry, Government, National Grid, Scottish grid operators and Ofgem representatives who have analysed the existing network to identify the major upgrades that are required and map the new grid routes required.

Figure 5 CO_2 intensity per kWh of electricity generated, 2006-2050



Source: CCC

National Grid has a responsibility to manage the supply of electricity minute by minute and day by day to ensure that the UK demand is met. Electricity suppliers choose and contract generation to supply their customers and each is incentivised to match their own supply and demand. As GB Transmission System Operator, National Grid is responsible for managing any residual imbalance by contracting with generators and suppliers to modify generation or demand in real time.

Wind power may be variable, but over the whole of UK/GB varies very slowly and is highly predicable in the short term. Also, because wind generator sets are small (around 2-3MW) compared to conventional generation units (up to 660MW) the impact of one, two or more generator faults on the system is much smaller for wind than for conventional power generation. National Grid's own figures show that it can successfully manage a much larger proportion of wind energy on the system with little or no adjustment[3].

The electricity system requires a surplus of generation capacity so that even when power stations are under maintenance or have broken down there is enough capacity to meet the demand. For most of the year at times of normal or low demand, and especially with high power station availability, many power stations are idle or shut down. The UK's current reserve margin is in the region of 25%, with an overall electricity generation capacity of 80GW, compared to a peak demand is 63GW and average demand in 44GW.

In the longer term there could be much more wind on the system and this will require more active management of the grid. This is likely to mean keeping some conventional capacity available to run in periods of low wind but high demand. However, the amount needed can be significantly reduced through a number of tools such as the control of demand, facilitated by a 'smart' grid and large-scale grid interconnection with the rest of Europe, which will allow peaks and troughs in generation to be traded between countries. In addition it should be noted that as this conventional 'reserve margin' will only be used at peak demand it will still mean a reduction in greenhouse gas emissions and the avoidance of an over reliance on increasingly expensive fossil fuel imports.

As more and more wind is added to the system the amount of time existing fossil fuel plants need to operate will diminish – reducing both operating costs and carbon emissions. Over time the carbon savings will be significant in order to meet the Government's Committee on Climate Change's plan to reduce carbon intensity in electricity generation from over 500g/kWh today to less than 100g/kWh by 2030.

Background section

Offshore wind speeds are generally higher than onshore wind speeds and this is the main reason why the development of offshore wind is attractive. The higher energy yields offset the higher construction costs. The higher energy yields work towards offseting the higher construction costs.

In the European Union, many member states could source a significant proportion of their electricity requirements from offshore wind and the total resource has been described as "truly enormous[4]". Studies estimate the generation potential at close to 1,000 terawatt hours (TWh) per year, equivalent to several times the UK's total electricity consumption. There is also interest in offshore wind in China, Japan, the United States and elsewhere.

The technology

Offshore wind turbines are based on the same technology as their onshore counterparts and their expected lifespan is the same, approximately 20 years. Currently the main difference is their size. A typical offshore turbine has a tower height of 80 or 90 metres (m) and a height to the uppermost blade tip of about 130 m. Turbines currently being used offshore are rated at 3 MW, 3.6 MW and 5 MW. Larger turbines are currently in development, with a prototype 10MW turbine being developed in the UK at Blyth.

The Government's renewable energy targets

The Government has agreed to two binding targets that drive the expansion of renewable energy. The first target is an agreement with the EU to produce 15% of all its energy from renewable sources by 2020 and this includes energy for heat, transportation and electricity. The Government published a Renewable Energy Strategy[5] last year which outlined how this could be produced, and will publish a further National Action Plan this June. Wind energy is the most commercially mature renewable energy technology and would be required to provide the largest single portion of this target – BWEA analysis suggests that this will require in the region of 34GW of installed wind, with roughly two-thirds coming from offshore.

The second UK target is an 80% reduction from 1990 levels of carbon emissions by 2050. This large challenge will require a transformation to a low carbon economy. Offshore wind development is well positioned to make a significant contribution to these targets.

The development of offshore wind to date

The UK's first offshore wind farm was commissioned in December 2000 off Blyth Harbour in Northumberland. The offshore wind sector has grown in the space of nine years and there are now (Jan 2010) nine operational projects totalling 688 megawatts (MW). Another 13 projects with a total capacity of 4598 MW have consents and a further 2200 MW are being developed for entry into the planning system. These projects are in addition to those created by the Round 3 announcement.

Offshore wind farm developments require a lease from the Crown Estate, who own the seabed out to the 12 nautical mile (nm) territorial limit around the UK and manage the seabed beyond 12 nm. The lease term of projects is between 22 and 50 years and the lease holder pays a rent.

The Crown Estate has decided to issue the rights to these leases in a series of commercial tender rounds. The first and second rounds have been issued and are being developed. The third round is about to commence.

Round 1

The first phase of the UK's offshore wind programme was launched in December 2000. Successful Round 1 applicants were announced in April 2001, with leases awarded for 18 sites at 13 locations, some of them multiple developments totalling over 1GW of capacity. Intended as a pilot phase, Round 1 sites were limited to a maximum of 30 turbines. Round 1 proposals proved to be successful and developers consequently expressed an interest for larger offshore projects in the second phase of development.

Round 1

Name	Location	MW Capacity	Developer/Turbines
North Hoyle	North Wales	60	npower renewables
Scroby Sands	East of England	60	E.ON UK Renewables
Kentish Flats	Thames Estuary	90	Vattenfall
Barrow	North West Eng	90	Centrica/DONG Energy
Gunfleet Sands I	Thames Estuary	108	DONG Energy
Lynn/Inner Dowsing	Greater Wash	194.4	Centrica
Rhyl Flats	North Wales	90	npower renewables
Burbo Bank	North West Eng	90	DONG Energy
Robin Rigg	North West Eng	180	E.ON UK Renewables
Teesside	Yorkshire & Humber	90	EDF
Ormonde	North West	150	Vattenfall

Round 2

Between November 2002 and February 2003, the Government held a Strategic Environmental Assessment (SEA) on the development of a programme for offshore wind. The Crown Estate and Government then identified three key areas as appropriate for development: the Thames Estuary, the Greater Wash and the North West. Round 2 sites are larger than Round 1 sites and some large schemes have been awarded sites – two are 1 GW or more in capacity and as big as conventional power stations.

In December 2003 the final results were announced, with the rights to develop 15 sites totalling 7.2 GW awarded to 10 companies or consortia. Projects in Round 2 have mostly completed the consenting process, though some are still to be determined. The 1,000 MW London Array development submitted its Environment Statement in June 2005. The current status of all the projects may be found on the BWEA website.

Round 2

Name	Location	MW capacity	Developer
Docking Shoal	Greater Wash	500	Centrica
Race Bank	Greater Wash	620	Centrica
Sheringham Shoal	East of England	315	StatoilHydro/Statkraft
Humber Gateway	Yorkshire & Humber	300	E.on
Triton Knoll	Greater Wash	1,200	npower renewables
Lincs	Greater Wash	270	Centrica
Westermost Rough	Greater Wash	240	DONG Energy
Dudgeon	Greater Wash	560	Warwick Energy
Greater Gabbard	Thames Estuary	504	SSE Airtricity/Fluor
Gunfleet Sands II	Thames Estuary	64.8	DONG Energy
London Array 1	Thames Estuary	630	DONG Energy / E.ON UK Renewables/Masdar
London Array II	Thames Estuary	370	DONG Energy / E.ON UK Renewables/Masdar
Thanet	Thames Estuary	300	Vattenfall
Walney I	North West	183.6	DONG Energy
Walney II	North West	183.6	DONG Energy
Gwynt y Mor	North Wales	750	npower renewables
West of Duddon Sands	North West	500	ScottishPower / DONG Energy

Rounds 1 and 2 extensions

In July 2009, the Crown Estate offered Round 1 and 2 offshore windfarm operators the opportunity to apply for area extensions. The results should be announced in the first half of 2010 and the resulting projects will be subject to the normal consenting process. This could provide an additional 1-2GW of capacity.

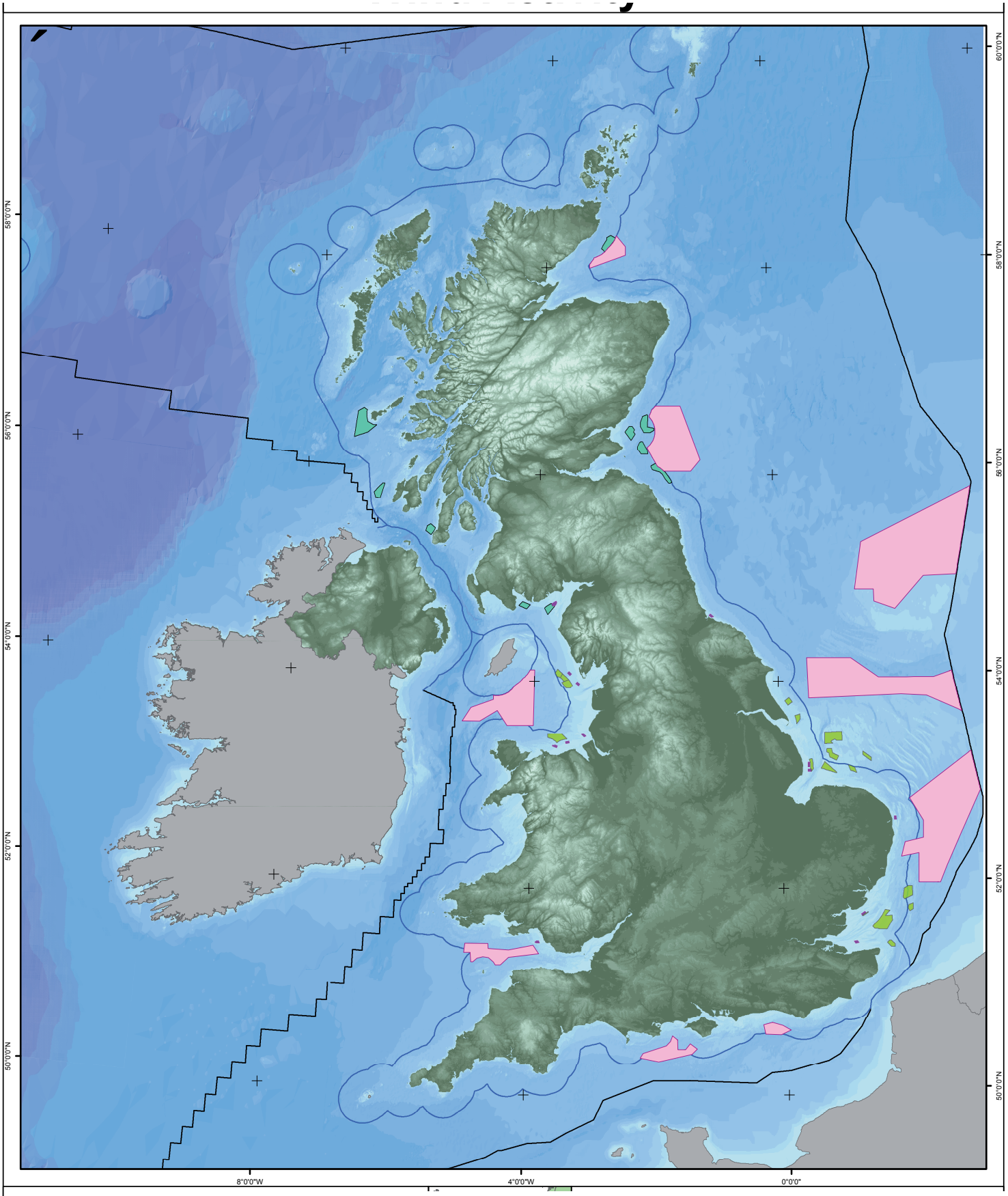
Scottish Offshore Wind

In May 2008, The Crown Estate requested initial expressions of interest from companies wishing to develop windfarms within Scottish territorial waters. The Scottish Government is carrying out a Strategic Environmental Assessment (SEA) for offshore wind to ensure this resource is developed strategically. In February 2009, The Crown Estate offered exclusivity agreements for 10 sites for offshore windfarms within Scottish territorial waters. In total the sites have the potential to generate more than 6 GW of offshore wind power. More information is available on the BWEA web site.

Scottish Territorial Waters

Wind farm	MW capacity	Developer
Argyll Array	1500	Scottish Power Renewables
Bell Rock	700	Airtricity & Flour
Beatrice	920	Airtricity & SeaEnergy
Forth Array	415	Fred Olsen Renewables
Inch Cape	905	Npower & SeaEnergy
Islay	680	Airtricity
Kintyre	378	Airtricity
Neart na Gaoithe	360	Mainstream
Solway Firth	300	E.ON
Wigtown Bay	280	DONG Energy

Wind Activity



Map courtesy Crown Estate

BWEA

Delivering the UK's wind, wave and tidal energy

BWEA
Greencoat House
Francis Street
London SW1P 1DH
United Kingdom

Tel: +44 (0)20 7901 3000
Fax: +44 (0)20 7901 3001

www.bwea.com

Annex 2 - Submission made by Hornsea Project 1 to Deadline 1 in relation to the Examination of the Hornsea Project 2

Hornsea Project One Deadline 1 Submission

1 INTRODUCTION

1.1 This document is submitted for Deadline 1 in relation to the Hornsea Project Two Examination, jointly on behalf of Heron Wind Limited ("Heron"), Njord Wind Limited ("Njord") and Vi Aura Limited ("Vi Aura"). The three companies are collectively referred to as the "Project One Companies". The undertakers in relation to the Project Two Order (Optimus Wind Limited and Breesea Limited) are referred to in this Representation as the Applicants or the Project Two Companies.

1.2 This document is structured as follows:

Written Representation

Section 2 sets out the status of the Project One Companies;

Section 3 provides background to DONG Energy Wind Power A/S to put Project One in the context of DONG Energy's UK portfolio of offshore wind farm projects;

Section 4 explains Project One's status and development timetable, and draws a high level contrast with Project Two in those terms;

Section 5 provides background information concerning existing legal agreements between Project One and Project Two;

Section 6 provides background information concerning the status of Project One in relation to The Crown Estate as landlord of the seabed;

Section 7 explains Project One's perspective on the legal mechanisms available to resolve issues between Project One and Project Two;

Sections 8 to 13 address the issues raised in the Project One Companies' Relevant Representation (Appendix 1) in more detail;

Replies to First Questions

Section 14 provides the Project One Companies' responses to the First Questions directed at them, together with responses to other Questions where they considered a response was appropriate;

Comments on Relevant Representations

Section 15 provides the Project One Companies' responses to points arising from the Relevant Representations of the Environment Agency (RR-25);

List of Appendices

A list of the appendices to accompany this Deadline 1 submission is at the end of this document.

1.3 There are ongoing constructive discussions with the Applicants to progress and agree solutions to the issues identified in sections 8 to 13, including negotiations on two confidential cooperation agreements (one offshore, one onshore) and specific Protective Provisions for inclusion in the Development Consent Order on an agreed basis. It is hoped that it will be possible to withdraw the various Representations in due course as part of a comprehensive package agreed between the two sets of project companies. The parties are aiming to have resolved these matters by Deadline 2.

Hearings and Site Visit

1.4 The Project One Companies have responded separately on the question of attendance and speaking at hearings and in relation to the site visit.

2 STATUS OF THE PROJECT ONE COMPANIES

2.1 Heron, Njord and Vi Aura are the three named undertakers under the Hornsea One Offshore Wind Farm Order 2014 (the "Project One Order") (Appendix 2). The project consented under this Order is referred to as "Project One".

2.2 Each of the Project One Companies holds a generation licence under section 6 Electricity Act 1989 and is a statutory undertaker (Appendix 3).

2.3 Heron holds all of the onshore land interests in relation to Project One. There are 282 plots (out of 522) in the Project Two Order where rights (temporary and permanent) are sought by Project Two over land within the Project One Order Limits. Accordingly, Heron is an affected party as well as an interested party.

2.4 This representation also constitutes a representation for the purposes of section 127 Planning Act 2008 on behalf of Heron.

2.5 This submission also engages section 138 Planning Act 2008 in relation to Heron, given the rights vested in or belonging to Heron in relation to its undertaking as a statutory undertaker. These rights take the form of agreements with landowners and lessees, or rights conferred under the Project One Order for the construction and maintenance of apparatus forming part of Project One.

3 BACKGROUND

3.1 Heron and Njord are owned 100% by DONG Energy Wind Power A/S ("DONG Energy"). Vi Aura is owned 100% by Heron.

3.2 DONG Energy was a minority shareholder in Heron and Njord until February 2015 when it took full ownership of Project One. SMart Wind Limited acted as agent for the Project One application but from February 2015, no longer has any involvement with Project One. DONG Energy has no legal interest in Project Two. Accordingly, the two projects are entirely at arm's length and are being promoted separately.

3.3 DONG Energy is the market leader in offshore wind power and the United Kingdom is one of its main markets. DONG Energy operates and is a full or part owner of five established operational offshore wind farms in the UK: Barrow, Burbo Bank, Walney 1 & 2, Gunfleet Sands and London Array (the world's largest offshore wind farm), and is a part owner in the Lincs Offshore Wind Farm which is operated by Centrica.

3.4 DONG Energy also operates and owns with partners the 389MW West of Duddon Sands offshore wind farm in the Irish Sea, inaugurated in October 2014, and the 210MW Westermost Rough offshore wind farm off the East of England, inaugurated in July 2015. DONG Energy's 258MW Burbo Bank Extension in the Irish Sea and 580MW Race Bank offshore wind farm off the East of England are under construction and are expected to be operational in 2017 and 2018, and the 660MW Walney Extension, is in advanced development having been awarded a Contract for Difference.

4 STATUS AND DEVELOPMENT TIMETABLE FOR PROJECT ONE

4.1 The Project One Order came into force on 31 December 2014. The Project One Companies applied for a correction order which came into force on 1 May 2015[1] (Appendix 4). At the Project Two Preliminary Meeting the Examining Authority requested that a proportionate approach was taken to submitting documents from other Nationally Significant Infrastructure Projects (NSIPs) applications and Examinations into the Project Two Examination, whilst taking into account that the Examining Authority cannot consider documents which are not formally submitted into this Examination.

4.2 Bearing that in mind, the following Project One documents are included as appendices to this submission:

(a) The Project One Order;

(b) The Project One Correction Order;

(c) The Explanatory Memorandum submitted with the draft Project One Order;

(d) The three generation licences for Heron, Njord and Vi Aura;

(e) The approved Land Plans;

(f) The approved Works Plans;

(g) The Final version of the Project One Book of Reference.

4.3 As already noted, the Project One Order was granted in December 2014. Project One has also been awarded a Contract for Difference by the Department for Energy and Climate Change under the Final Investment Decision Enabling for Renewables Process. The Contract for Difference enables the financial support mechanism that will facilitate Project One to be constructed. The Contract includes certain milestones and commits the project to a specific development programme. Project One is fully committed to meeting that programme and multiple workstreams are being taken forward ranging from detailed project optimisation, onshore and offshore procurement, through to preparation for the discharge of detailed requirements under the Project One Order and conditions under the deemed Marine Licences.

4.4 The Contract for Difference was awarded through a competitive process, with a significant number of unsuccessful applicants. A Government statement which outlines this process has been included at Appendix 5. The Contracts for Difference (or Investment Contracts) for all eight successful projects are publicly available. The statement to Parliament by the Secretary of State for Energy made when the Project One Contract was laid before Parliament is also reproduced at Appendix 5.

4.5 The Project One Companies consider that it is important that the Examining Authority has an outline understanding of the large number and range of workstreams involved in bringing forward a complex project like Project One to its Financial Investment Decision and then into construction and commissioning.

4.6 The remainder of this section seeks to provide this. The key point is that as Project One proceeds through these various workstreams it is fundamental that any interface with an emerging project opportunity like Project Two is resolved in Project One's favour in a satisfactory manner. Project One cannot accept uncertainty on this matters for any significant period of time, nor should it have to, given that it has secured its Development Consent Order and, crucially, a Contract for Difference.

[1] The Hornsea One Offshore Wind Farm (Correction) Order 2015.

4.7 By contrast, Project Two is still at an early stage and is running to a significantly later timetable. Importantly, it does not have a Contract for Difference. It will have to bid in a future Contract for Difference round against other offshore wind projects and other types of electricity generating projects. There is no guarantee that it will secure a Contract for Difference.

4.8 The Contract for Difference for Project One sets a Milestone Delivery Date of 31 March 2016. By this date, Project One will need to demonstrate to The Low Carbon Contract Company (LCCC), the Contract for Difference counterparty body, that either (i) 10% of the project pre-commissioning costs have been spent (approx. £246m) or (ii) that major supply contracts have been entered into. If this milestone is not met, then the LCCC has the right to terminate the contract.

4.9 Project One is well progressed in achieving its Contract for Difference milestones and deliverables. There are currently circa 100 people working on Project One advancing the design and procurement of the key project components. In parallel with this work are the ongoing discussions with regulators and stakeholders to discharge the requirements of the consents. In July 2015 the preferred supplier was appointed securing the supply and commissioning of wind turbines to Project One, and subject to Final Investment Decision it is intended that the wind farm will be producing electricity by 2020.

4.10 Onshore construction will commence in early 2016 with offshore construction commencing in 2018. A Final Investment Decision is targeted for 2016. The capital investment for Project One is estimated to be in excess of £3 - 4 billion which DONG Energy may seek to fund through the establishment of investor partnerships with a range of different investors requiring necessary due diligence.

4.11 In order to meet the March 2016 milestone in the Contract for Difference, Project One has significantly progressed its construction programme. Activities carried out or underway include:

(a) A detailed geotechnical survey carried out between October 2014 and April 2015. The results of this survey will provide DONG Energy with detailed information about ground conditions at each proposed wind turbine position thereby informing the selection of viable foundation locations and a feasible installation strategy. This survey was a considerable investment for the project with an estimated contract value of £13 million – data collection is complete and the data is currently being analysed.

(b) Agreement of a Planning Performance Agreement (PPA) with North Lincolnshire, North East Lincolnshire, West Lindsey and East Lindsey District Councils. Several meetings have been held to date to discuss the onshore installation programme, which is currently scheduled to commence in early 2016.

(c) Detailed design work for the onshore substation is considerably advanced with designs to inform the installation procurement process anticipated to be completed within the next four weeks. Once the design process is complete, DONG Energy will be conducting a procurement exercise to commission a construction contractor and commence work to prepare for construction.

(d) An employment and skills plan is being developed with the Local Enterprise Partnership and North Lincolnshire District Council. This will aim to highlight employment and supply chain opportunities associated with the construction, operation and maintenance of the Project. In addition, DONG Energy will be hosting events in the region for businesses interested in providing supplies and services for the wind farm.

4.12 It is the contrast between the two projects outlined in this section which sets the context for the examination of the relationship and interfaces between them. The approaches available to resolving issues between the projects are considered further in section 7.

5 EXISTING LEGAL AGREEMENTS BETWEEN PROJECTS ONE AND TWO

5.1 To assist the Examining Authority to understand the commercial context for this Written Representation the contractual background and current position is summarised in this section.

5.2 DONG Energy acquired a 33.3% stake in Project One pursuant to a complex agreement in 2011. At that time there were only two project companies, Heron and Njord. As part of the 2011 arrangements it was agreed to allow for the possibility that Project One might be delivered as three NSIPs rather than two. This led to the Project One draft Order being structured to allow for two or three NSIPs each with a separate undertaker. This is explained in the Explanatory Memorandum (Appendix 6).

5.3 Vi Aura Limited is the third undertaker under the Project One Order. It is owned 100% by Heron.

5.4 The 2011 agreement provided for cooperation between the three shareholders in taking Project One forward.

5.5 DONG Energy had an option, which it later exercised, to acquire the remaining shares in Heron and Njord resulting in DONG Energy taking full ownership of Project One (and thereby full control of Vi Aura, given that Vi Aura is 100% owned by Heron). The full effect of this option was conditional on the Project One Order being granted in accordance with certain criteria.

5.6 The acquisition of the remaining shares took place in February 2015 after the Project One Order had completed its legal challenge period without a legal challenge being made. Since that time Heron and Njord have been owned 100% by DONG Energy (and Vi Aura remains 100% owned by Heron) and are entirely separate from SMart Wind Limited and the Project Two Companies.

5.7 There are three legal agreements in place between relevant companies concerning the relationship between Project One and Project Two going forward, the details of which are commercially confidential.

5.8 One agreement relates to the onshore cable route and related matters and was entered into in December 2011.

5.9 Two other agreements, dated November 2013 and April 2014, relate principally to the onshore substation for Project One. The latter agreement envisaged the negotiation of a fully comprehensive onshore and offshore cooperation agreement between the two projects by Q4 2014, which would supersede the three agreements just mentioned. This agreement is still under negotiation, and is being taken forward as two confidential agreements – an onshore cooperation agreement and an offshore cooperation agreement.

6 THE CROWN ESTATE

6.1 Agreements for Lease are in place with The Crown Estate Commissioners in relation to the entire Project One turbine array areas. These provide for the exercise of an option to take leases over the seabed areas which constitute the consented array area for the Project One Order. They also provide for the grid connection to the shore from each lease area. These agreements are commercially confidential.

7 APPROACH TO RESOLVING ISSUES BETWEEN PROJECTS ONE AND TWO

7.1 Section 9 of the Project Two Order Cable Statement (Document 11.2) deals with "Interfaces between Project One and Project Two". The Cable Statement explains the close proximity, and partial overlap, between the two projects. It correctly states that there are a number of areas and issues, both offshore and onshore, where the interests of the two projects may conflict unless there is agreement between them.

7.2 There are two mechanisms by which conflict between Project One and Project Two can be resolved – by commercial agreement or by means of the final provisions of the Development Consent Order, assuming it is granted.

By Agreement

7.3 The Project One Companies are in active negotiation with the Project Two Companies in relation to the various issues highlighted in the Project One Relevant Representation and amplified in more detail in this Written Representation.

7.4 It is the Project One Companies' preference that these matters be dealt with by way of confidential commercial agreements, as long as it can be reached on satisfactory terms which properly protect the interests of Project One. As already noted it is intended that these be resolved by Deadline 2.

7.5 If binding agreements can be reached before the end of the Examination which resolves all matters between Project One and Project Two, then the Project One Companies will notify the Examining Authority of that fact and submit an agreed Statement of Common Ground. The Statement will outline the areas covered by the agreement and, in accordance with the terms of such agreement, will withdraw, vary or confirm the various Project One representations as part of such agreement. It may also provide for the inclusion of agreed Protective Provisions and Development Consent Order amendments.

By way of the Secretary of State's decision and the terms of any Development Consent Order

7.6 It is imperative to the delivery of Project One that its interests are protected in all eventualities. Given that the Project Two application was submitted without agreement of the confidential cooperation agreements having been reached between Project One and Project Two, Project One was obliged to submit a Relevant Representation highlighting the various areas of potential conflict between the two projects. It has furthermore been necessary for Project One to submit this Written Representation to explain the areas of conflict in more detail, to explain the adverse impact of these issues on Project One unless they are addressed, and to propose solutions which are necessary to protect the interests of Project One.

7.7 It should be noted that Project Two has not included any Protective Provisions in the draft Development Consent Order which seek to protect Project One from Project Two. The Project Two Companies have assumed that a confidential commercial agreement will be reached.

7.8 When considering the changes to the Project Two draft Development Consent Order which Project One requires, the Examining Authority and the Secretary of State are required to apply the test in section 104 Planning Act 2008. In particular, the Secretary of State:

(a) Must decide the application in accordance with any relevant national policy statement, except to the extent that (among other things) the Secretary of State is satisfied that the adverse impact of the proposed development would outweigh its benefits;

(b) In deciding the application must have regard to any relevant national policy statement and (among other things) any other matters which she thinks are both important and relevant to the decision.

7.9 It is submitted that in this case, where Project Two and the terms of the Development Consent Order sought by the Project Two Companies are adverse to the delivery of Project One that:

(a) Such adverse effects constitute matters which should be regarded as "important and relevant" the Secretary of State's decision and which must therefore be had with regard to;

(b) Such adverse effects would represent an "adverse impact" which is capable of outweighing the benefit of the proposed development i.e. Project Two, such as to justify amending the Development Consent Order;

(c) The principles set out in Section 2.6 of National Policy Statement for Renewable Energy Infrastructure (EN-3) should apply when deciding whether Project Two is "in accordance" with the relevant national policy statements (i.e. EN-1, EN-3 and EN-5).

7.10 Section 2.6 relates to the impacts of offshore wind farms on oil, gas and other offshore infrastructure and activities. It is does not specifically address the interaction between two offshore wind farms, but the principles to be applied in that situation must be the same. In particular:

(a) Paragraph 2.6.179: the promoter of an offshore wind farm should undertake an assessment of the potential effect of the proposed development on existing or permitted infrastructure or activities.

(b) Paragraph 2.6.180: the promoter should engage with interested parties (in this case the Project One Companies) early in the development phase with an aim to resolve as many issues as possible prior to the submission of an application;

(c) Paragraph 2.6.181: such engagement should continue throughout the life of the development to ensure that solutions are sought to exist that allow offshore wind farms and other uses of the sea to successfully co-exist.

(d) Paragraph 2.6.183: the decision maker should adopt a pragmatic approach where a proposed offshore wind farm potentially affects other offshore infrastructure or activity. The decision maker should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable.

(e) Paragraph 2.6.184: the decision maker should be satisfied that the site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. The decision maker should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.

(f) Paragraph 2.6.185: where a proposed development is likely to affect the future viability or safety of an existing or approved/licensed offshore infrastructure or activity, the decision maker should give these adverse effects substantial weight in its decision-making.

(g) Paragraph 2.6.186: providing proposed schemes have been carefully designed by the applicants and the necessary consultation has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on other offshore infrastructure or operations to a level sufficient to allow the decision maker to grant consent.

(h) Paragraph 2.6.187: detailed discussions between the applicant and relevant consultees should have progressed as far as reasonably possible prior to the submission of an application. As such appropriate mitigation should be included in any application and ideally agreed between relevant parties.

7.11 The tests set out in this section are those which must be applied when considering the issues considered below in sections 8 to 13.

Compulsory acquisition and Statutory Undertakers

7.12 In addition to the tests under section 104, where powers of compulsory acquisition are sought, the Secretary of State is also obliged to consider the tests for compulsory acquisition, which are set out in the Statement of Reasons and are not repeated here. This is particularly the case where another NSIP has already secured powers of compulsory acquisition as is the case here. Furthermore, where a statutory undertaker is affected by proposed compulsory acquisition, the Secretary of State must consider the "serious detriment" test under section 127 and the test under section 138 that the impact on the statutory undertaker is "necessary".

7.13 As already explained, whilst the manner of resolving matters in the absence of agreed cooperation agreements have just been highlighted, the Project One Companies are working towards an outcome where fully testing those issues in the Examination can be avoided and these representations can be withdrawn as part of an agreed package with Project Two.

8 OVERLAP OF ORDER LIMITS - ONSHORE TEMPORARY AND PERMANENT WORKING AREAS AND COMPOUNDS

8.1 In sections 8 to 13, the Project One Companies have followed a consistent approach in setting out the relevant part of the Relevant Representation, explaining the issues in more detail, proposing the solution or solutions required and highlighting the risks to Project One if those solutions cannot be achieved.

8.2 **Relevant Representation:** "There are a number of locations identified within the Project Two Work Plans where there is a complete overlap and, as a consequence, possession proposed for the usage of temporary working areas. This is particularly clear at the onshore substation site."

8.3 "There is an area of proposed permanent acquisition of part of the Project One substation area. This should either be removed, or made subject to Protective Provisions which mean that land/rights can only be acquired with Project One's consent."

8.4 **Issue in detail:** The Project Two application seeks a full set of powers of compulsory acquisition and temporary use to deliver Project Two. There is a considerable overlap between the works proposed and the powers sought for Project Two and the land arrangements already in place for Project One. The Project One Order contains a full set of compulsory acquisition powers and temporary use powers to deliver Project One, which underpin, where applicable, the numerous voluntary agreements which have been entered into by Heron with relevant land owners and those holding land interests. These powers have been granted after full consideration in the Examination into the Project One application and found to satisfy the various tests for compulsory acquisition under the Planning Act 2008.

8.5 The Statement of Reasons for Project Two, with one exception (the compensation compounds), does not address the overlap between the granted powers for Project One and those sought for Project Two. There are no Protective Provisions in the draft Development Consent Order to provide protection to Project One in relation to how the powers sought might be utilised. Section 9 of the Cable Statement (Document 11.2)

does, however, acknowledge the issue in general terms and highlights the need for a confidential cooperation agreement, which is under active negotiation.

8.6 The Project One Companies have reviewed the overlap of the powers sought for Project Two with the powers already secured in the Project One Order. The interaction between the powers is shown on 54 plans included at Appendix 7 referred to in this submission as the Project One Project Two Onshore Overlap Plans (the Overlap Plans). These plans show which Plots in the Project Two Land Plans affect the Plots in the approved Land Plans (Appendix 8) under the Project One Order. In addition the Overlap Plans show the full red line of the Project One Order Limits with the land unaffected by Project One shown in dark grey. Finally, the plans show in light grey the Project Two Order Limits land which does not overlap with the Project One Order Limits.

Project One Substation

8.7 There is a particular conflict between the Project Two proposals and the approved Project One substation, shown on Overlap Plan 1. Plot 506 in part seeks permanent acquisition of a significant part of the Project One substation land where Project One already has powers to acquire the land permanently. (The remainder of Plot 506 seeks permanent acquisition of land which Project One has temporary use powers for the purpose of constructing the neighbouring Project One substation.) In addition, Plot 505 seeks temporary occupation of the majority of the Project One substation land where Project One already has powers to acquire the land permanently. Finally, Plots 503 and 507 seek powers of temporary occupation and acquisition of permanent rights over land where, again, Project One already has powers to acquire the land permanently.

8.8 Since the grant of the Project One Order, Project One has significantly progressed its detailed design phase for the onshore substation. The designs show that Project One requires the full extent of the consented Order Limits designated for permanent use for the substation. Figure 1 below provides a visualisation of the Project One substation showing how the electrical infrastructure will fill the full extent of the Project One Order Limits at the substation site.

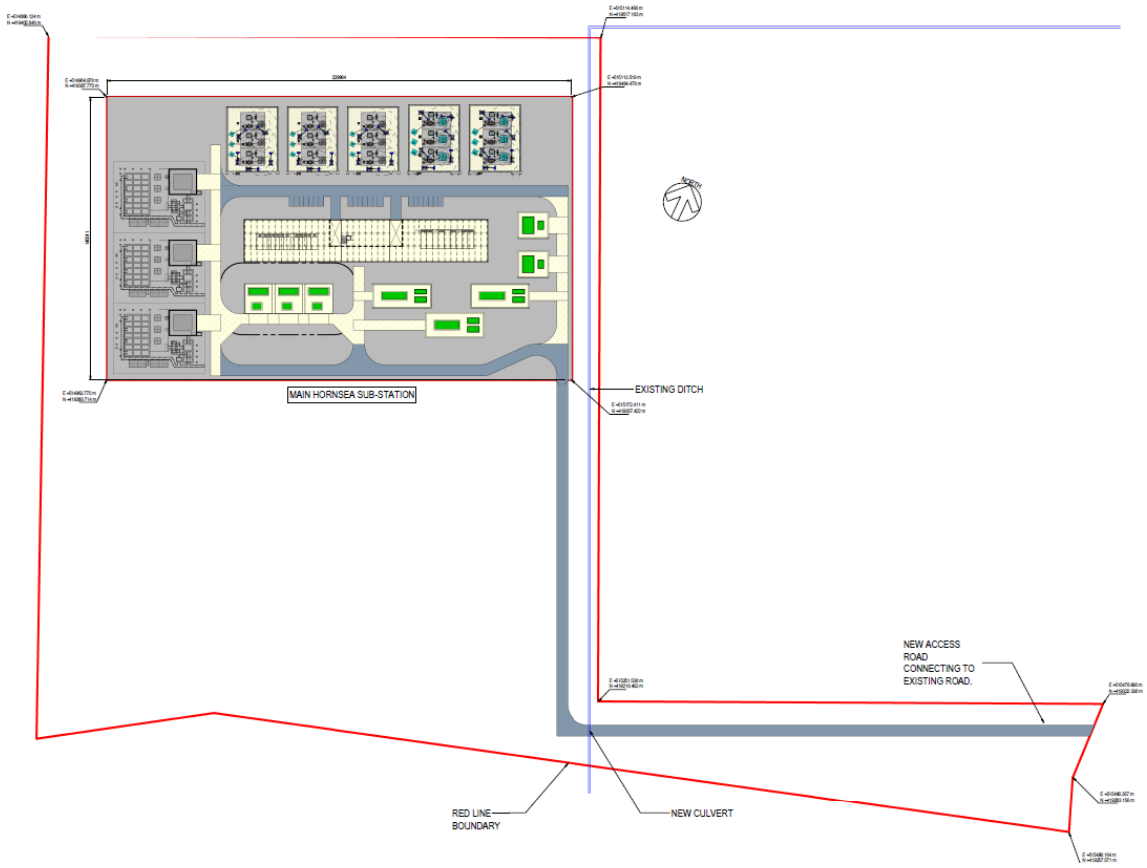


Figure 1: Diagram showing the Project One substation infrastructure illustrating full utilisation of the Order Limits for the substation.

8.9 The Statement of Reasons does not explain why Project Two requires permanent acquisition of part of this land, as part of Plot 506, in the light of its intended use for Project One (paragraph 5.2.5, for example, does not address the issue[2]). Given Project One's proposed use and the fact that it has already secured the land by agreement (and, as a fall back, successfully secured powers of compulsory acquisition under the Project One Order), the Project One Companies' request the compulsory powers sought are not granted and that this land is removed from the Book of Reference. If this is not done the uncertainty created by Project Two having competing powers of compulsory acquisition over part of its main substation site would adversely affect delivery of the project and would cause serious detriment to the undertakings of the Project One Companies given that all three statutory undertakers are relying on the delivery of the substation for delivery of the three NSIPs within the Project One Order.

8.10 An alternative approach would be for Protective Provisions to be included in the Project Two Order which prevented use of the powers of compulsory acquisition without the agreement of the Project One Companies. This, however, is not appropriate in this instance where it is known in advance that the land will not become available.

8.11 The same point applies to the request for powers of temporary use over Plot 505, 503 and 507. These are inconsistent with the delivery of the Project One substation across the full substation land and should be removed from the Order. In addition, the use of the remainder of Plot 506 as a lay down area for Project One needs to be preserved in Protective Provisions or a confidential cooperation agreement.

[2] The reference to Plot 508 should be to Plot 506.

Other Project One Land

8.12 There are various other Plots where Project Two is seeking permanent rights and/or powers of temporary occupation where Project One already has powers for permanent rights and/or temporary occupation under the Project One Order. These are shown in full in the Overlap Plans. If these powers are to be granted, they can only be granted if Project One has certainty as to how and when the powers will be used so that the Project One Companies have the ability to ensure that the construction and maintenance of Project One is not adversely affected. This can either be delivered by way of Protective Provisions or a confidential cooperation agreement or both.

8.13 The one area where the Statement of Reasons and the Project Two Development Consent Order acknowledges a potential impact on Project One relates to the use of construction compounds for Project One. This is addressed in paragraph 6.5 onwards. The Project One Companies understand and agree with the principle which Project Two is seeking to address. It is essential that the mechanics of proposals work satisfactorily to provide the necessary certainty and protection for Project One. These are the subject of discussions with Project Two as part of the onshore confidential cooperation agreement.

8.14 **Proposed solution:** The Project One Companies require the removal of Plots 503, 505, 507 and the northern part of Plot 506 (shown separately on Overlap Plan 1) from the Project Two Development Consent Order and the Book of Reference.

8.15 The Project One Companies require suitable Protective Provisions to be included within the Development Consent Order in relation to the other Plots where there is overlap between the powers sought for Project One and Project Two and/or for the relevant matters to be dealt with under a confidential cooperation agreement between the two projects.

8.16 The mechanism for the Compensation Compounds needs to provide sufficient certainty and control to Project One in the event that it is triggered. The provisions on the face of the Development Consent Order may require some amendment and may need to be supplemented in a confidential cooperation agreement.

8.17 The Protective Provisions for Project One should be included within a new Part 11 of Schedule L "For the protection of Heron Wind Limited".

Risk if proposed solution not implemented: If the relevant part of Plot 506, together with Plots 503, 507 and 508 are not removed from compulsory acquisition it will expose Project One to unacceptable risks in terms of the timely delivery and operation of the substation to be installed and therefore the project as a whole. One important aspect of this is the need to satisfy a future Offshore Transmission Owner that there are suitable protections in place in relation to the transmission assets which it will take over on appointment.

8.18 In relation to the remaining Plots where powers overlap, if suitable Protective Provisions are not included within the Development Consent Order to protect Project One (and/or a suitable confidential cooperation agreement is not entered into), it will expose Project One to unacceptable risks in terms of the timely delivery, operation and maintenance of the onshore works to be installed and therefore the project as a whole. Again, an important aspect of this is the need to satisfy a future Offshore Transmission Owner that there are suitable protections in place in relation to the transmission assets which it will take over on appointment.

9 CONNECTION INTO KILLINGHOLME SUBSTATION

9.1 **Relevant Representation:** "There are three new generating stations seeking to connect into Killingholme substation - Project One, Project Two and North Killingholme Power

Project (promoted by C.GEN North Killingholme Limited). Project One's current proposal is to begin works for the onshore substation in January 2016. In light of this Heron is in discussion with the Applicant and with C.GEN in relation to the routing of cables to the Killingholme substation."

9.2 **Issue in detail:** Project One has a connection agreement with National Grid Electricity Transmission Limited to connect into the Killingholme substation. The Project One Order authorises the construction of that connection. The route(s) available under the Development Consent Order are to be supplemented by a planning permission which has been designed to dovetail with the works powers under the Development Consent Order. This application is currently with North Lincolnshire Council for determination.

9.3 Heron has the benefit of powers of compulsory acquisition under the Project One Order, to enable it to secure the necessary property rights to deliver the grid connection, in addition to the rights obtained by agreement.

9.4 C.GEN North Killingholme Limted ("C.GEN") does not have planning permission or, it is understood, real estate rights, to connect its project to the Killingholme substation. Its attempt to obtain compulsory acquisition rights for a corridor were rejected by the Secretary of State. Nevertheless, the Project One Order includes protective provisions in favour of C.GEN North Killingholme Limited ("C.GEN"), which provide for the de facto reservation of a route for the grid connection for C.GEN's project to the Killingholme substation. The operation of these protective provisions were varied by way of a confidential agreement dated 20th January 2015. It is not intended that a further agreement will be entered into between the Project One Companies and C.GEN as the matter is already addressed. The Project One Companies are maintaining a dialogue with C.GEN generally going forward.

9.5 Project Two also has a grid connection agreement to connect to the Killingholme substation and is seeking development consent and associated compulsory powers in the Project Two Development Consent Order. The issues associated with the interaction between the Project One grid connection and the Project Two grid connection and associated powers of compulsory acquisition form part of the matters under discussion with Project Two as explained in section 8.

9.6 **Proposed solution:** The solution proposed in relation to Project Two has already been addressed in Section 8 i.e. a commercially confidential cooperation agreement and/or Protective Provisions. The C.GEN position has been explained by way of background as it does not require further measures in connection with the Project Two application from Project One's perspective.

10 INTERTIDAL ACCESS

10.1 **Relevant Representation:** "The interaction between the two projects during construction and maintenance must be controlled to ensure that the delivery of services to Project One is not adversely impacted."

10.2 **Issue in detail:** The Project Two draft Development Consent Order includes a condition in the deemed Marine Licences (Project A: Transmission assets and Project B: Transmission assets, Schedule 1, Part 1) stating that, where works authorised by the Project One Offshore Wind Farm Order 2014 are planned to take place within the Project Two Order Limits, the undertaker must not construct or install licensable activities comprised in Work numbers 4A and 5B within 1km of the sea wall. The condition as stated in the draft Project Two Development Consent Order states:

"*In the event that works authorised by the Hornsea One Offshore Wind Farm Order 2014(a) are planned to take place in the intertidal area comprised within the offshore Order limits or within the area whose co-ordinate in paragraph (5) below, the undertaker must not construct or install those licensable activities comprised in Work Nos. 4A and*

5A within one kilometre seaward of the seawall during the period of time commencing two hours before a high tide greater than 7.7 metres (as measured at Grimsby) and ending two hours after a high tide greater than 7.7 metres (as measured at Grimsby) between 1 April and 31 May (inclusive) and 1 August to 30 September (inclusive), unless otherwise approved in writing by the MMO, in consultation with Natural England."

10.3 The Project One deemed Marine Licence 4 carries a similar condition which states:

"*In the event that the MMO notifies the licence-holder that other works are planned to take place in the intertidal area comprised within the offshore Order Limits or within the area whose coordinates are set out in Table 8, the licence holder must not construct or install those licensable activities comprised in Work Nos. 6 and 7 within one kilometre seaward of the seawall during the period of time commencing two hours before a high tide greater than 7.7 metres (as measured at Grimsby) and ending two hours after a high tide greater than 7.7 metres (as measured at Grimsby) between 1st April and 31st May (inclusive) and 1st August to 30th September (inclusive), except to the extent approved in writing by the MMO, in consultation with Natural England*."

10.4 There is some ambiguity between these two conditions. On the one hand the condition within the Project Two draft Development Consent Order states that relevant works in the intertidal area will not be carried out if Project One activities are being carried out in the same area however, the Project One deemed Marine Licence states that Project One activities cannot be carried out in the same area if "other works" are planned to take place.

10.5 Project One is a consented project and has been awarded a Contract for Difference. As set out earlier in this Written Representation, Project One has to meet a series of milestones related to project development costs or supply contracts. As a consequence of this, the construction programme must align closely with the Contract for Difference to avoid any termination of the contract. The Project One intertidal cable installation is currently programmed for 2018. According to Document 7.1.3: Project Description; Section 3.5, Project Two is anticipated to commence construction in 2017 with intertidal cable installation anticipated to take place in Year 2. This suggests that the Project Two cable could be installed in the intertidal area in 2018.

10.6 Although, in theory, the intertidal section of the Project One export cable could be installed by the time the Project Two intertidal cable installation commences, Project One may still need access to the cable for installation and inspection purposes and ultimately during commissioning which will take place in 2018, 2019 and possibly 2020. Whilst the drafting in the Project Two draft Development Consent Order provides some protection for planned Project One works, it does not provide protection if emergency repairs works are needed. In the instance that Project Two cable installation is in progress, on the basis of the deemed Marine Licence conditions stated above, access may not be granted to Project One for unplanned works unless Project Two construction activities are halted. Project One and Project Two must come to an agreement about how to prioritise works in the intertidal area – both during construction so as not to risk Project One's Contract for Difference and to facilitate planned and emergency maintenance works.

10.7 **Proposed solution:** The Project One Companies require Protective Provisions to be included within the Development Consent Order or a confidential cooperation agreement (which is under negotiation) which will provide confidence that the detailed design of the route of the export cable (and associated equipment) and their subsequent construction can proceed in a timely manner without unacceptable interference from Project Two. The Protective Provisions will also need to enable the operations and maintenance of the circuits once installed are protected from unacceptable interference from the construction, operation and maintenance of any Project Two circuits.

10.8 The Protective Provisions for Project One should be included within a new Part 11 of Schedule L "For the protection of Heron Wind Limited".

10.9 **Risk if proposed solution not implemented:** If a suitable confidential cooperation agreement is not in place or suitable Protective Provisions are not included within the Development Consent Order to protect Project One, it will expose Project One to unacceptable risks in terms of the timely delivery and operation of the circuits to be installed and therefore the project as a whole. One important aspect of this is the need to satisfy a future Offshore Transmission Owner that there are suitable protections in place in relation to the transmission assets which it will take over on appointment.

11 OVERLAP OF ORDER LIMITS - PERMANENT INFRASTRUCTURE OFFSHORE

11.1 **Relevant Representation:** "The export cable area for Project Two crosses the consented wind farm array area for Project One. The Cable Statement explains that this is intended to allow for the possibility of a shorter grid connection for the north eastern area of Project Two. Such a route would, however, have substantial adverse consequences for Project One and consequently Project One must be specifically protected under the Project Two Order."

11.2 "The offshore export corridor for Project Two overlaps with that already consented for Project One. The interaction between the two projects during construction and maintenance must be controlled to ensure that the safe and timely delivery of Project One is not adversely impacted.

11.3 **Issue in detail:** Work Numbers 4A and 4B of the Project Two application (Document 5.1) overlap entirely with Project One's Order Limits. The intention is for Project Two to use this area for permanent infrastructure as described in Figure 3.2 in document 7.1.3 Project Description – this area is identified as a 'shared cable corridor'. There are three areas where protection must be guaranteed to Project One.

Overlap between Project Two export cable route(s) and Project One array

11.4 A large part of the area covered by Work Numbers 4A and 4B has already been granted consent in the Project One Order as the location for wind turbine generators (WTGs), array cabling and export cables. Installation of any permanent infrastructure within areas already identified and consented for Project One infrastructure presents a risk to the integrity of the assets.

11.5 As explained in section 4 of this submission, Project One is already progressing towards construction. Wind turbine generator and offshore substation foundations are currently planned to be installed in 2018 and 2019; inter array cabling is planned to be installed in 2018 and 2019.

11.6 Installation of Project Two cabling across the entire Project One array area(s) would involve a disproportionate number of cable crossings with the associated risk of damage to cables. The Cable Statement acknowledges that this has been included as an option, rather than a necessary part of the project. It must be the case that any cost savings arising from a shorter export cable route will be materially reduced by the extra costs of laying cables across a fully or partially installed array.

11.7 **Proposed solution**; The Project One Companies would strongly prefer that consent is not granted for export cables to run across the Project One array area and that Works 4A and 4B are revised accordingly. If, however, that is not accepted, then the Project One Companies require that Protective Provisions are included in the Development Consent Order which give the Project One Companies the ability to approve the detailed arrangements for the interface between Project One and Project Two during the construction, operation and maintenance of the projects.

11.8 The Protective Provisions for Project One should be included within a new Part 11 of Schedule L "For the protection of the Project One Companies".

Overlap between Project Two cable corridor and Project One cable corridor

11.9 A similar issue arises in relation to the export corridor for Project One. The Project Two export corridor (Works 4A and 4B) overlaps with the full length of the Project One export corridor (Work 6). The Project One Companies require a confidential cooperation agreement (which is under negotiation) or that Protective Provisions are included in the Development Consent Order which give the Project One Companies the ability to approve the detailed arrangements for the interface between Project One and Project Two during the construction, operation and maintenance of the projects.

11.10 A variation on these themes arises as the Project Two export corridor approaches landfall and in the intertidal area. Here Works 5A and 5B are drawn such that the Project Two export cable corridor passes just to be north of the consented corridor for Project One, though, importantly, there is overlap in relation to compulsory powers sought for permanent rights for access and anchorage and temporary occupation over Project One's export cable corridor.

11.11 **Proposed solution**: Again, the Project One Companies require a confidential cooperation agreement or that Protective Provisions are included in the Development Consent Order which give the Project One Companies the ability to approve the detailed arrangements for the interface between Project One and Project Two during the construction, operation and maintenance of the projects.

11.12 The Protective Provisions for Project One should be included within a new Part 11 of Schedule L "For the protection of Heron Wind Limited".

11.13 **Risk if proposed solution not implemented:** If a suitable confidential cooperation agreement is not in place or suitable Protective Provisions are not included within the Development Consent Order to protect Project One, it will expose Project One to unacceptable risks in terms of the timely delivery and operation of the circuits to be installed and therefore the project as a whole.

11.14 One important aspect of this is the need to satisfy a future Offshore Transmission Owner that there are suitable protections in place in relation to the transmission assets which it will take over on appointment.

12 PROJECT TWO BUFFER AREA AND WAKE EFFECTS

12.1 **Relevant Representation:** "If Project Two is constructed up to the Order Limits there will be wake effects which will impact Project One. This has been recognised in the 4 indicative layouts included in the Project Description (Figure 3.5) forming part of the Environmental Statement. Each of these layouts shows a buffer zone (area of no turbine installation) along the full length of the boundary with Project One. This is not however reflected in Project Two's Development Consent Order submission. Project One requires a provision in the Project Two Order which prevents the construction of turbines within the buffer area unless otherwise agreed by Project One. For the avoidance of doubt Project One will require a co-operation agreement in relation to these impacts."

12.2 **Issue in detail:** As a wind turbine extracts energy from the wind, it reduces the momentum of and increases the turbulence in the air that has passed through the rotor. This means that the wind passing through a location immediately downwind of a turbine will have a reduced wind speed and decreased electricity production potential. The wind gradually recovers its electricity production potential as it travels onward from the turbine, increasing back towards the level of useful energy it possessed before passing through the first wind turbine.

12.3 Turbines that are in the wake of another turbine (in a downwind position) will have a reduced energy production than those in an upwind location as there is less potential energy available in the wind. This loss of energy for downwind turbines relative to

turbines that are not in the wake of another turbine, is called 'wake loss'. The wake loss value for the wind farm is taken as an average of all turbine locations and includes the full distribution of wind speeds and directions. As wake losses represent a loss to the potential power production of a wind farm, they impact the productivity resulting in lower energy yields which in turn will reduce the contribution the wind farm can make to the Government's targets for renewable energy. This is also an important aspect in developing the business case which informs the Final Investment Decision for the project. Wind farm projects therefore seek to reduce wake losses to maximise energy production and to better understand the long term business case for the project.

12.4 The wake losses of a wind farm are affected by site conditions such as the wind speed and wind direction. They are also affected by wind farm design factors such as the turbine type, the turbine layout and turbine spacing. In general a windfarm layout optimisation to reduce wake losses seeks to allow each turbine the maximum free space surrounding the turbine, with a bias toward the prevailing wind directions. This means that wind farm layouts optimised for wake losses seek large spacing between turbines, but can have smaller turbine spacing on the windfarm boundaries. The Hornsea Project One layout has been optimised to reduce wake losses as well as considering a large number of other important factors such as navigation and Search and Rescue requirements as well as seabed conditions. The Project One layout has been developed such that the intended layout maximises the yield from Project One.

12.5 If Hornsea Project Two is constructed it will increase the wake losses of Project One (and hence decrease the productivity and revenue of Project One) by the above described mechanism as there will be turbines downwind of the Project One turbines in a large range of wind directions. There is some uncertainty within the current understanding of wake effects over very large turbine arrays, such as those seen at Hornsea Project One and Project Two. However, a conservative estimate of the impact that Project Two may have on Project One is an increase in the wake losses by approximately 40%, based on a Project Two layout designed only to reduce wake losses on Project Two.

12.6 The current drafting of the Project Two Development Consent Order leaves significant uncertainty as to the level of negative impact that Project Two will have on the business case of Project One. This uncertainty makes taking financial investment decision on the project much harder as well as significantly decreasing the value of the project to potential investors or financial partners, due to the significant increase in the uncertainty on the return of the project.

12.7 It is the view of Hornsea Project One that a buffer zone around Project One is required. Within this buffer, Project Two would have to seek approval for any turbine installation. The scale of such a buffer will be agreed by way of a confidential cooperation agreement between Project One and Project Two or Protective Provisions. Such a buffer would not compromise the potential for Project Two to design an efficient turbine layout.

12.8 **Proposed Solution:** The Project One Companies require a suitable confidential cooperation agreement (which is under negotiation) or Protective Provisions to be included within the Development Consent Order which will provide confidence that Project Two must agree to the scale of a wake loss mitigation buffer. The exact scale of the wake loss mitigation buffer will be agreed by way of a confidential cooperation agreement between Project One and Project Two.

12.9 The Protective Provisions for Project One should be included within a new Part 11 of Schedule L "For the protection of the Project One Companies".

12.10 **Risk if proposed solution not implemented:** If suitable Protective Provisions are not included within the Development Consent Order to protect Project One, Project One are at risk of having significant wake losses imposed by Project Two and they will not be able to maximise energy production from the wind farm. This will affect the long term business case for the project. A lack of Protective Provisions surrounding a buffer area

would also increase the uncertainty on the Project One energy yield and hence financial return, this could significantly reduce the ability of Project One to raise finance for the project.

13 PROXIMITY OF PROPOSED PROJECT TWO DREDGED DISPOSAL AREAS TO PROJECT ONE TRANSMISSION ASSETS

13.1 **Relevant Representation:** "The Project Two Order includes the designation of specific areas within the offshore Order Limits as disposal areas for dredged spoil generated during construction. These areas are located within the shared export cable corridor and the Project One Companies are concerned that these activities are controlled to ensure that they will not adversely affect the Project One transmission assets offshore."

13.2 **Issue in detail:** Project Two has issued a site characterisation report to the Marine Management Organisation and Cefas (Document 7.4.3.8 Dredging and Disposal Site Characterisation) to request three sites for the disposal of material produced during the construction of the Project Two project. This material will be produced as a consequence of:

a. Foundation installation i.e. any drilled material produced during installation of wind turbines, accommodation platforms, offshore substations where drilling is used; and

b. Cable installation i.e. from dredging sandwaves where dredging is used as a method to prepare the seabed for laying the export cables.

13.3 Of the three proposed disposal sites assessed in the Project Two application, two overlap entirely with disposal sites already designated in the Project One Order. These are identified as Disposal Area 2A and Disposal Area 2B in Document 7.4.3.8 Dredging and Disposal Site Characterisation and also in the draft Development Consent Order deemed Marine Licences (Project A: Transmission Assets and Project B – Transmission Assets). Both of these sites have already been designated as disposal sites HU209 (overlap with Disposal Area 2A) and HU210 (overlap with Disposal Area 2B) for a specified maximum volume in the Project One Order.

13.4 Project One can accept the shared use of HU209 (Disposal Area 2A) and HU210 (Disposal Area 2B) provided that they are only utilised by Project Two for the disposal of sand, and only with coordination and suitable control to protect Project One. This is also subject to Project Two securing the specified increases in volume in the Project Two Development Consent Order application documents.

13.5 **Proposed solution:** A suitable confidential cooperation agreement (which is under negotiation) or Protected Provisions should specify Project One agreement of disposal plans (and any relevant technical studies that evidence these plans) prior to issue to the Marine Management Organisation detailing location, methods and timings of dredging and disposal. It is also necessary that disposal monitoring and control requirements are agreed with Project One in advance of Project Two cable installation. In addition, Project One require a Project One representative on board the vessels engaged in Project Two dredging/disposal activities to ensure disposal takes place only in agreed locations.

13.6 In the event that it is necessary for Project Two to dispose material over the Project One cables only sand is permitted to be disposed over the cables and this should not be done without prior agreement from Project One.

13.7 In the case of clay and boulders only material from cable route clearance and trenching should be disposed of within the cable corridor (but not over Project One cables). The clay should, wherever possible be used to backfill the trenches and the boulders can

only be disposed of clear of any cables in accordance with a proximity agreement which must be drafted and agreed before disposal of boulders can take place.

13.8 Material from other operations i.e. wind turbine generator and offshore substation ground preparation or drilling cannot be disposed within the cable corridor.

13.9 The Protective Provisions for Project One should be included within a new Part 11 of Schedule L "For the protection of Heron Wind Limited".

13.10 **Risk if proposed solution not implemented:** If a suitable confidential cooperation agreement is not in place or suitable Protective Provisions are not included within the Development Consent Order to protect Project One, it will expose Project One to unacceptable risks in terms of the operation of the circuits to be installed and therefore the project as a whole. One important aspect of this is the need to satisfy a future Offshore Transmission Owner that there are suitable protections in place in relation to the transmission assets which it will take over on appointment.

14 RESPONSES TO EXA'S FIRST WRITTEN QUESTIONS

14.1 The Questions directed at the Project One Companies are reproduced and responded to in the tables below.

ExA ref.	Question to:	Question	Hornsea Project One Response
PN3	Hornsea Project 1 and the Applicant	The nature of the potential relationships, sequencing and timetabling of the construction of various elements of Hornsea Project 1 and Hornsea Project 2 are unclear, in particular where co-existence is required and rights may have to be shared. Some of the issues of concern are raised in [RR15]. Please clarify what progress has been made in the development of a Co-operative Agreement between Hornsea Project 1 and Hornsea Project 2, with regard to each of the following key issues of concern: (a) Overlap of Order limits for onshore temporary workings and compounds (b) Connection into the N. Killingholme sub-station; (c) Inter-tidal access and working areas; (d) Onshore and offshore cable routes and; (e) Offshore turbine layouts. Please also update the ExA on the current position on a SoCG in relation to these issues, as requested in the Rule 6 Letter, Annex G.	The confidential cooperation agreement, which is divided into two agreements (onshore and offshore), is the subject of ongoing and constructive discussions covering all the issues identified in PN3. It is intended that these are signed by Deadline 2. The Agreements are intended to provide for workable cooperation arrangements during all phases of Project One and Project Two. A draft statement of common ground, based on an original draft prepared by the Project Two Companies, has been submitted on 14 July 2015 to Smart Wind Ltd for discussion. It is enclosed at

			Appendix 9. The Project One Companies have been concentrating their efforts on the substantive issues to be addressed in the confidential cooperation agreements. Once these are signed a suitable Statement of Common Ground can be submitted into the Examination which summarises the position at that time.

ExA ref.	**Question to:**	**Question**	**Hornsea Project One Response**
CA10	Applicant	Do the Hornsea Project 1 Companies wish to comment on the proposed compensation compounds subject to requirement 22 of the draft DCO [APP-010] and set out in the Compensation Compounds Plan [APP-069] and discussed in the SoR [APP-016] in para. 6.5 – 6.12?	See section 8 of the Written Representation in which it is explained that the principle is accepted and the detail is under discussion with Project Two as part of negotiations on a confidential cooperation agreement.

ExA ref.	**Question to:**	**Question**	**Hornsea Project One Response**
CA11	Statutory undertakers (SU), and Hornsea Project 1 companies.	In relation to Requirement 22 'Compensation compounds' of the draft DCO [APP-010] and set out in the Compensation Compounds Plan [APP-069] and discussed in the SoR [APP-016] in p.6.5 – 6.12 can the applicant: (a) Explain what mechanisms will be used to ensure that land earmarked for compensation compounds in Hornsea Project 1 will be made available to Hornsea Project 2? (b) What steps will be taken to ensure that other stakeholders, for example the local planning authorities, are aware of any land transfers and which project operator has	(a) The Project One Companies' understanding of the Project Two proposal is that this would be dealt with under a confidential commercial agreement, which is currently under negotiation. (b) The Project One Companies' understanding of the Project Two proposal

		control of which plot of land?	is that the Compensation Compound arrangements will operate under the ambit of the Project Two Development Consent Order and it is for this reason that they have made the case for them being associated development.

15 COMMENTS ON RELEVANT REPRESENTATIONS

15.1 The Environment Agency refer at paragraph 12.1 of its Relevant Representation to a land agreement dealing with issues concerning Project One and Project Two. The Project One Companies would like to point out that this agreement does not relate to Project Two.

LIST OF APPENDICES

1. Project One Companies' Relevant Representation
2. The Hornsea One Offshore Wind Farm Order 2014
3. Electricity Generation licences for Heron, Njord and Vi Aura
4. The Hornsea One Offshore Wind Farm (Correction) Order 2015
5. DECC news item dated 23 June 2013 concerning the Final Investment Decision Enabling programme and Statement to Parliament by Edward Davey
6. The Explanatory Memorandum submitted with the draft Project One Order
7. Overlap Plans
8. Project One Land Plans
9. Draft Statement of Common Ground between Project One and Project Two Companies
10. The Final version of the Project One Book of Reference
11. Project One Works Plans

Annex 3 - Extracts from the Awel y Môr ExA report and decision

Awel Y Môr Offshore Wind Farm ExA's Report

- Perimeter fencing – The construction working area would be enclosed within fencing, enabling the continued use of nearby routes whilst work is underway but separated from users of the routes. The type of fencing would be selected to suit the location and purpose and would be agreed with Denbighshire County Council (DCC) and landowners. Perimeter fencing would be detailed in the Construction Method Statement, which would be secured by R10 of the dDCO; and
- Inspection and maintenance - The export cable and its infrastructure would be designed to require zero maintenance over the operation period. Inspection would be undertaken through link boxes and test pits.

5.14.37. At D4, the Applicant submitted an Outline Skills and Employment Strategy (oSES) [REP4-007], which would be secured by R20 of the dDCO. The document provided an outline strategy which would be developed further with the relevant key consultees into a Skills and Employment Strategy that would facilitate positive and meaningful commitments and activities within the North Wales region by the Applicant. As the oSES was developed during the Examination, it was not referred to in the mitigation section of the ES chapter [REP8-088]. It is however included in the final version of the Schedule of Mitigation and Monitoring [REP8-016].

The Planning Statement

5.14.38. The Planning Statement [REP8-083] provided a summary of the national policy of relevance to the Proposed Development. It concluded that the assessment of socioeconomics had full regard to the relevant requirements for assessment as set out in NPS EN-1, and that the assessment had been carried out in accordance with such requirements.

5.14.39. The Planning Statement concluded that the identified minor beneficial effects on socioeconomics should be considered in addition to the substantial benefits of the Proposed Development as a whole (paragraph 631 of [REP8-083]).

Statements of Common Ground

5.14.40. In the final Statements of Common Ground (SoCG) it was confirmed that all socioeconomic considerations had been resolved between the Applicant and DCC [REP7-049] and the Isle of Anglesey County Council (IoACC) [REP8-046].

Issues Considered in the Examination

Wake effect loss and energy yield

5.14.41. Throughout the Examination both the Applicant[35] and Rhyl Flats Wind Farm Limited[36] (RFWF) made detailed representations in respect of potential wake loss effects as a result of the Proposed Development.

5.14.42. The potential for wake loss effects was raised as an issue during the Examination by the representatives of RFWF, an existing wind farm to the southeast of the proposed turbine array. In summary, RFWF were of the view that the operation of the Proposed Development would reduce the wind energy reaching the existing

[35] Applicant submissions in respect of wake loss include: [REP1-006], [REP1-007], [REP2-002], [REP3-002], [REP5-003], [REP5-004], [REP6-003], [REP7-003], [REP7-004], [REP8-004], [REP8-005] and [REP8-117].
[36] RFWF submissions in respect of wake loss include: [RR-020], [REP1-086] to [REP1-088], [REP2-056], [REP2-057], [REP3-029], [REP4-047], [REP4-048], [REP5-041], [REP6-050], [REP7-058] and [REP8-106] to [REP8-109].

turbines of RFWF, thereby reducing their economic efficiency. RFWF state that would equate to a loss of 2% of their energy generation [REP1-086].

5.14.43. Furthermore, in response to ExQ1.0.19 [REP1-087], RFWF stated that Chapter 12 of the ES [APP-058] considered impacts from existing offshore wind farms for other marine users and activities. However, this assessment did not include consideration of wake loss impacts on RFWF. RFWF stated that no explanation had been offered as to why this effect had been scoped out and RFWF did not consider there was any information in the Examination which assessed the potential impact of the Proposed Development in respect of energy yield.

5.14.44. RFWF also noted that paragraph 2.6.179 of NPS EN-3 states:

Where a potential offshore wind farm is proposed close to existing operational offshore infrastructure or has the potential to affect activities for which a licence has been issued by Government, the applicant should undertake an assessment of the potential effect of the proposed development on such existing or permitted infrastructure or activities.

5.14.45. Accordingly, RFWF considered the approach adopted by the Applicant failed to comply with NPS EN-3 [REP1-087].

5.14.46. The ExA posed several questions to both the Applicant and RFWF in respect of this issue (ExQ1.16.7 [PD-009], ExQ2.3.8 [PD-015] and ExQ3.3.19 [PD-017]). The questions focused on:

- Provision of substantive evidence to support the claims made by the Applicant and RFWF;
- Relevance of NPS EN-3;
- Whether a wake loss effect assessment should have been undertaken;
- The effect on economic viability of RFWF; and
- Possible solutions.

5.14.47. Discussions in relation to this issue were also held at Issue Specific Hearing 1 (ISH1), with written summaries provided by both parties' at [REP1-006] and [REP1-086]. Further discussions were also held at the Compulsory Acquisition Hearing (CAH), where the Applicant confirmed that the parties' positions on wake loss had been clearly established [REP8-006].

5.14.48. In respect of the relevance of NPS EN-3, at [REP3-002] the Applicant noted RFWF submission at ISH1 in relation to paragraph 2.6.184 of NPS EN-1 which states:

The IPC should be satisfied that the site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. The IPC should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.

5.14.49. However, the Applicant noted the reference in the above paragraph related to 'other offshore industries' and also that the wording in paragraph 2.6.176 of NPS EN-3 also helped to clarify what was intended to be included, as it states *other offshore infrastructure, such as telecommunication cables or oil and gas pipelines, are located or other activities, including oil and gas exploration/drilling or marine aggregate dredging…* [REP3-002].

5.14.50. Moreover, the Applicant stated that there was no reference in this section of NPS EN-3 to the interaction between offshore wind farms. As such, the Applicant considered that this therefore only applies to interactions with other types of offshore infrastructure and industries [REP3-002].

5.14.51. As such, the Applicant confirmed that they did not consider the wording in NPS EN-3 was applicable to other offshore wind farms, and that appropriate distances between projects were managed by The Crown Estate (TCE) through its leasing process. Despite this, the Applicant stated that they had ensured that the site design of the Proposed Development would minimise disruption or economic loss to other offshore industries. This also included other offshore wind farms, including RFWF, as was set out in the 'Site Selection and Alternatives' chapter of the ES [APP-044] and in the 'Other Marine Users' chapter of the ES [APP-058] in which Table 11 sets out the relevant embedded mitigation [REP3-002].

5.14.52. Accordingly, the Applicant stated that they fundamentally disagreed with RFWF's interpretation of NPS EN-3 in respect of wake loss effects. The Applicant maintained that had paragraphs 2.6.176 to 2.6.188 of NPS EN-3 been intended to cover other offshore wind farms, then this would have been expressly stated. In particular, the use of the word 'other' and omission of such projects from the list in paragraph 2.6.176 of NPS EN-3 confirmed that their interpretation was correct. The Applicant further reiterated that any claims of wake loss was a commercial matter between the two parties, and it is not relevant to the Examination and subsequent decision [REP3-002] and [REP7-004]. The Applicant maintained the view that had it been the intention of NPS EN-3 to place a financial burden on developers as a result of wake loss effects, then this would have been explicitly stated in the relevant policy [REP8-006].

5.14.53. At ExQ3.3.19(b), the ExA asked the Applicant how the assessment undertaken complies with Regulation 5(2)(a) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 [PD-017]. In response the Applicant commented that this Regulation relates to impacts on population and public health. As such, these matters were assessed in the Public Health chapter of the ES [APP-073] and that this Regulation is not relevant to socioeconomic matters, which are considered in [REP8-088].

5.14.54. Furthermore, the Applicant considered that there were no factors listed in Regulation 5(2) that required a wake loss assessment to be undertaken and no representations were made regarding this in the Scoping Opinion in response to the Applicant's EIA scoping request [APP-295].

5.14.55. In terms of the possible loss of 2% of energy yield, and in the absence of an assessment by the Applicant, RFWF commissioned DNV to provide an opinion on potential wake loss [REP4-047]. The note provided stated that given the proposed distance between the two wind farms, it was the opinion of DNV that the construction of the Proposed Development would result in a tangible wake loss in the region of up to 2%. As such, DNV recommended a wake impact assessment to be carried out at the RFWF [REP4-048].

5.14.56. At D5, the Applicant noted that RFWF had not provided any assessment or details to support the assertion that wake loss effects of the Proposed Development would actually be 2% or the basis on which the calculation had been made. Also, the Applicant did not consider that a 2% wake loss would be sufficient to affect the future viability of RFWF and also that RFWF had not specifically claimed that such a loss would affect the future viability of the existing wind farm [REP5-003].

5.14.57. In response, at D6 RFWF stated that it was not for them to bear the costs of such an assessment. Furthermore, that they were aware that the Applicant accepted that there may be a wake loss effect similar to that stated by DNV but had chosen not to submit this information into the Examination. As such, RFWF felt it was disingenuous for the Applicant to question the figure supplied by DNV [REP6-050].

5.14.58. At ExQ3.3.19, the Applicant confirmed that they had never asserted that the presence of the Proposed Development would have no effect on RFWF. They acknowledged that it is a feature of offshore wind development that all new offshore wind farms would have a potential wake effect on existing offshore wind farms, including those that may be tens or even hundreds of kilometres apart. It remained the view of the Applicant that the matter was appropriately regulated through the TCE leasing process by adherence to TCE's siting criteria for new offshore wind farm development, which the Proposed Development would comply with [REP7-004].

5.14.59. In respect of the suggestion by RFWF that the Applicant should undertake a wake loss assessment, the Applicant did not consider it was necessary as it was not a policy requirement and that TCE's siting criteria for offshore wind farms dictates the location of the Proposed Development wind turbine generators (WTGs). In any event, to undertake an assessment based on the maximum design scenario would be overly precautionary as the number, layout and height of the WTGs had not been determined and would therefore not be a sound basis on which to reach any conclusions regarding wake loss effects [REP7-004].

5.14.60. The Applicant did not consider arbitration in relation to wake loss effects would be appropriate. This was as the key issue in the dispute related to the interpretation of NPS EN-3 and whether wake loss effects are a relevant consideration in determining the application for the Proposed Development. The Applicant considered the correct interpretation of NPS EN-3 is a matter for the ExA and the SoS and that it is not appropriate to be determined by an arbitrator [REP7-004].

5.14.61. In respect of the drafting of a requirement, the Applicant considered that even if the ExA and SoS concluded that the policies of NPS EN-3 should be engaged, the Applicant had complied with the policies by minimising the impact on the existing RFWF and there would therefore be no need, and thus no justification for a requirement [REP7-004].

5.14.62. The Applicant also reiterated that they considered there was nothing in any of the energy NPSs (either extant or revised drafts) or any other policies to prevent an offshore wind farm from being developed in the vicinity of another offshore wind farm. The only control that currently exists is through TCE's leasing process where buffers are built in to ensure appropriate separation, which the Applicant stated the Proposed Development complied with [REP7-004].

5.14.63. In response to ExQ3.3.19, RFWF stated that in terms of arbitration it was not clear how arbitration would assist in resolving the issue as, fundamentally, it required the SoS to determine whether the terms of paragraphs 2.6.176 – 2.6.188 NPS EN-3 applied in relation to assessment of impacts on existing wind farms. Despite this, RFWF further stated that on the assumption that the SoS did agree that the issue of wake loss effects needed to be addressed, then where arbitration might be relevant is in relation to the assessment of such an impact and determination of appropriate mitigation or compensation [REP7-058].

5.14.64. Also, in response to ExQ3.3.19, RFWF submitted a proposed Requirement to deal with the wake loss issue. RFWF felt that a methodology for the assessment of wake loss should be agreed with them and following this, the assessment would be carried out as agreed. Compensation would be paid for the loss of any revenue, with arbitration being addressed in the terms of the arbitration provisions of the dDCO [REP7-058].

5.14.65. The proposed wording of the wake loss requirement was attached as Appendix one to RFWF response to ExQ3.3.19 [REP7-058] and stated:

(1) Prior to the construction of any wind turbine generators as part of Work No. 1, the undertaker shall submit a methodology to the Company for the carrying out of an assessment of the wake effects of the Authorised Development on the operation of the Rhyl Flats Offshore Wind Farm to identify and quantify the extent of external wake loss to Rhyl Flats Offshore Wind Farm. If the Company does not respond within 28 days then approval is deemed to be given.

(2) Prior to the attachment of blades to any of the wind turbine generators as part of Work No. 1, the undertaker shall will undertake the assessment of assessment of the wake effects of the Authorised Development on the operation of the Rhyl Flats Offshore Wind Farm in terms of the methodology approved, as deemed to have been approved under sub-paragraph (1) and submit this for the approval of the Company. If the Company does not respond within 28 days then approval is deemed to be given.

(3) The undertaker shall indemnify the Company for any loss of electricity generation capacity identified in the assessment of wake loss approved or deemed to have been approved under subparagraph (2).

5.14.66. At D8, the Applicant stated that in view of their position on the non-application of NPS EN-3, and that as any impact on RFWF had been minimised, to indemnify RFWF for any loss of any electrical generation capacity resulting from any wake loss effects would not meet the relevant policy test as it is not necessary and would be unreasonable [REP8-004].

5.14.67. Turning to the issue of the potential for a 2% wake loss, the Applicant did not contest the figure. However, the Applicant considered that the actual wake impact may well be appreciably less than this figure and that it would remain within the current level of operating variability. As such the Applicant concluded that the Proposed Development would not have an appreciable impact on RFWF and in turn that any wake loss effects would not detract from the very substantial benefits of the Proposed Development [REP7-004].

5.14.68. RFWF confirmed that they had undertaken an initial calculation of the estimated loss of energy production if both the existing wind farm and the Proposed Development were both in operation. On the basis that both wind farms would be operating together for a period of 5 years, a 2% wake loss would equate to up to 26,000 megawatt hours (MWh). If RFWF was in operation longer than currently planned, this figure would increase [REP7-058].

5.14.69. Such figures were caveated by RFWF as they only had limited information. As such they suggested that in order to provide a more accurate figure, an assessment of wake loss was required which, to date, the Applicant had failed to undertake [REP7-058].

5.14.70. In respect of the figures provided by RFWF, at D8 the Applicant stated that a breakdown of how the alleged loss of 26,000 MWh of electrical generating capacity on account of wake loss effects had not been provided. As such, the Applicant was therefore not in a position to comment further. The Applicant also reiterated a previous point in that they considered any potential wake loss would have no appreciable impact on the very substantial benefits that the Proposed Development would provide if granted consent [REP8-004].

5.14.71. At ExQ3.3.20, the ExA asked TCE to confirm whether their siting criteria for offshore wind farm extensions, which sets a 5km stand-off from other operational offshore wind farms, takes into account the potential for wake effects/reductions in energy output [PD-017]. In response, TCE confirmed that:

The 5km buffer/stand-off between wind farms, unless developers consent to closer proximity, is a commercial arrangement to enable developers to develop, operate and maintain wind farms by allowing for a range of factors including amongst other matters, wake effects, navigation and safety. The location of a wind farm within an area of seabed leased from The Crown Estate is for developers to decide and design for, subject to obtaining the necessary consents and The Crown Estate's approval [REP7-060].

5.14.72. At the close of the Examination, the Applicant stated that the issue fundamentally came down to a question of interpretation of NPS EN-3 and whether in the absence of specific wording the SoS would interpret the policy as requiring the Applicant to undertake a wake loss assessment for RFWF [REP8-006].

5.14.73. In respect of RFWF, at the close of the Examination they confirmed that their position was that the RFWF was an operational offshore windfarm and constitutes existing offshore infrastructure. The provisions of paragraphs 2.6.176 – 2.6.188 of NPS EN-3 are therefore engaged in relation to the potential impact of the Proposed Development on RFWF. As such, RFWF considered that the Applicant had not followed the guidance in the relevant parts of NPS EN-3 [REP8-109].

5.14.74. Accordingly, it was the view of RFWF that consent should not be granted until the impact of the Proposed Development on RFWF was properly assessed, and appropriate provision was made to minimise negative impacts, disruption and economic loss to RF as required by EN-3 [REP8-109].

ExA's consideration

5.14.75. Taking into consideration the detailed information provided by both Parties in respect of this issue, the ExA accepts that the Proposed Development complies with adherence to TCE's siting criteria for new offshore wind farm development.

5.14.76. In respect of Regulation 5(2)(a) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017, the ExA concurs with the Applicant insofar as this relates to population and human health and is not relevant to the socioeconomics assessment and considerations.

5.14.77. However, the ExA concludes that NPS EN-3 does apply to offshore wind farm effects on other windfarms. Also, that the existing RFWF does fall within the definition of existing operational infrastructure, as referenced in NPS EN-3.

5.14.78. The ExA is satisfied that had the content of NPS EN-3 specifically intended to exclude existing wind farm development from the application of NPS EN-3, then this would have been made explicitly clear. As such, in respect of paragraph 2.6.179 of

NPS EN-3, an assessment should have been undertaken by the Applicant. Accordingly, the ExA finds that the Proposed Development does not, in this respect, comply with paragraph 2.6.179 of NPS EN-3.

5.14.79. In terms of the predicted wake loss effect of approximately 2%, the ExA notes that the Applicant stated that this figure was calculated using a maximum design scenario and therefore the losses may be lower. However, the Applicant did not contest the predicted effect of 2% on RFWF. From the evidence provided during the Examination, the ExA is satisfied with the figure of 2% as presented.

5.14.80. The ExA notes the potential loss of up to 26,000 MWh as a consequence of the Proposed Development may also increase if RFWF is operational for a longer period. However, and with regard to paragraph 2.6.185 of NPS EN-3, the ExA does not consider that the 2% effect would affect the future viability of RFWF and that when balancing the 2% figure against the energy benefits of the Proposed Development this provides moderate weight against the scheme.

5.14.81. In respect of the proposed wording of the Requirement as provided by RFWF, requirements need to observe the same tests as used for planning conditions, as set out in the National Planning Policy Framework 2021 (NPPF)[37] . Paragraph 56 of the NPPF states that:

Planning conditions should be kept to a minimum and only imposed where they are necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects.

5.14.82. The ExA notes that the same tests are set out in Wales in 'The use of planning conditions for development management'[38].

5.14.83. The wording of the proposed Requirement is vague and the ExA considers, as worded, the Requirement would fail to meet the tests of enforceability and precision. This relates specifically to the issue of indemnification and the extent of wake losses. The wording is also unclear in respect of how any areas of disagreement between the Parties would be resolved.

5.14.84. Accordingly, the ExA has drafted the wording as detailed below and this Requirement is also included in Volume 3, Appendix D Recommended Development Consent Order of this Report:

(1) No part of any wind turbine generator shall be erected as part of the authorised development until an assessment of any wake effects and subsequent design provisions to mitigate any such identified effects as far as possible has been submitted to and approved in writing by the Secretary of State, in order to mitigate the impact of the authorised development on the energy generation of Rhyl Flats Wind Farm. The assessment must be based on the scope of the DCO as granted.

(2) The authorised development shall be carried out in accordance with the approved details.

5.14.85. The ExA notes that this is, to their knowledge, the first time such a Requirement would be imposed on a DCO. Nevertheless, as it is likely such circumstances may

[37] https://www.gov.uk/guidance/national-planning-policy-framework
[38] Welsh Government Circular (WGC 016/2014)

become more common with the increase in offshore wind development, it is important to fully understand the economic effects on existing offshore wind farms.

5.14.86. The ExA is aware that the inclusion of the proposed requirement may been seen as creating a precedent. It would also require the SoS to become involved in the discharge of the Requirement as the offshore environment falls outside of the administrative boundaries of either CCBC or DCC. However, the inclusion of a wake effect assessment would ensure that the final detailed design of the Proposed Development had fully sought to minimise or negate the effects of the proposal on RFWF. Whilst not only complying with NPS-EN3, such an assessment may also result in the further reduction in wake loss effects to less than the quoted 2% figure.

Requirement 20: Skills and Employment Strategy

5.14.87. In their Relevant Representation (RR), the Isle of Anglesey County Council (IoACC) [RR-004] noted the confirmation that the opportunity to maximise local socio-economic benefits would be explored and presented in more detail post-consent. The IoACC further noted that this was to include a Requirement to submit for approval a 'Skills and Employment Strategy'.

5.14.88. However, IoACC noted that the dDCO requirements as drafted did not include a suitable worded requirement for the approval of a 'Skills and Employment Strategy'. The IoACC considered it best practice to prepare and submit an outline strategy as part of the dDCO to ensure that discussions took place early and during the consenting process, with engagement taking place with key stakeholders and that any final strategy would be approved based on the outline strategy [RR-004].

5.14.89. In response to ExQ1.18.11, the Welsh Government confirmed that they had engaged with the Applicant in respect of skills and employment and were keen to continue with such discussions and to co-ordinate work across the offshore wind sector with the other opportunities off the North Wales coast, as well as the Irish Sea projects, and with other renewable and low carbon sectors in North Wales [REP1-097].

5.14.90. Also, the Welsh Government stated that links to the Welsh language opportunities in relation to skills were key to such projects, ensuring the skills recognised the opportunities for Welsh through the training and education opportunities. As such, the Welsh Government felt it would be useful to work collaboratively across sectors and that they were happy to provide support for such activities [REP1-097].

5.14.91. At ISH1, the Applicant confirmed their willingness to provide a skills and employment strategy and confirmed they were preparing an outline strategy for discussion with relevant local authorities which they proposed would be secured as a requirement in the dDCO [REP1-006]. Details of the proposed wording for R20: Skills and Employment Strategy was included in a revised version of the dDCO submitted at D1 [REP1-008] which stated:

20. No stage of the authorised development may commence until a skills and employment strategy, substantially in accordance with the outline skills and employment strategy has been submitted to and approved by the relevant planning authority.

5.14.92. In their Written Representation (WR) at D2, the IoACC confirmed that they were pleased that the Applicant had been working on establishing an outline Skills and Employment Strategy (oSES) and had also been engaging with local stakeholders to explore opportunities within the local area for skills, employment, and

Awel Y Môr Offshore Wind Farm Secretary of State's Decision Letter

Wake Effect Loss and Energy Yield

4.162. The ExA acknowledged the disagreement between Rhyl Flats Wind Farm (RFWF) and the Applicant in their interpretation of NPS EN-3[3], in relation to the potential wake loss effects from the Proposed Development [ER 5.14.41]. In RFWF's view, the Proposed Development would risk reducing the wind energy reaching the existing turbines by 2% of their energy generation [ER 5.14.42].

4.163. NPS EN-3 states that where a potential offshore wind farm is proposed close to existing operational offshore infrastructure or has the potential to affect activities for which a licence has been issued by Government, the applicant should undertake an assessment of the potential effect of the Proposed Development on such existing or permitted infrastructure or activities [ER 5.14.44].

4.164. RFWF considered that the Applicant failed to comply with NPS EN-3 [ER 5.14.45], whilst the Applicant contended that there was no reference in NPS EN-3 to the interaction between offshore wind farms, but rather interactions with other types of offshore infrastructure (e.g., telecommunication cables) or activities (e.g., drilling) [ER 5.14.50]. Additionally, appropriate distances between projects were managed by The Crown Estate (TCE) through its leasing process, which the Applicant considered in the ES's site selection chapter [ER 5.14.51]. The Applicant fundamentally disagreed with RFWF's interpretation of NPS EN-3 in respect of wake loss effects [ER 5.14.52].

4.165. The ExA accepted that the Applicant complied with the TCE's siting criteria but concluded that NPS EN-3 does apply to offshore wind farm effects on other windfarms and that RFWF falls within the definition of existing operational infrastructure. The ExA reasoned that had NPS EN-3 intended to exclude existing wind farms this would have been made explicit [ER 5.14.75] [ER 5.14.78].

4.166. The ExA noted that the Applicant had calculated the predicted 2% wake loss using a maximum design scenario and therefore the losses may be lower, and as such, was satisfied with the 2% figure presented [ER 5.14.79]. RFWF's estimated calculation was on the basis that both wind farms would operate together for a period of 5 years, which equated to a potential loss of up to 26,000 megawatt hours (mWh) as a result of the Proposed Development [ER 5.14.68]. When measured against Awel y Môr's energy benefits, the 2% wake loss in the ExA's view provided moderate weight against the scheme [ER 5.14.80]. The ExA also agreed with RFWF's view that a wake effect assessment should be carried out, as drafted in the rDCO, which would ensure any identified effects on RFWF are mitigated and minimised [ER 5.14.84] [ER 5.14.86].

Requirement 20: Skills and Employment Strategy

4.167. IoACC noted the dDCO requirements did not include a requirement for the approval of a skills and employment strategy [ER 5.14.88]. The Applicant later confirmed their willingness to provide this and had prepared an outline Skills and Employment Strategy via R20 of the dDCO [5.14.91]. This was also updated into the Schedule of Mitigation and Monitoring [ER 5.14.95].

[3] Paragraph 2.6.179

Faenol Bropor Landholding

4.173. The OnSS proposed at Faenol Bropor would result in a permanent loss of land, which led to significant concern from the landowners who expressed that this would cause a devasting impact to their agricultural unit and livestock with 54% of the land to be acquired by the Applicant [ER 5.14.161]. The ExA was satisfied the Applicant had good reason for the required land take but as 54% would be required on a long-term basis, disagreed with the Applicant's view that no significant adverse effects would be experienced by the landowners [ER 5.14.165]. For this reason, the ExA considered a moderate significant adverse effect would be experienced by the landowners. The ExA also considers the Applicant's approach of a compensation code if mitigation is not possible to be appropriate [ER 5.14.166].

Cwbr Fawr Partnership

4.174. In respect of the Cwbyr Fawr Partnership land holding, concern was raised in respect of the removal of land and the time it would take to return to full productivity [ER 5.14.168].

4.175. The landowners considered that the installation of the ECC would have a significant effect on aspects of the business and financial implications and requested direct drilling of the proposed export cable rather than the use of open cut trenching [ER 5.14.170]. The ExA accepts there would be some disruption to the commercial operations during the construction of the ECC. However, the ExA considers such disruption would be short-term and temporary in nature [ER 5.14.177].

4.176. Whilst not secured by the dDCO, the ExA was satisfied the Applicant has committed to further discussions in respect of identifying possible measures to ensure the continued viability of the commercial activities at Cwybr Fawr Partnership during the construction phase [ER 5.14.178]. The ExA considered the Applicant's approach of a compensation code if mitigation is not possible to be appropriate [ER 5.14.180].

The Secretary of State's Conclusions

4.177. The Secretary of State agrees with the ExA that the Applicant has undertaken an appropriate assessment of socioeconomic factors and adequately assessed the effects of the Proposed Development.

4.178. The Secretary of State considers the matter of wake effects and agrees with the ExA's view that a wake effect assessment should be carried out, as drafted in the rDCO, to ensure identified effects on RFWF are mitigated and minimised. As such, the Secretary of State is satisfied to have this included within the DCO.

4.179. The Secretary of State considers that R20 of the DCO states that no stage of the development may commence until such time as a skills and employment strategy has been submitted and approved by DCC, despite the concerns raised by the ExA that such a requirement may not meet the six planning tests (particularly that of necessity). However, as there is precedent for such requirements, local authorities are happy to accept it and the Applicant has offered this, the Secretary of State is prepared to accept the current DCO wording.

Annex 4 - National Policy Statement for Renewable Energy Infrastructure (EN-3) July 2011

DEPARTMENT OF ENERGY & CLIMATE CHANGE

National Policy Statement for Renewable Energy Infrastructure (EN-3)

Planning for new energy infrastructure

July 2011

Department of Energy and Climate Change

National Policy Statement for Renewable Energy Infrastructure (EN-3)

Presented to Parliament pursuant to section 5(9)
of the Planning Act 2008

July 2011 London: The Stationery Office £20.50

© Crown copyright 2011

You may re-use this information (excluding logos) free of charge in any format or medium, under the terms of the Open Government Licence. To view this licence, visit http://www.nationalarchives.gov.uk/doc/open-government-licence/ or e-mail: psi@nationalarchives.gsi.gov.uk.

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.

Any enquiries regarding this publication should be sent to us at correspondence@decc.gsi.gov.uk

This publication is available for download at www.official-documents.gov.uk.

This document is also available from our website at www.decc.gov.uk.

ISBN: 9780108510793

Printed in the UK for The Stationery Office Limited
on behalf of the Controller of Her Majesty's Stationery Office

ID: 2441166 07/11

Printed on paper containing 75% recycled fibre content minimum.

Contents

Part 1 Introduction

1.1 Background

1.1.1 Electricity generation from renewable sources of energy is an important element in the Government's development of a low-carbon economy. There are ambitious renewable energy targets in place and a significant increase in generation from large-scale renewable energy infrastructure is necessary to meet the 15% renewable energy target (see Section 3.4 of EN-1).

1.2 Role of this NPS in the planning system

1.2.1 This National Policy Statement (NPS), taken together with the Overarching National Policy Statement for Energy (EN-1), provides the primary basis for decisions by the Infrastructure Planning Commission (IPC) on applications it receives for nationally significant renewable energy infrastructure defined at Section 1.8 of this NPS. The way in which NPSs guide IPC decision-making, and the matters which the IPC is required by the Planning Act 2008 to take into account in considering applications, are set out in Sections 1.1 and 4.1 of EN-1.

1.2.2 Applicants should, therefore, ensure that their applications and any accompanying supporting documents and information are consistent with the instructions and guidance in this NPS, EN-1 and any other NPSs that are relevant to the application in question.

1.2.3 This NPS may be helpful to local planning authorities (LPAs) in preparing their local impact reports. In England and Wales this NPS is likely to be a material consideration in decision making on relevant applications that fall under the Town and Country Planning Act 1990 (as amended). Whether, and to what extent, this NPS is a material consideration will be judged on a case by case basis.

1.2.4 Further information on the relationship between NPSs and the Town and Country Planning system, as well as information on the role of NPSs, is set out in paragraphs 13 to 19 of the Annex to the letter to Chief Planning Officers issued by the Department for Communities and Local Government (CLG) on 9 November 2009[1].

1.2.5 Paragraphs 1.2.2 and 4.1.5 of EN-1 provide details of how this NPS may be relevant to the decisions of the Marine Management Organisation (MMO) and how the Marine Policy Statement (MPS) may be relevant to the IPC in its decision making. The MMO, as provided for in the Marine and Coastal Access Act 2009, will determine applications under s.36 and s.36A of the Electricity Act 1989 relating to any generating station in waters adjacent to England and Wales or in the UK Renewable Energy Zone (REZ) (except the Scottish part) that does not exceed the capacity threshold set out in the Planning Act 2008. The MMO will determine applications in accordance with the MPS and any applicable Marine Plans, unless relevant considerations indicate otherwise.

1 http://www.communities.gov.uk/documents/planningandbuilding/pdf/1376507.pdf

1.3 Relationship with EN-1

1.3.1 This NPS is part of a suite of energy NPSs. It should be read in conjunction with EN-1 which covers:

- the high level objectives, policy and regulatory framework for new nationally significant infrastructure projects that are covered by the suite of energy NPSs and any associated development (referred to as energy NSIPs);
- the need and urgency for new energy infrastructure to be consented and built with the objective of contributing to a secure, diverse and affordable energy supply and supporting the Government's policies on sustainable development, in particular by mitigating and adapting to climate change;
- the need for specific technologies, including the infrastructure covered by this NPS;
- key principles to be followed in the examination and determination of applications;
- the role of the Appraisal of Sustainability in relation to the suite of energy NPSs;
- policy on good design, climate change adaptation and other matters relevant to more than one technology-specific NPS; and
- the assessment and handling of generic impacts that are not specific to particular technologies.

1.3.2 This NPS does not seek to repeat the material set out in EN-1, which applies to all applications covered by this NPS unless stated otherwise. The reasons for policy that is specific to the energy infrastructure covered by this NPS are given, but where EN-1 sets out the reasons for general policy these are not repeated.

1.4 Future planning reform

1.4.1 Aside from cases where the Secretary of State intervenes, or where the application is not covered by a designated NPS, the Planning Act 2008, as it is in force at the date of designation of this NPS, provides for all applications for development consent to be both examined and determined by the IPC. However, the enactment and entry into force of the provisions of the Localism Bill (introduced into Parliament in December 2010) relating to the Planning Act would abolish the IPC. The function of examining applications would be taken on by a new Major Infrastructure Planning Unit ("MIPU") within the Planning Inspectorate and the function of determining applications on major energy infrastructure projects by the Secretary of State (who would receive a report and recommendation on each such application from MIPU). In the case of energy projects, this function would be carried out by the Secretary of State for Energy and Climate Change.

1.4.2 If the Localism Bill is enacted and these changes take effect, references in this NPS to the IPC should be read as follows from the date when the changes take effect. Any statement about the IPC in its capacity as an

examining body should be taken to refer to MIPU. Any statement about the IPC in its capacity as a decision-maker determining applications should be taken to refer to the Secretary of State for Energy and Climate Change in his capacity as decision-maker. MIPU would have regard to such statements in framing its reports and recommendations to the Secretary of State.

1.5 Geographical coverage

1.5.1 This NPS, together with EN-1, is the primary decision-making policy document for the IPC on nationally significant onshore renewable energy infrastructure projects in England and Wales and nationally significant offshore renewable energy projects in waters in or adjacent to England or Wales up to the seaward limits of the territorial sea or in the UK Renewable Energy Zone (REZ) (defined in Section 84 (4) of the Energy Act 2004), except any part of a REZ in relation to which Scottish Ministers have functions.

1.5.2 It will remain possible for Welsh Ministers to consent offshore wind farms in territorial waters adjacent to Wales under the Transport and Works Act 1992 if applicants apply to them rather than to the IPC.

1.5.3 In Scotland the IPC will not examine applications for nationally significant generating stations or electricity network infrastructure. However, energy policy is generally a matter reserved to UK Ministers and this NPS may therefore be a relevant consideration in planning decisions in Scotland.

1.5.4 In Northern Ireland, planning consents for all energy infrastructure projects are devolved to the Northern Ireland Executive, so the IPC will not examine applications for energy infrastructure in Northern Ireland.

1.6 Period of validity and review

1.6.1 The NPS will remain in force in its entirety unless withdrawn or suspended in whole or part by the Secretary of State. It will be subject to review by the Secretary of State in order to ensure that it remains appropriate for IPC decision making. Information on the review process is set out in paragraphs 10 to 12 of the Annex to CLG's letter of 9 November 2009 (see paragraph 1.2.4 above).

1.7 Appraisal of Sustainability and Habitats Regulation Assessment[2]

1.7.1 All of the energy NPSs have been subject to an Appraisal of Sustainability (AoS)[3] incorporating the requirements of the regulations that implement the Strategic Environmental Assessment Directive[4]. General information on the AoSs can be found in paragraph 1.7.1 of EN-1. Habitats Regulations

2 Appraisal of Sustainability for the Revised Draft Electricity Networks available at http://www.energynpsconsultation.decc.gov.uk

3 As required by Section 5(3) of the Planning Act 2008

4 Directive 2001/42/EC of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment

Assessment was also done for all the energy NPSs. Paragraph 1.7.13 of EN-1 sets out the conclusions of the HRA.

1.7.2 Key points from the AoS for EN-3 are:

- Renewable energy infrastructure development would have similar effects to other types of energy infrastructure. Onshore wind facilities have a smaller footprint in land use terms than biomass or energy from waste (EfW) facilities. Offshore wind will have effects on marine and coastal environments. For the majority of the AoS objectives, the strategic effects of EN-3 are considered to be neutral for onshore and offshore wind, while biomass and EFW were associated with a greater number of negative effects.
- Through supporting the transition to a low carbon economy, EN-3 is considered likely to have positive effects on the climate change objective in the medium and long term, and both positive and negative effects on equality through the provision of affordable energy. There are positive effects on Economy and Skills for onshore and biomass/EfW, and both positive and negative effects from offshore wind. Biomass/EfW is associated with positive and negative effects on raw materials and resources.
- Effects on ecology are uncertain as they are dependent on the sensitivity of the environment and the design and location of the infrastructure.
- Significant negative effects were identified for all three technologies covered by EN-3 for traffic and transport, noise, and landscape, townscape and visual. Additionally for onshore wind negative effects were identified for soil and geology; for offshore wind, on water quality; and for biomass/EfW on flood risk and water quality.

1.7.3 As required by the SEA Directive, Part 2 of AoS 3 also includes an assessment of reasonable alternatives to the policies set out in EN-3 at a strategic level. The two alternatives assessed were:

(a) adopting a policy that would be less tolerant of the adverse visual, noise and shadow flicker impacts of onshore windfarms;

(b) adopting a policy that would mean consents set more stringent criteria for the fuel for biomass/waste combustion facilities based on sustainability considerations.

1.7.4 Alternative (a) would be likely to consist of more than one element of policy (covering, respectively, visual, noise and shadow flicker impacts). There is a significant risk that a policy that was significantly less tolerant than EN-3 of adverse visual impacts would result in many fewer wind farms being consented, and that it would benefit many fewer people than it disadvantaged (as a result of reduced security of supply and failure to meet targets for reducing greenhouse gas emissions). Policies that were less tolerant than EN-3 of potential adverse noise and shadow flicker impacts would probably be less likely to make a significant impact on consenting of development proposals. As a result they would be unlikely to make a significant difference even to those potentially adversely affected by such impacts and would have a smaller, but still adverse, impact on security of

supply and positive impacts to climate change brought about by renewable energy development. For these reasons, the approach in EN-3 is preferred.

1.7.5 As well as carrying out the AoS process for EN-3, DECC consulted on changes to the Renewables Obligation (RO). As a result of the consultation, the Renewables Obligation (Amendment) Order 2011 (ROO) came into effect on 1 April 2011 and eligibility for financial support under the RO regime for liquid biofuels is now subject to satisfying mandatory sustainability criteria (as set out in the Renewables Directive). The Government considers that it is neither necessary nor desirable to duplicate the RO sustainability regime though development consent requirements. However, sustainability of biomass is relevant and important to development consent decision-making, and it may be appropriate for the IPC to ensure that sustainability criteria are adhered to whether or not RO support is claimed. Further information on sustainability of biomass is set out in paragraphs 2.5.6 and 2.5.7.

1.7.6 In some possible scenarios (for example if the criteria were stricter than those proposed under the RO, alternative (b) could have significant negative impacts (such as fewer facilities being developed. This could lead to adverse impacts on security of supply and a reduction in potential socio-economic benefits associated with new biomass plant. It could also lead to some possible beneficial effects in terms of reduced negative impacts on traffic and transport, noise, flood risk, coastal change, ecology and visual effects. However, the Government is satisfied that its recognition of the merits of applying sustainability criteria through the consenting framework in a limited way in individual cases – where justified by the circumstances – is appropriate and will not result in loss of the benefits of the NPS policies, or in the potential negative impacts of alternative (b).

1.7.7 The offshore wind energy sections reflect the Offshore Energy SEA undertaken by DECC in 2009[5] and the subsequent post consultation report[6] and government decision[7].

1.8 Infrastructure covered by this NPS

1.8.1 This NPS covers the following types of nationally significant renewable energy infrastructure:

- Energy from biomass and/or waste (>50 megawatts (MW))
- Offshore wind (>100MW)
- Onshore wind (>50MW)

5 DECC (January 2009) UK Offshore Energy Strategic Environmental Assessment: Future Leasing for Offshore Wind Farms and Licensing for Offshore Oil & Gas and Gas Storage – Environmental Report, which can be found at http://www.offshore-sea.org.uk/site/scripts/book_info.php?consultationID=16&bookID=11

6 DECC (June 2009) Offshore Energy Strategic Environmental Assessment: Post Public Consultation Report, which can be found at http://www.offshore-sea.org.uk/consultations/Offshore_Energy_SEA/OES_Post_Consultation_Report.pdf

7 The Government's decision is explained in *A Prevailing Wind: Advancing UK Offshore Wind Deployment* (June 2009) URN 09D/619, which can be found at http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/energy%20mix/renewable%20energy/policy/offshore/wind_leasing/file51989.pdf

1.8.2 This NPS does not cover other types of renewable energy generation that are not at present technically viable over 50MW onshore or over 100MW offshore such as schemes that generate electricity from tidal stream or wave power. It is expected that tidal range schemes may be the subject of applications to the IPC within the near future. Government is, therefore, considering the need for either a revision to this NPS or a separate NPS to provide the primary basis for decision-making under the Planning Act on such schemes. When it appears that other renewables technologies will be economically and technically viable over 50MW, the Government will further consider either revisions to this NPS or separate NPSs to cover such technologies.

Part 2 Assessment and technology-specific information

2.1 Introduction

2.1.1 Part 4 of EN-1 sets out the general principles that should be applied in the assessment of development consent applications across the range of energy technologies. Part 5 of EN-1 sets out policy on the assessment of impacts which are common across a range of these technologies (generic impacts). This NPS is concerned with impacts and other matters which are specific to biomass and energy from waste (EfW), onshore and offshore wind energy, or where, although the impact or issue is generic and covered in EN-1, there are further specific considerations arising from the technologies covered here.

2.1.2 The policies set out in this NPS are additional to those on generic impacts set out in EN-1 and do not replace them. The IPC should consider this NPS and EN-1 together. In particular, EN-1 sets out the Government's conclusion that there is a significant need for new major energy infrastructure (see Section 3.3 of EN-1). EN-1 Section 3.4 includes assessments of the need for new major renewable energy infrastructure. In the light of this, the IPC should act on the basis that the need for infrastructure covered by this NPS has been demonstrated.

2.1.3 Factors influencing site selection by developers for renewable energy generating stations are set out below. These are not a statement of Government Policy but are included to provide the IPC and others with background information on the criteria that applicants consider when choosing a site. But the specific criteria considered by applicants and the weight they give to them will vary from project to project. The choices which energy companies make in selecting sites reflect their assessment of the risk that the IPC, following the general points set out in Section 4.1 of EN-1, will not grant consent in any given case. But it is for energy companies to decide what applications to bring forward and the Government does not seek to direct applicants to particular sites for renewable energy infrastructure other than in the specific circumstances described in this document in relation to offshore wind.

2.2 Relationship with English and Welsh renewables policies

2.2.1 Policy set out in existing planning guidance in England, and where a proposal is located in Wales in planning policy and advice issued by the Welsh Assembly Government relevant to renewables, will provide important information to applicants of nationally significant energy infrastructure projects (energy NSIPs). The IPC should have regard to these policies and

expect applicants to have taken them into account when working up their proposals. Applicants should explain in their applications to the IPC how their proposals fit with the guidance and support its targets or, alternatively, why they depart from them. Whether an application conforms to the guidance or the targets will not, in itself, be a reason for approving or rejecting the application.

2.2.2 Where the IPC considers that any refinement of boundaries of strategic search areas for onshore wind development that has been undertaken by LPAs in Wales is both important and relevant to its decision, the IPC should be satisfied that such an exercise has been undertaken in accordance with the relevant guidance published by the Welsh Assembly Government.

2.3 Climate change adaptation

2.3.1 Part 2 of EN-1 covers the Government's energy and climate change strategy, including policies for mitigating climate change. Section 4.8 of EN-1 sets out generic considerations that applicants and the IPC should take into account to help ensure that renewable energy infrastructure is resilient to climate change.

2.3.2 Biomass generating stations are likely to be proposed for coastal or estuarine sites where climate change is likely to increase risks from flooding or rising sea levels, for example. In such cases applicants should, in particular, set out how the proposal would be resilient to:

- effects of rising sea levels and increased risk from storm surge;
- increased risk of flooding;
- impact of higher temperatures; and
- increased risk of drought affecting river flows.

2.3.3 EfW generating stations may also require significant water resources, but are less likely to be proposed for coastal sites. For these proposals applicants should consider, in particular, how plant will be resilient to:

- increased risk of flooding; and
- increased risk of drought affecting river flows.

2.3.4 Offshore and onshore wind farms are less likely to be affected by flooding, but applicants should particularly set out how the proposal would be resilient to storms.

2.3.5 Section 4.8 of EN-1 advises that the resilience of the project to climate change should be assessed in the Environmental Statement (ES) accompanying an application. For example, the impact of increased risk of drought as a result of higher temperatures should be covered in the water quality and resources section of the ES.

2.4 Criteria for "good design" for energy infrastructure

2.4.1 Section 10(3)(b) of the Planning Act 2008 requires the Secretary of State to have regard, in designating an NPS, to the desirability of good design. Section 4.5 of EN-1 sets out the principles of good design that should be applied to all energy infrastructure.

2.4.2 Proposals for renewable energy infrastructure should demonstrate good design in respect of landscape and visual amenity, and in the design of the project to mitigate impacts such as noise and effects on ecology.

2.5 Biomass and waste combustion

Introduction

2.5.1 The combustion of biomass (fuels of recent biological origin as described in EN-1 Section 3.4 and paragraph 2.5.5 below) for electricity generation is likely to play an increasingly important role in meeting the UK's renewable energy targets.

2.5.2 The recovery of energy from the combustion of waste, where in accordance with the waste hierarchy[8], will play an increasingly important role in meeting the UK's energy needs. Where the waste burned is deemed renewable, this can also contribute to meeting the UK's renewable energy targets. Further, the recovery of energy from the combustion of waste forms an important element of waste management strategies in both England and Wales.

2.5.3 The combustion generating stations covered by this NPS are those which generate electricity:

- using waste (possibly including non-renewable sources of waste) and/or biomass as a fuel; and
- generate more than 50MW of electricity.

2.5.4 Biomass/EfW generating stations can be configured to produce Combined Heat and Power (CHP). Details of CHP criteria are set out in Section 4.6 of EN-1. Biomass generating stations should also be Carbon Capture Ready (CCR) and/or have Carbon Capture and Storage (CCS) technology applied. Details of the Government's policy on CCR and CCS is set out in Section 4.7 of EN-1. There is further information on CCR/CCS for biomass in this NPS.

Fuels

2.5.5 Biomass is material of recent biological origin derived from plant or animal matter. The biomass used for heat and power usually falls into one or more of three categories:

- biomass sourced from conventional forestry management. This includes thinning, felling and coppicing of sustainably managed forests, parklands and trees from other green spaces. It also includes sawmill residues (often processed to produce wood pellets), other wood processing residues and parts of trees unsuitable for the timber industry;
- biomass from agricultural crops and residues. This includes crops grown primarily for use in energy generation ('energy crops'), 'woody' energy crops such as short rotation coppice (SRC), or miscanthus grass which can be grown on land unsuitable for food crops. Biomass can also be sourced from agricultural residues such as straw, husks and kernels; and
- biomass from biodegradable waste and other similar materials including sewage sludge, animal manure, waste wood from construction, and food waste that would otherwise be disposed of in landfill.

8 Waste hierarchy as set out in Article 16 of the Waste Framework Directive 2008, and also see Section 5.14 of EN-1.

2.5.6 The social, environmental and economic case for widespread deployment of biomass-fuelled plant depends on the sustainability of fuel used in it. The RO, administered by the Office of Gas and Electricity Markets (Ofgem) is the main support mechanism for renewable electricity in the UK. In order to receive incentives (ROCs) under the Renewables Obligation (RO), and for their output to count towards the UK's renewable energy targets, plants fuelled by bioliquids must (from April 2011) use fuel which meets sustainability criteria laid down in the Renewable Energy Directive. The Government is also proposing to introduce sustainability criteria for solid and gaseous biomass plants as a condition of their eligibility for ROCs from 2013[9], (with mandatory reporting requirements against these criteria applicable from April 2011). Both sets of sustainability criteria include a minimum greenhouse gas (GHG) emissions saving relative to fossil fuel and general restrictions on the use of materials from land that is important on carbon or biodiversity grounds, such as primary forest, highly biodiverse grasslands or peatlands. Assessment of the GHG emissions will take account of emissions associated with cultivation, processing and transport of biomass for electricity generation and direct land use change. The criteria apply to both domestic and imported material.

2.5.7 Sustainability of the biomass or bioliquid fuel that a biomass or bioliquid -fuelled generating station will burn is a relevant and important consideration for the IPC in deciding on any development consent applications. The sustainability criteria under the RO will apply to both new and existing generating stations to the extent that they claim ROCs. The ROCs regime (and any successor to it) is a critical element in the business case of most biomass and bioliquid plants, so that in any given case the incentive effect of linking the award of ROCs or other financial assistance to the satisfaction of sustainability criteria may constitute an entirely adequate control on the sustainability of a plant's fuel sources. However, it is possible that the incentive of ROCs may not be available for the whole of a plant's operational life, and it is also possible in principle that plants may be able to operate profitably without them at certain periods. The IPC should therefore consider in each case whether it is appropriate to rely on the RO or any successor incentive regime to ensure the sustainability of a plant's fuel over its whole life. The IPC should not grant consent to a proposed biomass or bioliquid-fuelled generating station unless it is satisfied that the operator will (so far as it can reasonably be expected to do so) ensure that the biomass or bioliquid fuel it burns meets applicable RO or successor incentive regime sustainability criteria, whether or not ROCs (or successor incentives) are being claimed. Where appropriate, the IPC may include a requirement to this effect in the development consent order.

2.5.8 Methane gas produced through anaerobic digestion (AD) of biodegradable waste, when injected into the gas grid, may also be used as a renewable fuel source. However, AD plant is not anticipated to have a generating capacity greater than 50MW and is not, therefore, described separately in this NPS.

9 See the Renewables Obligation (Amendment) Order 2011 and the Government Response to the Statutory Consultation on the Renewables Obligation Order 2011, December 2010, available at http://www.decc.gov.uk/assets/decc/Consultations/Renewables%20Obligation/1059-gov-response-ro-order-2011-cons.pdf).

2.5.9 EfW generating stations take fuel that would otherwise be sent to landfill. Waste can come from municipal or commercial and industrial sources. Some of the waste suitable for such plant may comprise biodegradable waste as described in the third bullet point of 2.5.5. This may also include solid recovered fuel (SRF) from waste. Where the proposed fuel is a prepared fuel, such as SRF, conformity of the waste / biomass with the waste hierarchy may have been considered by the Waste Authority from which the feedstock originated as part of their assessment of their waste management solution. The IPC should take account of any assessment in considering the application.

2.5.10 A proportion of the biodegradable waste may be classed as "renewable" for the purposes of Renewable Obligation Certificates (ROCs)[10] eligibility. However, this is not an issue of relevance to the IPC.

Combustion plant types and scale

2.5.11 Waste and biomass combustion plant covered by this NPS may include a range of different combustion technologies, including grate combustion, fluidised bed combustion, gasification and pyrolysis. The IPC should not be concerned about the type of technology used. However all types of technology will need to adhere to the policy set out below.

2.5.12 The fuel throughput capacity of the combustion plant considered by the IPC may vary widely depending on composition, calorific value and availability of fuel.

2.5.13 Throughput volumes are not, in themselves, a factor in IPC decision-making as there are no specific minimum or maximum fuel throughput limits for different technologies or levels of electricity generation. This is a matter for the applicant. However the increase in traffic volumes, any change in air quality, and any other adverse impacts as a result of the increase in throughput should be considered by the IPC in accordance with this NPS and balanced against the net benefits of the combustion of waste and biomass as described in paragraph 2.5.2 above and in Section 3.4 of EN-1.

Nature of applications

2.5.14 A waste/biomass combustion plant proposal is likely to consist of the following:

- a main combustion plant building incorporating emissions abatement technologies, electricity generation units, a cooling assembly (variety of types and methods) and chimney stack(s);
- buildings necessary for fuel reception, storage, sorting and pre-treatment facilities; and
- ancillary plant such as an electricity substation, civil engineering workshops and offices.

2.5.15 Some development proposals may also incorporate additional features such as waste transfer facilities.

10 Definition of biomass in the Renewable Obligation Order 2009.

2.5.16 Where EfW proposals for mixed waste incineration include material of animal origin, applicants may require ancillary development in order to comply with the requirements of the Animal By-Products Regulations 2005 (S.I. 2005/2347).

Commercial aspects of waste combustion plant

2.5.17 Commercial issues are not likely to be an important matter for IPC decision-making, but are set out below to provide the IPC with background on the considerations taken into account by applicants.

2.5.18 Waste combustion plants are unlike other electricity generating power stations in that they have two roles: treatment of waste and recovery of energy. The commercial rationale for waste combustion plants will include both the gate fee received per tonne of waste handled and income received from energy recovery.

2.5.19 Like any combustion generating station, operators secure fuel through contracts. Local authorities issue municipal waste contracts which are often long term (up to 25 years). Contracts to manage private sector wastes are, generally, shorter. The operator may decide to focus on either public or private sector waste treatment contracts, or a combination of the two.

Co-firing

2.5.20 For development proposals involving co-firing of biomass alongside fossil fuel within a conventional fossil fuelled power station, the IPC should refer to the Fossil Fuel NPS (EN-2).

2.5.21 The IPC should also refer to EN-2 for development proposals involving co-firing of waste alongside fossil fuel. Such proposals will, however, be subject to the Waste Incineration Directive (WID)(2000/76/EC)[11].

Factors influencing site selection by applicants

Grid connection

2.5.22 Biomass and EfW electricity generating stations connect into a transmission network. The technical feasibility of exporting electricity from a biomass or waste combustion plant is dependent on the capacity of the grid network to accept the likely electricity output together with the voltage and distance of the connection.

2.5.23 Applicants will usually have assured themselves that a viable connection exists before submitting the development proposal to the IPC and where they have not done so, they take that commercial risk. In accordance with Section 4.9 in EN-1, any application to the IPC must include information on how the generating station is to be connected and whether there are any particular environmental issues likely to arise from that connection. Further advice on the relationship with grid applications is in EN-1 and EN-5.

11 EU Waste Incineration Directive 2000/76/EC which can be found at: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2000/l_332/l_33220001228en00910111.pdf?lang=_e

Transport Infrastructure

2.5.24 Biomass or EfW generating stations are likely to generate considerable transport movements. For example, a biomass or EfW plant that uses 500,000 tonnes of fuel per annum might require a large number of heavy goods vehicle (HGV) movements per day to import the fuel. There will also be residues which will need to be regularly transported off site.

2.5.25 Government policy encourages multi-modal transport and the IPC should expect materials (fuel and residues) to be transported by water or rail routes where possible. (See Section 5.13 of EN-1 on transport impacts). Applicants should locate new biomass or waste combustion generating stations in the vicinity of existing transport routes wherever possible. Although there may in some instances be environmental advantages to rail or water transport, whether such methods are viable is likely to be determined by the economics of the scheme. Road transport may be required to connect the site to the rail network, waterway or port. Therefore, any application should incorporate suitable access leading off from the main highway network. If the existing access is inadequate and the applicant has proposed new infrastructure, the IPC will need to be satisfied that the impacts of the new infrastructure are acceptable as set out in Section 5.13 of EN-1.

Combined Heat and Power (CHP)

2.5.26 The Government's strategy for CHP is described in Section 4.6 of EN-1, which sets out the requirements on applicants either to include CHP or present evidence in the application that the possibilities for CHP have been fully explored.

2.5.27 Given the importance which Government attaches to CHP, for the reasons set out in EN-1, if an application does not demonstrate that CHP has been considered the IPC should seek further information from the applicant. The IPC should not give development consent unless it is satisfied that the applicant has provided appropriate evidence that CHP is included or that the opportunities for CHP have been fully explored. For non-CHP stations, the IPC may also require that developers ensure that their stations are configured to allow heat supply at a later date as described in paragraph 4.6.8 of EN-1 and the guidance on CHP issued by BIS in 2006.

Carbon Capture Readiness (CCR)

2.5.28 The Government's policy and criteria on CCR for new combustion generating stations with a generating capacity at or over 300MW are set out in Section 4.7 of EN-1. They are relevant to proposed biomass plant at or over 300MW of generating capacity. If an application to build such plant does not demonstrate that CCR has been assessed according to the policy and criteria set out in Section 4.7 of EN-1, the IPC should seek further information from the applicant. The IPC should not give development consent unless it is satisfied that the proposed development meets all the criteria and is, therefore, CCR.

2.5.29 The IPC should impose requirements on any consent, requiring operators to:

- retain control over sufficient additional space (whether on or near the site) for the carbon capture equipment;

- retain their ability to build carbon capture equipment on this space (whether on or near the site) in the future; and
- submit update reports on the technical aspects of its CCR status to the Secretary of State for DECC. These reports should be required within 3 months of the date on which a consented station first begins to supply electricity to the grid and every two years thereafter until the plant moves to retrofit CCS.

Technical considerations for the IPC when determining biomass/waste combustion plant applications

Flexibility in the project details

2.5.30 Generic information on flexibility is set out in Section 4.2 of EN-1. The IPC should accept that biomass/waste combustion plant operators may not know the precise details of all elements of the proposed development until some time after any consent has been granted. Where some details have not been included in the application to the IPC, the applicant should explain which elements of the scheme have yet to be finalised and give the reasons. Therefore, some flexibility may be required in the consent. Where this is sought and the precise details are not known, then the applicant should assess the effects the project could have (as set out in EN-1 paragraph 4.2.8) to ensure that the project as it may be constructed has been properly assessed. In this way the maximum-adverse case scenario will be assessed and the IPC should allow for this uncertainty in its consideration of the application and consent.

IPC impact assessment principles

2.5.31 The IPC should adhere to the following principles when examining and determining applications for biomass and relevant EfW infrastructure.

2.5.32 The impacts identified in Part 5 of EN-1 and this NPS are not intended to be exhaustive and the IPC should therefore consider any impacts which it determines are relevant and important to its decision.

National designations

2.5.33 In sites with nationally recognised designations (Sites of Special Scientific Interest, National Nature Reserves, National Parks, the Broads, Areas of Outstanding Natural Beauty and Registered Parks and Gardens), consent for renewable energy projects should only be granted where it can be demonstrated that the objectives of designation of the area will not be compromised by the development, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.[12]

12 Policy on consent for renewable energy projects is set out in Planning Policy Statement 22. This amends the generic policy on designated landscapes set out in Section 5.9 of in EN-1 in respect of renewable energy projects only.

2.5.34 In considering the impact on the historic environment as set out in Section 5.8 of EN-1 and whether it is satisfied that the substantial public benefits would outweigh any loss or harm to the significance of a designated heritage asset, the IPC should take into account the positive role that large-scale renewable projects play in the mitigation of climate change, the delivery of energy security and the urgency of meeting the national targets for renewable energy supply and emissions reductions.

Green Belts

2.5.35 Policy on energy infrastructure development in the Green Belt is set out in Section 5.10 of EN-1. When located in the Green Belt, elements of many biomass and EfW projects will constitute inappropriate development, which may impact on the openness of the Green Belt. Careful consideration will therefore need to be given to the visual impact of projects, and developers will need to demonstrate very special circumstances that clearly outweigh any harm by reason of inappropriateness and any other harm if projects are to proceed. Such very special circumstances may include the wider environmental benefits associated with increased production of energy from renewable sources.

Other locational considerations

2.5.36 As most renewable energy resources can only be developed where the resource exists and where economically feasible, the IPC should not use a sequential approach in the consideration of renewable energy projects (for example, by giving priority to the re-use of previously developed land for renewable technology developments).

Biomass/Waste Impacts – Air quality and emissions

Introduction

2.5.37 Generic air emissions impacts other than CO_2 are covered in Section 5.2 of EN-1. In addition there are specific considerations which apply to biomass/waste combustion plant as set out below.

2.5.38 CO_2 emissions may be a significant adverse impact of biomass/waste combustion plant. Although an ES on air emissions will include an assessment of CO_2 emissions, the policies set out in Section 2.2 of EN-1 will apply. The IPC does not, therefore need to assess individual applications in terms of carbon emissions against carbon budgets and this section does not address CO_2 emissions or any Emissions Performance Standard that may apply to plant.

2.5.39 In addition to the air quality legislation referred to in EN-1 the Waste Incineration Directive (WID) is also relevant to waste combustion plant. It sets out specific emission limit values for waste combustion plants.

Applicant's assessment

2.5.40 The applicant's EIA should include an assessment of the air emissions resulting from the proposed infrastructure and demonstrate compliance with the relevant regulations (see Section 5.2 of EN-1).

IPC decision making

2.5.41 Compliance with the WID and the Large Combustion Plant Directive[13] (LCPD) is enforced through the environmental permitting regime regulated by the Environment Agency (EA). Plants not meeting the requirements of the WID and/or LCPD would not be granted a permit to operate. The IPC should refer to the policy in Section 4.10 of EN-1 relating to other regimes.

2.5.42 The pollutants of concern arising from the combustion of waste and biomass include NO_x[14], SO_x[15], particulates and CO_2. In addition emissions of heavy metals, dioxins and furans are a consideration for waste combustion generating stations but limited by the WID and regulated by the EA.

2.5.43 Where a proposed waste combustion generating station meets the requirements of WID and will not exceed the local air quality standards, the IPC should not regard the proposed waste generating station as having adverse impacts on health.

2.5.44 Similarly, where a proposed biomass combustion generating station meets the requirements of LCPD and will not exceed the local air quality standards, the IPC should not regard the proposed biomass infrastructure as having adverse impacts on health.

13 Large Combustion Plant Directive 2001/80/EC can be found at: http://eur-lex.europa.eu/LexUriServ/site/en/oj/2001/l_309/l_30920011127en00010021.pdf

14 Oxides of nitrogen.

15 Sulphur oxides.

Mitigation

2.5.45 Abatement technologies should be those set out in the relevant sector guidance notes as produced by the EA. The EA will determine if the technology selected for the waste/ biomass combustion generating station is considered Best Available Technique (BAT) and therefore the IPC does not need to consider equipment selection in its determination process.

Biomass/Waste Impacts – Landscape and visual

Introduction

2.5.46 Generic landscape and visual effects are covered in detail in Section 5.9 of EN-1. In addition, there are specific considerations which apply to biomass/waste combustion generating stations as set out below.

2.5.47 The IPC should be satisfied that the design of the proposed generating station is of appropriate quality and minimises adverse effects on the landscape character and quality.

Applicant's assessment

2.5.48 An assessment of the landscape and visual effects of the proposed infrastructure should be undertaken in accordance with the policy set out in 5.9 of EN-1.

IPC decision making

2.5.49 The IPC should take into account that any biomass/waste combustion generating station will require a building able to host fuel reception and storage facilities, the combustion chamber and abatement units. The overall size of the building will be dependent on design and fuel throughput, although it is unlikely to be less than 25m in height. External to the building there may be cooling towers, the size of which will also be dependent on the throughput of the generating station.

2.5.50 Good design that contributes positively to the character and quality of the area will go some way to mitigate adverse landscape/visual effects. Development proposals should consider the design of the generating station, including the materials to be used in the context of the local landscape.

2.5.51 Mitigation is achieved primarily through aesthetic aspects of site layout and building design including size and external finish and colour of the generating station to minimise intrusive appearance in the landscape as far as engineering requirements permit. The precise architectural treatment will need to be site-specific.

2.5.52 The IPC should expect applicants to seek to landscape waste/biomass combustion generating station sites to visually enclose them at low level as seen from surrounding external viewpoints. This makes the scale of the generating station less apparent, and helps conceal its lower level, smaller scale features. Earth bunds and mounds, tree planting or both may be used for softening the visual intrusion and may also help to attenuate noise from site activities.

Biomass/Waste Impacts – Noise and vibration

Introduction

2.5.53 Generic noise and vibration impacts are covered in detail in Section 5.11 of EN-1. In addition there are specific considerations which apply to biomass and EfW generating stations as set out below. Sources of noise and vibration may include:

- delivery and movement of fuel and materials;
- processing waste for fuel at EfW generating stations;
- the gas and steam turbines that operate continuously during normal operation; and
- external noise sources such as externally-sited air-cooled condensers that operate continuously during normal operation.

Applicant's assessment

2.5.54 The ES should include a noise assessment of the impacts on amenity in case of excessive noise from the project as described in Section 5.11 in EN-1.

IPC decision making

2.5.55 The IPC should consider the noise and vibration impacts according to Section 5.11 in EN-1. It should be satisfied that noise and vibration will be adequately mitigated through requirements attached to the consent. The IPC will need to take into consideration the extent to which operational noise will be separately controlled by the EA.

2.5.56 The IPC should not grant development consent unless it is satisfied that the proposals will meet the aims set out in paragraph 5.11.9 in EN-1.

Mitigation

2.5.57 As described in EN-1, the primary mitigation for noise for biomass and EfW generating stations is through good design to enclose plant and machinery in noise-reducing buildings, wherever possible, and to minimise the potential for operations to create noise. Noise from gas turbines should be mitigated by attenuation of exhausts to reduce any risk of low-frequency noise transmission.

2.5.58 Noise from features including sorting and transport of material during operation of biomass or EfW generating stations is unavoidable. Similarly, noise from apparatus external to the main generating station may be unavoidable. This can be mitigated through careful plant selection.

Biomass/Waste Impacts – Odour, insect and vermin infestation

Introduction

2.5.59 Generic impacts of dust, odour, artificial light, smoke, steam and insect infestation are set out in EN-1 Section 5.6. Insect and vermin infestation may be a particular issue with regard to storage of fuels for EfW generating stations as they may be attracted to biodegradable waste stored and processed at the facility. Odour is also likely to arise during the reception, storage and handling/processing of incoming biodegradable waste.

Applicant's Assessment

2.5.60 The applicant should assess the potential for insect infestation and emissions of odour as set out in EN-1 Section 5.6 with particular regard to the handling and storage of waste for fuel.

IPC Decision making

2.5.61 The IPC should satisfy itself that the proposal sets out appropriate measures to minimise impacts on local amenity from odour, insect and vermin infestation.

Mitigation

2.5.62 In addition to the mitigation measures set out in EN-1, reception, storage and handling of waste and residues should be carried out within defined areas, for example bunkers or silos, within enclosed buildings at EfW generating stations.

2.5.63 To minimise potential for infestation, the time between reception, processing and combustion of waste may be limited by consent requirements.

Biomass/Waste Impacts – Waste management

Introduction

2.5.64 Waste combustion generating stations need not disadvantage reuse or recycling initiatives where the proposed development accords with the waste hierarchy.

2.5.65 National, local and municipal strategies in England and Wales provide policy expectations for waste management at these different geographical levels. Local authorities will be responsible for providing an informative framework for the amount of waste management capacity sought. Information on the type of wastes arising and those that are combustible may also be provided. In Wales, the relevant regional waste plan will set out the strategy for dealing with waste generated in that region and include waste targets.

Applicant's assessment

2.5.66 An assessment of the proposed waste combustion generating station should be undertaken that examines the conformity of the scheme with the waste hierarchy and the effect of the scheme on the relevant waste plan or plans where a proposal is likely to involve more than one local authority.

2.5.67 The application should set out the extent to which the generating station and capacity proposed contributes to the recovery targets set out in relevant strategies and plans, taking into account existing capacity.

2.5.68 It may be appropriate for assessments to refer to the Annual Monitoring Reports published by relevant waste authorities which provide an updated figure of existing waste management capacity and future waste management capacity requirements.

2.5.69 The results of the assessment of the conformity with the waste hierarchy and the effect on relevant waste plans should be presented in a separate document to accompany the application to the IPC.

IPC decision making

2.5.70 The IPC should be satisfied, with reference to the relevant waste strategies and plans, that the proposed waste combustion generating station is in accordance with the waste hierarchy and of an appropriate type and scale so as not to prejudice the achievement of local or national waste management targets in England and local, regional or national waste management targets in Wales. Where there are concerns in terms of a possible conflict, evidence should be provided to the IPC by the applicant as to why this is not the case or why a deviation from the relevant waste strategy or plan is nonetheless appropriate and in accordance with the waste hierarchy.

Biomass/Waste Impacts – Residue management

Introduction

2.5.71 Generic waste management impacts are set out in Section 5.14 of EN-1. In addition, there are specific considerations which apply to waste and biomass combustion generating stations as set out below. All waste/biomass combustion generating stations will produce residues that require further management. Much of the residues can be used for commercial purposes.

2.5.72 Generating stations that burn waste (even if mixed with biomass fuel) produce two types of residues:

- combustion residue is inert material from the combustion chamber. The quantity of residue produced is dependent on the technology process and fuel type but might be as much as 30% (in terms of weight) of the fuel throughput of the generating station; and
- fly ash, a residue from flue gas emission abatement technology and usually 3-4% (in terms of weight) of the fuel throughput of the generating station.

2.5.73 Under the WID the two residues from waste combustion generating stations cannot be mixed; they must be disposed of separately, under different regimes.

2.5.74 Biomass combustion generating stations will also produce both combustion and flue gas treatment residues. However the residue types can be mixed and managed as one product for disposal. Residues arising from biomass combustion generating stations are usually between 1% and 12% (in terms of weight) of the fuel capacity of the plant.

2.5.75 The regulations on waste disposal for waste combustion and flue gas residues from biomass combustion are intended to reduce the amount of waste that is sent to landfill. Waste combustion fly ash is classified as a hazardous waste material and needs to be managed as such.

2.5.76 Waste management is covered in the Environmental Permit for operation of waste or biomass generating stations. (See Section 5.14 of EN-1.)

Applicant's assessment

2.5.77 The assessment should include the production and disposal of residues as part of the ES. Any proposals for recovery of ash and mitigation measures should be described.

2.5.78 Applicants should set out the consideration they have given to the existence of accessible capacity in waste management sites for dealing with residues for the planned life of the power station.

IPC decision making

2.5.79 The IPC should consult the EA on the suitability of the proposals.

2.5.80 When the IPC considers noise and vibration, release of dust and transport impacts, as set out in this NPS and EN-1, it should recognise that these impacts may arise as a result of the need for residue disposal as well as other factors.

2.5.81 The IPC should be satisfied that management plans for residue disposal satisfactorily minimise the amount that cannot be used for commercial purposes. The IPC should give substantial positive weight to development proposals that have a realistic prospect of recovering residues.

2.5.82 The IPC should consider what requirements it may be appropriate to impose. If the EA has indicated that there are no known barriers to it issuing an Environmental Permit for operation of the proposed biomass/waste fuelled generating station and agrees that management plans suitably minimise the wider impacts from ash disposal, any residual ash disposal impacts should have limited weight.

Mitigation

2.5.83 The environmental burdens associated with the management of combustion residues can be mitigated through recovery of secondary products, for example aggregate or fertiliser, rather than disposal to landfill. The IPC should give substantial positive weight to development proposals that have a realistic prospect of recovering these materials. The primary management route for fly ash is hazardous waste landfill. However, there may be opportunities to reuse this material for example in the stabilisation of industrial waste. The management of hazardous waste will be considered by the EA through the Environmental Permitting regime.

Biomass/Waste Impacts – Water quality and resources

Introduction

2.5.84 Generic water quality and resource impacts are set out in Section 5.15 of EN-1. The design of water cooling systems for EfW and biomass generating stations will have additional impacts on water quality, abstraction and discharge. These may include:

- discharging water at a higher temperature than the receiving water, affecting the biodiversity of aquatic flora and fauna;
- use of resources may reduce the flow of watercourses, affecting the rate at which sediment is deposited, conditions for aquatic flora and potentially affecting migratory fish species (e.g. salmon);
- fish impingement and/or entrainment – i.e. being taken into the cooling system during abstraction; and
- discharging water containing chemical anti-fouling treatment of water for use in cooling systems may have adverse impacts on aquatic biodiversity.

Applicant's assessment

2.5.85 Where the project is likely to have effects on water quality or resources the applicant should undertake an assessment as required in EN-1, Section 5.15. The assessment should particularly demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of cooling water.

IPC decision making

2.5.86 The IPC should be satisfied that the applicant has demonstrated measures to minimise adverse impacts on water quality and resources as described above and in EN-1.

Mitigation

2.5.87 In addition to the mitigation measures set out in EN-1, design of the cooling system should include intake and outfall locations that avoid or minimise adverse impacts. There should also be specific measures to minimise fish impingement and/or entrainment and the discharge of excessive heat to receiving waters.

2.6 Offshore Wind

Introduction

2.6.1 Offshore wind farms are expected to make up a significant proportion of the UK's renewable energy generating capacity up to 2020 and towards 2050.

2.6.2 There are two main UK sea areas in which structures such as offshore wind farms can be built:

- in UK territorial waters, which generally extend up to 12 nautical miles (nm) from the coast; and
- beyond the 12nm limit where, under international law, the UK is able to construct wind farm installations or other structures to produce renewable energy in the Renewable Energy Zone (REZ) as declared in the Energy Act 2004[16].

2.6.3 For clarification, any reference within this NPS to offshore wind farm infrastructure includes all the elements which may be part of an application, including wind turbines, all types of foundations, onshore and offshore substations, anemometry masts, accommodation platforms and cabling.

2.6.4 The extent to which generic impacts set out in EN-1 are relevant may depend upon the phase of the proposed development being considered. For example, land-based traffic and transport and noise issues may be relevant during the construction and decommissioning periods only, depending upon the specific proposal.

2.6.5 The applicant should identify the impacts of a proposal and these impacts, together with proposals for their avoidance or mitigation wherever possible, should be set out in an Environmental Statement (ES) that should accompany each project application. Policy on ESs is set out in Section 4.2 of EN-1.

IPC offshore consenting process

CPA consent

2.6.6 Any consent granted by the IPC may include provision deeming consent under s.34 of the Coast Protection Act 1949 (a CPA consent) for operations carried out wholly in England, Wales, waters adjacent to England and Wales up to the seaward limits of the territorial sea or in any area designated under s.1(7) of the Continental Shelf Act 1964.

FEPA licence

2.6.7 Any consent granted by the IPC may include provision deeming a licence to have been issued under Part 2 of the Food and Environment Protection Act 1985 (a FEPA licence) for operations carried out wholly in England, waters

16 The REZ was designated by the Renewable Energy Zone (Designation of Area) Order 2004 (SI 2004/2668), exercising powers in section 8(4) of the Energy Act 2004. It extends from the seaward limit of the territorial sea up to a maximum of 200 nautical miles from the baseline.

adjacent to England up to the seaward limits of the territorial sea, the UK REZ (except any part of a REZ in relation to which the Scottish Ministers have functions) or in any area designated under s.1(7) of the Continental Shelf Act 1964. (See, however, paragraph 2.6.9 on future replacement of a FEPA licence by a Marine Licence)

2.6.8 Welsh Ministers are responsible for issuing FEPA licences for operations carried out in Wales and in waters adjacent to Wales up to the seaward limits of the territorial sea.

Marine licence

2.6.9 As provided for in the Marine and Coastal Access Act 2009, Marine Licences replace the requirement for CPA consents and FEPA licences[17]. Any consent granted by the IPC will be able to include provision deeming the grant of a Marine Licence for operations carried out wholly in England, waters adjacent to England up to the seaward limits of the territorial sea or the UK REZ (except any part of a REZ in relation to which the Scottish Ministers have functions).

2.6.10 Welsh Ministers will be responsible for issuing Marine Licences for operations carried out in Wales and in waters adjacent to Wales up to the seaward limits of the territorial sea.

Implications for IPC

2.6.11 FEPA licences and CPA consents, and their successor, the Marine Licence, are primarily concerned with the need to protect the environment and human health, and to prevent interference with legitimate uses of the sea.

2.6.12 Marine Licences are likely to be required for all the offshore elements of the proposed wind farm, including associated development such as the offshore cabling and any offshore substations that are required.

2.6.13 The Marine Management Organisation (MMO) is responsible for enforcement and ongoing management of licence conditions, for operations carried out in England, waters adjacent to England up to the seaward limits of the territorial sea or a REZ (except any part of a REZ in relation to which the Scottish Ministers have functions).

2.6.14 The IPC should liaise closely with the MMO on the proposed terms of any deemed CPA consent, FEPA licence or Marine Licence.

Factors Influencing Site Selection and Design by Applicant

Strategic Environmental Assessment

2.6.15 Through the Offshore Energy Strategic Environmental Assessment 2009 (SEA) process, the Government has assessed the environmental implications and spatial interactions of a plan/programme for some 25GW

17 From 6 April 2011.

of new offshore wind capacity[18], on top of existing plans for 8GW of offshore wind. The Government concluded that there are no overriding environmental considerations to prevent the achievement of the plan/programme for offshore wind, if mitigation measures are implemented to prevent, reduce and offset significant adverse effects[19]. In the light of the SEA process, consultation responses and other available information, the Government decided[20] to adopt the plan/programme for some 25GW of new offshore wind capacity in the UK Renewable Energy Zone (REZ) and the territorial waters of England and Wales, up to 60m depth and subject to some spatial restrictions.

2.6.16 In addition to new offshore projects, the Government has decided that, in line with Recommendation 6 of the Post Consultation Report (PCR), there is potential for capacity extensions to existing wind farm leases within UK waters[21]. However, this will require careful, site-specific evaluation through the planning process, since significant new information on sensitivities and uses of these areas has become available.

2.6.17 Applicants should set out how they have drawn on the Government's Offshore Energy SEA in making their site selection.

2.6.18 Government is undertaking a rolling SEA programme for offshore energy, including a research programme and data collection to facilitate future assessments. These future offshore SEAs and data will be relevant to the applicants and the IPC as and when they become available.

The Crown Estate

2.6.19 The Crown Estate owns virtually the entire seabed out to the 12nm territorial limit, including the rights to explore and utilise the natural resources of the UK Continental Shelf (excluding oil, gas and coal). Therefore it is necessary to obtain a licence from The Crown Estate prior to placing any offshore structures on, or passing cables over, the seabed and its foreshore. As well as owning the rights to explore and utilise waters up to 12nm, the Energy Act 2004 gives The Crown Estate rights to issue licences for development beyond the territorial limit and within the REZ.

2.6.20 The Crown Estate Act 1961 states that, with regard to property and land, The Crown Estate must "maintain and enhance its value and the return obtained from it, but with due regard to the requirements of good management".

---

18 DECC (January 2009) UK Offshore Energy Strategic Environmental Assessment: Future Leasing for Offshore Wind Farms and Licensing for Offshore Oil & Gas and Gas Storage – Environmental Report, which can be found at http://www.offshore-sea.org.uk/site/scripts/book_info.php?consultationID=16&bookID=11

19 DECC (June 2009) Offshore Energy Strategic Environmental Assessment: Post Public Consultation Report, which can be found at http://www.offshore-sea.org.uk/consultations/Offshore_Energy_SEA/OES_Post_Consultation_Report.pdf.

20 The Government's decision is explained in *A Prevailing Wind: Advancing UK Offshore Wind Deployment* (June 2009) URN 09D/619, which can be found at http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/energy%20mix/renewable%20energy/policy/offshore/wind_leasing/file51989.pdf

21 Territorial waters and the UK Renewable Energy Zone.

2.6.21 The Crown Estate identifies potential development areas in accordance with the requirements of The Crown Estate Act, Government policy, plans and associated SEA work. The Crown Estate issues leases for offshore wind farms in tendering Rounds. Rounds 1 and 2 are closed and sites leased in those rounds are operational, in construction, consented but yet to be constructed or, in some cases, still awaiting determination. The Crown Estate may grant capacity extensions to existing wind farm leases in Round 1 and 2 areas, again in accordance with the above, subject to applicants obtaining necessary consents.

2.6.22 For Round 3, The Crown Estate has adopted an approach based on development zones. The Crown Estate has entered into exclusive agreements with development partners to identify and seek consent for sites within each of the zones. There are a number of zones, each with a separate agreement. The size of the zones and the number of sites that may be applied for within them vary.

2.6.23 The award of Zone Development Agreements (ZDAs) amounts to a plan within the meaning of the Offshore Marine Regulations Conservation (Natural Habitats, &c.) 2007. The Crown Estate has therefore undertaken an Appropriate Assessment before awarding the ZDAs.

2.6.24 Applicants for wind farms will select sites having considered a range of technical, environmental and operational constraints as set out below.

2.6.25 The zonal approach to development adopted by The Crown Estate is intended to provide applicants with a flexible approach to site identification and the means to minimise the risk of a significant environmental impact (alone or where there are multiple sites within a zone, cumulatively or in-combination).

2.6.26 In the process of identifying sites within zones, particularly the larger zones, applicants may have conducted a process of Zonal Appraisal and Planning (ZAP). This could involve various studies to characterise the zone and an assessment of the constraints and opportunity for wind farm development.

2.6.27 ZAP is also an opportunity for early consultation with stakeholders, including statutory consultees, about development alternatives, the scope of EIA and any Appropriate Assessment required, particularly with respect to cumulative and in-combination effects arising from those sites identified within the zone.

2.6.28 There may be some instances where the outputs of the ZAP exercise are considered relevant to feed into those aspects of EIA and any Appropriate Assessment (where this is required) relating to cumulative or in-combination effects for each of the individual site applications brought forward within each zone.

2.6.29 Future offshore development may occur in rounds or as piecemeal development using zones, ZAP or any other development mechanism as required.

Wind resource

2.6.30 The wind resource is critical to the economics of a proposed offshore wind farm. Applicants may have collected wind speed data using an anemometry mast or similar to inform their economic modelling. However, collection of this data is not obligatory as the suitability of the wind speed across the site and economics of the scheme are a matter for the technical and commercial judgement of the wind farm applicant.

Water depth and foundation conditions

2.6.31 Water depth, bathymetry and geological conditions are all important considerations for the selection of sites and will affect the design of the foundations of the turbines, the layout of turbines within the site and the siting of the cables that will export the electricity.

2.6.32 The onus is on the applicant to ensure that the foundation design is technically suitable for the seabed conditions and that the application caters for any uncertainty regarding the geological conditions. Whilst the technical suitability of the foundation design is not in itself a matter for the IPC, it will need to be satisfied that the foundations will not have an unacceptable adverse effect on marine biodiversity, physical environment and marine heritage assets in accordance with the policy below. The applicant should have provided the necessary details to allow the IPC to assess such impacts.

Grid connection

2.6.33 The connection of a proposed offshore wind farm into the relevant electricity network will be an important consideration for applicants. The grid connection text at Section 4.9 in EN-1 sets out the important issues here.

2.6.34 Applicants for consent for offshore wind farms will have to work within the regulatory regime for offshore transmission networks established by Ofgem. Under the regime offshore transmission will be a licensed activity regulated by Ofgem.

Other offshore infrastructure

2.6.35 There may be constraints imposed on the siting or design of offshore wind farms because of restrictions resulting from the presence of other offshore infrastructure or activities.

Technical considerations for the IPC when determining consent applications for offshore wind farms

Grid connection infrastructure

2.6.36 When considering grid connection issues, the IPC should be mindful of the constraints of the regulatory regime for offshore transmission networks. At the time of the application, the applicant may or may not have secured a connection with the network operator into the onshore transmission network, and is unlikely to know who will own and manage the offshore transmission assets required for the wind farm.

2.6.37 Where the applicant has identified a precise route for the cable from the wind farm to a precise location for the onshore substation and connection to the transmission network, the EIA should assess the effects of the cable.

2.6.38 Where the applicant does not know the precise location of any cabling or any necessary onshore and/or offshore substations, a corridor should be identified within which the cable and any offshore substation is likely to be located. The EIA for the proposed project should assess the effects of including this infrastructure within that corridor.

2.6.39 Where the point of onshore connection is unknown at the time of the application, the applicant should assess a corridor from the wind farm to the shore that is considered to be a reasonably likely area for the cable and any offshore substation should be assessed as part of the EIA.

2.6.40 A proposed offshore electricity cable connecting the wind farm with the onshore electricity infrastructure and any offshore electricity substations that may be required, may constitute associated development, depending on their scale and nature in relation to the offshore wind farm[22]. Where the IPC is satisfied that such offshore infrastructure does constitute associated development and can form part of the application, it should be considered by the IPC in accordance with this NPS.

2.6.41 The onshore element of the grid connection (electric lines and substations) should be determined in accordance with the Electricity Networks Infrastructure NPS, EN-5. Depending upon the scale and type of this onshore development, elements of it could constitute either associated development or an energy NSIP in its own right.

Flexibility in the project details

2.6.42 Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application to the IPC, possibly including:

- precise location and configuration of turbines and associated development;
- foundation type;

22 "Guidance on associated development: Applications to the Infrastructure Planning Commission", can be found at http://www.communities.gov.uk/documents/planningandbuilding/pdf/guidanceassocdevelopment.pdf .

- exact turbine tip height;
- cable type and cable route; and
- exact locations of offshore and/or onshore substations.

2.6.43 In accordance with Section 4.2 of EN-1, the IPC should accept that wind farm operators are unlikely to know precisely which turbines will be procured for the site until some time after any consent has been granted. Where some details have not been included in the application to the IPC, the applicant should explain which elements of the scheme have yet to be finalised, and the reasons. Therefore, some flexibility may be required in the consent. Where this is sought and the precise details are not known, then the applicant should assess the effects the project could have (as set out in EN-1 paragraph 4.2.8) to ensure that the project as it may be constructed has been properly assessed (the Rochdale Envelope)[23]. In this way the maximum adverse case scenario will be assessed and the IPC should allow for this uncertainty in its consideration of the application and consent.

Micrositing

2.6.44 Any consent that is granted by the IPC should be flexible to allow for necessary micrositing of elements of the proposed wind farm during its construction where requested at the application stage. This allows for unforeseen events such as the discovery of previously unknown marine archaeology that it would be preferable to leave in situ.

2.6.45 Where micrositing tolerance is requested by the applicant in any consent, given that the EIA should assess a maximum adverse case scenario, the assessment should reflect the implications of any micrositing as far as reasonably possible.

Extensions

2.6.46 The Crown Estate may offer new leases in areas adjacent to existing consented wind farms. This could be to either the owner/operator of the existing site or to a different company from that operating the existing wind farm. These leases will form extensions to existing wind farms.

2.6.47 Leases may be awarded subject to the company obtaining the necessary consents and may be subject to various constraining conditions, including the presence of an existing operational wind farm.

2.6.48 The IPC should be aware of the potential for applications for extensions to existing wind farms and that there may be constraints on such leases over which the applicant will have little or no control.

23 Case law (for example Rochdale MBC Ex. Parte C Tew 1999) provides a legal principle that indicative sketches and layouts cannot provide the basis for determining applications for EIA development. The “Rochdale Envelope” is a series of maximum extents of a project for which the significant effects are established. The detailed design of the project can then vary within this ‘envelope’ without rendering the ES inadequate.

Repowering

2.6.49 Where an operational offshore wind farm reaches the end of its life, subject to obtaining the necessary lease from The Crown Estate or providing an existing lease is still valid, the owner of the wind farm may wish to "repower" the site with new turbines. Given the likely change in technology over the intervening time period, any repowering of sites is likely to involve wind turbines of a different scale and nature. This could result in significantly different impacts as well as a different electricity generating capacity and a new consent application would be required.

2.6.50 In determining an application for the repowering of a site, the proposed replacement scheme should be determined by the IPC on its individual merits.

Future monitoring

2.6.51 Owing to the relatively new and complex nature of offshore wind development, the IPC should consider requiring the applicant to undertake monitoring prior to and during construction and during its operation in order to measure and document the effects of the development. This enables an assessment of the accuracy of the original predictions and may inform the scope of future EIAs.

2.6.52 The IPC may consider that monitoring of any impact is appropriate. Monitoring should be presented in formal reports which should be made publicly available.

Decommissioning

2.6.53 Section 105 of the Energy Act 2004 enables the Secretary of State to require the submission of a decommissioning programme for a proposed offshore wind farm, provided at least one of the statutory consents required has been given or has been applied for and is likely to be given.

2.6.54 Where the IPC decides to grant consent for a proposed offshore wind farm, the IPC should include a condition requiring the applicant to submit a decommissioning programme to the Secretary of State before any offshore construction works begin. The decommissioning programme must satisfy the requirements of s.105(8) of the Energy Act 2004.

IPC Impact Assessment principles

2.6.55 The IPC should adhere to the principles set out in paragraphs 2.5.31, 2.5.32 and 2.5.33 since these also apply to offshore wind farms and associated infrastructure.

Green Belts

2.6.56 Although offshore wind farms themselves will not have a direct impact on Green Belts, it is possible that some elements of these projects may be proposed on Green Belt land, such as electricity network infrastructure, and comprise inappropriate development which may impact on the openness of the Green Belt. The policy on development in the Green Belt is set out in Section 5.10 of EN-1 and paragraph 2.5.34 of this NPS.

Other locational considerations

2.6.57 As most renewable energy resources can only be developed where the resource exists and where economically feasible, the IPC should not use a sequential approach in the consideration of renewable energy projects (for example, by giving priority to the re-use of previously developed land for renewable technology developments).

Offshore Wind Farm Impacts – Biodiversity

Introduction

2.6.58 Generic ecology and biodiversity effects are covered in detail in Section 5.3 of EN-1. The coastal change policy in Section 5.5 of EN-1 may also be relevant. In addition, there are specific considerations which apply to offshore wind energy infrastructure proposals as discussed below.

2.6.59 Biodiversity considerations to which applicants and the IPC should have regard concerning offshore infrastructure include:

- fish;
- seabed habitats – intertidal and subtidal;
- marine mammals; and
- birds.

2.6.60 These considerations are described in paragraphs 2.6.72 to 2.6.110 by reference to both species and habitats.

2.6.61 Effects on commercial fish stocks are covered in paragraphs 2.6.120 to 2.6.136.

2.6.62 Evidence from existing offshore wind farms demonstrates that it has been possible to locate wind farms in ecologically sensitive areas where careful siting of turbines has been undertaken following appropriate ecological surveys and assessments.

2.6.63 Effects of offshore wind farms can include temporary disturbance during the construction phase (including underwater noise) and ongoing disturbance during the operational phase and direct loss of habitat. Adverse effects can be on spawning, overwintering, nursery and feeding grounds and migratory pathways in the marine area. However, the presence of wind turbines can also have positive benefits to ecology and biodiversity.

Applicant's assessment

2.6.64 Assessment of offshore ecology and biodiversity should be undertaken by the applicant for all stages of the lifespan of the proposed offshore wind farm and in accordance with the appropriate policy for offshore wind farm EIAs.

2.6.65 Consultation on the assessment methodologies should be undertaken at early stages with the statutory consultees as appropriate.

2.6.66 Any relevant data that has been collected as part of post-construction ecological monitoring from existing, operational offshore wind farms should be referred to where appropriate.

2.6.67 The assessment should include the potential of the scheme to have both positive and negative effects on marine ecology and biodiversity.

IPC decision making

2.6.68 The IPC should consider the effects of a proposal on marine ecology and biodiversity taking into account all relevant information made available to it.

2.6.69 The designation of an area as Natura 2000[24] site does not necessarily restrict the construction or operation of offshore wind farms in or near that area (see also Section 4.3 of EN-1).

Mitigation

2.6.70 Mitigation may be possible in the form of careful design of the development itself and the construction techniques employed.

2.6.71 Ecological monitoring is likely to be appropriate during the construction and operational phases to identify the actual impact so that, where appropriate, adverse effects can then be mitigated and to enable further useful information to be published relevant to future projects.

24 Ecological network of protected areas in the territory of the European Union.

Offshore Wind Farm Impacts – Fish

Introduction

2.6.72 Section 5.3 of EN-1 sets out the policy for the IPC in relation to generic biodiversity impacts and paragraphs 2.6.58 to 2.6.71 above set out offshore wind-specific biodiversity policy. The coastal change section at Section 5.5 of EN-1 may also be relevant. In addition, there are specific considerations which apply to the effect of offshore wind energy infrastructure proposals on fish as set out below.

2.6.73 There is the potential for the construction and decommissioning phases, including activities occurring both above and below the seabed, to interact with seabed sediments and therefore have the potential to impact fish communities, migration routes, spawning activities and nursery areas of particular species. In addition, there are potential noise impacts, which could affect fish during construction and decommissioning and to a lesser extent during operation.

Applicant's assessment

2.6.74 The applicant should identify fish species that are the most likely receptors of impacts with respect to:

- spawning grounds;
- nursery grounds;
- feeding grounds;
- over-wintering areas for crustaceans; and
- migration routes.

IPC decision making

2.6.75 Where it is proposed that mitigation measures of the type set out in paragraph 2;6;76 below are applied to offshore export cables to reduce electromagnetic fields (EMF) the residual effects of EMF on sensitive species from cable infrastructure during operation are not likely to be significant. Once installed, operational EMF impacts are unlikely to be of sufficient range or strength to create a barrier to fish movement[25].

Mitigation

2.6.76 EMF during operation may be mitigated by use of armoured cable for inter-array and export cables which should be buried at a sufficient depth. Some research has shown that where cables are buried at depths greater than 1.5m below the sea bed impacts are likely to be negligible[26]. However sufficient depth to mitigate impacts will depend on the geology of the sea bed.

2.6.77 During construction, 24 hour working practices may be employed so that the overall construction programme and the potential for impacts to fish communities is reduced in overall time.

25 Bio/Consult, 2005. Infauna monitoring. Horns Rev Offshore Wind Farm. Annual Status Report, 2004, npower Renewables Limited, 2003. Baseline Monitoring Report. North Hoyle Offshore Wind Farm.

26 CMACS, 2004. Kentish Flats Offshore Wind Farm. EMF Modelling and Interpretation for Electrosensitive Fish Species. CMACS Report J3025/v1.2/10-04.

Offshore Wind Farm Impacts – Intertidal

Introduction

2.6.78 Section 5.3 of EN-1 sets out the policy for the IPC in relation to generic biodiversity impacts and paragraphs 2.6.58 to 2.6.71 above set out offshore wind-specific biodiversity policy. Section 5.5 of EN-1 on coastal change may also be relevant. In addition, there are specific considerations which apply to offshore wind energy infrastructure proposals and the intertidal zone as set out below.

2.6.79 The intertidal zone is the area between high tide and low tide marks. Intertidal habitat and ecology are often recognised through statutory nature conservation designations.

2.6.80 Export cable routes will cross the intertidal zone resulting in habitat loss, and temporary disturbance of intertidal ecology.

Applicant's assessment

2.6.81 An assessment of the effects of installing cable across the intertidal zone should include information, where relevant, about:

- any alternative landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice;
- any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice;
- potential loss of habitat;
- disturbance during cable installation and removal (decommissioning);
- increased suspended sediment loads in the intertidal zone during installation; and
- predicted rates at which the intertidal zone might recover from temporary effects.

2.6.82 If it is proposed to install offshore cables to a depth of at least 1.5m below the sea bed, the applicant should not have to assess the effect of the cables on intertidal habitat during the operational phase of the offshore wind farm[27].

2.6.83 Applicants are expected to have regard to guidance issued in respect of FEPA (now Marine Licence) requirements.

IPC decision making

2.6.84 The conservation status of intertidal habitat is of relevance to the IPC.

27 CMACS July 2003, Cowrie Phase 1 Report. "A Baseline Assessment of Electromagnetic Fields Generated by Offshore Windfarm Cables", Centre for Marine and Coastal Studies (CMACS). COWRIE Report EMF – 01-2002 66; and CMACS July 2005, Cowrie Phase 1.5 Report. "The Potential Effects of Electromagnetic Fields Generated by Sub-sea Power Cables associated with Offshore Wind Farm developments on Electrically and Magnetically Sensitive Marine Organisms – A Review".

2.6.85 The IPC should be satisfied that cable installation and decommissioning has been designed sensitively taking into account intertidal habitat.

2.6.86 Where adverse effects are predicted during the installation or decommissioning of cables, in coming to a judgement, the IPC should consider the extent to which the effects are temporary or reversible.

2.6.87 Where it is proposed that the offshore export cables are armoured and buried at a sufficient depth to minimise heat effects (as described in 2.6.76 above), the effects of heat on sensitive species from cable infrastructure during operation are unlikely to be a reason for the IPC to have to refuse to grant consent for a development.

Mitigation

2.6.88 Effects on intertidal habitat cannot be avoided entirely. Landfall and cable installation and decommissioning methods should be designed appropriately to minimise effects on intertidal habitats, taking into account other constraints.

2.6.89 Where cumulative effects on intertidal habitats are predicted as a result of the cumulative effects of multiple cable routes, it may be appropriate for applicants of various schemes to work together to ensure that the number of cables crossing the intertidal zone are minimised and installation and decommissioning phases are coordinated to ensure that disturbance is also reasonably minimised.

Offshore Wind Farm Impacts – Marine Mammals

Introduction

2.6.90 Section 5.3 of EN-1 sets out the policy for the IPC in relation to generic biodiversity impacts and paragraphs 2.6.58 to 2.6.71 above sets out offshore wind-specific biodiversity policy. In addition, there are specific considerations from piling noise which apply to offshore wind energy infrastructure proposals with regard to marine mammals, including cetaceans and seals, which have statutory protection.

2.6.91 Offshore piling may reach noise levels which are high enough to cause injury, or even death, to marine mammals. If piling associated with an offshore wind farm is likely to lead to the commission of an offence (which would include deliberately disturbing, killing or capturing a European Protected Species), an application may have to be made for a wildlife licence to allow the activity to take place.

Applicant's assessment

2.6.92 Where necessary, assessment of the effects on marine mammals should include details of:

- likely feeding areas;
- known birthing areas/haul out sites;
- nursery grounds;
- known migration or commuting routes;
- duration of the potentially disturbing activity including cumulative/in-combination effects with other plans or projects;
- baseline noise levels;
- predicted noise levels in relation to mortality, permanent threshold shift (PTS) and temporary threshold shift (TTS);
- soft-start noise levels according to proposed hammer and pile design; and
- operational noise.

2.6.93 The applicant should discuss any proposed piling activities with the relevant body. Where assessment shows that noise from offshore piling may reach noise levels likely to lead to an offence as described in 2.6.91 above, the applicant should look at possible alternatives or appropriate mitigation before applying for a licence.

IPC decision making

2.6.94 The IPC should be satisfied that the preferred methods of construction, in particular the construction method needed for the proposed foundations and the preferred foundation type, where known at the time of application, are designed so as to reasonably minimise significant disturbance effects on marine mammals. Unless suitable noise mitigation measures can be imposed by requirements to any development consent the IPC may refuse the application.

2.6.95 The conservation status of marine European Protected Species and seals are of relevance to the IPC. The IPC should take into account the views of the relevant statutory advisors.

2.6.96 Fixed submerged structures such as foundations are likely to pose little collision risk for marine mammals and the IPC is not likely to have to refuse to grant consent for a development on the grounds that offshore wind farm foundations pose a collision risk to marine mammals.

Mitigation

2.6.97 Monitoring of the surrounding area before and during the piling procedure can be undertaken.

2.6.98 During construction, 24-hour working practices may be employed so that the overall construction programme and the potential for impacts to marine mammal communities is reduced in time.

2.6.99 Soft start procedures during pile driving may be implemented. This enables marine mammals in the area disturbed by the sound levels to move away from the piling before significant adverse impacts are caused.

Offshore Wind Farm Impacts – Birds

Introduction

2.6.100 Section 5.3 of EN-1 sets out the policy for the IPC in relation to generic biodiversity impacts and paragraphs 2.6.58 to 2.6.71 above set out offshore wind-specific biodiversity policy. In addition, there are specific considerations which apply to the effect of offshore wind energy infrastructure proposals on birds as set out below.

2.6.101 Offshore wind farms have the potential to impact on birds through:

- collisions with rotating blades;
- direct habitat loss;
- disturbance from construction activities such as the movement of construction/decommissioning vessels and piling;
- displacement during the operational phase, resulting in loss of foraging/ roosting area; and
- impacts on bird flight lines (i.e. barrier effect) and associated increased energy use by birds for commuting flights between roosting and foraging areas.

Applicant's assessment

2.6.102 The scope, effort and methods required for ornithological surveys should have been discussed with the relevant statutory advisor.

2.6.103 Relevant data from operational offshore wind farms should be referred to in the applicant's assessment.

2.6.104 It may be appropriate for assessment to include collision risk modelling for certain species of birds. Where necessary, the assessments carried out by applicants should assess collision risk using survey data collected from the site at the pre-application EIA stage. The IPC will want to be satisfied that the collision risk assessment has been conducted to a satisfactory standard having had regard to the advice from the relevant statutory advisor.

2.6.105 Applicants are expected to adhere to requirements in respect of FEPA licence requirements (now Marine Licence). As set out in paragraph 2.6.7 above, a FEPA licence may be deemed to be given by a provision in a development consent given by the IPC.

IPC decision making

2.6.106 In addition to Section 5.3 of EN-1 the offshore wind-specific biodiversity considerations set out in paragraphs 2.6.58 to 2.6.71 above should inform IPC decision-making.

Mitigation

2.6.107 Aviation and navigation lighting should be minimised to avoid attracting birds, taking into account impacts on safety.

2.6.108 Subject to other constraints, wind turbines should be laid out within a site, in a way that minimises collision risk, where the collision risk assessment shows there is a significant risk of collision.

2.6.109 Construction vessels associated with offshore wind farms should, where practicable and compatible with operational requirements and navigational safety, avoid rafting seabirds during sensitive periods.

2.6.110 The exact timing of peak migration events is inherently uncertain. Therefore, shutting down turbines within migration routes during estimated peak migration periods is unlikely to offer suitable mitigation.

Offshore Wind Farm Impacts – Subtidal

Introduction

2.6.111 Section 5.3 of EN-1 sets out the policy for the IPC in relation to generic biodiversity impacts and paragraphs 2.6.58 to 2.6.71 above set out offshore wind-specific biodiversity policy. The coastal change section, 5.5, in EN-1 may also be relevant. In addition, there are specific considerations which apply to the effect of offshore wind energy infrastructure proposals on the subtidal zone as set out below.

2.6.112 The subtidal zone is the area below the low tide mark which remains submerged at low tide. Loss of subtidal habitat and benthic ecology is an additional issue for consideration.

Applicant's assessment

2.6.113 Where necessary, assessment of the effects on the subtidal environment should include:

- loss of habitat due to foundation type including associated seabed preparation, predicted scour, scour protection and altered sedimentary processes;
- environmental appraisal of inter-array and cable routes and installation methods;
- habitat disturbance from construction vessels' extendible legs and anchors;
- increased suspended sediment loads during construction; and
- predicted rates at which the subtidal zone might recover from temporary effects.

2.6.114 If it is proposed to install offshore cables to a depth of at least 1.5m below the sea bed, the applicant should not have to assess the effect of the cables on subtidal habitat during the operational phase of the offshore wind farm.[28]

IPC decision making

2.6.115 The conservation status of subtidal habitat is of relevance to the IPC.

2.6.116 The IPC should be satisfied that activities have been designed taking into account sensitive subtidal environmental aspects.

2.6.117 Where adverse effects are predicted, in coming to a judgement, the IPC should consider the extent to which the effects are temporary or reversible.

2.6.118 Where it is proposed that the offshore export cables are armoured and buried at a sufficient depth to minimise heat effects (as described in paragraph 2.6.76 above) the effects of heat on sensitive species from cable infrastructure during operation are unlikely to be a reason for the IPC to refuse to grant consent for a development.

28 CMACS, 2004. Kentish Flats Offshore Wind Farm. EMF Modelling and Interpretation for Electrosensitive Fish Species. CMACS Report J3025/v1.2/10-04.

Mitigation

2.6.119 Construction and decommissioning methods should be designed appropriately to minimise effects on subtidal habitats, taking into account other constraints. Mitigation measures which the IPC should expect the applicants to have considered may include:

- surveying and micrositing of the export cable route to avoid adverse effects on sensitive habitat and biogenic reefs;
- burying cables at a sufficient depth, taking into account other constraints, to allow the seabed to recover to its natural state; and
- the use of anti-fouling paint might be minimised on subtidal surfaces, to encourage species colonisation on the structures.

2.6.120 Where cumulative effects on subtidal habitats are predicted as a result of the cumulative effects of multiple cable routes, it may be appropriate for applicants for various schemes to work together to ensure that the number of cables crossing the subtidal zone is minimised and installation/ decommissioning phases are coordinated to ensure that disturbance is reasonably minimised.

Offshore Wind Farm Impacts – Commercial fisheries and fishing

Introduction

2.6.121 There are a number of different fishing activities within UK waters including:

- bottom trawling – fishing with one or more towed nets being dragged along the sea bed;
- mid-water trawling – fishing for pelagic species such as herring and mackerel by towing one or more nets through the water column;
- long-lining – using static or trailed hooks and lines usually set on the sea bed and left for a number of hours;
- dredging – towing several dredges either side of a vessel and through the sea bed, typically for scallops but also other shellfish;
- fixed netting – using 'fleets' of nets anchored in some way to the sea beds and lifted, cleared and re-set from time to time;
- drift netting – allowing nets (attached to a vessel) to drift with the vessel downwind/tide; and
- potting – typically for crab, lobster and whelks using numbers of pots (a string of pots) anchored to the sea bed.

2.6.122 The construction and operation of offshore wind farms can have both positive and negative effects on fish and shellfish stocks.

2.6.123 Whilst the footprint of the offshore wind farm and any associated infrastructure may be a hindrance to certain types of commercial fishing activity such as trawling and long-lining, other fishing activities may be able to take place within operational wind farms without unduly disrupting or compromising navigational safety. Consequently, the establishment of a wind farm can increase the potential for some fishing activities, such as potting, where this would not compromise any safety zone in place. The IPC should consider adverse or beneficial impacts on different types of commercial fishing on a case by case basis.

2.6.124 In some circumstances, transboundary issues may be a consideration as fishermen from other countries may fish in waters within which offshore wind farms are sited.

2.6.125 Where an offshore wind farm could affect a species of fish that is of commercial interest, but is also of ecological value, the IPC should refer to paragraphs 2.6.58 to 2.6.77 of this NPS with regard to the latter.

2.6.126 In some circumstances, applicants may seek declaration of safety zones around wind turbines and other infrastructure, although these might not be applied until after consent to the wind farm has been granted. The declaration of a safety zone excludes or restricts activities within the defined sea areas including commercial fishing.

Applicant's assessment

2.6.127 Early consultation should be undertaken with statutory advisors and with representatives of the fishing industry which could include discussion of impact assessment methodologies. Where any part of a proposal involves a grid connection to shore, appropriate inshore fisheries groups should also be consulted.

2.6.128 Where a number of offshore wind farms have been proposed within an identified zone, it may be beneficial to undertake such consultation at a zonal, rather than a site-specific, level.

2.6.129 The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and any potential reduction in such stocks, as well as any likely constraints on fishing activity within the project's boundaries. Robust baseline data should have been collected and studies conducted as part of the assessment.

2.6.130 Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on commercial fishing.

2.6.131 Where the precise extents of potential safety zones are unknown, a realistic worst case scenario should be assessed. Applicants should consult the Maritime and Coastguard Agency (MCA). Exclusion of certain types of fishing may make an area more productive for other types of fishing. The assessment by the applicant should include detailed surveys of the effects on fish stocks of commercial interest and the potential reduction or increase in such stocks that will result from the presence of the wind farm development and of any safety zones.

IPC decision making

2.6.132 The IPC should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on fish stocks, including during peak spawning periods and the activity of fishing itself. This will include siting in relation to the location of prime fishing grounds. The IPC should consider the extent to which the proposed development occupies any recognised important fishing grounds and whether the project would prevent or significantly impede protection of sustainable commercial fisheries or fishing activities. Where the IPC considers the wind farm would significantly impede protection of sustainable fisheries or fishing activity at recognised important fishing grounds, this should be attributed correspondingly significant weight.

2.6.133 The IPC should be satisfied that the applicant has sought to design the proposal having consulted representatives of the fishing industry with the intention of minimising the loss of fishing opportunity taking into account effects on other marine interests. Guidance has been jointly agreed by the renewables and fishing industries on how they should liaise with the intention of allowing the two industries to successfully co-exist.

Mitigation

2.6.134 Any mitigation proposals should result from the applicant having detailed consultation with relevant representatives of the fishing industry.

2.6.135 Mitigation should be designed to enhance where reasonably possible any potential medium and long-term positive benefits to the fishing industry and commercial fish stocks.

2.6.136 The IPC will need to consider the extent to which disruption to the fishing industry, whether short term during construction or long term over the operational period, including that caused by the future implementation of any safety zones, has been mitigated where reasonably possible.

Offshore Wind Farm Impacts – Historic environment

Introduction

2.6.137 Generic onshore historic environment effects are covered in Section 5.8 of EN-1. For offshore energy infrastructure, there are considerations for certain types of heritage assets.

2.6.138 Heritage assets, as described in Section 5.8 of EN-1, may exist offshore and within the intertidal areas (the area between high tide and low tide marks). Such heritage assets can include remains from pre-historic settlements which existed prior to sea level rises as well as wreck sites and other features of historic maritime significance.

2.6.139 Heritage assets can be affected by offshore wind farm development in two principal ways:

- from the direct effect of the physical siting of the development itself such as the installation of the wind turbine foundations and electricity cables or the siting of plant required during the construction period; and
- from indirect changes to the physical marine environment (such as scour, coastal erosion or sediment deposition) caused by the proposed infrastructure itself or its construction (see the policy on physical environment starting at paragraph 2.6.189 of this NPS).

Applicant's assessment

2.6.140 Consultation with the relevant statutory consultees (including English Heritage or Cadw) should be undertaken by the applicants at an early stage of the development.

2.6.141 Assessment should be undertaken as set out in Section 5.8 of EN-1. Desk-based studies should take into account any geotechnical or geophysical surveys that have been undertaken to aid the wind farm design.

2.6.142 Assessment should also include the identification of any beneficial effects on the historic marine environment, for example through improved access or the contribution to new knowledge that arises from investigation.

2.6.143 Where elements of an application (whether offshore or onshore) interact with features of historic maritime significance that are located onshore, the effects should be assessed in accordance with the policy at Section 5.8 in EN-1.

IPC decision making

2.6.144 The IPC should be satisfied that offshore wind farms and associated infrastructure have been designed sensitively taking into account known heritage assets and their status, for example features designated as Protected Wrecks.

Mitigation

2.6.145 The avoidance of important heritage assets, including archaeological sites and historic wrecks, is the most effective form of protection and can be achieved through the implementation of exclusion zones around

such heritage assets which preclude development activities within their boundaries. The boundaries can be drawn around either discrete sites or more extensive areas identified in the ES.

2.6.146 As set out in paragraphs 2.6.44 and 2.6.45 above, where requested by applicants, the IPC should consider granting consents that allow for micrositing to be undertaken within a specified tolerance. This allows changes to be made to the precise location of infrastructure during the construction phase so that account can be taken of unforeseen circumstances such as the discovery of marine archaeological remains.

Offshore Wind Farm Impacts – Navigation and shipping

Introduction

2.6.147 Offshore wind farms will occupy an area of the sea and therefore it is inevitable that there will be some impact on navigation in and around the area of the site. This is relevant to both commercial and recreational users of the sea who may be affected by disruption or economic loss as a result of the proposed offshore wind farm. To ensure safety of shipping, it is Government policy that wind farms should not be consented where they would pose unacceptable risks to navigational safety after mitigation measures have been adopted.

2.6.148 Impacts on navigation can arise from the wind farm or other infrastructure and equipment creating a physical barrier during construction and operation. The presence of the wind turbines can also have impacts on communication and shipborne and shore-based radar systems.

2.6.149 Further impacts may arise from the granting of safety zones. Applicants may seek declaration of safety zones around wind turbines and other infrastructure, although these might not be applied for until after consent for the wind farm has been granted. The declaration of a safety zone excludes or restricts activities within the defined sea areas.

2.6.150 There is a public right of navigation over navigable tidal waters. In International Law, foreign vessels have the right of innocent passage through the UK's territorial waters. Beyond the seaward limit of the territorial sea, shipping has the freedom of navigation although offshore infrastructure and the imposition of safety zones can hinder this.

2.6.151 The use of the sea by recreational craft is also an important consideration for applicants and the IPC. Recreational craft, such as yachts, may try to avoid areas of sea used by commercial vessels such as recognised sea lanes essential to international navigation.

2.6.152 In some circumstances, vessels from other countries may sail in waters within which offshore wind farms are sited.

Applicant's assessment

2.6.153 Applicants should establish stakeholder engagement with interested parties in the navigation sector early in the development phase of the proposed offshore wind farm and this should continue throughout the life of the development including during the construction, operation and decommissioning phases. Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and navigation uses of the sea to successfully co-exist.

2.6.154 Assessment should be underpinned by consultation with the MMO, Maritime and Coastguard Agency (MCA), the relevant General Lighthouse Authority, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be affected.

2.6.155 Information on internationally recognised sea lanes is publicly available and this should be considered by applicants prior to undertaking assessments. The assessment should include reference to any relevant, publicly available data available on the Maritime Database.

2.6.156 Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant Government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above.

2.6.157 The navigation risk assessment will for example necessitate:

- a survey of vessels in the vicinity of the proposed wind farm;
- a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and
- cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.

2.6.158 Where there is a possibility that safety zones will be sought around offshore infrastructure, potential effects should be included in the assessment on navigation and shipping.

2.6.159 Where the precise extents of potential safety zones are unknown, a realistic worst case scenario should be assessed. Applicants should consult the MCA and refer to the Government guidance on safety zones.

2.6.160 The potential effect on recreational craft, such as yachts, should be considered in any assessment.

IPC decision making

2.6.161 The IPC should not grant development consent in relation to the construction or extension of an offshore wind farm if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development. The use of recognised sea lanes essential to international navigation means:

(a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; or

(b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a Renewable Energy Zone (REZ).

2.6.162 The IPC should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries[29] and recreational users of the sea. Where a proposed development is likely to affect major commercial navigation routes, for instance by causing

29 "Lifeline ferries" provide an essential service between islands or an island and the mainland on which the occupiers of the island rely for transportation of passengers and goods.

appreciably longer transit times, the IPC should give these adverse effects substantial weight in its decision making. There may, however, be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the wind farm proposal. Such circumstances should be discussed with the MCA and the commercial shipping sector and it should be recognised that alterations might require national endorsement and international agreement and that the negotiations involved may take considerable time and do not have a guaranteed outcome.

2.6.163 Where a proposed offshore wind farm is likely to affect less strategically important shipping routes, a pragmatic approach should be employed by the IPC. For example, vessels usually tend to transit point to point routes between ports (regional, national and international). Many of these routes are important to the shipping and ports industry as is their contribution to the UK economy. In such circumstances the IPC should expect the applicant to minimise negative impacts to as low as reasonably practicable (ALARP). Again, there may be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the wind farm application and such circumstances should be discussed with the MCA and the commercial shipping sector.

2.6.164 A detailed Search and Rescue Response Assessment should be undertaken prior to commencement of construction should consent for the offshore wind farm be granted. This assessment could be secured by a requirement to any consent. However, where there are significant concerns over the frequency or the consequences of such incidents, a full assessment may be required before the application can be determined.

2.6.165 The IPC should not consent applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered.

2.6.166 The IPC should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes. In view of the level of need for energy infrastructure, where an adverse effect on the users of recreational craft has been identified, and where no reasonable mitigation is feasible, the IPC should weigh the harm caused with the benefits of the scheme.

2.6.167 Providing proposed schemes have been carefully designed by the applicants, and that the necessary consultation with the MCA and the other navigation stakeholders listed above has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on navigation to a level sufficient to enable the IPC to grant consent. The MCA will use the NRA as described in paragraph 2.6.156 above when advising the IPC on any mitigation measures proposed.

2.6.168 The IPC should, in determining whether to grant consent for the construction or extension of an offshore wind farm, and what requirements to include in such a consent, have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development.

2.6.169 In considering what interference, obstruction or danger to navigation and shipping is likely and its extent and nature, the IPC should have regard to the likely overall effect of the development in question and to any cumulative effects of other relevant proposed, consented and operational offshore wind farms.

Extinguishing public rights of navigation

2.6.170 The IPC may include provisions within the terms of a development consent as respects rights of navigation so far as they pass through waters in or adjacent to Great Britain which are between the mean low water mark and the seaward limits of the territorial sea. The provisions may specify or describe rights of navigation which:

- are extinguished;
- are suspended for the period that is specified in the development consent order;
- are suspended until such time as may be determined in accordance with provisions contained in the development consent order; or
- are exercisable subject to such restrictions or conditions, or both, as are set out in the development consent order.

2.6.171 The IPC should specify the date on which any such provisions are to come into force, or the means by which that date is to be determined.

2.6.172 The IPC should require the applicant to publish any provisions that are included within the terms of the development consent order, in such a manner as appears to the IPC to be appropriate for bringing them, as soon as is reasonably practicable, to the attention of persons likely to be affected by them.

2.6.173 The IPC should include provisions as respects rights of navigation within the terms of a development consent order only if the applicant has requested such provision be made as part of their application for development consent.

Mitigation

2.6.174 Mitigation measures will include site configuration, lighting and marking of projects to take account of any requirements of the General Lighthouse Authority and also the provision of an acceptable Active Safety Management System.

2.6.175 In some circumstances, the IPC may wish to consider the potential to use requirements involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.

Offshore Wind Farm Impacts – Oil, gas and other offshore infrastructure and activities

Introduction

2.6.176 The scale and location of future offshore wind development around England and Wales raises the likelihood of development being proposed in or close to areas where other offshore infrastructure, such as telecommunication cables or oil and gas pipelines, are located or other activities, including oil and gas exploration/drilling or marine aggregate dredging, take place.

2.6.177 Further, it is likely that developers will apply in the future for development consent to deploy other technologies that may interact with offshore wind farms, including other marine renewable electricity generation, such as wave and tidal devices, and the infrastructure required for the transportation and storage of carbon as a result of its capture in some combustion power stations.

2.6.178 The use of the offshore area for other offshore activities and siting of new infrastructure is regulated. For example, the Government grants licences to companies to explore for and develop oil and gas reserves in waters around the UK. Such activity could result in the construction of offshore infrastructure necessary for extraction of any reserves discovered, including offshore platforms and pipelines, much of which require access for helicopters. In some situations, new developments may be able to access existing petroleum pipelines, but in some circumstances new pipelines will need to be constructed.

Applicant's assessment

2.6.179 Where a potential offshore wind farm is proposed close to existing operational offshore infrastructure, or has the potential to affect activities for which a licence has been issued by Government, the applicant should undertake an assessment of the potential effect of the proposed development on such existing or permitted infrastructure or activities. The assessment should be undertaken for all stages of the lifespan of the proposed wind farm in accordance with the appropriate policy for offshore wind farm EIAs.

2.6.180 Applicants should engage with interested parties in the potentially affected offshore sectors early in the development phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application to the IPC.

2.6.181 Such stakeholder engagement should continue throughout the life of the development including construction, operation and decommissioning phases where necessary. As many of these offshore industries are regulated by Government, the relevant Secretary of State should also be a consultee where necessary. Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and other uses of the sea to successfully co-exist.

IPC decision making

2.6.182 There are statutory requirements concerning automatic establishment of navigational safety zones relating to offshore petroleum developments[30].

2.6.183 Where a proposed offshore wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the IPC. Much of this infrastructure is important to other offshore industries as is its contribution to the UK economy. In such circumstances the IPC should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable.

2.6.184 As such, the IPC should be satisfied that the site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. The IPC should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.

2.6.185 Where a proposed development is likely to affect the future viability or safety of an existing or approved/licensed offshore infrastructure or activity, the IPC should give these adverse effects substantial weight in its decision-making.

2.6.186 Providing proposed schemes have been carefully designed by the applicants, and that the necessary consultation with relevant bodies has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on other offshore infrastructure or operations to a level sufficient to enable the IPC to grant consent.

Mitigation

2.6.187 Detailed discussions between the applicant for the offshore wind farm and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application to the IPC. As such, appropriate mitigation should be included in any application to the IPC, and ideally agreed between relevant parties.

2.6.188 In some circumstances, the IPC may wish to consider the potential to use requirements involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.

30 Section 21, Part 3 Petroleum Act 1987.

Offshore Wind Farm Impacts – Physical environment

Introduction

2.6.189 The construction, operation and decommissioning of offshore energy infrastructure can affect the following elements of the physical offshore environment:

- water quality – disturbance of the seabed sediments or release of contaminants can result in indirect effects on habitats and biodiversity and fish stocks thus affecting the fishing industry;
- waves and tides – the presence of the turbines can cause indirect effects on flood defences, marine ecology and biodiversity, marine archaeology and potentially, coastal recreation activities;
- scour effect – the presence of wind turbines and other infrastructure can result in a change in the water movements within the immediate vicinity of the infrastructure, resulting in scour (localised seabed erosion) around the structures. This can indirectly affect navigation channels for marine vessels and marine archaeology;
- sediment transport – the resultant movement of sediments, such as sand across the seabed or in the water column, can indirectly affect navigation channels for marine vessels; and
- suspended solids – the release of sediment during construction and decommissioning can cause indirect effects on marine ecology and biodiversity.

Applicant's assessment

2.6.190 Assessment should be undertaken for all stages of the lifespan of the proposed wind farm in accordance with the appropriate policy for offshore wind farm EIAs.

2.6.191 The Environment Agency (EA) regulates emissions to land, air and water out to 3nm. Where any element of the wind farm or any associated development included in the application to the IPC is located within 3nm of the coast, the EA should be consulted at the pre-application stage on the assessment methodology for impacts on the physical environment.

2.6.192 Beyond 3nm, the MMO is the regulator. The applicant should consult the MMO and the Centre for Environment, Fisheries & Aquaculture Science (CEFAS) on the assessment methodology for impacts on the physical environment at the pre-application stage.

2.6.193 Geotechnical investigations should form part of the assessment as this will enable design of appropriate construction techniques to minimise any adverse effects.

2.6.194 The assessment should include predictions of the physical effect that will result from the construction and operation of the required infrastructure and include effects such as the scouring that may result from the proposed development.

IPC decision making

2.6.195 As set out above, the direct effects on the physical environment can have indirect effects on a number of other receptors. Where indirect effects are predicted, the IPC should refer to relevant sections of this NPS and EN-1.

2.6.196 The IPC should be satisfied that the methods of construction, including use of materials, are such as to reasonably minimise the potential for impact on the physical environment. This could involve, for instance, the exclusion of certain foundations on the basis of their impacts or minimising quantities of rock that are used to protect cables whilst taking into account other relevant considerations such as safety.

Mitigation

2.6.197 Mitigation measures which the IPC should expect the applicants to have considered include the burying of cables to a necessary depth and using scour protection techniques around offshore structures to prevent scour effects around them. Applicants should consult the statutory consultees on appropriate mitigation.

Offshore Wind Farm Impacts –Seascape and visual effects

Introduction

2.6.198 Generic landscape and visual impacts are covered in Section 5.9 of EN-1. In addition, there are specific considerations which apply to offshore wind energy infrastructure proposals as set out below.

2.6.199 Seascape is an additional issue for consideration. Seascape is a discrete area within which there is shared inter-visibility between land and sea.[31] In some circumstances it may be necessary to carry out a seascape and visual impact assessment (SVIA) in accordance with the relevant offshore wind farm EIA policy.

2.6.200 The seascape is an important resource and an economic asset. Coastal landscapes are often recognised through statutory landscape designations.

Applicant's assessment

2.6.201 Some applications for offshore wind farms that are submitted to the IPC will be proposed at distances that mean that a project would not be visible from the shore. In these instances, the IPC is likely to be able to conclude that an SVIA will not be required.

2.6.202 Where a proposed offshore wind farm will be visible from the shore, an SVIA should be undertaken which is proportionate to the scale of the potential impacts. Impact on seascape should be addressed in addition to the landscape and visual effects discussed in EN-1.

2.6.203 Where necessary, assessment of the seascape should include an assessment of three principal considerations on the likely effect of offshore wind farms on the coast:

- limit of visual perception from the coast;
- individual characteristics of the coast which affect its capacity to absorb a development; and
- how people perceive and interact with the seascape.

2.6.204 As part of the SVIA, photomontages are likely to be required. Viewpoints to be used for the SVIA should be selected in consultation with the statutory consultees at the EIA Scoping stage.

2.6.205 Magnitude of change to both the identified seascape receptors (such as seascape units and designated landscapes) and visual receptors (such as viewpoints) should be assessed in accordance with the standard methodology for SVIA.

31 Definition taken from Appendix 3 of DTI (2005) Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report.

2.6.206 Where appropriate, cumulative SVIA should be undertaken in accordance with the policy on cumulative assessment outlined in Section 4.2 of EN-1.

IPC decision making

2.6.207 The IPC should assess the proposal in accordance with the policy set out in the landscape and visual impacts Section 5.9 of EN-1.

2.6.208 Where a proposed offshore wind farm is within sight of the coast, there may be adverse effects. The IPC should not refuse to grant consent for a development solely on the ground of an adverse effect on the seascape or visual amenity unless:

- it considers that an alternative layout within the identified site could be reasonably proposed which would minimise any harm, taking into account other constraints that the applicant has faced such as ecological effects, while maintaining safety or economic viability of the application; or
- taking account of the sensitivity of the receptor(s) as set out in EN-1 paragraph 5.9.18, the harmful effects are considered to outweigh the benefits of the proposed scheme.

2.6.209 Where adverse effects are anticipated either during the construction or operational phases, in coming to a judgement, the IPC should take into account the extent to which the effects are temporary or reversible.

Mitigation

2.6.210 Neither the design nor scale of individual wind turbines can be changed without significantly affecting the electricity generating output of the wind turbines. Therefore, the IPC should expect it to be unlikely that mitigation in the form of reduction in scale will be feasible. However, the layout of the turbines should be designed appropriately to minimise harm, taking into account other constraints such as ecological effects, safety reasons or engineering and design parameters.

2.7 Onshore Wind

Introduction

2.7.1 Onshore wind farms are the most established large-scale source of renewable energy in the UK. Onshore wind farms will continue to play an important role in meeting renewable energy targets.

2.7.2 Onshore wind farm proposals are currently likely to involve turbines from between two megawatts (MW) of generating capacity and up to three and a half MW individually, but as technology develops, this could increase. The total number of turbines comprising a wind farm of 50 MW capacity or greater covered by this NPS is therefore likely to be fourteen or more. This scale of development will inevitably have some visual and/or noise impacts, particularly if sited in rural areas.

Factors influencing site selection by applicant

2.7.3 The key considerations involved in the siting of an onshore wind farm are likely to be influenced by factors set out in the following paragraphs.

Predicted wind speed

2.7.4 The predicted wind resource will be a key consideration for the applicant in identifying a potential site as the electricity generated on site is directly affected by the wind speed. Wind speed increases with height above ground level and the amount of electricity generated increases disproportionately with increases in the wind speed. This in turn affects the carbon emission savings and the commercial viability of the site.

2.7.5 Applicants will often have installed temporary anemometry masts or similar on the site for 12 months or more to ascertain precise onsite wind speeds prior to submitting the wind farm application. It is the decision of individual applicants as to whether this is necessary.

Proximity of site to dwellings

2.7.6 Commercial scale wind turbines are large structures and can range from tip heights of 100m up to 150m although advances in technology may result in larger machines coming on the market. All wind turbines generate sound during their operation. As such, appropriate distances should be maintained between wind turbines and sensitive receptors to protect amenity. The two main impact issues that determine the acceptable separation distances are visual amenity and noise. These are considered in the Landscape and visual (paragraph 2.7.46) and Noise and vibration (paragraph 2.7.52) impact sections below.

Capacity of a site

2.7.7 In order for wind turbines to generate electricity efficiently, the turbines must be placed at a sufficient distance from one another within the site. The spacing will depend on the prevailing wind direction and the physical characteristics of the site. A spacing of six rotor diameters is normally required in the direction of the prevailing wind direction, and four rotor diameters perpendicular to this. However, this is a matter for the applicant.

Electricity grid connection

2.7.8 The connection of the proposed onshore wind farm into the relevant electricity network will be an important consideration for applicants of onshore wind farms. The grid connection text at Section 4.9 in EN-1 sets out the important issues.

2.7.9 Most onshore wind farms are connected into the local distribution network at an intermediate voltage of 33, 66 or 132 kilovolts (kV). The capacity of the local grid network to accept the likely output from a proposed wind farm is critical to the technical feasibility of a development. The connection voltage and the distance from the wind farm to the existing network can have a significant effect on the commercial feasibility of a development proposal.

Access

2.7.10 Applicants will need to consider the suitability of the access routes to the proposed site for both the construction and operation of the wind farm with the former likely to raise more significant issues. Section 5.13 of EN-1 advises on generic traffic and transport impacts while those which are specific to onshore wind farms are considered in sections 2.7.73 to 2.7.83 of this NPS. Given that potential onshore wind farm sites are largely in rural areas, access for the delivery of turbine components during construction can be a significant consideration for wind farm siting.

Technical considerations for the IPC when determining onshore wind farms

2.7.11 Applications for onshore wind farms are likely to comprise a number of elements including wind turbines, access tracks, crane pads, substation, underground connecting cables and anemometer.

Access tracks

2.7.12 Developers will usually need to construct access tracks to connect onshore wind farms to the public road network. Applications should include the full extent of the access tracks necessary and an assessment of their effects.

Project lifetimes

2.7.13 Onshore wind turbines typically have a design life of 25 years, although this can vary, and can be decommissioned relatively easily and cheaply. Applicants may apply for consent for a specified period, based on the design life of the wind turbines. Such consent, where granted, is described as temporary because there is a finite period for which it exists, after which the project would cease to have consent and therefore must be decommissioned and removed.

2.7.14 The nature and extent of decommissioning of a site can vary. Generally the wind turbines themselves will always be decommissioned with the concrete foundations in the ground dug out to a certain depth to ensure that the use of the site, typically for agriculture, can continue.

2.7.15 Applications for onshore wind farms should set out details of what will be decommissioned and removed from the site at the end of the operational

life of the generating station. There may be some instances where it would be more harmful to the ecology of the site to remove elements of the development, such as the access tracks or underground cabling, than to retain them. Further, there may be socio-economic benefits of retaining parts of the development. For example, the tracks may increase access to land that was previously relatively inaccessible for farming or other purposes.

2.7.16 Where the consent for onshore wind farms is to be time-limited, the IPC should impose a condition setting that time-limit from the date the wind farms start to generate electricity. Such a condition should also secure the decommissioning of the generating station after the expiration of its permitted operation to ensure that inoperative plant is removed after its operational life. A limit of 25 years is typical, although applicants may seek consent for differing time-periods for operation.

2.7.17 The time-limited nature of wind farms, where a time limit is sought by an applicant as a condition of consent, is likely to be an important consideration for the IPC when assessing impacts such as landscape and visual effects and potential effects on the settings of heritage assets. Such judgements should include consideration of the period of time sought by the applicants for the generating station to operate and the extent to which the site will return to its original state may also be a relevant consideration.

Flexibility in the project details

2.7.18 Many different makes and models of onshore wind turbines are available. Each of these will have differing hub heights, tip heights, design and generating capacity. Further, the need for external cabins adjacent to the wind turbines to house transformers can also vary depending upon make and model of wind turbines.

2.7.19 As set out in Section 4.2 of EN-1, at the time of application, wind farm operators may not know precisely which turbine will be procured for the site until some time after any consent has been granted. If turbine details, or any other relevant information, are not available, such as the precise location of the source of concrete and crushed stone to be used for the construction, then the applicant should assess the effects that the project could have (as set out in EN-1 paragraph 4.2.8) to ensure that the project as it may be constructed has been properly assessed. In this way, some flexibility should be provided in the consent.

2.7.20 In the case of onshore wind farms, it is likely that this flexibility will be needed in relation to the dimensions of the turbines, including tip height, hub height and rotor diameter. This may extend to other details of the turbine design, including the necessary size of any external cabins that may be required. In some specific circumstances, applicants may not know the precise layout of wind turbines, such as where the site is covered by forestry at the time of the application.

2.7.21 Where specific details of the design of the site are uncertain at the time of application, this should be made clear by the applicant with the reasons for the uncertainty given.

2.7.22 Where elements of the design of the scheme are unknown, the maximum-case scenario should be assessed and the IPC should consider the maximum adverse effects in its consideration of the application and consent.

Micrositing

2.7.23 Applicants are likely to need flexibility in a project consent to allow for any necessary micrositing of elements of the proposed wind farm after its consent and during its construction. This allows for unforeseen events which may arise.

2.7.24 Whilst it is for the applicant to specify the level of tolerance they are seeking, a tolerance of between 30m and 50m of elements of the required infrastructure is typical. However, there may be some circumstances where the IPC considers that the micrositing tolerance requested by the applicant is too great, and that on the evidence of the EIA and its own assessment of the proposal, that it is necessary to restrict either the overall tolerance for the scheme or the tolerance of specific elements of the proposal. When making this judgement, the IPC should take into account the reason for the applicant having requested the micrositing.

Repowering

2.7.25 Given the age of some of the UK's older wind farms, the owner of the wind farm may seek to "repower" the site with new turbines. The IPC is therefore likely to have to consider applications for the repowering of existing sites.

2.7.26 Where an onshore wind farm nears the end of its operational life or reaches the permitted time-limit for operation, the older turbines are very likely to have to be decommissioned. Where repowering of a site is planned, it will involve renegotiation between the owner/operator of the wind farm and the owner of the land or, potentially, a new developer. This is a commercial matter for the applicant.

2.7.27 Given the likely change in technology over the intervening time period, any repowering of sites may involve a different number of wind turbines (usually fewer) of a different scale and nature (usually larger). This would result in a significantly altered site layout and electricity generating capacity and a new consent application would be required.

2.7.28 In determining an application for the repowering of a site, the proposed replacement scheme should be determined by the IPC on its individual merits.

IPC Impact Assessment principles

2.7.29 The IPC should adhere to the principles set out in paragraphs 2.5.31 to 2.5.36 since these also apply to onshore wind farms and associated infrastructure.

Onshore Wind Farm Impacts – Biodiversity and geological conservation

Introduction

2.7.30 Generic biodiversity and geological impacts are covered in Section 5.3 of EN-1. In addition, there are specific considerations which apply to onshore wind turbines as set out below.

2.7.31 In addition to the impacts set out in EN-1, there is the potential for the rotating blades of a wind turbine to strike birds and adversely affect bats, resulting in injury or death.

2.7.32 Onshore wind farm sites within England and Wales may be proposed on peat. Peat is a sensitive habitat that is important for many species of flora and fauna. In some instances, soil disturbance may lead to change in the local hydrological regime which can affect biodiversity. Further, peat is rich in carbon so disturbance of peat can result in a release of carbon stored in soils.

Applicant's assessment

2.7.33 Where necessary, the assessments carried out by applicants should assess collision risks using the data collected from the site at the pre-application EIA stage. The IPC should satisfy itself that the assessment has been conducted to a satisfactory standard having had regard to advice from the relevant statutory advisor.

2.7.34 Relevant data from operational wind farms should be referred to in the applicant's assessment.

2.7.35 It may be appropriate for the assessment to include collision risk modelling for certain species of birds or to estimate the mortality rate for certain species of bat. The parameters to be used in such modelling should have been discussed with the relevant statutory consultees.

2.7.36 The assessment should include any effects on biodiversity resulting from the disturbance of important habitats such as peat. Where relevant, the IPC may instruct applicants to provide geotechnical and hydrological information in support of applications, identifying the presence of peat at each site, including the risk of landslide connected to any development work.

IPC decision making

2.7.37 In addition to Section 5.3 of EN-1 there are specific considerations which should inform IPC decision-making where developments are proposed on peat. In these cases the IPC should be satisfied that the wind farm layout and construction methods have been designed to minimise soil disturbance when building and maintaining roads and tracks, turbine bases and other infrastructure. This is to ensure the development will result in minimal disruption to the ecology, or release of CO_2 and that the carbon balance savings of the scheme are maximised.

Mitigation

2.7.38 Taking into account other constraints, wind turbines should be laid out in such a way as to minimise risk of impacts on birds or bats where the risk assessment shows there is a significant risk.

2.7.39 There may be other forms of mitigation such as making the land surrounding the turbines less attractive to the species of concern. However, in many cases the applicant will not own the wind farm site or surrounding land. Often, applicants only lease the land required for the wind turbines and access tracks.

Future surveys and monitoring

2.7.40 Whilst there is a considerable amount of knowledge about the effects of onshore wind farms on specific species of birds, and currently a more limited knowledge about the effects on bats, the IPC should seek to validate the results of the EIA and any collision risk modelling by requiring, where reasonable, relevant monitoring during the construction and operational phases of onshore wind farms. Such monitoring results should be made publicly available.

Onshore Wind Farm Impacts – Historic environment

Introduction

2.7.41 Historic environment impacts are covered in Section 5.8 of EN-1. However, with respect to onshore wind farms, the following considerations also apply.

Applicant's assessment

2.7.42 Visualisations may be required to demonstrate the effects of a proposed onshore wind farm on the setting of heritage assets.

IPC decision making

2.7.43 As explained in paragraphs 2.7.13 to 2.7.17 above, onshore wind turbines are generally consented on the basis that they will be time-limited in operation. The IPC should therefore take into account the length of time for which consent is sought when considering any indirect effect on the historic environment, such as effects on the setting of designated heritage assets.

Mitigation

2.7.44 The ability of the applicants to microsite specific elements of the proposed development during the construction phase, as set out in paragraphs 2.7.23 to 2.7.24 above, should be an important consideration by the IPC when assessing the risk of damage to archaeology.

2.7.45 Therefore, where requested by the applicant, the IPC should consider granting consents which allow for the micrositing within a specified tolerance of elements of the permitted infrastructure so that precise locations can be amended during the construction phase in the event that unforeseen circumstances, such as the discovery of previously unknown archaeology, arise.

Onshore Wind Farm Impacts – Landscape and visual

Introduction

2.7.46 Generic landscape and visual impacts are covered in Section 5.9 of EN-1. In addition, there are specific considerations which apply to onshore wind turbines, which are set out in the following paragraphs.

Applicant's assessment

2.7.47 Detailed pre-application consultation should be carried out in accordance with the assessment policy set out in l Section 5.9 of EN-1.

IPC decision making

2.7.48 Modern onshore wind turbines that are used in commercial wind farms are large structures and there will always be significant landscape and visual effects from their construction and operation for a number of kilometres around a site.

2.7.49 The arrangement of wind turbines should be carefully designed within a site to minimise effects on the landscape and visual amenity while meeting technical and operational siting requirements and other constraints.

2.7.50 There are existing operating wind farms where commercial scale wind turbines are sited close to residential dwellings. The IPC should consider any evidence put before it on the experience of similar-scale turbines at similar distances to residential properties.

Mitigation

2.7.51 It is unlikely that either the number or scale of wind turbines can be changed without significantly affecting the electricity generating output of the wind farm. Therefore, mitigation in the form of reduction in scale may not be feasible.

Onshore Wind Farm Impacts – Noise and vibration

Introduction

2.7.52 Generic information on the assessment of noise and vibration impacts, including noise associated with the construction, operation and decommissioning of most energy infrastructure, are covered in detail in Section 5.11 of EN-1. In addition, there are specific considerations which apply to the operation of onshore wind turbines as discussed below.

2.7.53 Operational wind turbines will generate increases in noise levels (whether from machinery, for example aerodynamic noise from turbines, or from associated sources, such as traffic) although the relative noise impact diminishes with distance. The noise associated with the construction and decommissioning of the proposed infrastructure, including construction traffic, is covered in EN-1.

Applicant's assessment

2.7.54 The ES should include a noise assessment as set out in Section 5.11 of EN-1. However, the noise created by wind turbines in operation is related to wind speed and is different to general industrial noise and an additional assessment of this noise should be made.

2.7.55 The method of assessing the impact of noise from a wind farm on nearby residents is described in the report, 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97) [32]. This was produced by the Working Group on Noise from Wind Turbines Final Report, September 1996 and the report recommends noise limits that seek to protect the amenity of wind farm neighbours[33]. The noise levels recommended by ETSU-R-97 are determined by a combination of absolute noise limits and noise limits relative to the existing background noise levels around the site at different wind speeds. Therefore noise limits will often influence the separation of wind turbines from residential properties.

2.7.56 The applicant's assessment of noise from the operation of the wind turbines should use ETSU-R-97, taking account of the latest industry good practice. This should include any guidance on best practice that the Government may from time to time publish[34].

32 All references to ETSU-R-97 in this section should be taken to include any successor or supplementary guidance to it endorsed by the Government.

33 Notwithstanding the date of this report, the Government is satisfied on the balance of subsequent scientific research that its key conclusions (and in particular the limits it recommends) remain a sound basis for planning decisions.

34 In July 2010, DECC commissioned an analysis of the application of ETSU-R-97 by LPAs and developers from Hayes McKenzie. Their peer-reviewed report on this analysis was published in [June] 2011. It concluded that the methodology in ETSU-R-97 was inconsistently applied and recommended better guidance on best practice for developers and planning authorities. Government is working with industry to draft better guidance.

IPC decision making

2.7.57 The IPC should consider noise and vibration impacts according to Section 5.11 of EN-1 and use ETSU-R-97 to satisfy itself that the noise from the operation of the wind turbines is within acceptable levels.

2.7.58 Where the correct methodology has been followed and a wind farm is shown to comply with ETSU-R-97 recommended noise limits, the IPC may conclude that it will give little or no weight to adverse noise impacts from the operation of the wind turbines.

2.7.59 Where a wind farm cannot demonstrate compliance with the recommended noise limits set out in ETSU-R-97, the IPC will need to consider refusing the application unless suitable noise mitigation measures can be imposed by requirements to the development consent.

2.7.60 There is no evidence that ground transmitted low frequency noise from wind turbines occurs at a sufficient level to be harmful to human health[35]. Therefore, the IPC is unlikely to have to give any weight to claims of harm to human health as a result of ground transmitted low frequency noise.

2.7.61 The IPC should consider including requirements setting a noise limit to ensure that the operational noise levels from the development do not exceed those described in the assessment upon which the IPC's decision was based. If the predicted noise levels from the proposed development only just meet the recommended noise limits set out in ETSU-R-97, the IPC should include a requirement setting such a noise limit.

Mitigation

2.7.62 Mitigation should be inherent in good design of a wind farm, but the IPC should consider whether mitigation measures additional to those described in Section 5.11 may be needed.

35 ODPM (2004) Planning for Renewable Energy. A Companion Guide to PPS22. Paragraph 44. Technical Annex 8.

Onshore Wind Farm Impacts – Shadow flicker

Introduction

2.7.63 Shadow flicker is the effect caused when an operating turbine is located between the sun and a receptor, such as a dwelling or place of work. The effect occurs when the shadow of the rotating blades falls over the dwelling causing the light intensity within specific affected rooms of the occupied building to fluctuate.

2.7.64 The potential significance of the effect is dependent on a number of factors:

- the location of the relevant building relative to the path of the sun and the turbines;
- the distance of turbines from such buildings; the size of the window apertures and their location in the building relative to the turbines;
- the turbine height and rotor diameter;
- the presence of intervening topography, buildings or vegetation;
- the frequency of bright sun and cloudless skies;
- the time of the year; and
- the prevailing wind direction and hence usual rotor orientation.

Research and computer modelling on flicker effects has demonstrated that there is unlikely to be a significant impact at distances greater than ten rotor diameters from a turbine[36]. Therefore if the turbine has 80m diameter blades, the potentially significant shadow flicker effect could be observed up to 800m from a turbine.

2.7.65 The occurrence and duration of shadow flicker at a particular occupied building is dependent upon:

- wind speed – wind speed will determine its frequency;
- wind direction – must allow the rotor to be perpendicular to the dwelling for a shadow flicker effect to take place; and
- cloud cover – must be sufficiently thin to allow the sun to shine brightly enough for shadow flicker to occur.

Applicant's assessment

2.7.66 Where wind turbines have been proposed within 10 rotor diameters of an existing occupied building, a shadow flicker assessment should be carried out by the applicant. The IPC should anticipate that the intensity of the shadow of the rotating blades from turbines at distances from such buildings of 10 rotor diameters and beyond is sufficiently diminished so as to have no significant impact on occupied buildings.

36 Office of the Deputy Prime Minister (2004) Planning for Renewable Energy. A Companion Guide to PPS22. Paragraph 76, Technical Annex 8 and Parsons Brinckerhoff report "Update of Shadow Flicker Evidence Base" for DECC, 16 March 2011.

2.7.67 The maximum potential number of hours that shadow flicker could occur at each affected occupied building should be calculated, using industry good practice. There are several computer programs that will calculate precisely the maximum number of hours each year that shadow flicker could occur at individual properties, including specific days of the year, times of the day and duration of each potential episode.

IPC decision making

2.7.68 Modern wind turbines can be controlled such that the operation of individual wind turbines at the periods when shadow flicker has the potential to occur at a specific property or group of properties can be inhibited on sunny days, for those properties, for the specific times of the day, and on specific days of the year.

2.7.69 In circumstances where a wind turbine has the potential to affect a property, but is fitted with a mechanism to inhibit shadow flicker, the IPC should be able to judge the shadow flicker impacts on that property to be of negligible significance.

2.7.70 The maximum frequency of the shadowing effect from commercial scale wind turbines is less than 1 hertz, which is well below the frequency known to affect sufferers of epilepsy (which is above 2.5 hertz[37]). Therefore, shadow flicker frequencies are not in the region known to induce seizures in sufferers of epilepsy, and as such, where the frequency of potential flashes will not exceed 2.5 hertz, the IPC should give very limited weight to any claims of effects on epileptics from onshore wind turbines. Recent research on the subject concludes that the shadows cast by one turbine on another should not be viewable by the public if the cumulative flash rate exceeds three per second and if the turbine blades are not reflective[38].

Mitigation

2.7.71 Where the possibility of shadow flicker exists, mitigation can be enforced through the use of conditions.

2.7.72 As far as technologically possible, rotating blades should not be reflective (other than in terms of countering effects on radar).

37 Office of the Deputy Prime Minister (2004) Planning for Renewable Energy. A Companion Guide to PPS22. Paragraph 77, Technical Annex 8.

38 Harding, G. Harding P, and Wilkins, A. (2008) Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them.

Onshore Wind Farm Impacts – Traffic and transport

Introduction

2.7.73 Generic traffic and transport impacts are covered in EN-1, Section 5.13. In addition, there are specific considerations which apply to onshore wind turbines as set out below. Public perception of the construction phase of an onshore wind farm will derive mainly from the effects of traffic movements.

2.7.74 Many onshore wind farms will be sited in areas served by a minor road network. Modern wind turbines are large structures and some components, notably the rotor blades, can currently only be transported to sites as complete structures. Blades currently range from between 30m and 45m in length, although this could change as technology develops. The construction of a wind farm will therefore require sufficient access for long and wide load items. Further, some individual components of the wind turbines can weigh in excess of 100 tonnes and it is important that all sections of roads and bridges on the proposed delivery route can accommodate the weight of the loads.

Applicant's assessment

2.7.75 The applicant should have assessed the various potential routes to the site for delivery of materials and components where the source of the materials is known at the time of the application, and selected the route that is considered to be the most appropriate. It is possible that the exact location of the source of construction materials, such as crushed stone or concrete will not be known at the time of the application to the IPC. In these circumstances, the impact of additional vehicles on the likely potential routes should have been assessed.

2.7.76 The applicant should assess whether the access roads are suitable for the transportation of components which will include whether they are sufficiently wide for the rotor blades, or bridges sufficiently strong for the heavier components to be transported to the site. Any sections of the route which will require modification to allow for the transportation of components to site should be identified and potential effects assessed as part of the ES.

2.7.77 There may be a number of wind farms proposed that use a common port and/or access route and pass through the same towns. Where a cumulative impact is likely then a cumulative transport assessment should form part of the EIA to consider the impacts of abnormal traffic movements relating to the project in question in combination with those from any other relevant development. Consultation with the relevant local highways authorities is likely to be necessary.

IPC decision making

2.7.78 Consistent with the generic policy set out in EN-1, the IPC should be satisfied, taking into account the views of the relevant local highway authorities, that abnormal loads can be safely transported in a way that minimises inconvenience to other road users and that the environmental effects of this and other construction traffic, after mitigation, are acceptable.

2.7.79 Once wind farms are in operation, traffic movements to and from the site are generally very light, in some instances as little as a few visits each month by a light commercial vehicle or car. The need to replace machine components will generate heavier commercial vehicle movements, but these are likely to be infrequent. Therefore, it is very unlikely that traffic or transport impacts from the operational phase of a project would prevent it from being approved by the IPC.

Mitigation

2.7.80 In some instances, it may be necessary for the applicant to undertake modifications to the highway to facilitate delivery of components and/or minimise disruption to other highway users. Further, it may be appropriate to request that the applicant undertake a "dry-run" of the delivery of the largest components to ensure delivery is possible in a way that minimises disruption. Requirements for strengthening bridges may also be requested by the relevant highways authority.

2.7.81 In some cases, the local highways authority may request that the IPC impose controls on the number of vehicle movements to and from the wind farm site in a specified period during its construction and, possibly, on the routeing of such movements particularly by heavy vehicles. Where the IPC agrees that this is necessary taking into account all representations, this could be achieved by imposing suitable requirements on development consent.

2.7.82 Where cumulative effects on the local road network or residential amenity are predicted as a result of multiple wind farm developments, it may be appropriate for applicants for various projects to work together to ensure that the number of abnormal loads and deliveries are minimised and the timings of deliveries are managed and coordinated to ensure that disruption to local residents and other highway users is reasonably minimised. It may also be appropriate for the highway authority to set limits for and coordinate these deliveries through active management of the delivery schedules through the abnormal load approval process. Once consent for a scheme has been granted, applicants should liaise with the relevant local highway authority (or other coordinating body) regarding the start of construction and the broad timing of deliveries. It may be necessary for an applicant to agree a planning obligation to secure appropriate measures.

2.7.83 It may be appropriate for any non-permanent highway improvements carried out for the development (such as temporary road widening) to be made available for use by other subsequent wind farm developments.

Glossary

AoS	Appraisal of Sustainability
Associated infrastructure	Development associated with the NSIP as defined in Section 115 of the Planning Act
Biomass	Material of recent biological origin derived from plant or animal matter
CCGT	Combined Cycle Gas Turbine
CHP	Combined Heat and Power
CCS	Carbon Capture and Storage
CCR	Carbon Capture Readiness
CLG	Department for Communities and Local Government
Co-firing	Use of two fuel types (eg coal and biomass) in a thermal generating station (qv)
DECC	Department of Energy and Climate Change
Defra	Department of Environment, Food and Rural Affairs
DfT	Department for Transport
EA	The Environment Agency
EIA	Environmental Impact Assessment
EN-1	Overarching NPS for Energy
EP	Environmental Permit issued by EA (qv)
ES	Environmental Statement
FEPA	Food and Environmental Protection Act 1985: licences for operations in England or waters adjacent to England are issued under this Act, although they have been replaced by marine licences under the Marine and Coastal Access Act 2008
Generic Impacts	Potential impacts of any energy infrastructure projects, the general policy for consideration of which is set out in Part 5 of EN-1
Habitats Directive	The European Directive (92/43/EEC) on the Conservation of Natural Habitats and Wild Flora and Fauna
Habitats And Species Regulations	The Conservation of Habitats and Species Regulations 2010(SI2010/490), which implement the Habitats Directive and relevant parts of the Birds Directive
HRA	Habitats Regulations Assessment
LCPD	Large Combustion Plant Directive: sets emission limits of certain pollutants from industrial combustion plants with a thermal input equal to or greater than 50 MW
MMO	Marine Maritime Organisation: set up under the Marine and Coastal Access Act 2008
MW	Megawatt = one million watts
NSIP	Nationally Significant Infrastructure Project
SEA	Strategic Environmental Assessment (under the Directive 2001/42/EC)

Thermal Generating Station	Electricity generating station that uses a heat source (combustion of fuel or nuclear) to create steam that drives a generating turbine or which uses gas directly to drive a generating turbine
WID	Waste Incineration Directive: sets specific emission limits for waste combustion plant

URN 11D/713

Energy Planning Reform
Department of Energy & Climate Change
Area 3A
3 Whitehall Place
London
SW1A 2AW
www.decc.gov.uk

Published by TSO (The Stationery Office) and available from:

Online
www.tsoshop.co.uk

Mail, telephone fax and e-mail
TSO
PO Box 29, Norwich, NR3 1GN
Telephone orders/general enquiries 0870 600 5522
Order through the Parliamentary Hotline Lo-Call 0845 7 023474
Fax orders: 0870 600 5533
E-mail: customer.services@tso.co.uk
Textphone: 0870 240 3701

The Parliamentary Bookshop
12 Bridge Street, Parliament Square,
London SW1A 2JX
Telephone orders/general enquiries: 020 7219 3890
Fax orders: 020 7219 3866
Email: bookshop@parliament.uk
Internet: http://www.bookshop.parliament.uk

TSO@Blackwell and other accredited agents

Customers can also order publications from
TSO Ireland
16 Arthur Street, Belfast BT1 4GD
Telephone orders/general enquiries: 028 9023 8451
Fax orders: 028 9023 5401

ISBN 978-0-10-851079-3
9 780108 510793

Annex 5 - National Policy Statement for Renewable Energy Infrastructure (EN-3) published for Consultation in March 2023 (dated 2022 in the document)

Department for
Energy Security
& Net Zero

National Policy Statement for Renewable Energy Infrastructure (EN-3)

March 2023

© Crown copyright 2022

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit **nationalarchives.gov.uk/doc/open-government-licence/version/3** or write to the Information Policy Team, The National Archives, Kew, London TW9 4DU, or email: **psi@nationalarchives.gsi.gov.uk**.

Where we have identified any third-party copyright information you will need to obtain permission from the copyright holders concerned.

Any enquiries regarding this publication should be sent to us at:
enquiries@beis.gov.uk

1 Introduction

2 Introduction

2.1 Background

2.1.1 There is an urgent need for new electricity generating capacity to meet our energy objectives.

2.1.2 Electricity generation from renewable sources is an essential element of the transition to net zero and meeting our statutory targets for the sixth carbon budget (CB6). Our analysis suggests that demand for electricity is likely to increase significantly over the coming years and could more than double by 2050. This could require a fourfold increase in low carbon electricity generation, with most of this likely to come from renewables.[1]

2.1.3 In the Net Zero Strategy[2], published in October 2021, government committed to action so that by 2035, all our electricity will come from low carbon sources, subject to security of supply, whilst meeting a 40-60% increase in demand.

2.1.4 The British Energy Security Strategy[3], published in April 2022, accelerates this plan and sets out a series of bold commitments to deliver a more independent, more secure energy system and support consumers to manage their energy bills. More low-cost renewables on the system will reduce household electricity bills and ensure Britain is less affected by fluctuations in volatile global gas prices as seen as the economy reopened after COVID-19 and the Russian invasion of Ukraine.

2.1.5 This National Policy Statement (NPS), taken together with the Overarching National Policy Statement for Energy (EN-1), provides the primary policy for decisions by the Secretary of State on applications they receive for nationally significant renewable energy infrastructure defined at Section 1.6 of this NPS.

2.1.6 The way in which NPSs guide Secretary of State decision-making, and the matters which the Secretary of State is required by the Planning Act 2008 to take into account in considering applications, are set out in Sections 1.1 and 4.1 of EN-1.

2.1.7 Applicants should, therefore, ensure that their applications and any accompanying supporting documents and information are consistent with the instructions and guidance in this NPS, EN-1 and any other NPSs that are relevant to the application in question.

1 See https://www.gov.uk/government/publications/modelling-2050-electricity-system-analysis
2 See https://www.gov.uk/government/publications/net-zero-strategy
3 See https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy

2.1.8 This NPS may be helpful to local planning authorities (LPAs) in preparing their local impact reports.

2.2 Role of this NPS in the wider planning system

2.2.1 Section 1.2 of EN-1 provides details on the role of this NPS in the wider planning system.

2.3 Relationship with EN-1

2.3.1 This NPS is part of a suite of energy infrastructure NPSs. It should be read in conjunction with EN-1.

2.3.2 This NPS does not seek to repeat the material set out in EN-1, which applies to all applications covered by this NPS unless stated otherwise.

2.4 Geographical coverage

2.4.1 This NPS, together with EN-1, is the primary decision-making policy document for the Secretary of State on nationally significant onshore renewable electricity generating stations in England and Wales and nationally significant offshore renewable electricity generating stations in waters in or adjacent to England or Wales up to the seaward limits of the territorial sea or in the UK Renewable Energy Zone (REZ) (defined in section 84 (4) of the Energy Act 2004), except any part of a REZ in relation to which Scottish Ministers have functions.

2.4.2 The Secretary of State will only examine electricity generating stations in Wales or in territorial waters adjacent to Wales if their capacity is greater than 350 megawatts (MW).

2.4.3 The Secretary of State has no functions in relation to planning applications in Wales that do not relate to nationally significant infrastructure.

2.4.4 In Scotland, the Secretary of State will not examine applications for nationally significant electricity generating stations.

2.4.5 However, energy policy is generally a matter reserved to UK Ministers and this NPS may therefore be a relevant consideration in planning decisions in Wales and Scotland.

2.4.6 In Northern Ireland, planning consents for all nationally significant energy infrastructure projects are devolved to the Northern Ireland Executive, so the Secretary of State will not examine applications for energy infrastructure in Northern Ireland.

2.5 Period of validity and review

2.5.1 See section 1.5 of EN-1 for guidance on the period of validity and review of the energy NPS.

2.6 Infrastructure covered by this NPS

2.6.1 This NPS covers the following types of nationally significant renewable electricity generating stations:

- energy from biomass and/or waste including mixed waste containing non-renewable fractions (>50 MW in England and >350MW in Wales);
- pumped hydro storage (>50 MW in England and >350MW in Wales);
- solar photovoltaic (PV) (>50 MW in England and >350MW in Wales);
- offshore wind (>100MW in England and >350MW in Wales); and
- tidal stream (>100MW in England and >350MW in Wales).

2.6.2 In England, this NPS will also apply to renewable generation proposals of the types listed above, whose capacity is below the relevant threshold, which are directed into the NSIP regime under section 35 of the Planning Act 2008.

2.6.3 Similarly, it will apply to offshore transmission infrastructure projects in English waters which are directed into the NSIP regime under section 35 of the Planning Act 2008. This could include interconnectors, Multi-Purpose Interconnectors (MPIs) or 'bootstraps' to support the onshore network which are routed offshore.

2.6.4 This NPS does not cover onshore wind.[4]

2.6.5 This NPS does not cover other types of renewable electricity energy generation that are not at present technically viable over 50MW onshore, or over 100MW offshore.

[4] Onshore wind farm planning applications are determined in accordance with the Town and Country Planning Act

2.6.6 When it appears that other renewables technologies will be economically and technically viable over 50MW, the government will consider either revisions to this NPS or separate NPSs to cover such technologies.

2.6.7 EN-1 (paragraphs 3.2.9 – 3.2.11) provide further information on assessing the need for other novel technologies or processes that may emerge during the life of this NPS.

2.7 Appraisal of Sustainability and Habitats Regulation Assessment

2.7.1 All the NPSs have been subject to an Appraisal of Sustainability (AoS) required by the 2008 Act and the Environmental Assessment of Plans and Programmes Regulations 2004. A Habitats Regulations Assessment (HRA) has also been prepared in accordance with the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017.

2.7.2 These are published alongside this NPS and available at https://www.gov.uk/government/consultations/planning-for-new-energy-infrastructure-revisions-to-national-policy-statements.

3 General Assessment and Technology Specific Information

3.1 Introduction

3.1.1 Part 4 of EN-1 sets out the general principles that should be applied in the assessment of development consent applications across the range of energy technologies.

3.1.2 Part 5 of EN-1 sets out policy on the assessment of impacts which are common across a range of these technologies (generic impacts).

3.1.3 This NPS is concerned with impacts and other matters which are specific to biomass and EfW, offshore wind energy, pumped hydro storage, solar PV and tidal stream energy or where, although the impact or issue is generic and covered in EN-1, there are further specific considerations arising from the technologies covered here.

3.1.4 The policies set out in this NPS are additional to those on generic impacts set out in EN-1.

3.1.5 The Secretary of State should consider this NPS and EN-1 together. In particular, EN-1 sets out the government's conclusion that there is a urgent need for new major electricity infrastructure (see Part 3 of EN-1).

3.1.6 Section 3 of EN-1 includes assessments of the need for new major renewable electricity infrastructure. In the light of this, the Secretary of State should act on the basis that the need for infrastructure covered by this NPS has been demonstrated.

3.2 Relationship with English and Welsh renewables policies

3.2.1 Policy set out in existing planning guidance in England and, for any proposed project located in Wales, in relevant planning policy and advice issued by the Welsh Government, will provide important information to applicants of nationally significant renewable energy projects.

3.2.2 Applicants should take these policies and guidance (including any relevant targets) into account and explain how their proposals fit with guidance or, alternatively, why they depart from them.

3.2.3 The Secretary of State should also have regard to these policies and guidance (including any relevant targets) in its decision making.

3.2.4 Whether an application conforms to the guidance, or the targets will not necessarily be a reason for approving or rejecting the application.

3.3 Factors influencing site selection and design

3.3.1 Factors influencing site selection by applicants for renewable energy generating stations are set out below.

3.3.2 The specific criteria considered by applicants and the weight they give to them will vary from project to project.

3.3.3 Where there are requirements on applicants or the Secretary of State to consider specific factors, these are made clear in the text.

3.3.4 The choices which applicants make in selecting sites reflect their assessment of the risk that the Secretary of State, following the general points set out in Section 4.1 of EN-1, will not grant consent in any given case.

3.3.5 It is for applicants to decide what applications to bring forward and the government does not seek to direct applicants to particular sites for renewable energy infrastructure other than in the specific circumstances described in this document in relation to offshore wind, such as Strategic Environmental Assessments (SEAs) and the Crown Estate Leasing Rounds. Marine plans set out marine specific aspects of many of the assessment principles set out in Part 4 of EN-1.

National designations

3.3.6 In sites with nationally recognised designations (such as SSSIs, National Nature Reserves, National Parks, the Broads, Areas of Outstanding Natural Beauty and Registered Parks and Gardens), consent for renewable energy projects should only be granted where the relevant tests in Sections 5.4 and 5.10 of EN-1 are met and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.

3.3.7 The Secretary of State should have regard to the aims, goals and targets of the government's Environmental Improvement Plan[5] (of which the 25 Year Environment Plan[6] is the first), and other existing and future measures and targets in England, including under the new strategy for nature, as well as Welsh policy, such as the Wales

[5] See https://www.gov.uk/government/publications/environmental-improvement-plan
[6] See https://www.gov.uk/government/publications/25-year-environment-plan.

National Marine Plan, Planning Policy Wales and Technical Advice Note (TAN) 5,[7] and comply with the Environment Act 2021.[8]

3.3.8 In considering the impact on the historic environment as set out in Section 5.9 of EN-1 and whether it is satisfied that the substantial public benefits would outweigh any loss or harm to the significance of a designated heritage asset, the Secretary of State should take into account the positive role that large-scale renewable projects play in the mitigation of climate change, the delivery of energy security and the urgency of meeting the net zero target.

Other locational considerations

3.3.9 As most renewable energy resources can only be developed where the resource exists and where economically feasible, and because there are no limits on the need established in Part 3 of EN-1, the Secretary of State should not use a sequential approach in the consideration of renewable energy projects (for example, by giving priority to the re-use of previously developed land for renewable technology developments).

Seabed leasing

3.3.10 The Crown Estate owns and manages the seabed out to the 12 nm territorial limit in England, Wales and Northern Ireland. The seabed around Scotland is managed by Crown Estate Scotland.

3.3.11 As well as owning the rights to explore and utilise waters up to 12nm, the Energy Act 2004 gives The Crown Estate rights to issue leases for development beyond the territorial limit and within the REZ.

3.3.12 Applicants must obtain a lease from The Crown Estate or Crown Estate Scotland prior to placing any offshore structures on, or passing cables over, the seabed and its foreshore.

Extensions

3.3.13 The Crown Estate may offer new leases in areas adjacent to existing consented wind farms. This could be to either the owner/operator of the existing site or to a different company from that operating the existing wind farm. These leases will form extensions to existing wind farms.

3.3.14 Leases may be awarded subject to the company obtaining the necessary consents and may be subject to various constraining conditions, including the presence of an existing operational wind farm.

[7] https://gov.wales/technical-advice-note-tan-5-nature-conservation-and-planning
[8] See https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

3.3.15 The Secretary of State should be aware of the potential for applications for extensions to existing wind farms and that there may be constraints on such leases over which the applicant will have little or no control.

Marine Licensing

3.3.16 Marine Licences are required for all the marine elements of a proposed offshore development (up to Mean High Water Springs), including associated development such as the cabling and any offshore substations that are required, and any other matters the MMO may consider relevant under s69 of the Marine and Coastal Access Act 2009.

3.3.17 Any DCO granted by the Secretary of State may include provisions deeming the grant of a Marine Licence for operations carried out wholly in England and English waters, or the Welsh Zone of the REZ.

3.3.18 The MMO is responsible for the enforcement, ongoing management and discharge of licence conditions, for operations carried out in English Waters and the Northern Ireland offshore region.[9]

3.3.19 It is not possible to deem a Marine Licence as part of the DCO in waters adjacent to Wales up to the 12nm seaward limits of the territorial sea. In Wales, Welsh Ministers, through NRW, are responsible for issuing marine licences for operations in Welsh waters.

3.3.20 In Scottish waters Marine Scotland is responsible for marine licensing.

3.3.21 The Secretary of State should liaise closely with the MMO, NRW, Marine Scotland where relevant, on the proposed terms of any deemed Marine Licence.

3.3.22 As part of marine licensing, impacts on marine protected areas (MPAs) will be considered. Further guidance on marine licensing is set out in Section 1.2 of EN-1.

3.4 Climate change adaptation

3.4.1 Part 2 of EN-1 covers the government's energy and climate change strategy, including policies for mitigating climate change.

3.4.2 Section 4.9 of EN-1 sets out generic considerations that applicants and the Secretary of State should take into account to help ensure that renewable energy infrastructure is safe and resilient to climate

[9] In Northern Ireland inshore waters to up 12nm Northern Ireland's Department of Agriculture, Environment and Rural Affairs is responsible for marine licensing.

change, and that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime.

3.4.3 Section 4.9 of EN-1 advises that the resilience of the project to climate change should be assessed in the Environmental Statement (ES) accompanying an application. For example, the impact of increased risk of drought as a result of higher temperatures should be covered in the water quality and resources section of the ES.

Biomass

3.4.4 Biomass generating stations may be proposed for coastal or estuarine sites where climate change is likely to increase risks from flooding or rising sea levels, for example.

3.4.5 In such cases applicants should, in particular, set out how the proposal would be resilient to:

- the effects of rising sea levels and increased risk from storm surge;
- increased risk of flooding;
- impact of higher temperatures; and
- increased risk of drought affecting river flows.

Energy from Waste

3.4.6 Energy from Waste (EfW) generating stations may also require significant water resources, but are less likely to be proposed for coastal sites. For these proposals, applicants should consider, in particular, how plant will be resilient to:

- increased risk of flooding; and
- increased risk of drought affecting river flows.

Offshore wind

3.4.7 Offshore wind farms will not be affected by flooding. However, applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately resilient to climate-change induced weather phenomena. Similarly, applicants should particularly set out how the proposal would be resilient to storms.

Pumped Hydro Storage

3.4.8 Pumped Hydro Storage sites are likely to be proposed for hilly and mountainous locations where climate change is likely to increase risks from rain fall and flooding.

3.4.9 In such cases applicants should, in particular, set out how the proposal would be resilient to:

- increased risk from storm surge;
- increased risk of flooding;
- impact of higher temperatures; and
- increased risk of drought affecting river flows.

Solar photovoltaic

3.4.10 Solar photovoltaic (PV) sites may also be proposed in low lying exposed sites. For these proposals, applicants should consider, in particular, how plant will be resilient to:

- increased risk of flooding; and
- impact of higher temperatures.

Tidal Stream

3.4.11 Tidal turbines and their associated marine infrastructure will not be affected by flooding, sea level rises, or higher average temperatures. However, applicants should demonstrate that any necessary land-side infrastructure (such as landfall stations, transformers, and so on) will be appropriately resilient to climate-change induced weather phenomena.

3.5 Consideration of good design for energy infrastructure

3.5.1 Section 4.6 of EN-1 sets out the criteria for good design that should be applied to all energy infrastructure.

3.5.2 Proposals for renewable energy infrastructure should demonstrate good design, particularly in respect of landscape and visual amenity, opportunities for co-existence/co-location with other marine uses, and in the design of the project to mitigate impacts such as noise and effects on ecology and heritage.

3.6 Flexibility in the project details

3.6.1 Where details are still to be finalised applicants should explain in the application which elements of the proposal have yet to be finalised, and the reason why this is the case.

3.6.2 Where flexibility is sought in the consent as a result, applicants should, to the best of their knowledge, assess the likely worst-case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed.[10]

3.6.3 Full guidance on how applicants and the Secretary of State should manage flexibility is set out in Section 4.2 of EN-1.

3.7 Biomass and Waste Combustion

Introduction

3.7.1 The combustion of biomass for electricity generation plays an important role in meeting the UK's energy needs and supports the decarbonisation of the sector. It also has a potentially significant role in supporting delivery towards the UK's net zero target when combined with carbon capture and storage.

3.7.2 In accordance with the waste hierarchy[11] Energy from Waste (EfW) also plays an important role in meeting the UK's energy needs. Furthermore, the recovery of energy from the combustion of waste forms an important element of waste management strategies in both England and Wales.

3.7.3 The Biomass Policy Statement[12] sets out the strategic aims for the role of biomass across the economy in the short, medium, and long term in achieving our net zero target.

3.7.4 The upcoming Biomass Strategy will seek to inform decisions on how biomass is supported in the future, reviewing the amount of sustainable biomass available to the UK and how this resource could be best utilised across the economy to help achieve our net zero greenhouse gas (GHG) emissions target, and wider environmental targets.

10 Case law, beginning with R v Rochdale MBC Ex p. Tew [2000] Env.L.R.1 establishes that while it is not necessary or possible in every case to specify the precise details of development, the information contained in the ES should be sufficient to fully assess the project's impact on the environment and establish clearly defined worst case parameters for the assessment. This is sometimes known as 'the Rochdale Envelope'. See https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/

11 Waste hierarchy as set out in Regulation 12 of the Waste (England and Wales) Regulations 2011, and also see Section 5.15 of EN-1.

12 See https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero

3.7.5 Biomass is material of recent biological origin derived from plant or animal matter. The biomass used for heat and power usually falls into one or more of three main categories:

- biomass derived from forest residues as co-products of conventional forestry management. This includes forest products generated during thinning, felling and coppicing of sustainably managed forests, parklands and trees from other green spaces. It also includes sawmill residues (often processed to produce wood pellets), other wood processing residues and parts of trees unsuitable for the timber industry;
- biomass from agricultural crops and residues. This includes crops grown primarily for use in energy generation ('energy crops'), such as short rotation coppice (SRC), or Miscanthus which can be grown on land unsuitable for food crops. Biomass can also be sourced from agricultural residues such as straw, husks and kernels; and
- biomass from biodegradable waste and other similar materials including sewage sludge, animal manure, waste wood from construction, the biodegradable fraction of mixed municipal waste, and food waste that would otherwise be disposed of in landfill.

Applicant Assessment

Factors Influencing site selection and design

Waste treatment capacity

3.7.6 As the primary function of EfW plants is to treat waste, applicants must demonstrate that proposed EfW plants are in line with Defra's policy position on the role of energy from waste in treating waste from municipal or commercial and industrial sources.[13]

3.7.7 The proposed plant must not compete with greater waste prevention, re-use, or recycling, or result in over-capacity of EfW waste treatment at a national or local level.

Transport infrastructure

3.7.8 Biomass or EfW generating stations are likely to generate considerable transport movements. For example, a biomass or EfW plant that uses 500,000 tonnes of fuel per annum might require up to approximately 220 heavy goods vehicle (HGV) movements per day (Monday – Friday) to import the fuel. There will also be residues which will need to be regularly transported off site.

[13] 2021 Waste Management Plan for England p.45: https://www.gov.uk/government/publications/waste-management-plan-for-england-2021

3.7.9 Government policy encourages multi-modal transport and it is expected that applicants will transport materials (fuel and residues) by water or rail routes where possible, with road transport expected where this is not feasible or for shorter journeys.

3.7.10 Applicants should locate new biomass or waste combustion generating stations in the vicinity of existing transport routes wherever possible.

3.7.11 Although there may in some instances be environmental advantages to rail or water transport, whether such methods are viable is likely to be determined by the economics of the scheme.

3.7.12 Road transport may be required to connect the site to the rail network, waterway, or port. Therefore, any application should incorporate suitable access leading from the main highway network including any new transport infrastructure required.

Technical considerations

Combined heat and power

3.7.13 Guidance on CHP is set out Section 4.7 of EN-1, which sets out the requirements on applicants either to include CHP or present evidence in the application that the possibilities for CHP have been fully explored.

Carbon capture readiness[14]

3.7.14 The government recognises the need to prioritise biomass use to applications where it can deliver GHG emission reductions in hard-to-decarbonise sectors, without other viable alternatives, to comply with our net zero and wider environmental goals. One of these priority applications is the use of biomass to deliver negative emissions through Bioenergy with Carbon Capture & Storage (BECCS).

3.7.15 The Biomass Strategy will establish the role which BECCS could play in reducing carbon emissions across the economy and set out how the technology could be deployed.

3.7.16 Guidance on CCR and plans to transition to a new regime, Decarbonisation Readiness, are set out in Section 4.8 of EN-1.

14 The Energy White Paper, published in December 2020, committed to consult on proposals to update the Carbon Capture Readiness requirements to reflect technological advances, such as conversion to low carbon hydrogen, and apply them more broadly, by removing the 300MW threshold and including all combustion technologies within scope. That separate consultation process, on new proposals for Decarbonisation Readiness, is running in parallel to the review of the national policy statements. If that consultation leads to changes in the relevant legal or policy framework, then those new requirements will apply and this NPS will be updated to reflect any revised requirements ahead of designation. In the meantime, CCR policy remains as set out in this section.

3.7.17 CCR is relevant to proposed biomass plant at or over 300MW of generating capacity, but not to EfW plants.

Fuels

3.7.18 The social, environmental, and economic case for widespread deployment of biomass-fuelled plant depends on the sustainability of fuel used in it.

3.7.19 The Renewables Obligation (RO)[15], administered by the Office of Gas and Electricity Markets (Ofgem) and the Contracts for Difference (CfD) scheme[16] are the main support mechanisms for renewable electricity in the UK.

3.7.20 To receive incentives under these two schemes, and for their output to count towards the UK's renewable energy targets, plants fuelled by biomass must use fuel which meets certain sustainability criteria. These criteria are set out in the relevant Renewables Obligation Order, in the case of the RO, and in the contract for the CfD scheme, and reporting against them is mandatory.

3.7.21 The sustainability criteria include a minimum GHG emissions saving and general restrictions on the use of materials from land that is important on carbon or biodiversity grounds, such as primary forest, highly biodiverse grasslands, or peatlands and, for woody biomass, a requirement that the forests are managed sustainably.

3.7.22 In assessing the GHG emissions, applicants should take account of emissions associated with cultivation, processing, and transport of biomass for electricity generation and direct land use change. The criteria apply to both domestic and imported material.

3.7.23 As a part of the Biomass Strategy government has committed to reviewing the UK's biomass sustainability criteria. Once final guidance is published, we expect that applicants for new installations to comply with any new requirements.

Nature of applications

3.7.24 Applicants must provide details on the makeup of their proposed waste/biomass combustion plant, which is likely to consist of the following:

- a main combustion plant building incorporating emissions abatement technologies, electricity generation units, a cooling assembly (variety of types and methods), and chimney stack(s);

15 The Renewables Obligations closed to all new generating capacity on 31 March 2017. See https://www.ofgem.gov.uk/environmental-programmes/ro/about-ro/ro-closure
16 Further detail on the CfD scheme is set out in paragraph 2.4.2-3 in EN-1.

- buildings necessary for fuel reception, storage, sorting and pre-treatment facilities; and
- ancillary plant such as an electricity substation, civil engineering workshops and offices.

3.7.25 Details should be provided on any development proposals that may also incorporate additional features such as waste transfer facilities.

3.7.26 Where EfW proposals for mixed waste incineration include material of animal origin, applicants may require ancillary development in order to comply with the requirements of the Animal By-Products (Enforcement) (England) Regulations 2013 and in Wales the Animal By-Products (Enforcement) (Wales) Regulations 2014.

Commercial aspects of waste combustion plants

3.7.27 Waste combustion plants are unlike other electricity generating power stations in that they have two roles: the principal purpose being treatment of waste; and secondly the recovery of energy. The commercial rationale for waste combustion plants will include both the gate fee received per tonne of waste handled and income received from energy recovery.

3.7.28 Like any combustion generating station, operators secure fuel through contracts. Local authorities issue municipal waste contracts which are often long term (up to 25 years). Contracts to manage private sector wastes are, generally, shorter. Applicants may decide to focus on either public or private sector waste treatment contracts, or a combination of the two.

3.7.29 Applicants must ensure EfW plants are fit for the future, do not compete with greater waste prevention, re-use, or recycling and do not result in an over-capacity of EfW waste treatment provision at a local or national level.

Network connection

3.7.30 Biomass and EfW electricity generating stations connect into a transmission network. The technical feasibility of exporting electricity from a biomass or waste combustion plant is dependent on the capacity of the grid network to accept the likely electricity output together with the voltage and distance of the connection.

3.7.31 Applicants will usually have assured themselves that a viable connection exists before submitting the development proposal to the Secretary of State and where they have not done so, they take that commercial risk. In accordance with Section 4.10 in EN-1, any application to the Secretary of State must include information on how the generating station is to be connected and whether any environmental issues are likely to arise from that connection. Further

advice on grid connections is presented in Section 4.10 of EN-1 and in EN-5.

Flexibility

3.7.32 In some cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- The composition, calorific value and availability of fuel.
- The precise details of all elements of the proposed development.

3.7.33 Guidance on how applicants should manage flexibility is set out in 4.2 of EN-1.

Impacts

3.7.34 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

3.7.35 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Air quality and greenhouse gas emissions

3.7.36 Applicants should include in the ES an assessment of the air emissions resulting from the proposed infrastructure and demonstrate compliance with the relevant regulations (see Section 5.2 and 5.3 of EN-1).

3.7.37 For combustion plant using CCS, the ES should reflect the latest evidence on the air quality impacts of carbon capture using amine-based solvents.

Landscape and visual

3.7.38 An assessment of the landscape and visual effects of the proposed infrastructure should be undertaken in accordance with the guidance set out in 5.10 of EN-1.

3.7.39 Consideration should also be given to the potential impact of overshadowing neighbouring land uses.

Noise and vibration

3.7.40 Sources of noise and vibration may include:

- the delivery and movement of fuel and materials;
- the processing of waste for fuel at EfW generating stations;
- the gas and steam turbines that operate continuously during normal operation; and

- the external noise sources such as externally-sited air-cooled condensers that operate continuously during normal operation.

3.7.41 Applicants should include in the ES a noise assessment of the impacts on amenity in case of excessive noise from the project in line with guidance set out in Section 5.12 in EN-1.

Odour, insect and vermin infestation

3.7.42 Applicants should assess the potential for insect and vermin infestation and emissions of odour as set out in EN-1 Section 5.7 with particular regard to the handling and storage of waste for fuel.

Waste management

3.7.43 EfW plants need not disadvantage reuse or recycling initiatives where the proposed development accords with the waste hierarchy.

3.7.44 Applicants should undertake an assessment of the proposed waste combustion generating station examining the conformity of the scheme with the waste hierarchy and the effect of the scheme on the relevant Waste Local Plans or plans where a proposal is likely to involve more than one local authority.

3.7.45 Applicants should set out the extent to which the generating station and capacity proposed is compatible with, and supports long-term recycling targets, taking into account existing residual waste treatment capacity and that already in development.

3.7.46 It may be appropriate for assessments to refer to the Annual Monitoring Reports published by relevant waste authorities which provide an updated figure of existing waste management capacity and future waste management capacity requirements.

3.7.47 The results of the assessment of the conformity with the waste hierarchy and the effect on relevant waste plans should be included in the application to the Secretary of State.

Residue management

3.7.48 Generating stations that burn waste (even if mixed with biomass fuel) produce two types of residues:

- combustion residue is inert material from the combustion chamber. The quantity of residue produced is dependent on the technology process and fuel type but might be as much as 30% (in terms of weight) of the fuel throughput of the generating station; and
- fly ash, a residue from flue gas emission abatement technology and usually 3-4% (in terms of weight) of the fuel throughput of the generating station.

3.7.49 The two residues from waste combustion generating stations cannot be mixed; they must be disposed of separately, under different regimes.

3.7.50 Biomass combustion generating stations will also produce both combustion and flue gas treatment residues which must not be mixed. Residues arising from biomass combustion generating stations are usually between 1% and 12% (in terms of weight) of the fuel capacity of the plant.

3.7.51 The regulation of waste disposal for waste combustion and flue gas residues from biomass combustion is intended to reduce the amount of waste that is sent to landfill. Waste combustion APCr is classified as a hazardous waste material and needs to be managed as such.[17]

3.7.52 Waste management is covered in the Environmental Permit for operation of waste or biomass generating stations (see Section 5.15 of EN-1).

3.7.53 Applicants should include the production and disposal of residues as part of the ES. Any proposals for recovery of ash and mitigation measures should be described.

3.7.54 Applicants should set out the consideration they have given to the existence of accessible capacity in waste management sites for dealing with residues for the planned life of the power station.

3.7.55 Applicants must ensure proposals do not result in an over-capacity of EfW waste treatment provision at a local or national level.

Water quality and resources

3.7.56 The design of water-cooling systems for EfW and biomass generating stations will have additional impacts on water quality, abstraction and discharge. This can affect marine ecosystems where cooling systems use seawater. These may include:

- discharging water at a higher temperature than the receiving water, affecting the biodiversity of aquatic flora and fauna;
- the use of resources may reduce the flow of watercourses, affecting the rate at which sediment is deposited, conditions for aquatic flora and potentially affecting migratory fish species (e.g. salmon);
- the fish impingement and/or entrainment, i.e. being taken into the cooling system during abstraction; and

[17] See Regulation 19(1) Hazardous Waste Regulations 2005 for permitting on the mix of hazardous and non-hazardous waste, article 18 Waste Framework Directive for regulation and on residue treatment facilities and requiring separate handling and treatment to improve resource efficiency, as well as Article 11 Industrial Emissions Directive for all Chapter II Installations and Article 44 for regulation on separation.

- the discharging of water containing chemical anti-fouling treatment for use in cooling systems may have adverse impacts on aquatic biodiversity.

3.7.57 Where the project is likely to have effects on water quality or resources the applicant should undertake an assessment as required in EN-1, Section 5.16. The assessment should particularly demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of cooling water.

3.7.58 Applicants should include specific measures to minimise fish impingement and/or entrainment, and the discharge of excessive heat to receiving waters should consider discharge profiles that minimise the impact on temperature and resultant dissolved oxygen levels.

3.7.59 As river and sea temperatures rise (as a result of already locked-in climate change) then the operational constraints necessary to protect ecosystems will also increase. Applicants should consider climate risks when designing water cooling systems – ensuring they're fit for the future.

Mitigation

Air quality and greenhouse gas emissions

3.7.60 Applicants should provide details on the air quality and emissions that will result from their plant, which may include NOx[18], SOx[19], NMVOCs[20] or other particulates. They should detail the abatement technologies adopted, which should be those set out in the relevant sector guidance notes as produced by the Environment Agency (EA). The EA will determine if the technology selected for the waste/biomass combustion generating station is considered Best Available Technique (BAT) and therefore the Secretary of State does not need to consider equipment selection in its determination process.

Landscape and visual

3.7.61 Good design that is sympathetic and contributes positively to the landscape character and quality of the area will go some way to mitigate adverse landscape and visual effects.

3.7.62 Applicants should consider the design of the generating station, including the materials to be used in the context of the local landscape character.

[18] Nitrogen oxides.
[19] Sulphur oxides.
[20] Non-Methyl Volatile Organic Compounds.

3.7.63 Although micro-siting within the development area can help, mitigation is achieved primarily through aesthetic aspects of site layout and building design including size and external finish and colour of the generating station to minimise intrusive appearance in the landscape as far as engineering requirements permit. The precise architectural treatment will need to be site-specific.

Noise and vibration

3.7.64 As described in Section 5.12.15 of EN-1, the primary mitigation for noise for biomass and EfW generating stations is through good design to enclose plant and machinery in noise-reducing buildings, wherever possible, and to minimise the potential for operations to create noise.

3.7.65 Noise from gas turbines should be mitigated by attenuation of exhausts to reduce any risk of low-frequency noise transmission.

3.7.66 Noise from features including sorting and transport of material during operation of biomass or EfW generating stations is unavoidable. Similarly, noise from apparatus external to the main generating station may be unavoidable. This can be mitigated through careful plant selection.

Odour, insect and vermin infestation

3.7.67 In addition to the mitigation measures set out in Section 5.7.8 of EN-1, reception, storage and handling of waste and residues should be carried out within defined areas, for example bunkers or silos, within enclosed buildings at EfW generating stations.

3.7.68 To minimise potential for infestation, operators are required to produce a written management system[21] as part of their environmental permit and this will include consideration of odour, insect and vermin management. The EA and NRW will regulate facilities against this plan.

Residue management

3.7.69 The environmental burdens associated with the management of combustion residues can be mitigated through recovery of secondary products, for example aggregate or fertiliser, rather than disposal to landfill.

3.7.70 The primary management route for fly ash is hazardous waste landfill; however, there may be opportunities to reuse this material for example in the stabilisation of industrial waste.

[21] The Environmental Protection (Miscellaneous Amendments) (England and Wales) Regulations 2018

3.7.71 The management of hazardous waste will be considered by the EA or NRW through the Environmental Permitting regime.[22]

Water quality and resources

3.7.72 In addition to the mitigation measures set out in Section 5.16.8 – 5.16.10 of EN-1, design of the cooling system should include intake and outfall locations that avoid or minimise adverse impacts.

Secretary of State decision making

Site selection and design

Transport infrastructure

3.7.73 Where existing access is inadequate and the applicant has proposed new infrastructure, the Secretary of State will need to be satisfied that the impacts of the new infrastructure are acceptable as set out in Section 5.14 of EN-1.

National designations

3.7.74 In sites with nationally recognised designations (SSSIs, National Nature Reserves, National Parks, the Broads, Areas of Outstanding Natural Beauty, Heritage Coasts, Registered Parks and Gardens and Marine Conservation Zones), consent for projects utilising purpose grown biomass or energy crops should only be granted where the relevant tests in Sections 5.4 and 5.10 of EN-1 are met, and any adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.

3.7.75 In considering the impact on the environment where the biomass is grown, as set out in Section 5.9 of EN-1 and whether it is satisfied that the substantial public benefits would outweigh any loss or harm to the significance of a designated heritage asset, the Secretary of State should take into account the positive role that large-scale renewable projects play in the mitigation of climate change, the delivery of energy security and the urgency of meeting the net zero target.

Technical considerations

Fuels

3.7.76 Sustainability of the waste, biomass or bioliquid fuel that a biomass or bioliquid-fuelled generating station will burn is a relevant and

[22] The Environmental Permitting (England and Wales) Regulations 2016 https://www.legislation.gov.uk/uksi/2016/1154/contents

important consideration for the Secretary of State in deciding on any development consent applications.

3.7.77 The sustainability criteria will apply to both new and existing generating stations to the extent that they claim renewable electricity support. The RO and CfD regimes (and any successor to them) are critical elements in the business case of most biomass and bioliquid plants, so that in any given case the incentive effect of linking the support to the satisfaction of sustainability criteria may constitute an entirely adequate control on the sustainability of a plant's fuel sources. However, it is possible that the support may not be available for the whole of a plant's operational life, and it is also possible in principle that plants may be able to operate profitably without them at certain periods.

3.7.78 The Secretary of State should consider in each case whether it is appropriate to rely on the RO and CfD, or any successor incentive regime to ensure the sustainability of a plant's fuel over its whole life.

3.7.79 The Secretary of State should not grant consent to a proposed biomass or bioliquid-fuelled generating station unless it is satisfied that the operator will (so far as it can reasonably be expected to do so) ensure that the biomass or bioliquid fuel it burns meets applicable RO, CfD or any successor incentive regime sustainability criteria, whether or not support is being claimed.

3.7.80 Where appropriate, the Secretary of State may include a requirement to this effect in the Development Consent Order (DCO).

Combustion plant types and scale

3.7.81 Waste and biomass combustion plant covered by this NPS may include a range of different combustion technologies, including grate combustion, fluidised bed combustion, gasification and pyrolysis.

3.7.82 The Secretary of State should not be concerned about the type of technology used.

3.7.83 The fuel throughput capacity of the combustion plant considered by the Secretary of State may vary widely depending on composition, calorific value, and availability of fuel.

3.7.84 Throughput volumes are not, in themselves, a factor in Secretary of State decision-making as there are no specific minimum or maximum fuel throughput limits for different technologies or levels of electricity generation; this is a matter for the applicant. However, the increase in traffic volumes, any change in air quality, and any other adverse impacts as a result of the increase in throughput should be considered by the Secretary of State in accordance with this NPS and balanced against the net benefits of the combustion of waste and biomass as described in paragraph 2.7.1 above and in Section 3.3.36 of EN-1.

Combined heat and power

3.7.85 The government's strategy for CHP is described in Section 4.7 of EN-1, which sets out the requirements on applicants either to include CHP or present evidence in the application that the possibilities for CHP have been fully explored.

3.7.86 Given the importance which government attaches to CHP, for the reasons set out in EN-1 the Secretary of State will need to be satisfied that the applicant has provided appropriate evidence that CHP is included or that the opportunities for CHP have been fully explored. For non-CHP stations, the Secretary of State may also require that developers ensure that their stations are configured to allow heat supply at a later date as described in Section 4.7 of EN-1 and the guidance on CHP issued by then DTI in 2006.[23]

Impacts

3.7.87 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

3.7.88 The Secretary of State should consider any impacts which they determine are relevant and important to its decision.

Air quality and greenhouse gas emissions

3.7.89 Although a carbon assessment will be provided as part of the ES, the policies set out in Part 2 of EN-1 will apply. As set out in Section 5.3 of EN-1, the Secretary of State does not need to assess individual applications for planning consent against operational carbon emissions and their contribution to carbon budgets, net zero and our international climate commitments.

3.7.90 The Secretary of State should otherwise generally give air quality and emissions considerations substantial weight, following the guidance set out in Section 5.2 of EN-1.

3.7.91 Compliance with the Environmental Permitted Regulations (EPR) is enforced through the environmental permitting regime regulated by the EA. Plants not meeting the requirements of the EPR would not be granted a permit to operate.

3.7.92 The pollutants of concern arising from the combustion of waste and biomass may include NOx, SOx, NMVOCs particulates. In addition, emissions of heavy metals, dioxins and furans are a consideration for waste combustion generating stations, but limited by the EPR and waste incineration BAT conclusions and regulated by the EA.

[23] Guidance on background information to accompany notifications under Section 14(1) of the Energy Act 1976 and applications under Section 36 of the Electricity Act 1989. See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/43594/Power_station_proposals_-_guidance_2006.pdf

3.7.93 Where a proposed EfW plant or biomass generating station meets the requirements of the EPR and BAT conclusions and will not exceed the local air quality standards, the Secretary of State should not regard the proposed waste generating station as having adverse impacts on health.

Landscape and Visual

3.7.94 The Secretary of State should be satisfied that the design of the proposed generating station is of appropriate quality and minimises adverse effects on the landscape character, visual amenity and quality.

3.7.95 The Secretary of State should take into account that any biomass/waste combustion generating station will require a building able to host fuel reception and storage facilities, the combustion chamber and abatement units.

3.7.96 The overall size of the building will be dependent on design and fuel throughput, although it is unlikely to be less than 25m in height. External to the building there may be cooling towers, the size of which will also be dependent on the throughput of the generating station.

3.7.97 The Secretary of State should expect applicants to seek to design the landscape design of waste/biomass combustion generating station sites to visually enclose them at low level as seen from surrounding external viewpoints. This makes the scale of the generating station less apparent, and helps conceal its lower level, smaller scale features.

3.7.98 Earth bunds and mounds, tree planting or both may be used for softening the visual intrusion and may also help to attenuate noise from site activities. However, these features should be sympathetic to local landscape character and follow best practice.[24]

3.7.99 If having regard to the considerations in respect of other impacts set out Section 5.10 in EN-1 and this NPS, the Secretary of State is satisfied that the location is appropriate for the project, and that it has been designed sensitively (given the various siting, operational and other relevant constraints) to minimise harm to landscape and visual amenity, the visibility of a EfW plant or biomass electricity generating station should be given limited weight.

Noise and vibration

3.7.100 The Secretary of State should consider the noise and vibration impacts according to Section 5.12 in EN-1.and be satisfied that noise

[24] Such as the 10 characteristics of good design which are set out in the National Design Guide, see https://www.gov.uk/government/publications/national-design-guide and the draft National Model Design Code and guidance notes. See https://www.gov.uk/government/consultations/national-planning-policy-framework-and-national-model-design-code-consultation-proposals

and vibration will be adequately mitigated through requirements attached to the consent.

3.7.101 The Secretary of State will need to take into consideration the extent to which operational noise will be separately controlled by the EA or NRW.

3.7.102 The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the aims set out in 5.12 of EN-1.

Odour, insect and vermin infestation

3.7.103 The Secretary of State should be satisfied that the proposal sets out appropriate measures to minimise impacts on local amenity from odour, insect and vermin infestation.

Waste management

3.7.104 The Secretary of State should be satisfied, with reference to the relevant waste strategies and plans, that the proposed waste combustion generating station is in accordance with the waste hierarchy and of an appropriate type and scale so as not to prejudice the achievement of local or national waste management targets in England and local, regional or national waste management targets in Wales.

3.7.105 Where there are concerns in terms of a possible conflict, evidence should be provided to the Secretary of State by the applicant as to why this is not the case or why a deviation from the relevant waste strategy or plan is nonetheless appropriate and in accordance with the waste hierarchy.

3.7.106 The Secretary of State should also consider whether a requirement, including monitoring, is appropriate to ensure compliance with the waste hierarchy.

Residue management

3.7.107 The Secretary of State should give substantial weight to development proposals that have a realistic prospect of recovering materials as described in Section 2.7.69 of this NPS.

3.7.108 The Secretary of State should consult the EA on the suitability of the proposals.

3.7.109 When the Secretary of State considers noise and vibration, release of dust and transport impacts, it should recognise that these impacts may arise from the need for residue disposal as well as other factors.

3.7.110 The Secretary of State should be satisfied that management plans for residue disposal satisfactorily minimise the amount that cannot be used for commercial purposes.

3.7.111 The Secretary of State should consider what requirements it may be appropriate to impose. If the EA has indicated that there are no known barriers to it issuing an Environmental Permit for operation of the proposed biomass/waste fuelled generating station and agrees that management plans suitably minimise the wider impacts from ash disposal, any residual ash disposal impacts should have limited weight.

Water quality and resources

3.7.112 The Secretary of State should be satisfied that the applicant has demonstrated measures to minimise adverse impacts on water quality and resources as described above and in Section 5.16 of EN-1.

3.8 Offshore Wind

Introduction

3.8.1 As set out in the British Energy Security Strategy, the Government expects that offshore wind (including floating wind) will play a significant role in meeting demand and decarbonising the energy system. The ambition is to deploy up to 50GW of offshore wind capacity (including up to 5GW floating wind) by 2030, with an expectation that there will be a need for substantially more installed offshore capacity beyond this to achieve net zero carbon emissions by 2050.[25]

3.8.2 There are two main UK sea areas where offshore wind farms can be built:

- in UK territorial waters, which generally extend up to 12 nautical miles (nm) from the coast; and
- beyond the 12 nm limit where, under international law, the UK is able to construct wind farm installations or other structures to produce renewable energy in the Renewable Energy Zone (REZ) as declared in the Energy Act 2004.[26]

3.8.3 Any reference within this NPS to offshore wind farm infrastructure includes all the elements which may be part of an application including:

- wind turbines;
- all types of foundations (fixed bottom or floating);

[25] The Climate Change Act 2008 (2050 Target Amendment) Order 2019

[26] The REZ was designated by the Renewable Energy Zone (Designation of Area) Order 2004 (SI 2004/2668), exercising powers in section 8(4) of the Energy Act 2004. It extends from the seaward limit of the territorial sea up to a maximum of 200 nautical miles from the baseline.

- onshore and offshore substations;
- anemometry masts;
- accommodation platforms; and
- cabling.

Consenting process

3.8.4 For guidance on DCOs and Marine Licences applicants and the Secretary of State should consult 2.3.16 of this NPS.

3.8.5 Given ambitions to deliver up to 50 GW of offshore wind by 2030, including up to 5 GW of floating wind, there is a need to speed up, and reduce delays in, the consenting process.

3.8.6 The British Energy Security Strategy sets an ambition to reduce the consenting process to 12 months and establish a fast track consenting route for certain projects where quality standards are met.

3.8.7 The British Energy Security Strategy also proposes an offshore wind Environmental Improvement Package, including committing to establishing Offshore Wind Environmental Standards (formerly nature-based design standards), required to assist a project's passage through the consenting process. Applicants can find further guidance at paragraphs 2.8.102 of this NPS.

The critical national priority for offshore wind

3.8.8 As set out in EN-1, more than half of final energy demand in 2050 could be met by electricity, as transport and heating in particular shift from fossil fuel to electrical technology. The security, reliability, climate change, and cost implications of this requires a focus on renewable and other low carbon sources of electricity.

3.8.9 The UK's resources, with its shallow seabeds and high winds, offer unique advantages that have made the country a global leader in offshore wind and pioneers of floating wind.

3.8.10 In addition, along with strong public support for offshore projects[27], the cost of offshore wind power has fallen dramatically. Offshore wind prices in the Round 4 Contracts for Difference auctions were around 65% less than those achieved in the first allocation round in 2015, making offshore wind one of the lowest cost ways of generating electricity.

27 BEIS Public Attitudes Tracker continually show strong public support for renewables, in particular off-shore wind.

3.8.11 With smarter planning the UK can maintain high environmental standards and minimise impacts while increasing the levels of deployment needed to meet our 2030 ambitions and net zero.

3.8.12 Therefore, Government has concluded that there is a critical national priority (CNP) for the provision of nationally significant new offshore wind development and supporting onshore and offshore network infrastructure and related network reinforcements ("CNP Infrastructure").

3.8.13 Applicants for CNP infrastructure must continue to show how their application meets the requirements in EN-1 and this NPS, applying the mitigation hierarchy, as well as any other legal[28] and regulatory requirements. Where an applicant has done so and there are residual impacts the following policy will apply.

Secretary of State's approach to non-HRA residual impacts of CNP Infrastructure

3.8.14 Where there are residual non-HRA impacts, of any sort other than those that present an unacceptable risk to, or unacceptable interference with, human health, national defence or navigation, these are unlikely, in all but the most exceptional cases, to outweigh the urgent need for this type of infrastructure and are therefore unlikely to result in an application being refused.

3.8.15 As a result, the Secretary of State will take as the starting point for decision-making that such infrastructure is to be treated as if it has met any test requiring a clear outweighing of harm, exceptionality, or very special circumstances within EN-1, this NPS or any other planning policy.

3.8.16 This means that the Secretary of State will take as a starting point that CNP Infrastructure will meet the following, non-exhaustive, list of tests:

- where development within a Green Belt requires very special circumstances to justify development;
- where development within or near a Site of Special Scientific Interest (SSSI) requires the benefits (including need) of the development in the location proposed to clearly outweigh the harm;
- where development affecting irreplaceable habitats requires the benefits (including need) to clearly outweigh the harm. Where development is, exceptionally, necessary in coastal change

[28] The Secretary of State will continue to comply with any legislative requirements, such as those contained in regulations 3 and 7 of the Infrastructure Planning (Decisions) Regulations 2010, section 40 of the Natural Environment and Rural Communities Act 2006 and section 6 of the Environment (Wales) Act 2016 and section 126 of the Marine and Coastal Access Act 2009.

areas, flood risk areas or where an increase in flood risk elsewhere cannot be avoided or mitigated;

- where development in nationally designated landscapes requires exceptional circumstances; and
- where substantial harm to or loss of significance to heritage assets should be exceptional or wholly exceptional.

Secretary of State's approach to HRA derogations for CNP Infrastructure[29]

3.8.17 Any HRA residual impacts will continue to be considered under the framework set out in the Habitats Regulations.

3.8.18 Where, following Appropriate Assessment, CNP Infrastructure has residual adverse impacts on the integrity of sites forming part of the UK national site network, either alone or in combination with other plans or projects, the Secretary of State will consider making a derogation under the Habitats Regulations.[30]

3.8.19 In doing so, the Secretary of State will consider the particular circumstances of any application, but start from the position that energy security and decarbonising the power sector to combat climate change:

- requires a significant number of deliverable locations for CNP Infrastructure and for each location to maximise its capacity. There are no limits to how many such locations may be required. Therefore, the existence of another deliverable location to meet the need for CNP Infrastructure should not be treated as an alternative solution. Further, the existence of another way of developing the proposed site which results in a significantly lower generation capacity should not be treated as an alternative solution; and
- are capable of amounting to imperative reasons of overriding public interest (IROPI) for CNP Infrastructure, which relate to human health, public safety, and/or beneficial consequences of primary importance to the environment.

3.8.20 Where an applicant has shown there are no alternative solutions, and that there are IROPI, compensatory measures must be secured to offset the adverse effects to site integrity as part of a derogation.

3.8.21 Government will table amendments to the Energy Bill to establish a process of statutory strategic compensation in the offshore

[29] This section may also be relevant to any consideration in relation to MCZs under s126(7) of the Marine and Coastal Access Act 2009

[30] A derogation under Regulations 64 and 68 of The Conservation of Habitats and Species Regulations 2017 or Regulations 29 and 36 of The Conservation of Offshore Marine Habitats and Species Regulations 2017

environment, including all offshore wind and transmission infrastructure. Further details on compensation are provided in Section 5.4 of EN-1 and paragraphs 2.8.282-2.8.300 below.

Applicant assessment

Factors influencing site selection and design

3.8.22 General factors influencing site selection by applicants are set out at Section 2.3 of this NPS.

3.8.23 Specific considerations involved in the siting of an offshore wind development are additionally likely to be influenced by factors set out in the following paragraphs.

3.8.24 The specific criteria considered by applicants, and the role that they play in site selection, will vary from project to project.

Offshore Energy Strategic Environmental Assessment

3.8.25 In proposing sites for offshore wind, NSIP applicants should demonstrate that their choice of site takes into account the government's Offshore Energy SEA 4[31] and any successors to it.

3.8.26 The government is undertaking a rolling Offshore Energy SEA programme, including a research programme[32] and data collection to facilitate future strategic and project specific assessments to achieve the 50GW ambitions.

Marine Planning

3.8.27 Marine planning currently enables the increasing demands for use of the marine area to be balanced and managed in an integrated way that protects the marine environment whilst supporting sustainable development.

3.8.28 Marine plans provide a transparent framework for consistent, evidence-based decision making and should be used by applicants to guide site selection.

3.8.29 Marine plans will help applicants understand generic potential impacts of their proposal at an early stage e.g., in relation to other activities, or where there are marine protected areas. Further information is provided in Section 4.4 of EN-1.

31 Applicants should note that the Offshore Energy SEA 4 consultation was published before the British Energy Security Strategy and does not reflect the current 50GW by 2030 ambition. The spatial analysis indicated space for further generation capacity beyond the 40GW initially considered. See https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4

32 See https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-research-projects

3.8.30 The cross-Government Marine Spatial Prioritisation Programme will review how marine plans, the wider planning regime, legislation and guidance may need to evolve to ensure a more holistic approach to the use of the seas, and that this is taken to maximise co-existence/co-location possibilities.

Seabed leasing

3.8.31 The Crown Estate issues leases for offshore wind farms in tendering rounds. Applicants must obtain a lease prior to placing an offshore wind structures on, or passing cables over, the seabed and its foreshore (see 2.3.10 of this NPS).

3.8.32 Rounds 1, 2 and 3 are closed and sites leased in those rounds are either operational; in construction; consented but yet to be constructed; awaiting determination; or yet to apply for development consent. Leasing Round 4 is nearing completion.[33]

3.8.33 The Crown Estate may grant capacity extensions to existing wind farm leases subject to requirements (see 2.3.10 of this NPS for further information) and applicants obtaining necessary consents.

3.8.34 To date, each offshore wind leasing round has been supported by a plan level HRA, which assesses the impact of the leasing round on protected sites.[34]

3.8.35 The assessment serves to provide a better understanding of the potential effects and identify measures which can be put in place to avoid, mitigate, or reduce those significant effects at a plan level.

3.8.36 Where an assessment concludes that there will still be an adverse impact, a case for derogation can be considered. This must meet strict legal tests, which includes identifying compensatory measures.

3.8.37 Future offshore development may occur in rounds, as piecemeal development or using any other development mechanism as required.

3.8.38 Future leasing rounds may continue to be supported by separate plan level HRA or, in appropriate cases, may be the subject of a coordinated approach to the HRA, where there is overlap between the activities of more than one competent authority in relation to offshore development.

3.8.39 The Crown Estate is designing new leasing opportunities for floating wind projects in the Celtic Sea as part of The Crown Estate's

[33] See https://www.thecrownestate.co.uk/round-4/

[34] This is an objective, scientific assessment of the implications for the protected site qualifying features potentially affected by the plan in the context of their conservation objectives.

commitment to enabling projects that can help deliver the government's ambition for up to 5GW of floating wind by 2030.[35]

Wind resource

3.8.40 Available wind resource is critical to the economics of a proposed offshore wind farm.

3.8.41 To inform their economic modelling applicants may collect wind speed data using an anemometry mast or similar.

3.8.42 Collection of this data is not obligatory as the suitability of the wind speed across the site and economics of the scheme are a matter for the technical and commercial judgement of the wind farm applicant not the Secretary of State.

Water depth and foundation conditions

3.8.43 Water depth, bathymetry and geological conditions are all important considerations for the selection of sites and will affect the design of the foundations of the turbines, the layout of turbines within the site and the siting of the cables that will export the electricity.

3.8.44 The onus is on the applicant to ensure that the foundation design is technically suitable for the seabed conditions and that the application caters for any uncertainty regarding the geological conditions.

3.8.45 Whilst the technical suitability of the foundation design is not in itself a matter for the Secretary of State, the Secretary of State will need to be satisfied that the foundations will not have an unacceptable adverse effect on marine biodiversity, the physical environment or marine heritage assets.

Offshore-onshore connection

3.8.46 As identified in paragraphs 3.3.63 - 3.3.78 and Section 4.10 of EN-1, and Section 2.12 of EN-5, a more co-ordinated approach to offshore-onshore transmission[36] is required.

3.8.47 The previous standard approach to offshore-onshore connection involved a radial connection between single windfarms projects and the shore. A coordinated approach will involve the connection of multiple, spatially close, offshore windfarms and other offshore infrastructure as relevant to onshore networks.

3.8.48 This will include connections via multi-purpose interconnectors (MPIs), which combine the connection of offshore wind with the function of market to market interconnectors.

[35] https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/floating-offshore-wind/
[36] In this context transmission means all cabling and associated infrastructure including onshore converter stations.

3.8.49 Co-ordinated transmission proposals are principally developed through, and as a consequence of, a process of ongoing reform through the Offshore Transmission Network Review (OTNR)[37] with the lead party or parties for the initial co-ordination proposals varying according to the different temporal workstreams. Further details are provided in EN-5, section 2.12.

3.8.50 As part of the transition to more co-ordinated transmission, it is anticipated that some proposals for transmission could be consented separately to those for the windfarm (array) application.

3.8.51 For this to occur, an applicant will need to make a request to the Secretary of State. The Secretary of State would then decide whether to give direction under Section 35 of the Planning Act 2008.

3.8.52 For some windfarm projects, the grid connection proposals in the application could comprise an offshore grid connection to a transmission network taking power to shore or with an MPI.

3.8.53 MPIs can allow power flows from windfarms to two or more countries. They can provide the grid valuable flexibility to integrate the increased deployment of intermittent offshore renewable generation into the system by:

- allowing market-to-market trading when there is additional capacity on the cable; and
- limiting the need to curtail offshore wind generation when domestic demand has been met by providing a direct route for export to neighbouring North Sea countries.

3.8.54 This will provide system benefits, reduce costs to consumers and maximise market access for generators.

3.8.55 The design of both wind farms and interconnection projects should seek to be sufficiently flexible so that they are future proofed as far as possible to enable future connections with either interconnectors or wind farms respectively, where these are proposed to be spatially proximate.

Other offshore infrastructure and activities

3.8.56 There may be constraints imposed on the siting or design of offshore wind farms because of the presence of other offshore infrastructure, such as co-existence/co-location, oil and gas, Carbon Capture, Usage and Storage (CCUS), co-location of electrolysers for hydrogen production, marine aggregate dredging, telecommunications, or activities, such as aviation and recreation.

3.8.57 Given the scale of offshore wind deployment required to meet 2030 and 2050 ambitions, and the importance of the UK Continental Shelf

[37] See https://www.gov.uk/government/groups/offshore-transmission-network-review.

(UKCS) in supporting progress towards net zero commitments there will be increasing demand on the UKCS which could give rise to conflicts. The occurrence of conflict between offshore development projects in the short term could restrict the capacity of the UKCS to support the variety of technologies required for the delivery of net zero.

3.8.58 Applicants should consult the Government's Marine Plans (further detailed in Section 4.4 of EN-1) which are a useful information source of existing activities and infrastructure.

3.8.59 Prior to the submission of an application involving the development of the seabed, applicants should engage with The Crown Estate to ensure they are aware of any current or emerging interests on or underneath the seabed which might give rise to a conflict with a specific application.

3.8.60 Applicants are encouraged to work collaboratively with those other developers and sea users on co-existence/co-location opportunities, shared mitigation, compensation and monitoring where appropriate. Where applicable, the creation of statements of common ground between developers is recommended. Work is ongoing between government and industry to support effective collaboration and find solutions to facilitate to greater co-existence/co-location.

3.8.61 As an interested party, The Crown Estate may also provide further supporting information and evidence as part of the examination. This guidance is to encourage early engagement between parties with a potential overlap in their development plans so that a solution can be found that optimises the capacity of the UKCS to enable net zero.

3.8.62 The applicant will also need to consider impacts on civil and military radar and other aviation and defence interests (Section 5.5 of EN-1).

Marine Protected Areas

3.8.63 The UK Government has obligations to protect the marine environment with a network of well managed Marine Protected Areas (MPAs). MCZs together with HRA sites and marine elements of SSSIs form an ecologically coherent network of MPAs.

3.8.64 Given the scale of offshore wind deployment required to meet 2030 and 2050 ambitions, applicants will need to give close consideration to impacts on MPAs, either alone or in combination, in addition to mitigation measures and/or compensation (both individually and in combination with other plans or projects) which may be needed to approve their projects.

3.8.65 It is likely that these may include proactive measures to reduce the impact of deployment e.g., micrositing of cable routes to avoid vulnerable habitats, alternatives piling or trenching techniques, noise abatement technology, collision avoidance methods, or compensation

for habitat loss. See Section 2.8.103 for Offshore Wind Environmental Standards.

3.8.66 Further guidance can be found in Sections 4.2 and 5.4 of EN-1.

3.8.67 The British Energy Security Strategy has committed to introducing mechanisms to support strategic compensatory measures, including for projects already in the consenting process (where possible), to offset environmental impacts and reduce delays to individual projects. Only once all feasible alternatives and mitigation measures have been employed, should applicants explore possible compensatory measures to make good any remaining significant adverse effects to site integrity.

3.8.68 Applicants are expected to seek advice from SNCBs and Defra on potential mitigation and/or compensation requirements at the earliest opportunity and comply with future statutory requirements and/or guidance once available.

3.8.69 Applicants will also be able to facilitate delivery of strategic compensation measures where appropriate.

Green belts

3.8.70 Although offshore wind farms themselves will not have a direct impact on green belts, it is possible that some elements of these projects may be proposed on green belt land, such as electricity network infrastructure, and comprise inappropriate development which may impact on the openness of the green belt.

3.8.71 For guidance on developing on green belts applicants should consult Section 5.11 of EN-1.

Technical considerations

Network connection

3.8.72 Applicants should consider important issues relating to network connection at Section 4.10 of EN-1 and in EN-5. In particular, applicants should proceed in a manner consistent with the regulatory regime for offshore transmission networks established by Ofgem. The co-ordination of transmission is supported by regulatory changes to enable this as part of the Offshore Transmission Network Review.

3.8.73 As co-ordinated offshore transmission development may sometimes occur separate to that for wind farm development[38], it is expected that an initial agreement will be reached regarding connection with the

[38] The work to increase co-ordinated transmission for proposed wind farms and the development of a holistic network design for offshore transmission forms part of the Offshore Transmission Network Review (OTNR).

offshore transmission network developer (or operator) and/or connection into the onshore transmission network.

3.8.74 For many wind farm projects, including those from The Crown Estate Leasing Round 4 onwards, connection agreements will be limited to connection points proposed through strategic network design exercises such as those undertaken by the National Grid Electricity System Operator, including the Holistic Network Design for offshore-onshore transmission under the OTNR. Please see section 2.7 and 2.8 of EN-5 for further details on strategic network designs.

3.8.75 Transmission cabling from offshore energy infrastructure can negatively impact (both during installation and over their lifetime) seabed habitats and protected sites.

3.8.76 Greater coordination of offshore-onshore transmission infrastructure is important to help lessen the overall impact.

3.8.77 Where applicants seek consent for transmission proposals separately from proposals for offshore wind development, for example potentially for MPIs, consideration should be given at a strategic level to the overall environmental impacts of the offshore development and transmission infrastructure.

3.8.78 Early planning can help avoid the location of either windfarm or transmission infrastructure pushing the other into areas where environmental impacts could be increased.

3.8.79 The location of arrays and transmission infrastructure should be assessed strategically (especially where they are not covered by the same consent or marine licence) and the mitigation hierarchy should be used to address any environmental impact.

3.8.80 In addition, the applicant is expected to define the precise route for the cable from the wind farm to the transmission network connection point offshore or, where the applicant is proposing the transmission to shore, the precise onshore connection point together with the onshore and offshore locations of any associated infrastructure such as substations.

3.8.81 The applicant should assess the effects of the cable and any associated infrastructure on the marine, coastal and onshore environment.

3.8.82 Where the applicant does not know the precise location of the transmission cable connection to the offshore connection point or the location for connection with onshore networks, including any necessary onshore and/or offshore substations and the onshore landing point, a corridor should be identified within which the specific infrastructure is proposed to be located.

3.8.83 The ES for the proposed project should assess the effects of including this infrastructure within that corridor.

3.8.84 Applicants are expected to demonstrate compliance with mitigation measures identified by The Crown Estate in any plan-level HRA produced as part of its leasing rounds and with any future statutory requirements, guidance or mitigation measures developed to deliver the commitments in the British Energy Security Strategy, including on Offshore Wind Environmental Standards.

3.8.85 Assessment of environmental effects of cabling infrastructure and any proposed offshore or onshore substations should assess effects both alone and cumulatively with other existing and proposed infrastructure.

3.8.86 Applicants should include details on how avoidance has been achieved, good design principles have been followed and provide proposals for mitigation, as well as demonstrating that they have considered how their proposals can contribute towards environmental net gain. Further information is provided in Sections 4.2, and 4.4 to 4.6 of EN-1.

Flexibility in the project details

3.8.87 Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application to the Secretary of State. Such aspects may include:

- the precise location and configuration of turbines and associated development;
- the foundation type and size;
- the installation technique or hammer energy;
- the exact turbine blade tip height and rotor swept area;
- the cable type and precise cable route;
- the exact locations of offshore and/or onshore substations.

3.8.88 Guidance on how applicants should manage flexibility is set out at 2.6 of this NPS and 4.2 of EN-1.

Micrositing and microrouting

3.8.89 Micrositing/microrouting provides developers with flexibility to accommodate any unforeseen events, such as the discovery of previously unknown marine archaeological objects that it would be preferable to leave in situ.

3.8.90 To inform micrositing/microrouting applicants should undertake high-resolution survey work and make provision for investigative work, such as archaeological examination, to assess the impacts of any

proposed cables or foundation placement on potential archaeological assets.

3.8.91 Applicants should submit an outline archaeological Written Scheme of Investigation (WSI) as part of the DCO submission, with a commitment to complete a project-specific WSI post-consent in consultation with Historic England.

3.8.92 Where the applicant requests micrositing or microrouting tolerance, and insofar as it is reasonably possible to do so, the applicant should factor this tolerance into the environmental impact assessment of the development's worst-case scenario.[39]

Repowering

3.8.93 Where an operational wind farm reaches the end of its life, subject to obtaining the necessary lease from The Crown Estate or providing an existing lease is still valid, the owner of the wind farm may wish to "repower" the site.

3.8.94 While there may be benefits to making use of an existing site, given the likely change in technology over the intervening time period, any repowering of sites is likely to involve wind turbines of a different scale and nature. This could result in significantly different impacts as well as a different electricity generating capacity.

3.8.95 Applicants must submit a new consent application for any repowering of an existing site, this would be subject to EIA and HRA.

Future monitoring

3.8.96 Where requested by the Secretary of State applicants are required to undertake environmental monitoring (e.g. ornithological surveys, geomorphological surveys, archaeological surveys) prior to and during construction and operation.

3.8.97 Monitoring must measure and document the effects of the development and the efficacy of any associated mitigation or compensation.

3.8.98 This will enable an assessment of the accuracy of the original predictions and improve the evidence base for future mitigation and compensation measures enabling better decision-making in future EIAs and HRAs.

3.8.99 Monitoring should be presented in formal reports which must be made publicly available.

[39] In relation to uncertainty about routing details of the project, applicants should have regard to the concept of the 'Rochdale Envelope', as established in R v Rochdale Metropolitan Borough Council, ex parte Tew [2000] Env. L.R. 1 and subsequent caselaw.

3.8.100 Where appropriate, applicants are also encouraged to consider monitoring collaboratively with other developers and sea users. Work is ongoing between government and industry to support effective collaboration.

Decommissioning

3.8.101 Section 105 of the Energy Act 2004 enables the Secretary of State to require the submission of a decommissioning programme for a proposed offshore wind farm, provided at least one of the statutory consents required (including one under the 2008 Act) has been given or has been applied for and is likely to be given.

3.8.102 Where requested by the Secretary of State applicants should submit a decommissioning programme, satisfying the requirements of s.105(8) of the Energy Act 2004[40] before any offshore construction works begin.

Offshore wind environmental standards

3.8.103 As part of the Offshore Wind Environmental Improvement Package set out in the British Energy Security Strategy, Government committed to establishing Offshore Wind Environmental Standards (previously referred to as Nature Based Design Standards) to accelerate deployment whilst enhancing the marine environment.

3.8.104 In 2023 Defra will consult on guidance setting out Offshore Wind Environmental Standards applicable to the design, construction, operation and decommissioning of offshore wind farms.

3.8.105 Once the final guidance[41] setting out Offshore Wind Environmental Standards applicable to the design, construction, operation and decommissioning of offshore wind farms is issued, the Secretary of State will expect applicants to have applied the guidance to their proposals.

3.8.106 Applicants should explain how their proposals comply with the guidance and support its targets or, alternatively, the grounds on which a departure from them is justified.

Impacts

3.8.107 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

3.8.108 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

[40] See https://www.gov.uk/government/publications/decommissioning-offshore-renewable-energy-installations

[41] This guidance will be available following a consultation, which will run in due course.

Biodiversity and ecological conservation

3.8.109 Generic biodiversity and ecology effects and receptors are covered in detail in Section 5.4 of EN-1.

3.8.110 The coastal change policy in Section 5.6 of EN-1 may also be relevant.

3.8.111 Impacts on the physical environment may have indirect effects on marine biodiversity.

3.8.112 In addition applicants should have regard to the specific ecological and biodiversity considerations that pertain to proposed offshore renewable energy infrastructure developments, namely:

- fish (see Section 2.8.129 of this NPS);
- intertidal and subtidal seabed habitats and species (see Section 2.8.134 of this NPS);
- marine mammals (see Section 2.8.139 of this NPS);
- birds (see Section 2.8.149 of this NPS); and
- wider ecosystem impacts and interactions (see Section 2.8.160 of this NPS).

3.8.113 Evidence from existing offshore wind farms demonstrates that it has been possible to locate wind farms in ecologically sensitive areas where careful siting of turbines has been undertaken following appropriate ecological surveys and assessments.

3.8.114 However, with increasing deployment of offshore wind to 2030 and beyond, with a likely focus on deployment of fixed offshore wind in the shallow waters of the North Sea, it is likely that the cumulative impact of multiple wind farms on the marine environment will increase impacts beyond identified thresholds for increasing numbers of species and habitats, leading to increased requirements for both mitigation and compensation for impacts to be acceptable.

3.8.115 Applicants must undertake a detailed assessment of the offshore ecological, biodiversity and physical impacts of their proposed development, for all phases of the lifespan of that development, in accordance with the appropriate policy for offshore wind farm EIAs, HRAs and MCZ assessments (See Sections 4.2 and 5.4 of EN-1).

3.8.116 Applicants need to consider environmental and biodiversity net gain as set out in Section 4.5 of EN-1 and the Environment Act 2021.

3.8.117 Applicants should assess the potential of their proposed development to have net positive effects on marine ecology and biodiversity, as well as negative effects.

3.8.118 Applicants should consult at an early stage of pre-application with relevant statutory consultees, as appropriate, on the assessment methodologies, baseline data collection, and potential avoidance, mitigation and compensation options should be undertaken.

3.8.119 In developing proposals applicants must refer to the best practice advice provided by the Offshore Wind Enabling Action Programme.[42]

3.8.120 Any relevant data that has been collected as part of post-construction ecological monitoring from existing, operational offshore wind farms should be referred to where appropriate.

3.8.121 A range of research programmes are ongoing to investigate impacts of offshore wind farm development, including, but not limited to: BEIS SEA Research Programme[43], ORJIP[44], ScotMER[45], the ORE Catapult[46] and OWEC[47]. Applicants should explain why their decisions on siting, design, and impact mitigation are proportionate and well-targeted, referring to relevant scientific research and literature.

3.8.122 Applicants are expected to have regard to guidance issued in respect of Marine Licence requirements.

3.8.123 Applicants should have regard to Good Environmental Status (GES) under the UK Marine Strategy.[48]

3.8.124 The British Energy Security Strategy commits to reviewing the Habitats Regulation Assessment process for offshore wind farm developments and powers have been sought through the Energy Bill to implement this through secondary legislation. Further guidance will be published as a separate document setting out what information assessments must contain. Once final guidance is published applicants will be expected to comply.

Physical environment

3.8.125 The construction, operation and decommissioning of offshore energy infrastructure (including the preparation and installation of the cable route) can affect the following elements of the physical offshore environment, which can have knock on impacts on other biodiversity receptors:

[42] See https://naturalengland.blog.gov.uk/2022/04/13/offshore-wind-best-practice-advice-to-facilitate-sustainable-development/
[43] See https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-research-projects
[44] See http://www.orjip.org.uk/
[45] See https://www.gov.scot/policies/marine-renewable-energy/science-and-research/
[46] See https://ore.catapult.org.uk/
[47] See https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/energy/offshore-wind-a-sustainable-future/
[48] See https://moat.cefas.co.uk/introduction-to-uk-marine-strategy/

- water quality – disturbance of the seabed sediments or release of contaminants can result in direct or indirect effects on habitats and biodiversity, as well as on fish stocks thus affecting the fishing industry;
- waves and tides – the presence of the turbines can cause indirect effects through change to wave climate and tidal currents on flood defences, marine ecology and biodiversity, marine archaeology and potentially coastal recreation activities;
- scour effect – the presence of wind turbines and other infrastructure can result in a change in the water movements within the immediate vicinity of the infrastructure, resulting in scour (localised seabed erosion) around the structures. This can indirectly affect navigation channels for marine vessels, marine archaeology and impact biodiversity and seabed habitats;
- sediment transport – the resultant movement of sediments, such as sand across the seabed or in the water column, can indirectly affect navigation channels for marine vessels, could affect sediment supply to sensitive coastal sites and impact biodiversity and seabed habitats;
- suspended solids – the release of sediment during construction, operation and decommissioning can cause indirect effects on marine ecology and biodiversity;
- sandwaves – the modification/clearance of sandwaves can cause direct physical and ecological effects both at the seabed and within the water column due to disturbance and suspension of sediment, and potentially indirect effects (e.g. changes to seabed morphology in water depths where waves can influence the seabed, which can in turn affect wave climate and sediment transport; and
- water column – wind turbine structures can also affect water column features such as tidal mixing fronts or stratification due to a change in hydrodynamics and turbulence around structures.

3.8.126 Applicant assessments are expected to include predictions of the physical effects arising from modifications to hydrodynamics (waves and tides), sediments and sediment transport, and sea bed morphology that will result from the construction, operation and decommissioning of the required infrastructure.

3.8.127 Assessments should also include effects such as the scouring that may result from the proposed development and how that might impact sensitive species and habitats.

3.8.128 Applicants should undertake geotechnical investigations as part of the assessment, enabling the design of appropriate construction techniques to minimise any adverse effects.

Fish

3.8.129 Fish in the context of this NPS also includes elasmobranchs (sharks and rays) and shellfish (e.g., crabs).

3.8.130 There is the potential for the construction and decommissioning phases, including activities occurring both above and below the seabed, to impact fish communities, migration routes, spawning activities and nursery areas of particular species.

3.8.131 There are potential impacts associated with energy emissions into the environment (e.g. noise or electromagnetic fields (EMF)), as well as potential interaction with seabed sediments.

3.8.132 The applicant should identify fish species that are the most likely receptors of impacts with respect to:

- spawning grounds;
- nursery grounds;
- feeding grounds;
- over-wintering areas for crustaceans;
- migration routes; and
- protected sites.

3.8.133 Applicant assessments should identify the potential implications of underwater noise from construction and unexploded ordnance including, where possible, implications of predicted construction and soft start noise levels in relation to mortality, permanent threshold shift (PTS), temporary threshold shift (TTS) and disturbance and addressing both sound pressure and particle motion) and EMF on sensitive fish species.

Intertidal and coastal habitats and species

3.8.134 The intertidal zone is the area between mean high water and mean low water.

3.8.135 Intertidal habitat and ecology are often recognised through statutory nature conservation designations.

3.8.136 Coastal habitats (in the coastal fringe above the high-water mark) are also often protected, may also be affected and should undergo a similar review as part of the assessment detailed below.

3.8.137 Export cable routes will cross the intertidal/coastal zone resulting in habitat loss, and temporary disturbance of intertidal flora and fauna.

3.8.138 Applicant assessment of the effects of installing cable across the intertidal/coastal zone should demonstrate compliance with mitigation

measures identified by The Crown Estate in any plan-level HRA produced as part of its leasing round and include information, where relevant, about:

- any alternative landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice;
- any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice;
- potential loss of habitat;
- disturbance during cable installation, maintenance/repairs and removal (decommissioning);
- increased suspended sediment loads in the intertidal zone during installation and maintenance/repairs;
- predicted rates at which the intertidal zone might recover from temporary effects, based on existing monitoring data; and
- Protected sites.

Marine mammals

3.8.139 Construction activities, including installing wind turbine foundations by pile driving, geophysical surveys, and clearing the site and cable route of unexploded ordinance (UXOs) may reach noise levels which are high enough to cause disturbance, injury, or even death to marine mammals.

3.8.140 All marine mammals are protected under Part 3 of the Habitats Regulations.

3.8.141 If construction and associated noise levels are likely to lead to an offence under Part 3 of the Habitats Regulations (which would include deliberately disturbing, injuring or killing), applicants will need to apply for a wildlife licence[49] to allow the activity to take place.

3.8.142 The development of offshore wind farms can also impact fish species (see paragraphs 2.8.129 – 2.8.133), which can have indirect impacts on marine mammals if those fish are prey species.

3.8.143 There is also the risk of collision with construction and maintenance vessels and potential entanglement risks from floating wind structures.

3.8.144 Where necessary, assessment of the effects on marine mammals should include details of:

[49] See https://www.gov.uk/guidance/understand-marine-wildlife-licences-and-report-an-incident

- likely feeding areas and impacts on prey species and prey habitat;
- known birthing areas/haul out sites for breeding and pupping;
- migration routes;
- protected sites;
- baseline noise levels;
- predicted construction and soft start noise levels in relation to mortality, permanent threshold shift (PTS), temporary threshold shift (TTS) and disturbance;
- operational noise;
- duration and spatial extent of the impacting activities including cumulative/in-combination effects with other plans or projects;
- collision risk;
- entanglement risk; and
- barrier risk.

3.8.145 The scope, effort and methods required for marine mammal surveys should be discussed with the relevant SNCB.

3.8.146 The applicant should discuss any proposed noisy activities with the relevant statutory body and must reference the joint JNCC and SNCB underwater noise guidance[50] in relation to noisy activities (alone and in-combination with other plans or projects) within HRA sites, in addition to the JNCC mitigation guidelines[51] to piling, explosive use, and geophysical surveys.

3.8.147 Where the assessment identifies that noise from construction and UXO clearance may reach noise levels likely to lead to noise thresholds being exceeded (as detailed in the JNCC guidance) or an offence as described in paragraph 2.8.138 above, the applicant will be expected to look at possible alternatives or appropriate mitigation.

3.8.148 The applicant should develop a Site Integrity Plan (SIP) to allow the cumulative impacts of underwater noise to be reviewed closer to the construction date, when there is more certainty in other plans and projects.

Birds

3.8.149 Offshore wind farms have the potential to impact on birds through:

- collisions with rotating blades;

[50] See https://hub.jncc.gov.uk/assets/2e60a9a0-4366-4971-9327-2bc409e09784
[51] See https://jncc.gov.uk/our-work/marine-mammals-and-noise-mitigation/

- direct habitat loss;
- disturbance from construction activities such as the movement of construction/decommissioning vessels and piling;
- displacement during the operational phase, resulting in loss of foraging/roosting area;
- impacts on bird flight lines (i.e. barrier effect) and associated increased energy use by birds for commuting flights between roosting and foraging areas;
- impacts upon prey species and prey habitat; and
- impacts on protected sites.

3.8.150 Currently, cumulative impact assessments for ornithology are based on the consented Rochdale Envelope parameters of projects,[52] rather than the 'as-built' parameters, which may pose a lower risk to birds.

3.8.151 The applicant must ensure any draft consents include provisions to define the final 'as built' parameters (which may not then be exceeded). These parameters must be used in future cumulative impact assessments.

3.8.152 In parallel the Government will look to explore opportunities to reassess ornithological impact assessment of historic consents to reflect their 'as built' parameters.

3.8.153 Any ornithological 'headroom' between the effects defined in the 'as built' parameters and Rochdale Envelope parameters can then be released.

3.8.154 Applicants are encouraged to make appropriate applications for amendments to development consent to secure reduced parameters and ornithological impacts.

3.8.155 Government will also consider the potential applicability of these principles to other consent parameters.

3.8.156 Applicants should discuss the scope, effort and methods required for ornithological surveys with the relevant statutory advisor, taking into consideration baseline and monitoring data from operational windfarms.

3.8.157 Applicants must undertake collision risk modelling, as well as displacement and population viability assessments for certain species of birds. Advice can be sought from SNCBs.

3.8.158 Where necessary, applicants should assess collision risk using survey data collected from the site at the pre-application EIA stage.

[52] https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/

3.8.159 Applicant assessments should cover all aspects included in paragraph 2.8.257.

Subtidal habitats and species

3.8.160 The subtidal zone is the area below low water springs which remains submerged at low tide.

3.8.161 Subtidal habitat and ecology are often recognised through statutory nature conservation designations.

3.8.162 Offshore wind construction, maintenance and decommissioning activities can cause loss and temporary disturbance of subtidal habitat and benthic ecology.

3.8.163 The applicant should demonstrate compliance with mitigation measures identified by The Crown Estate in any plan-level HRA produced as part of its leasing round.

3.8.164 Applicants should follow guidelines for leasing transmission assets infrastructures, and any successor to it produced by the Crown Estate.[53]

3.8.165 All work associated with cable installation including trenching, laying and surface protections are licenced through a Deemed Marine Licence as part of the DCO. In all offshore windfarm cases however, applicants should be aware that the operation and maintenance of cables after construction may require new Marine Licences.

3.8.166 Applicant assessment of the effects on the subtidal environment should include:

- loss of habitat due to foundation type including associated seabed preparation, predicted scour, scour protection and altered sedimentary processes, e.g. sandwave/boulder/UXO clearance;
- environmental appraisal of inter-array and export cable routes and installation/maintenance methods, including predicted loss of habitat due to predicted scour and scour/cable protection and sandwave/boulder/UXO clearance;
- habitat disturbance from construction and maintenance/repair vessels' extendable legs and anchors;
- increased suspended sediment loads during construction and from maintenance/repairs;
- predicted rates at which the subtidal zone might recover from temporary effects;

[53] https://www.thecrownestate.co.uk/media/3994/the-crown-estate-cable-route-identification-leasing-guidelines.pdf

- potential impacts from EMF on benthic fauna;
- protected sites; and
- potential for invasive/non-native species introduction.

Commercial fisheries and fishing

3.8.167 There are a number of different fishing activities within UK waters including:

- bottom trawling;
- mid-water trawling;
- long-lining;
- dredging;
- fixed netting;
- drift netting;
- seine netting; and
- potting.

3.8.168 Whilst the footprint of an offshore wind farm and any associated infrastructure may be a hindrance to certain types of commercial fishing activity such as trawling, other fishing activities, such as potting, may be able to take place within operational wind farms without unduly disrupting or compromising navigational safety.

3.8.169 Applicants should consider guidance on best practice for fisheries liaison, which has been jointly agreed by the renewables industry and fishing community.[54]

3.8.170 In some circumstances, transboundary issues may be a consideration as fishing vessels from other coastal States may fish in waters within which offshore wind farms are sited. Applicants should seek advice from Defra in such circumstances.

3.8.171 Applicants should undertake early consultation with a cross-section of the fishing industry, as well as MMO, SNCBs, Defra and Welsh Government, to identify impacts, and actively encourage input from active fishermen to provide evidence of their use of the area to support the impact assessments.

3.8.172 Where any part of a proposal involves a grid connection to shore, appropriate inshore fisheries groups should also be consulted.

[54] See https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/our-partnerships/the-fishing-liaison-with-offshore-wind-and-wet-renewables-group/

3.8.173 Applicants will be expected to undertake dialogue with the fishing industry during the planning and design of individual offshore wind farm proposals to maximise the potential for co-existence/co-location and reduce potential displacement.

3.8.174 Applicant assessments should include robust baseline data and detailed surveys of the effects on fish stocks of commercial interest and any potential reduction in such stocks, as well as any likely constraints on fishing activity within the project's boundaries.

3.8.175 In some circumstances, applicants may seek declaration of safety zones around wind turbines and other infrastructure. Although these might not be applied until after consent to the wind farm has been granted.

3.8.176 The declaration of a safety zone excludes or restricts activities within the defined sea areas including commercial fishing.

3.8.177 Where there is a possibility that safety zones will be sought applicant assessments should include potential effects on commercial fishing.

3.8.178 Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the Maritime and Coastguard Agency (MCA) as part of this process.

3.8.179 Exclusion of certain types of fishing may make an area more productive for other types of fishing. Applicant assessments should therefore include detailed surveys of the effects on fish stocks of commercial interest and the potential reduction or increase in such stocks that will result from the presence of the wind farm development and of any safety zones.

Marine historic environment

3.8.180 Heritage assets and other remains of past human activity may exist offshore and within the intertidal area (the area between mean high and mean low water).

3.8.181 This can include evidence of pre-historic human activity and submerged prehistoric landscapes which existed prior to sea level rises, as well as maritime wreck sites, remains of crashed aircraft and associated cultural material.

3.8.182 The marine historic environment can be affected by offshore wind farm development in two principal ways:

- from direct effects arising from of the physical siting of the development itself such as the installation of wind turbine foundations and electricity cables or the siting of plant required during the construction phase of development; and

- from indirect changes to the physical marine environment (such as scour, coastal erosion or sediment deposition) caused by the proposed infrastructure itself or its construction (see the policy on physical environment at paragraphs 2.8.25 of this NPS).

3.8.183 Applicants should consult with the relevant statutory consultees, such as Historic England or Cadw, on the potential impacts on the marine historic environment at an early stage of development during pre-application, taking into account any applicable guidance (e.g., offshore renewables protocol for archaeological discoveries[55]).

3.8.184 Assessment of potential impacts upon the historic environment should be considered as part of the Environmental Impact Assessment process undertaken to inform any application for consent.

3.8.185 Desk based studies to characterise the features of the historic environment that may be affected by a proposed development and assess any likely significant effects should be undertaken by competent archaeological experts.

3.8.186 These studies should consider any geotechnical or geophysical surveys that have been undertaken to aid the wind farm design.

3.8.187 Whilst it might be possible for a development project to avoid designated heritage assets, the knowledge currently available about the historic environment in the inshore and offshore areas is limited .

3.8.188 Applicants are required to determine how any known heritage assets might best be avoided.

3.8.189 The applicant will be expected to conduct all necessary examination and assessment exercises using a variety of survey techniques to plan the development so as to optimise opportunities for avoidance.

3.8.190 Once a site has been chosen, it may be necessary to undertake further archaeological assessment, including field evaluation, to identify as yet unknown heritage assets when considering the options for detailed site development, which may also include ancillary matters, such as those described in Section 5.9 of EN-1.

3.8.191 Assessment may also include the identification of any beneficial effects on the marine historic environment, for example through improved access or the contribution to new knowledge that arises from investigation.

[55] See https://www.wessexarch.co.uk/our-work/offshore-renewables-protocol-archaeological-discoveries
Commercial Renewable Energy Development and the Historic Environment: Historic England Advice Note 15 (Historic England 2021)
Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology 2007)
Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate and Wessex Archaeology 2021)

3.8.192 Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are located onshore, applicants should assess the effects in accordance with Section 5.9 in EN-1.

Offshore wind impacts: navigation and shipping

3.8.193 Offshore wind farms will occupy an area of the sea and therefore it is inevitable that there will be an impact on navigation in and around the area of the site. This is relevant to both commercial and recreational users of the sea who may be affected by disruption or economic loss because of the proposed offshore wind farm.

3.8.194 To ensure safety of shipping applicants should reduce risks to navigational safety to as low as reasonably practicable (ALARP).

3.8.195 There is a public right of navigation over navigable tidal waters and in International Law, foreign vessels have the right of innocent passage through the UK's territorial waters.

3.8.196 Beyond the seaward limit of the territorial sea, shipping has the freedom of navigation although offshore infrastructure and the imposition of safety zones can hinder this.

3.8.197 Impacts on navigation can arise from the wind farm or other infrastructure and equipment creating a physical barrier during construction and operation.

3.8.198 There may be some situations where reorganisation of traffic activity might be both possible and desirable when considered against the benefits of the wind farm application and such circumstances should be discussed with the Maritime and Coastguard Agency (MCA), Government, Trinity House, and the commercial shipping sector.

3.8.199 Applicants should engage with interested parties in the navigation sector early in the pre-application phase of the proposed offshore wind farm to help identify mitigation measures, including alterations to navigation routes, to facilitate proposed offshore wind development. This includes the MMO or NRW in Wales, MCA, the relevant General Lighthouse Authority, such as Trinity House, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be affected. This should continue throughout the life of the development including during the construction, operation and decommissioning phases.

3.8.200 Engagement should seek solutions that allow offshore wind farms to successfully co-exist with navigation and shipping uses of the sea.

3.8.201 The presence of the wind turbines can also have impacts on communication and shipborne and shore-based radar systems. See section 5.5 in EN-1 for further guidance.

3.8.202 Prior to undertaking assessments applicants should consider information on internationally recognised sea lanes, which is publicly available.

3.8.203 Applicants should refer in assessments to any relevant, publicly available data available on the Maritime Database.[56]

3.8.204 Applicants should undertake a Navigational Risk Assessment (NRA) in accordance with relevant government guidance prepared in consultation with the MCA and the other navigation stakeholders listed above.

3.8.205 The navigation risk assessment will for example necessitate:

- a survey of vessel traffic in the vicinity of the proposed wind farm;
- a full NRA of the likely impact of the wind farm on navigation in the immediate area of the wind farm in accordance with the relevant marine guidance; and
- cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea.

3.8.206 In some circumstances, applicants may seek declaration of a safety zone around wind turbines and other infrastructure. Although these might not be applied until after consent to the wind farm has been granted.

3.8.207 The declaration of a safety zone excludes or restricts activities within the defined sea areas including navigation and shipping.

3.8.208 Where there is a possibility that safety zones will be sought applicant assessments should include potential effects on navigation and shipping.

3.8.209 Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA and refer to the government guidance on safety zones[57] as a part of this process.

3.8.210 Should consent for the offshore wind farm be granted, applicants should undertake a detailed Search and Rescue Response

[56] See https://www.maritime-database.com/
[57] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/372561/Safety_Zones_DECC_2011.pdf

Assessment prior to commencement of construction.[58] This assessment could be secured by a requirement to any consent.

3.8.211 However, where there are significant concerns over the frequency or the consequences of such incidents, applicants may be required to take a full assessment before the application can be determined.

Other offshore infrastructure and activities

3.8.212 The scale and location of future offshore wind development around England and Wales means that development has occurred, and will continue to occur, in or close to areas where there is other offshore infrastructure.

3.8.213 Where a potential offshore wind farm is proposed close to existing operational offshore infrastructure or has the potential to affect activities for which a licence has been issued by government, the applicant should undertake an assessment of the potential effects of the proposed development on such existing or permitted infrastructure or activities.

3.8.214 The assessment should be undertaken for all stages of the lifespan of the proposed wind farm in accordance with the appropriate policy and guidance for offshore wind farm EIAs.

3.8.215 Applicants should use marine plans (paragraph 2.8.27 of this NPS and Section 4.4 of EN-1) in considering which activities may be most affected by their proposal and thus where to target their assessment.

3.8.216 Applicants should engage with interested parties in the potentially affected offshore sectors early in the pre-application phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application. (see paragraphs 2.8.55 and 2.8.277 of this NPS for further guidance).

3.8.217 Such stakeholder engagement should continue throughout the life of the development including construction, operation and decommissioning phases where necessary.

3.8.218 As many offshore industries are regulated by government, the relevant Secretary of State should also be a consultee where necessary.

3.8.219 Such engagement should be taken to ensure that solutions are sought that allow offshore wind farms and other uses of the sea to successfully co-exist.

[58] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1034158/OREI_SAR_Requirements_v3.pdf

Seascape and visual effects

3.8.220 Applicants should address impact on seascape in addition to the landscape and visual effects discussed in Section 5.10 of EN-1.

3.8.221 Seascape is an additional issue for consideration given that it is an important environmental, cultural and economic asset. This is especially so where seascape provides the setting for a nationally designated landscape (National Park, The Broads or AONB) and supports the delivery of the designated area's statutory purpose; and for stretches of coastline identified as Heritage Coasts, which are associated with a largely undeveloped coastal character.

3.8.222 Seascape is a discrete area, with views of the coast or seas, and coasts and the adjacent marine environment with cultural, historical and archaeological links with each other.[59]

3.8.223 Applicants should follow relevant guidance including, but not limited to seascape character assessments[60] and marine plan seascape character assessments (e.g., NRW Marine Character Areas (with associated guidance)[61] England's marine plans[62]).

3.8.224 Where a proposed offshore wind farm will be visible from the shore and would be within the setting of a nationally designated landscape with potential effects on the area's statutory purpose, a seascape, landscape and visual impact assessment (SLVIA[63]) should be undertaken in accordance with the relevant offshore wind farm EIA policy and the latest Offshore Energy SEA, including the White 2020 report.[64] The SLVIA should be proportionate to the scale of the potential impacts. This will always be the case where a coastal National Park, the Broads or AONB, or a Heritage Coast or their setting is potentially affected.

3.8.225 Where necessary, assessment of the seascape should include an assessment of four principal considerations on the likely effect of offshore wind farms on the coast:

[59] Definition taken from the UK Marine Policy Statement 2011(UKMPS para. 2.6.5)
[60] See https://www.gov.uk/government/publications/seascape-character-assessments-identify-and-describe-seascape-types
[61] See https://naturalresources.wales/evidence-and-data/maps/marine-character-areas/?lang=en
[62] See https://www.gov.uk/government/publications/seascape-assessments-for-north-east-north-west-south-east-south-west-marine-plan-areas-mmo1134
East Marine Plans - GOV.UK (www.gov.uk)
Seascape assessment for the South marine plan areas (MMO 1037) - GOV.UK (www.gov.uk)

[63] Seascape, Landscape and Visual Impact Assessment. See Landscape Institute Guidelines for Landscape and Visual impact Assessment Edition 3
[64] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/896084/White_Consultants_2020_Seascape_and_visual_buffer_study_for_offshore_wind_farms.pdf

- the limit of visual perception from the coast under poor, good and best lightening conditions;
- the effects of navigation and hazard prevention lighting on dark night skies;
- individual landscape and visual characteristics of the coast and the special qualities of designated landscapes, such as World Heritage Sites, which limits the coasts capacity to absorb a development; and
- how people perceive and interact with the coast and natural seascape.

3.8.226 As part of the SLVIA, photomontages[65] will be required. Viewpoints to be used for the SLVIA should be selected in consultation with the statutory consultees at the EIA Scoping stage.

3.8.227 Applicants should assess the magnitude and significance of change to both the identified seascape receptors (such as seascape and landscape units, visual receptors and the special qualities of designated landscapes) in accordance with the standard methodology for SLVIA.

3.8.228 Where appropriate, cumulative SLVIA should be undertaken in accordance with the policy on cumulative assessment outlined in Section 5.10.15 of EN-1.

Mitigation

3.8.229 Applicants must always employ the mitigation hierarchy, in particular to avoid as far as is possible the need to find compensatory measures for coastal, inshore and offshore developments affecting HRA sites and/or MCZs. It is essential that applicants involve SNCBs and Defra as early as possible in the planning process to enable discussions of what is and isn't a significant and/or adverse effect, subsequent implications, and if required, mitigation and/or compensation.

3.8.230 At the earliest possible stage alternative ways of working and use of technology should be employed to avoid environmental impacts. For example, construction vessels may be rerouted to avoid disturbing seabirds. Where impacts cannot be avoided, measures to reduce and mitigate impacts should be employed, for example using trenching techniques or noise abatement technology.

3.8.231 Only once all feasible alternatives and mitigation measures have been employed, should applicants explore possible compensatory measures to make good any remaining significant adverse effects to site integrity.

65

3.8.232 Where several developers are likely to have cumulative impacts on the same species or feature it may be appropriate to collaborate on mitigation and compensation measures. (see paragraphs 2.8.282 below for further guidance on compensation).

Biodiversity and ecological conservation

3.8.233 Mitigation will be possible in the form of careful design of the development itself and the construction techniques employed.

3.8.234 General mitigation requirements and considerations are set out in Section 5.4 of EN-1.

3.8.235 See paragraphs 2.8.103 and 2.8.315 of this NPS for further guidance on Offshore Wind Environmental Standards to enable developments to mitigate their impacts on the marine environment.

3.8.236 Applicants are advised to develop an ecological monitoring programme to monitor impacts during the pre-construction, construction and operational phases to identify the actual impacts caused by the project and compare them to what was predicted in the EIA/HRA.

3.8.237 Should impacts be greater than those predicted, an adaptive management process may need to be implemented and additional mitigation required, to ensure that so far as possible the effects are brought back within the range of those predicted.

3.8.238 Monitoring should be of sufficient standard to inform future decision-making. Increasing the understanding of the efficacy of alternatives and mitigation will deliver greater certainty on applicant requirements.

Physical environment

3.8.239 Applicants are expected to have considered the best ecological outcomes in terms of potential mitigation. These might include:

- avoidance of areas sensitive to physical effects;
- consideration of micro-siting of both the array and cables;
- alignment and density of the array;
- design of foundations;
- ensuring that sediment moved is retained as locally as possible;
- the burying of cables to a necessary depth;
- using scour protection techniques around offshore structures to prevent scour effects or designing turbines to withstand scour, so scour protection is not required or is minimised.

3.8.240 Applicants should consult the statutory consultees on appropriate mitigation and monitoring.

Intertidal and coastal habitats and species

3.8.241 Effects on intertidal/coastal habitat cannot be avoided entirely.

3.8.242 Applicants should undertake a review of up-to-date research and all potential avoidance, reduction and mitigation options presented.

3.8.243 Landfall and cable installation and decommissioning methods should be designed appropriately to minimise effects on intertidal/coastal habitats, taking into account other constraints.

3.8.244 Where applicable, use of horizontal directional drilling techniques (HDD) should be considered as a method to avoid impacts on sensitive habitats and species.

3.8.245 Where HDD is proposed, the applicant should provide an alternative plan for installing the infrastructure in the event that HDD fails.

3.8.246 The applicant should explain their justification for the alternative plan and ensure this is the least impactful method possible.

3.8.247 Where cumulative effects on intertidal habitats are predicted as a result of the cumulative impact of multiple cable routes, applicants of various schemes are encouraged to work together to ensure that the number of cables crossing the intertidal/coastal zone are minimised and installation and decommissioning phases are coordinated to ensure that disturbance is also reasonably minimised.

3.8.248 It is expected that a more co-ordinated approach to offshore-onshore transmission will be delivered. See paragraphs 2.8.46 of this NPS.

Subtidal habitats and species

3.8.249 Applicants should design construction, maintenance and decommissioning methods appropriately to minimise effects on subtidal habitats, taking into account other constraints.

3.8.250 Applicants should undertake a review of up-to-date research and all potential avoidance, reduction and mitigation options presented.

3.8.251 Mitigation measures which applicants are expected to have considered may include:

- surveying and micrositing of the turbines, or re-routing of the export and inter-array cables to avoid adverse effects on sensitive/protected habitats, biogenic reefs or protected species;
- burying cables at a sufficient depth, taking into account other constraints, to allow the seabed to recover to its natural state; and

- the use of anti-fouling paint might be minimised on subtidal surfaces, to encourage species colonisation on the structures.

3.8.252 Where cumulative impacts on subtidal habitats are predicted as a result of multiple cable routes, applicants for various schemes are encouraged to work together to ensure that the number of cables crossing the subtidal zone is minimised and installation/ decommissioning phases are coordinated to ensure that disturbance is reasonably minimised.

3.8.253 It is expected that a more co-ordinated approach to offshore-onshore transmission will be delivered going forward. See paragraphs 2.8.46 of this NPS.

Marine Mammals

3.8.254 Monitoring of the surrounding area before and during the piling procedure can be undertaken by various methods including marine mammal observers and passive acoustic monitoring. Active displacement of marine mammals outside potential injury zones can be undertaken using equipment such as acoustic deterrent devices. Soft start procedures during pile driving may be implemented. This enables marine mammals in the area disturbed by the sound levels to move away from the piling before physical or auditory injury is caused.

3.8.255 Where noise impacts cannot be avoided, other mitigation should be considered, including alternative installation methods and noise abatement technology, spatial/temporal restrictions on noisy activities, alternative foundation types.

3.8.256 Applicants should undertake a review of up-to-date research and all potential mitigation options presented as part of the application, having consulted the relevant JNCC mitigation guidelines[66].

Birds

3.8.257 Applicants should undertake a review of up-to-date research and all potential mitigation options presented. Aviation and navigation lighting should be minimised and/or on demand (as encouraged in EN-1 Section 5.5) to avoid attracting birds, taking into account impacts on safety. Subject to other constraints, wind turbines should be laid out within a site, in a way that minimises collision risk.

3.8.258 Turbine parameters should also be developed to reduce collision risk where the assessment shows there is a significant risk of collision (e.g., altering rotor height).

3.8.259 Construction vessels and post-construction maintenance vessel traffic associated with offshore wind farms should, where practicable and

[66] See https://jncc.gov.uk/our-work/marine-mammals-and-noise-mitigation/

compatible with operational requirements and navigational safety, avoid rafting seabirds during sensitive periods and follow agreed navigation routes to and from the site and minimise the number of vessel movements overall.

3.8.260 The exact timing of peak migration events is inherently uncertain, although research is ongoing into estimates for peak migration periods for a number of bird species and detection technologies (e.g. using radar and integrated sensors) are improving.

3.8.261 Currently, shutting down turbines within migration routes during estimated peak migration periods is unlikely to offer suitable mitigation, but this might be a possibility in the future.

Fish

3.8.262 Applicants should undertake a review of up-to-date research and present all potential mitigation options as part of their proposal.

3.8.263 EMF in the water column during operation, is in the form of electric and magnetic fields, which are reduced by use of armoured cables for interarray and export cables.

3.8.264 Burial of the cable increases the physical distance between the maximum EMF intensity and sensitive species. However, what constitutes sufficient depth to reduce impact will depend on the geology of the seabed.

3.8.265 It is unknown whether exposure to multiple cables and larger capacity cables may have a cumulative impact on sensitive species. It is therefore important to monitor EMF emissions which may provide the evidence to inform future EIAs.

3.8.266 In the case of floating wind, the cables may hang freely in the water and thus potentially require alternative monitoring and mitigation.

3.8.267 Construction of specific elements can also be timed to reduce impacts on spawning or migration. Underwater noise mitigation can also be used to prevent injury and death of fish species.

Commercial fisheries and fishing

3.8.268 Any mitigation proposals should result from the applicant having detailed consultation with relevant representatives of the fishing industry, the MMO and the relevant Defra policy team in England and NRW and the relevant Welsh Government policy team in Wales.

3.8.269 Mitigation should be designed to enhance where reasonably possible any potential medium and long-term positive benefits to the fishing industry, commercial fish stocks and the marine environment.

Marine historic environment

3.8.270 The avoidance of important heritage assets to ensure their protection in situ, is the most effective form of protection.

3.8.271 This can be achieved through the implementation of exclusion zones around known and potential heritage assets which preclude development activities within their boundaries.

3.8.272 These boundaries can be drawn around either discrete sites or more extensive areas identified in the Environmental Statement produced to support an application for consent.

3.8.273 The ability of the applicants to microsite specific elements of the proposed development during the construction phase should be an important consideration by the Secretary of State when assessing the risk of damage to archaeology.

3.8.274 Where requested by the applicant, the Secretary of State should consider granting consents which allow for micrositing/microrouting (see paragraphs 2.8.89 above) within a specified tolerance.

3.8.275 This allows changes to be made to the precise location of infrastructure during the construction phase so that account can be taken of unforeseen circumstances such as the discovery of marine archaeological remains.

Offshore wind impacts: navigation and shipping

3.8.276 Mitigation measures will include site configuration, lighting and marking of projects to take account of any requirements of the General Lighthouse Authority.

3.8.277 In some circumstances, the Secretary of State may wish to consider the potential to use requirements involving arbitration (between the applicant and third parties) as a means of resolving how adverse impacts on other commercial activities will be addressed.

Other offshore infrastructure and activities

3.8.278 Detailed discussions between the applicant for the offshore wind farm and the relevant consultees should have progressed as far as reasonably possible prior to the submission of an application. As such, appropriate mitigation should be included in any application, and ideally agreed between relevant parties.

3.8.279 In some circumstances, the Secretary of State may wish to consider the potential to use requirements involving arbitration as a means of resolving how adverse impacts on other commercial activities will be addressed.

Seascape and visual effects

3.8.280 Neither the design nor scale of individual wind turbines can be changed without significantly affecting the electricity generating output of the wind turbines. Therefore, the Secretary of State should expect it to be unlikely that mitigation in the form of reduction in scale will be feasible.

3.8.281 However, the siting layout of the turbines should be designed appropriately to minimise harm, considering other constraints such as ecological effects, safety reasons or engineering and design parameters.

Compensatory measures

3.8.282 With increasing deployment of offshore wind farms, cumulative environmental impacts upon HRA sites and MCZs may not be addressed by avoidance, reduction, or mitigation alone, therefore compensatory measures may be required where adverse effects on site integrity and/or on conservation objectives cannot be ruled out.

3.8.283 For many receptors, the scale of offshore wind developments and potential in-combination effects means compensation could be required and applicants should refer to the latest Defra compensation guidance when making their assessments.

3.8.284 If, during the pre-application stage, SNCBs indicate that the proposed development is likely to adversely impact a protected site, the applicant should include with their application such information as may reasonably be required to assess potential derogations under the Habitats Regulations or the Marine and Coastal Access Act 2009.

3.8.285 Where such an indication is given later in the development consent process, the applicant should share this information as soon as reasonably practical.

3.8.286 This information includes:

- assessment of alternative solutions, showing the relevant tests on alternatives have been met;
- a case showing that the relevant tests for IROPI or Measures of Equivalent Environmental Benefit have been met; and
- appropriate securable environmental compensation

3.8.287 Provision of such information will not be taken as an acceptance of adverse impacts and if applicants dispute the likelihood of adverse effects, they can provide this information as part of their application, ‘without prejudice’ to the Secretary of State’s final decision on the impacts of the potential development.

3.8.288 If, in these circumstances, an applicant does not supply information required for the assessment of a potential derogation, there will be no expectation that the Secretary of State will allow the applicant the opportunity to provide such information following the examination.

3.8.289 It is vital that applicants consider the need for compensation as early as possible in the design process as 'retrofitting' compensatory measures will introduce delays and uncertainty to the consenting process.

3.8.290 Applicants should work closely at an early stage in the pre-application process with SNCBs, and Defra, to develop a compensation plan for all protected sites adversely affected by the development.

3.8.291 Before submitting an application, applicants should seek the views of the SNCB and Defra Secretary of State, as to the suitability, securability and effectiveness of the compensation plan to ensure the development will not hinder the achievement of the conservation objectives for the protected site.

3.8.292 In cases where such views are provided, the applicant should include a copy of this information with the compensation plan in their application for further consideration by the Examining Authority and Secretary of State.

Strategic compensation

3.8.293 The British Energy Security Strategy has committed to introducing mechanisms to support strategic compensatory measures, to offset environmental impacts and reduce delays to individual projects.

3.8.294 Strategic compensation refers to environmental actions by/on behalf of government or third parties to offset the impacts of multiple marine developments on the national site network or MCZs.

3.8.295 This may include central coordination for measures delivered across a series of projects or biogeographic region.

3.8.296 Applicants will be able to access tools and mechanisms to support identification of suitable compensation and facilitate delivery of strategic compensation measures where appropriate.

3.8.297 The government is still developing its policies on strategic compensation and guidance will be published in due course.

3.8.298 The government will work collaboratively with industry and stakeholders to develop strategic compensation for projects currently in the consenting process (where possible) as well as for future developments.

3.8.299 Not every impact for every project will initially fall within the strategic compensation proposals, so applicants should continue to discuss

with SNCBs and Defra the need for site specific or strategic compensation at the earliest opportunity.

3.8.300 Applicants may also want to coordinate with other marine industry sectors who also need to find compensatory measures. This will ensure compensatory measures are complementary and/or take advantage of opportunities to join together to deliver strategic compensation. Applicant's may also want to consult with those industries/stakeholders who are affected by any proposed compensation measures.

Secretary of State decision making

Factors influencing site selection and design

Water depth and foundation conditions

3.8.301 Whilst the technical suitability of the foundation design is not in itself a matter for the Secretary of State, the Secretary of State will need to be satisfied that the foundations will not have an unacceptable adverse effect on marine biodiversity, the physical environment or marine heritage assets.

Technical considerations

Network connection

3.8.302 When considering grid connection issues, the Secretary of State should be mindful of the requirements of the regulatory regime for onshore and offshore electricity networks and consider how this affects the proposal put forward by the applicant.

3.8.303 A proposed offshore electricity transmission cable connecting the wind farm or wind farms with the onshore electricity infrastructure, and any offshore electricity substations that may be required, may constitute associated development, depending on their scale and nature in relation to the offshore wind farm(s).[67]

3.8.304 Where the Secretary of State is satisfied that such offshore infrastructure does constitute associated development and can form part of the application, it should be considered by the Secretary of State in accordance with this NPS.

[67] Guidance on associated development: See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/192681/Planning_Act_2008_Guidance_on_associated_development_applications_for_major_infrastructure_projects.pdf.

3.8.305 However, some proposals for transmission could be consented separately to the windfarm (array), see paragraphs 2.8.46 above. and paragraph 1.3.5 in EN-1.

3.8.306 The Secretary of State should assess the offshore-onshore element(s) of the grid connection (e.g. electric lines, substations) in accordance with the guidelines and requirements contained in EN-5.

3.8.307 Depending upon the scale and type of this onshore development, elements of it could constitute either associated development or an energy NSIP in its own right.

Flexibility in the project details

3.8.308 In addition to guidance set out at 2.6 of this NPS and 4.2 of EN-1 the Secretary of State should consider paragraph 2.8.153 in relation to ornithological headroom.

Micrositing and microrouting

3.8.309 Where requested by the applicant, any consent granted by the Secretary of State should be flexible enough to allow for such micrositing or microrouting changes as may be advised during and after the application stage. This allows for unforeseen events, such as the discovery of previously unknown marine archaeology that it would be preferable to leave in situ.

3.8.310 The Secretary of State must also be satisfied that there is sufficient space to microsite/microroute for any proposal to be acceptable as a mitigation (e.g. any feature to avoid must not cover the full width of the assessed cable corridor).

Repowering

3.8.311 In determining an application for the repowering of a site, the proposed replacement scheme should be determined by the Secretary of State on its own merits.

Future monitoring

3.8.312 Owing to the complex nature of offshore wind development, and the difficulty in establishing the evidence base for marine environmental recovery the Secretary of State should, where appropriate, request the applicant undertake environmental monitoring (e.g. ornithological surveys, geomorphological surveys, archaeological surveys) prior to and during construction and operation.

3.8.313 The Secretary of State may consider that monitoring of any impact is appropriate.

Decommissioning

3.8.314 For guidance on the decommissioning the Secretary of State should consult 2.8.101 of this NPS.

Offshore wind environmental standards

3.8.315 Once final guidance setting out Offshore Wind Environmental Standards is issued, the Secretary of State should expect applicants to have applied the guidance to their proposals.

3.8.316 The Secretary of State will consider an application for development consent in accordance with the guidance and its targets.

3.8.317 Whether an application conforms to the guidance or targets (or any justification for departing from them) is likely to be material to the decision on development consent and, where relevant, will inform the Secretary of State's Habitats Regulations Assessment.

Impacts

3.8.318 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

3.8.319 The Secretary of State should consider any impacts which it determines are relevant and important to its decision.

Biodiversity and ecological conservation

3.8.320 The Secretary of State should consider the effects of a proposed development on marine ecology and biodiversity, considering all relevant information made available by the applicant.

3.8.321 The Secretary of State should be satisfied that, in the development of their proposal, the applicant has made appropriate, and extensive, use of up-to-date evidence from previous deployments and research results from scientific peer reviewed papers and the programmes listed in paragraph 2.8.121 and assessed through HRA/MCZ processes, the impact on any protected species or habitats.

3.8.322 The designation of an area as a protected site (including HRA sites, MCZs and SSSIs) does not necessarily restrict the construction or operation of offshore wind farms in, near, or through that area (see also Sections 4.2 and 5.4 of EN-1). However, it may make consent for such construction more difficult to secure.

3.8.323 Where adverse effects on site integrity/conservation objectives are predicted the Secretary of State should consider the extent to which the effects are temporary or reversible, and the timescales for recovery.

3.8.324 See paragraphs 2.8.315 of this NPS for further guidance on offshore wind environmental standards.

Physical environment

3.8.325 As set out in paragraphs 2.8.125 of this NPS the direct effects on the physical environment can have indirect effects on a number of other receptors.

3.8.326 Where indirect effects are predicted, the Secretary of State should refer to relevant sections of this NPS and EN-1.

3.8.327 The Secretary of State must be satisfied that the design of the windfarm and methods of construction, including use of materials, are such as to reasonably minimise the potential for impact on the physical environment. This could involve, for instance, the exclusion of certain foundations because of their impacts or minimising quantities of rock that are used to protect cables whilst taking into account other relevant considerations such as safety.

Fish

3.8.328 The use of external cable protection has been suggested as a mitigation for EMF (by increasing the distance between fish species and individual cables). However, the Secretary of State should also consider any negative impacts from external cable protection on benthic habitats, and a balance between protection of various receptors must be made, with all mitigation and alternatives reviewed.

Intertidal and coastal habitats and species

3.8.329 The Secretary of State should be satisfied that cable installation and decommissioning has been designed sensitively, considering intertidal/coastal habitats.

Marine Mammals

3.8.330 The Secretary of State should be satisfied that the preferred methods of construction, in particular the construction method needed for the proposed foundations and the preferred foundation type, where known at the time of application, are designed to reasonably minimise significant impacts on marine mammals.

3.8.331 Unless suitable noise mitigation measures can be imposed by requirements to any development consent the Secretary of State may refuse the application.

3.8.332 The conservation status of cetaceans and seals are of relevance and the Secretary of State should be satisfied that cumulative and in-combination impacts on marine mammals have been considered.

Birds

3.8.333 The Secretary of State must be satisfied that the collision risk and displacement assessments have been conducted to a satisfactory

standard having had regard to the advice from the relevant statutory advisor.

3.8.334 The conservation status of seabirds is of relevance and the Secretary of State should take into account the views of the relevant statutory advisors and be satisfied that cumulative and in-combination impacts on seabird species have been considered.

Subtidal habitats and species

3.8.335 The Secretary of State should be satisfied that activities have been designed considering sensitive subtidal environmental aspects and discussions with the relevant conservation bodies have taken place.

Commercial fisheries and fishing

3.8.336 The Secretary of State should be satisfied that the site selection process has been undertaken in a way that reasonably minimises adverse effects on fish stocks, including during peak spawning periods and the activity of fishing itself.

3.8.337 The Secretary of State should consider the extent to which the proposed development occupies any recognised important fishing grounds and whether the project would prevent or significantly impede protection of sustainable commercial fisheries or fishing activities.

3.8.338 Where the Secretary of State considers the wind farm would significantly impede protection of sustainable fisheries or fishing activity at recognised important fishing grounds, this should be attributed a correspondingly significant weight.

3.8.339 The Secretary of State should consider adverse or beneficial impacts on different types of commercial fishing on a case-by-case basis.

3.8.340 The Secretary of State should be satisfied that the applicant has sought to design the proposal having consulted the MMO or NRW in Wales, Defra or Welsh Government in Wales and representatives of the fishing industry with the intention of minimising the loss of fishing opportunity taking into account effects on other marine interests. Guidance has been jointly agreed by the renewables and fishing industries on how they should liaise with the intention of allowing the two industries to successfully co-exist.[68]

3.8.341 The Secretary of State will need to consider the extent to which disruption to the fishing industry, whether short term during pre-construction (e.g. surveying) or construction or long term over the operational period, including that caused by the future implementation of any safety zones, has been mitigated where reasonably possible.

[68] https://www.sff.co.uk/floww/

3.8.342 Where an offshore wind farm could affect a species of fish that is of commercial interest, but is also of ecological value, the Secretary of State should refer to Section 2.8.109 of this NPS with regard to the latter.

Marine historic environment

3.8.343 The Secretary of State should be satisfied that any proposed offshore wind farm project has appropriately considered and mitigated for any impacts to the historic environment, including both known heritage assets, and discoveries that may be made during the course of development.

Navigation and shipping

3.8.344 The Secretary of State should not grant development consent in relation to the construction or extension of an offshore wind farm if it considers that intolerable interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development.

3.8.345 The use of recognised sea lanes essential to international navigation means:

a) anything that constitutes the use of such a sea lane for the purposes of article 60(7) of the United Nations Convention on the Law of the Sea 1982; and

b) any use of waters in the territorial sea adjacent to Great Britain that would fall within paragraph (a) if the waters were in a REZ.

3.8.346 The Secretary of State should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries[69] and recreational users of the sea.

3.8.347 Where after carrying out a site selection, a proposed development is likely to adversely affect major commercial navigation routes, for instance by causing appreciably longer transit times, the Secretary of State should give these adverse effects substantial weight in its decision making.

3.8.348 Where a proposed offshore wind farm is likely to affect less strategically important shipping routes[70], the Secretary of State

[69] "Lifeline ferries" provide an essential service between islands or an island and the mainland on which the occupiers of the island rely for transportation of passengers and goods.
[70] For example, vessels usually tend to transit point to point routes between ports (regional, national, and international). Many of these routes are important to the shipping and ports industry as is their contribution to the UK economy.

should take a pragmatic approach to considering proposals to minimise negative impacts.

3.8.349 The Secretary of State should not consent Search and Rescue Response Assessment applications which pose intolerable risks to navigational safety after all possible mitigation measures have been considered.

3.8.350 The Secretary of State should be satisfied that the scheme has been designed to minimise the effects on recreational craft and that appropriate mitigation measures, such as buffer areas, are built into applications to allow for recreational use outside of commercial shipping routes.

3.8.351 In view of the level of need for energy infrastructure, where an adverse effect on the users of recreational craft has been identified, and where no reasonable mitigation is feasible, the Secretary of State should weigh the harm caused with the benefits of the scheme.

3.8.352 The Secretary of State should make use of advice from the MCA, who will use the NRA described in paragraphs 2.8.204 and 2.8.205 above.

3.8.353 The Secretary of State should have regard to the extent and nature of any obstruction of or danger to navigation which (without amounting to interference with the use of such sea lanes) is likely to be caused by the development in determining whether to grant consent for the construction, or extension, of an offshore wind farm, and what requirements to include in such a consent.

3.8.354 The Secretary of State may include provisions within the terms of a development consent as respects rights of navigation so far as they pass through waters in or adjacent to Great Britain which are between the mean low water mark and the seaward limits of the territorial sea.

3.8.355 The provisions may specify or describe rights of navigation which:

- are extinguished;
- are suspended for the period that is specified in the DCO;
- are suspended until such time as may be determined in accordance with provisions contained in the DCO; and
- are exercisable subject to such restrictions or conditions, or both, as are set out in the DCO.

3.8.356 The Secretary of State should specify the date on which any such provisions are to come into force, or how that date is to be determined.

3.8.357 The Secretary of State should require the applicant to publish any provisions that are included within the terms of the DCO, in such a manner as appears to the Secretary of State to be appropriate for

bringing them, as soon as is reasonably practicable, to the attention of persons likely to be affected by them.

3.8.358 The Secretary of State should include provisions as respects rights of navigation within the terms of a DCO only if the applicant has requested such provision be made as part of their application for development consent.

Other offshore infrastructure and activities

3.8.359 There are statutory requirements concerning automatic establishment of navigational safety zones relating to offshore petroleum developments.[71]

3.8.360 Where a proposed offshore wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the Secretary of State.

3.8.361 Much of this infrastructure is important to other offshore industries as is its contribution to the UK economy.

3.8.362 In such circumstances, the Secretary of State should expect the applicant to work with the impacted sector to minimise negative impacts and reduce risks to as low as reasonably practicable.

3.8.363 As such, the Secretary of State should be satisfied that the site selection and site design of the proposed offshore wind farm has been made with a view to avoiding or minimising disruption or economic loss or any adverse effect on safety to other offshore industries. Applicants will be required to demonstrate that risks to safety will be reduced to as low as reasonably practicable.

3.8.364 The Secretary of State should not consent applications which pose intolerable risks to safety after mitigation measures have been considered.

3.8.365 Where a proposed development is likely to affect the future viability or safety of an existing or approved/licensed offshore infrastructure or activity, the Secretary of State should give these adverse effects substantial weight in its decision-making.

3.8.366 Providing proposed schemes have been carefully designed, and that the necessary consultation with relevant bodies and stakeholders has been undertaken at an early stage, mitigation measures may be possible to negate or reduce effects on other offshore infrastructure or operations to a level sufficient to enable the Secretary of State to grant consent.

[71] Section 21, Part 3 Petroleum Act 1987.

Seascape and visual effects

3.8.367 The Secretary of State should assess the proposal in accordance with the policy set out in the landscape and visual impacts Section 5.10 of EN-1.

3.8.368 Where an application relates to a proposed development that is at such a distance that it would not be visible from the shore the Secretary of State may conclude that an SLVIA will not be required.

3.8.369 Where a proposed offshore wind farm is within sight of the coast, there may be adverse effects. The Secretary of State should not refuse to grant consent for a development solely on the ground of an adverse effect on the seascape or visual amenity unless:

- it considers that an alternative layout within the identified site could be reasonably proposed which would minimise any harm, taking into account other constraints that the applicant has faced such as ecological effects, while maintaining safety or economic viability of the application; or
- it takes account of the sensitivity of the receptor(s) and impacts on the statutory purposes of designated landscapes as set out in Section 5.10 of EN-1; the harmful effects are considered to outweigh the benefits of the proposed scheme. See also Critical National Priority (Section 2.8.8 of EN3)

3.8.370 Where adverse effects are anticipated either during the construction or operational phases, in coming to a judgement, the Secretary of State should consider the extent to which the effects are temporary or reversible.

3.9 Pumped Hydro Storage

Introduction

3.9.1 Electricity storage is essential for a net zero energy system, it stores electricity when it is abundant for periods when it is scarce, as well as providing a range of services to help maintain the resilience and stability of the grid.

3.9.2 The need for electricity storage is rising as we increase the volume of variable renewables and increase peak demand through the electrification of heat and transport. It will be critical to maintaining energy security as we shift away from gas over the 2020s-30s.

3.9.3 Pumped hydro storage (PHS) is a form of electricity storage that uses the difference in height between two reservoirs or other bodies of water to store energy. By transferring water from the upper reservoir

to the lower reservoir through a turbine, power can be generated. Later, the water must then be pumped back to the upper reservoir using power from the grid or elsewhere.

3.9.4 This section of EN-3 refers specifically to PHS, not hydroelectric power generation (for example where the upper reservoir is filled naturally from a watercourse or rainfall, or a run-of-the-river scheme).

3.9.5 Opportunities for NSIP hydroelectric power generation are currently limited, but if such an application is made then the information in this section may be relevant.

3.9.6 Unlike hydroelectric power generation, PHS is not typically a net generator of electricity: any power generation must subsequently be balanced by consumption to return the water to the upper reservoir.[72] However, the storage capability is useful to the electricity grid as it helps to correct for imbalances in electricity supply and demand, as well as providing a range of other services to the grid, including inertia.

3.9.7 In general, PHS is likely to consume electricity when there is excess renewable generation on the system and generate electricity when renewable electricity is scarce. This helps to decarbonise the energy system by integrating more renewable electricity and providing greater flexibility.

3.9.8 PHS can have significant impacts on local landscape and visual amenity, including:

- flooding of land to form the reservoirs;
- construction of a dam to artificially hold back large volumes of water; and
- significant infrastructure including pipework, turbine and pumping stations, electricity transmission lines and vehicular access.

3.9.9 PHS is most likely to be in mountainous or hilly locations, and less likely to be situated in lowland areas.

Technology details

3.9.10 PHS consists of two reservoirs and different elevations. A pipeline ("penstock") connects the upper reservoir to the generating station, which has another pipeline connecting it to the lower reservoir.

[72] In some cases some natural replenishment of the upper reservoir may occur, for example due to rainfall run-off, which may allow the PHS scheme to generate a small amount of electricity and thus be considered a net generator. However the amount of electricity generation arising from this is likely to be minimal compared to the overall station output.

3.9.11 PHS can be characterised as “open-loop”, where one or both reservoirs is connected to a natural water source, or “closed-loop” where there is no connection to a natural water source.

3.9.12 The reservoirs may be formed in various ways, including the possible use of a dam to hold back water or flooding of former quarries.

3.9.13 The generating station includes one or more turbines that convert the flow of water into rotational energy. “Reaction” type turbines are typically used, although “impulse” type turbines can also be used. The choice of turbine could affect the power station performance, requirements for supporting equipment, and impacts on fish.

3.9.14 Often the turbines are reversible so can be used to pump the water back to the upper reservoir. However, in some cases separate pumps are used.

3.9.15 Each turbine is coupled to a generator to convert the rotational energy to electricity. A substation for electrical equipment such as transformers is also required. Where the purpose of this substation is entirely to support the operation of the PHS facility itself, it should be considered integral to the PHS facility, and not an associated development. Finally, the power station must be connected to the electricity grid using electricity lines.

3.9.16 PHS facilities range in size, with generating capacities typically up to 3000 MW. Schemes can typically deliver their full rated power for several hours before the upper reservoir is depleted and typically have an efficiency of 70-80%. Most schemes can ramp from zero to full load in a matter of minutes.

Significance to renewable generation

3.9.17 Few technologies that are commercial or have been demonstrated at scale are able to provide storage services at the scale of PHS.

3.9.18 As the electricity grid sees increasing levels of generation from variable renewable generators such as offshore wind, onshore wind and solar power, there will be an increasing need for storage infrastructure to balance electricity supply and demand. PHS could therefore be a key piece of infrastructure for enabling increased use of renewable generation.

Applicant assessment

Factors influencing site selection and design

Site topography

3.9.19 Site topography is essential for PHS schemes, as they require two bodies of water at different heights (typically hundreds of metres apart

in elevation). It may be possible to use natural bodies of water, especially for the lower reservoir.

3.9.20 PHS schemes may require at least one man-made reservoir, therefore requiring suitable land to be flooded, such as a valley or former quarry. The site may also require space to build a dam to hold back the water flow.

3.9.21 The site will also require a sufficient water source to fill the reservoirs. This may be from a single watercourse or wider rainfall catchment area.

Accessibility

3.9.22 Given the location of PHS schemes in remote, mountainous areas where access may be limited applicants will need to consider the suitability of the access routes to the proposed site for both the construction and operation of the PHS scheme with the former likely to raise more significant issues.

3.9.23 Construction of a new PHS scheme is likely to require a significant amount of civil engineering, potentially including the extraction of large amounts of material using heavy goods vehicles.

3.9.24 Applications should include the full extent of the access routes necessary and an assessment of their effects.

Technical considerations

Network connection

3.9.25 PHS schemes typically connect to the electricity network at an intermediate voltage of 275 kV or 400 kV.

3.9.26 PHS schemes can play an essential role in maintaining grid stability, including at times where the grid is under stress (such as rapid changes in supply or demand). Therefore, it is critical that PHS schemes have grid connections with sufficient capacity. This may be especially challenging given the typically remote locations of PHS schemes.

3.9.27 Applicants should consider important issues relating to network connection at Section 4.10 of EN-1 and in EN-5.

3.9.28 Applicants will usually have assured themselves that a viable connection exists before submitting the development proposal to the Secretary of State and where they have not done so, they take that commercial risk.

Flexibility in the project details

3.9.29 In some cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- Detail of turbine machinery
- Details of generator design.
- Details of exact routes of buried cabling and grid connections

3.9.30 Guidance on how applicants should manage flexibility is set out at 2.6 of this NPS.

Impacts

3.9.31 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

3.9.32 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Landscape and visual impact

3.9.33 PHS schemes have the potential to have significant impacts on the landscape and visual amenity (See EN-1 Section 5.10). The nature of these impacts will depend on the design of the system (for example open vs closed-loop systems), but may include:

- construction of a substantial concrete dam (potentially several hundred metres in length, depending on the scale of the PHS scheme);
- construction of the generating station (requiring a building in excess of 25m in height);
- substantial civil works for the scheme foundations and to dig the reservoir(s), generating significant amounts of spoil; and
- flooding of land or disused quarries/pits to create the reservoir(s) (potentially covering an area of several hundred square metres).

3.9.34 Construction of PHS schemes has the potential to generate large amounts of spoil, from the digging of foundations and the reservoirs themselves. If these spoil heaps are to be kept within the locality, applicants should ensure they located in a way that minimises their visual impact.

3.9.35 Applicants must ensure the safety and stability of spoil heaps is continually managed.

3.9.36 Applicants should seek to landscape PHS sites to visually enclose them at a low level as seen from surrounding external viewpoints. This makes the scale of the scheme less apparent, and helps conceal its lower level, smaller scale features. Earth bunds and mounds, tree planting or both may be used for softening the visual intrusion and may also help to attenuate noise from site activities.

Noise and vibration

3.9.37 During operation, noise may arise from the operation of the turbines and other power generation equipment. There is also likely to be considerable noise in the construction phase, where blasting is required to create reservoirs and penstocks.

3.9.38 Where the project is likely to have noise and vibration impacts the applicant must undertake an assessment as required in Section 5.12 of EN-1.

Water quality and resources

3.9.39 Both the construction of a PHS scheme (including creation of reservoirs) and operation of the scheme may have impacts on the water quality and resource.

3.9.40 The nature of these impacts will depend on the design of the system (for example open vs closed-loop systems), but may include:

- disposal of spoil from the scheme construction in the reservoirs may alter sedimentation rates and alter conditions for aquatic flora and fauna;
- altering the flow of watercourse and wider landscape hydrology, both upstream and downstream of the installation. This may affect the rate at which sediment is deposited, conditions for aquatic flora and potentially migratory fish species (e.g. salmon);
- fish impingement and/or entrainment – i.e. being drawn into the PHS turbines;
- discharging water of an altered quality or temperature than the received water, affecting the biodiversity of aquatic flora and fauna. In particular, pumping of water to the upper reservoir is likely to result in increased temperatures; and
- connecting two bodies of water that would otherwise be unconnected may create a route for the spread of invasive non-native species, especially in the case where the two waterbodies are in different hydrological catchments.

3.9.41 Where the project is likely to have effects on water quality or resources the applicant must undertake an assessment as required in Section 5.16. EN-1.

3.9.42 The assessment must demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of water.

Biodiversity and ecological conservation

3.9.43 Where the project is likely to have effects on biodiversity the applicant must undertake an assessment as required in Section 5.4 of EN-1. The assessment is likely to need to take account of the ecological status of the water environment.

3.9.44 The design and construction of PHS schemes will have additional impacts on biodiversity. These may include:

- alterations or loss of habitats resulting from flooding of land and/or clearing of vegetation;
- removal and damage of soil arising from alterations to landscape hydrology and/or construction of infrastructure; and
- compromised water quality impacting aquatic flora and fauna, as described in above in paragraphs 2.9.40.

Recreation

3.9.45 As PHS schemes are likely to be located in hilly or mountainous areas and have impacts on water courses they may have specific impacts on recreation recreational activities such as water sports (e.g., canoeing) and fishing.

3.9.46 Where the project is likely to have impacts on recreational activities, the applicant should undertake a full assessment, accounting for the views of relevant representational bodies and taking measures to minimise adverse impacts.

Mitigation

Landscape and visual impact

3.9.47 Good design that contributes positively to the character and quality of the area will go some way to mitigate adverse landscape and visual effects.

3.9.48 Development proposals should consider the design of the generating station and dam (if required), including the materials to be used in the context of the local landscape character.

3.9.49 Mitigation is achieved primarily through aesthetic aspects of site layout and building design including size and external finish and colour of the infrastructure to minimise intrusive appearance in the landscape as far as engineering requirements permit.

3.9.50 In some cases it may be possible to house some of the station, including the generation station, underground or inside the dam. The precise architectural treatment will need to be site-specific.

Noise and vibration

3.9.51 As described in Section 5.12 of EN-1, the primary mitigation for noise for PHS schemes is through good design to enclose plant and machinery in noise-reducing buildings or underground, wherever possible, and to minimise the potential for operations to create noise.

3.9.52 Noise from the operation of the PHS generating stations may be unavoidable. Similarly, noise from apparatus external to the main generating station may be unavoidable. This can be mitigated through careful plant selection.

3.9.53 Noise during construction, particularly from blasting, will be unavoidable. Careful consideration should be given to mitigating the impact of this on noise sensitive receptors.

Water quality and resources

3.9.54 In addition to the mitigation measures set out in Section 5.16 of EN-1 the design of the PHS scheme should include intake and outfall locations that avoid or minimise adverse impacts.

3.9.55 There should also be specific measures to minimise fish impingement and/or entrainment and the discharge of excessive heat to receiving waters.

Biodiversity

3.9.56 In addition to the mitigation measures set out in Section 5.4 of EN-1 applicants should have consideration for the potential benefits to local biodiversity, including through habitat creation and/or enhancement, fish re-stocking, and bankside planting. Further some turbines may assist in increasing dissolved oxygen levels.

Recreation

3.9.57 PHS schemes should be designed to minimise impacts on existing recreational activities and consideration should be given to how schemes can be designed in such a way that enhances such recreational activities.

Secretary of State decision making

3.9.58 The impacts identified in Part 5 of EN-1, 2.9.31 of this NPS and above, are not intended to be exhaustive.

3.9.59 The Secretary of State should consider any impacts which they determine are relevant and important to its decision and be satisfied that the applicant has demonstrated measures to minimise adverse impacts.

3.10 Solar Photovoltaic Generation

Introduction

3.10.1 The government has committed to sustained growth in solar capacity to ensure that we are on a pathway that allows us to meet net zero emissions. As such solar is a key part of the government's strategy for low-cost decarbonisation of the energy sector.

3.10.2 Solar also has an important role in delivering the government's goals for greater energy independence and the British Energy Security Strategy[73] states that government expects a five-fold increase in solar deployment by 2035 (up to 70GW). It sets out that government is supportive of solar that is co-located with other functions (for example, agriculture, onshore wind generation, or storage) to maximise the efficiency of land use.

3.10.3 Government is also supporting solar through the Contracts for Difference Scheme and will include it in future rounds.

3.10.4 Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation.

3.10.5 Solar farms can be built quickly and, coupled with consistent reductions in the cost of materials and improvements in the efficiency of panels[74], large-scale solar is now viable in some cases to deploy subsidy-free.

3.10.6 Solar farm proposals are currently likely to consist of solar panel arrays, mounting structures, piles, inverters, transformers and cables.

3.10.7 Associated infrastructure may also be proposed such as energy storage[75], electrolysers associated with the production of low carbon hydrogen, or security arrangements (which may encompass flood defences, fencing, lighting and surveillance).

3.10.8 Along with associated infrastructure, a solar farm requires between 2 to 4 acres for each MW of output. A typical 50MW solar farm will consist of around 100,000 to 150,000 panels and cover between 125 to 200 acres. However, this will vary significantly depending on the site, with some being larger and some being smaller. This is also expected to change over time as the technology continues to evolve to become more efficient. Nevertheless, this scale of development will inevitably have impacts, particularly if sited in rural areas.

[73] See https://www.gov.uk/government/publications/british-energy-security-strategy/british-energy-security-strategy
[74] See https://www.gov.uk/government/publications/beis-electricity-generation-costs-2020
[75] See paras 3.3.4 -3.3.7 in EN-1

Applicant assessment

Factors influencing site selection and design

3.10.9 The key considerations involved in the siting of a solar farm are likely to be influenced by factors set out in the following paragraphs, in addition to considerations specific to individual projects.

Irradiance and site topography

3.10.10 Irradiance will be a key consideration for the applicant in identifying a potential site as the amount of electricity generated on site is directly affected by irradiance levels. Irradiance of a site will in turn be affected by surrounding topography, with an uncovered or exposed site of good elevation and favourable south-facing aspect more likely to increase year-round irradiance levels. This in turn affects the carbon emission savings and the commercial viability of the site.

3.10.11 In order to maximise irradiance, applicants may choose a site and design its layout with variable and diverse panel types and aspects, and panel arrays may also follow the movement of the sun in order to further maximise the solar resource.

Proximity of a site to dwellings

3.10.12 Utility-scale solar farms are large sites that may have a significant zone of visual influence. The two main impact issues that determine distances to sensitive receptors are therefore likely to be visual amenity and glint and glare. These are considered in Landscape, Visual and Residential Amenity (paragraphs 2.10.84- 2.10.92) and Glint and Glare (paragraphs 2.10.93 – 2.10.97) impact sections below.

Agriculture land classification and land type

3.10.13 Solar is a highly flexible technology and as such can be deployed on a wide variety of land types.

3.10.14 While land type should not be a predominating factor in determining the suitability of the site location applicants should, where possible, utilise previously developed land, brownfield land, contaminated land and industrial land. Where the proposed use of any agricultural land has been shown to be necessary, poorer quality land should be preferred to higher quality land (avoiding the use of “Best and Most Versatile” agricultural land where possible).[76]

3.10.15 Whilst the development of ground mounted solar arrays is not prohibited on agricultural land classified 1, 2 and 3a, or sites designated for their natural beauty, or recognised for ecological or

[76] Details of the Agricultural Land Classification are at : http://publications.naturalengland.org.uk/publication/6257050620264448

archaeological importance, the impacts of such are expected to be considered and are discussed under paragraphs 2.10.66 – 2.10.83 and 2.10.98 – 2.10.110.

3.10.16 It is recognised that at this scale, it is likely that applicants' developments may use some agricultural land. Applicants should explain their choice of site, noting the preference for development to be on brownfield and non-agricultural land.

3.10.17 Where sited on agricultural land, consideration may be given as to whether the proposal allows for continued agricultural use and/or can be co-located with other functions (for example, onshore wind generation, or storage) to maximise the efficiency of land use.

3.10.18 The Agricultural Land Classification (ALC) is the only approved system for grading agricultural quality in England and Wales and, if necessary, field surveys should be used to establish the ALC grades in accordance with the current, or any successor to it, grading criteria[77] and identify the soil types to inform soil management at the construction, operation, and decommissioning phases in line with the Defra Construction Code.[78]

3.10.19 Applicants are encouraged to develop and implement a Soil Resources and Management Plan which could help to use and manage soils sustainably and minimise adverse impacts on soil health and potential land contamination. This should be in line with the ambition set out in the Environmental Improvement Plan to bring 60% of England's agricultural soils into sustainable management by 2030.

Accessibility

3.10.20 Applicants will need to consider the suitability of the access routes to the proposed site for both the construction and operation of the solar farm with the former likely to raise more issues.

3.10.21 Given that potential solar farm sites are largely in rural areas, access for the delivery of solar arrays and associated infrastructure during construction can be a significant consideration for solar farm siting.

3.10.22 Developers will usually need to construct on-site access routes for operation and maintenance activities, such as footpaths, earthworks, or landscaping.

3.10.23 In addition, sometimes access routes will need to be constructed to connect solar farms to the public road network.

[77] Details of the Agricultural Land Classification are at : http://publications.naturalengland.org.uk/publication/6257050620264448

[78] The Defra Construction Code at: (See https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites)"

3.10.24 Applications should include the full extent of the access routes necessary for operation and maintenance and an assessment of their effects.

Public rights of ways

3.10.25 Proposed developments may affect the provision of public rights of way networks.[79]

3.10.26 Public rights of way may need to be temporarily stopped to enable construction, however, applicants should keep, as far as is practicable and safe, all public rights of way that cross the proposed development site open during construction and protect users where a public right of way borders or crosses the site.

3.10.27 Applicants are encouraged to design the layout and appearance of the site to ensure continued recreational use of public rights of way, where possible during construction, and in particular during operation of the site.

3.10.28 Applicants are encouraged where possible to minimise the visual outlook from existing public rights of way, considering the impacts this may have on any other visual amenities in the surrounding landscape.[80]

3.10.29 Applicants should consider and maximise opportunities to facilitate enhancements to the public rights of way and the adoption of new public rights of way through site layout and design of access.

3.10.30 Applicants should set out detail on how public rights of way would be managed to ensure they are safe to use is set out in an outline Public Rights of Way Management Plan.

Security and lighting

3.10.31 Security of the site is a key consideration for developers. Applicants may wish to consider not only the availability of natural defences such as steep gradients, hedging and rivers but also perimeter security measures such as fencing, electronic security, CCTV and lighting, with the measures proposed on a site-specific basis.

3.10.32 Applicants should assess the visual impact of these security measures, as well as the impacts on local residents, including for example issues relating to intrusion from CCTV and light pollution in the vicinity of the site.

[79] Public rights of way can include footpaths, bridleways, byways, restricted byways, Nature Trails and other rights of access to land. Further information is provided by the Land Registry at: https://www.landregistry-titledeeds.co.uk/frequently-asked-questions/information/public-rights-of-way.asp

[80] For example, screening along public right-of-way networks to minimise the outlook into the Solar Park may, impact on the ability of users to appreciate the surrounding landscapes

3.10.33 Applicants should consider the need to minimise the impact on the landscape and the visual impact of security measures.

Network connection

3.10.34 Applicants should consider important issues relating to network connection at Section 4.10 of EN-1 and in EN-5. In particular, and where appropriate, applicants should proceed in a manner consistent with the regulatory regime for offshore transmission networks established by Ofgem, details of which are set out in EN-5.

3.10.35 Many solar farms are connected into the local distribution network. The capacity of the local grid network to accept the likely output from a proposed solar farm is critical to the technical and commercial feasibility of a development proposal.

3.10.36 Larger developments may seek connection to the transmission network if there is available network capacity and/or supportive infrastructure.

3.10.37 In either case the connection voltage, availability of network capacity, and the distance from the solar farm to the existing network[81] can have a significant effect on the commercial feasibility of a development proposal.

3.10.38 To maximise existing grid infrastructure, minimise disruption to existing local community infrastructure or biodiversity and reduce overall costs applicants may choose a site based on nearby available grid export capacity.

3.10.39 Where this is the case, applicants should consider the cumulative impacts of situating a solar farm in proximity to other energy generating stations and infrastructure.

Technical considerations

3.10.40 Applications for solar farms are likely to comprise a number of elements including solar panel arrays, piling, inverters, mounting structures, cabling, earthworks, and measures associated with site security, and may also include associated infrastructure such as energy storage and electrolysers associated with the production of low carbon hydrogen.[82]

Capacity of a site

3.10.41 Solar panels generate electricity in direct current (DC) form. A number of panels feed an external inverter, which is used to convert the

[81] The route and type of terrain traversed by the cabling linking the solar project to the grid connection may also have an impact on the project's viability.
[82] As set out in EN1 1.3.5, where the need for a particular type of energy infrastructure is established in EN1, but that type of infrastructure is outside the scope of one of the technology specific NPSs, EN1 will have effect alone and will be the primary basis for Secretary of State's decision making.

electricity to alternating current (AC). After inversion a transformer will step-up the voltage for export to the grid. Because the inverter is separate from the panels, the total capacity of a solar farm can be measured either in terms of the combined capacity of installed solar panels (measured in DC) or in terms of combined capacity of installed inverters (measured in AC).

3.10.42 For the purposes of determining the capacity thresholds in Section 15 of the 2008 Act, all forms of generation other than solar are currently assessed on an AC basis, while a practice has developed where solar farms are assessed on their DC capacity.

3.10.43 Having reviewed this matter, the Secretary of State is now content that this disparity should end, particularly as electricity from some other forms of generation is switched between DC and AC within a generator before it is measured.

3.10.44 From the date of designation of this NPS, for the purposes of Section 15 of the Planning Act 2008, the maximum combined capacity of the installed inverters (measured in alternating current (AC)) should be used for the purposes of determining solar site capacity.

3.10.45 The capacity threshold is 50MW (AC) in England and 350MW (AC) in Wales.[83]

3.10.46 The direct current (DC) installed generating capacity of a solar farm will decline over time in correlation with the reduction in panel array efficiency. Light induced degradation affects solar panels differently depending on the technology used to construct the panel and is one factor, along with price, that developers need to consider when deciding on a solar panel technology to be used. Applicants may account for this by overplanting solar panel arrays.[84]

3.10.47 AC installed export capacity should not be seen as an appropriate tool to constrain the impacts of a solar farm. Applicants should use other measurements, such as panel size, total area and percentage of ground cover to set the maximum extent of development when determining the planning impacts of an application.

3.10.48 Nothing in this section should be taken to change any development consent or other planning permission granted prior to the designation of this NPS. Any such permission should be interpreted on the basis upon which it was examined and granted.

[83] The combined maximum AC capacity of the installed inverters may only exceed the aforementioned thresholds for the sole purpose of overcoming reactive power consumption within the solar farm between the inverters and the connection point.

[84] "Overplanting" refers to the situation in which the installed generating capacity or nameplate capacity of the facility is larger than the generator's grid connection. In the case described in paragraph 2.10.46 solar generators may install but not initially use additional panels to act as a back-up for when panels degrade, thereby enabling the grid connection to be maximised across the lifetime of the site. For planning purposes, the proposed development will be assessed on the impacts of the overplanted site.

3.10.49 In particular, any permissions granted on the basis of a DC installed generating capacity should be built on that basis, unless an amendment is made to that permission and the difference in impacts is considered.

Site layout design, and appearance

3.10.50 Applicants should consider the criteria for good design set out in EN-1 Section 4.6 at an early stage when developing projects.

3.10.51 As set out above applicants will consider several factors when considering the design and layout of sites, including, proximity to available grid capacity to accommodate the scale of generation, orientation, topography, previous land – use and ability to mitigate environmental impacts and flood risk.

3.10.52 For a solar farm to generate electricity efficiently the panel array spacing should seek to maximise the potential power output of the site. The type, spacing and aspect of panel arrays will depend on the physical characteristics of the site such as site elevation.

3.10.53 In terms of design and layout, applicants may favour a south-facing arrangement of panels to maximise output although other orientations may be chosen. For example, an east-west layout, whilst likely to result in reduced output compared to south-facing panels on a panel-by-panel basis, may allow for a greater density of panels to compensate and therefore for generation to be spread more evenly throughout the day.

3.10.54 It is likely that underground and overhead cabling will be required to connect the electrical assets of the site, such as from the substation to the panel arrays or storage facilities.

3.10.55 In the case of underground cabling, applicants are expected to provide a method statement describing cable trench design, installation methodology, as well as details of the operation and maintenance regime.

Project lifetime

3.10.56 Applicants should consider the design life of solar panel efficiency over time when determining the period for which consent is required. An upper limit of 40 years is typical, although applicants may seek consent without a time-period or for differing time-periods of operation.

3.10.57 Time limited consent, where granted, is described as temporary because there is a finite period for which it exists, after which the project would cease to have consent and therefore must seek to extend the period of consent or be decommissioned and removed.

3.10.58 Solar panel efficiency deteriorates over time and applicants may elect to replace panels during the lifetime of the site.

Decommissioning

3.10.59 Solar panels can be decommissioned relatively easily and cheaply. The nature and extent of decommissioning of a site can vary. Generally, it is expected that the panel arrays and mounting structures will be decommissioned, and underground cabling dug out to ensure that prior use of the site can continue.

3.10.60 Applicants should set out what would be decommissioned and removed from the site at the end of the operational life of the generating station, considering instances where it may be less harmful for the ecology of the site to keep or retain certain types of infrastructure, for example underground cabling, and where there may be socio-economic benefits in retaining site infrastructure after the operational life, such as retaining pathways through the site or a site substation.

Flexibility in the project details

3.10.61 In many cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- the type, number and dimensions of the panels;
- layout and spacing;
- the type of inverter or transformer; and
- whether storage will be installed (with the option to install further panels as a substitute).

3.10.62 Applicants should set out a range of options based on different panel numbers, types and layout, with and without storage.

3.10.63 Guidance on how applicants should manage flexibility is set out at Section 2.6 of this NPS.

Impacts

3.10.64 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

3.10.65 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Biodiversity and ecological conservation

3.10.66 Generic environmental, biodiversity, ecology and geological impacts are covered in Section 4.2 (Environmental Principles), Section 4.5 (Environmental and Biodiversity Net Gain) and Section 5.4 (Biodiversity and Geological Conservation) of EN-1.

3.10.67 The applicant's ecological assessments should identify any ecological risk from developing on the proposed site.

3.10.68 Issues that need assessment may include habitats, ground nesting birds, wintering and migratory birds, bats, dormice, reptiles, great crested newts, water voles and badgers.

3.10.69 The applicant should use an advising ecologist during the design process to ensure that adverse impacts are avoided, minimised or mitigated in line with the mitigation hierarchy, and biodiversity enhancements are maximised.

3.10.70 The assessment may be informed by a 'desk study' of existing ecological records, an evaluation of the likely impacts of the solar farm upon ecological features and should specify mitigation to avoid or minimise these impacts, and any further surveys required.

3.10.71 Applicants should consider earthworks associated with construction compounds, access roads and cable trenching.

3.10.72 Where soil stripping occurs topsoil and subsoil should be stripped, stored, and replaced separately to minimise soil damage and to provide optimal conditions for site restoration. Further details on minimising impacts on soil and soil handling are above at paragraphs 2.10.18 and 2.10.19.

3.10.73 Applicants should consider how security and lighting installations may impact on the local ecology. Where pole mounted CCTV facilities are proposed the location of these facilities should be carefully considered to minimise impact. If lighting is necessary, it should be minimised and directed away from areas of likely habitat.

3.10.74 Applicants should consider how site boundaries are managed. If any hedges/scrub are to be removed, further surveys may be necessary to account for impacts. Buffer strips between perimeter fencing and hedges may be proposed, and the construction and design of any fencing should account for enabling mammal, reptile and other fauna access into the site if required to do so in the ecological report.

3.10.75 Where a Flood Risk Assessment has been carried out this must be submitted alongside the applicant's ES. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not, in general, be significant.

3.10.76 Where access tracks need to be provided, permeable tracks should be used, and localised Sustainable Drainage Systems (SuDS), such as swales and infiltration trenches, should be used to control any run-off where recommended.

3.10.77 Given the temporary nature of solar PV farms, sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses.

3.10.78 Culverting existing watercourses/drainage ditches should be avoided.

3.10.79 Where culverting for access is unavoidable, applicants should demonstrate that no reasonable alternatives exist and where necessary it will only be in place temporarily for the construction period.

3.10.80 Solar farms have the potential to increase the biodiversity value of a site, especially if the land was previously intensively managed. In some instances, this can result in significant benefits and enhancements beyond Biodiversity Net Gain, which result in wider environmental gains which is encouraged.

3.10.81 For projects in England, applicants should consider enhancement, management, and monitoring of biodiversity in line with the ambition set out in the Environmental Improvement Plan and any relevant measures and targets, including statutory targets set under the Environment Act or elsewhere.

3.10.82 In Wales, applicants should consider the guidance set out in section 6.4 of Planning Policy Wales.

3.10.83 Applicants should consider whether they need to provide geotechnical and hydrological information (such as identifying the presence of peat at each site) including the risk of landslide connected to any development work.

Landscape, visual and residential amenity

3.10.84 Generic landscape and visual impacts are covered in Section 5.10 of EN-1.

3.10.85 The approach to assessing cumulative landscape and visual impact of large-scale solar farms is likely to be the same as assessing other onshore energy infrastructure. Solar farms are likely to be in low lying areas of good exposure and as such may have a wider zone of visual influence than other types of onshore energy infrastructure.

3.10.86 However, whilst it may be the case that the development covers a significant surface area, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography, the area of a zone of visual influence could be appropriately minimised.

3.10.87 Landscape and visual impacts should be considered carefully pre-application. Potential impacts on the statutory purposes of nationally designated landscapes should form a part of the pre application process.

3.10.88 Applicants should carry out a landscape and visual assessment and report it in the ES. Visualisations may be required to demonstrate the effects of a proposed solar farm on the setting of heritage assets and any nearby residential areas or viewpoints.

3.10.89 Applicants should follow the criteria for good design set out in Section 4.6 of EN-1 when developing projects and will be expected to direct considerable effort towards minimising the landscape and visual impact of solar PV arrays especially within nationally designated landscapes.

3.10.90 Whilst there is an acknowledged need to ensure solar PV installations are adequately secured, required security measures such as fencing should consider the need to minimise the impact on the landscape and visual impact (see paragraphs 2.10.31 – 2.10.33 above).

3.10.91 The applicant should consider as part of the design, layout, construction, and future maintenance plans how to protect and retain, wherever possible, the growth of vegetation on site boundaries, as well as the growth of existing hedges, established vegetation, including mature trees within boundaries. Applicants should also consider opportunities for individual trees within the boundaries to grow on to maturity.

3.10.92 The impact of the proposed development on established trees and hedges should be informed by a tree survey and arboricultural/hedge assessment as appropriate.

Glint and glare

3.10.93 Solar panels are specifically designed to absorb, not reflect, irradiation.[85] However, solar panels may reflect the sun's rays at certain angles, causing glint and glare. Glint is defined as a momentary flash of light that may be produced as a direct reflection of the sun in the solar panel. Glare is a continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the panel. The effect occurs when the solar panel is stationed between or at an angle of the sun and the receptor.

3.10.94 Applicants should map receptors to qualitatively identify potential glint and glare issues and determine if a glint and glare assessment is necessary as part of the application.

3.10.95 When a quantitative glint and glare assessment is necessary, applicants are expected to consider the geometric possibility of glint and glare affecting nearby receptors and provide an assessment of potential impact and impairment based on the angle and duration of incidence and the intensity of the reflection.

3.10.96 The extent of reflectivity analysis required to assess potential impacts will depend on the specific project site and design. This may need to

85 Most commercially available solar panels are designed with anti-reflective glass or are produced with anti-reflective coating and have a reflective capacity that is generally equal to or less hazardous than other objects typically found in the outdoor environment, such as bodies of water or glass buildings.

account for 'tracking' panels if they are proposed as these may cause differential diurnal and/or seasonal impacts.

3.10.97 When a glint and glare assessment is undertaken, the potential for solar PV panels, frames and supports to have a combined reflective quality may need to be assessed, although the glint and glare of the frames and supports is likely to be significantly less than the panels.

Cultural Heritage

3.10.98 The impacts of solar PV developments on the historic environment will require expert assessment in most cases and may have effect both above and below ground.

3.10.99 Above ground impacts may include the effects on the setting of Listed Buildings and other designated heritage assets as well as on Historic Landscape Character.

3.10.100 Below ground impacts, although generally limited, may include direct impacts on archaeological deposits through ground disturbance associated with trenching, cabling, foundations, fencing, temporary haul routes etc.

3.10.101 Equally solar PV developments may have a positive effect, for example archaeological assets may be protected by a solar PV farm as the site is removed from regular ploughing and shoes or low-level piling is stipulated.[86]

3.10.102 Generic historic environment impacts are covered in Section 5.9 of EN-1.

3.10.103 Applicant assessments should be informed by information from Historic Environment Records (HERs)[87] or the local authority.

3.10.104 Where a site on which development is proposed includes, or has the potential to, include heritage assets with archaeological interest, the applicant should submit an appropriate desk-based assessment and, where necessary, a field evaluation. These should be carried out, using expertise where necessary and in consultation with the local planning authority, and should identify archaeological study areas and propose appropriate schemes of investigation, and design measures, to ensure the protection of relevant heritage assets.

3.10.105 In some instances, field studies may include investigative work (and may include trial trenching beyond the boundary of the proposed site) to assess the impacts of any ground disturbance, such as proposed

[86] The results of pre-determination archaeological evaluation inform the design of the scheme and related archaeological planning conditions.
[87] For more information on HERs see https://historicengland.org.uk/advice/technical-advice/information-management/hers/

cabling, substation foundations or mounting supports for solar panels on archaeological assets.

3.10.106 The extent of investigative work should be proportionate to the sensitivity of, and extent of proposed ground disturbance in, the associated study area.

3.10.107 Applicants should take account of the results of historic environment assessments in their design proposal.

3.10.108 Applicants should consider what steps can be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting.

3.10.109 As the significance of a heritage asset derives not only from its physical presence but also from its setting, careful consideration should be given to the impact of large-scale solar farms which depending on their scale, design and prominence, may cause substantial harm to the significance of the asset.

3.10.110 Applicants may need to include visualisations to demonstrate the effects of a proposed solar farm on the setting of heritage assets.

Construction including traffic and transport noise and vibration

3.10.111 Modern solar farms are large sites that are mainly comprised of small structures that can be transported separately and constructed on-site, with developers designating a compound on-site for the delivery and assemblage of the necessary components.

3.10.112 Many solar farms will be sited in areas served by a minor road network. Public perception of the construction phase of solar farm will derive mainly from the effects of traffic movements, which is likely to involve smaller vehicles than typical onshore energy infrastructure but may be more voluminous.

3.10.113 Generic traffic and transport impacts are covered Section 5.14 of EN-1.

3.10.114 Applicants should assess the various potential routes to the site for delivery of materials and components where the source of the materials is known at the time of the application and select the route that is the most appropriate.

3.10.115 Where the exact location of the source of construction materials, such as crushed stone or concrete is not be known at the time of the application applicants should assess the worst-case impact of additional vehicles on the likely potential routes.

3.10.116 Applicants should ensure all sections of roads and bridges on the proposed delivery route can accommodate the weight and volume of the loads and width of vehicles. Although unlikely, where

modifications to roads and/or bridges are required, these should be identified, and potential effects addressed in the ES.

3.10.117 Where a cumulative impact is likely because multiple energy infrastructure developments are proposing to use a common port and/or access route and pass through the same towns and villages, applicants should include a cumulative transport assessment as part of the ES. This should consider the impacts of abnormal traffic movements relating to the project in question in combination with those from any other relevant development. Consultation with the relevant local highways authorities is likely to be necessary.

Mitigations

Agriculture Land classification and land type

3.10.118 The Defra Construction code of practice for the sustainable use of soils on construction sites[88] provides guidance on ensuring that damage to soil during construction is mitigated and minimised. Mitigation measures focus on minimising damage to soil that remains in place, and minimising damage to soil being excavated and stockpiled. The measures aim to preserve soil health and soil structure to minimise soil carbon loss and maintain water infiltration and soil biodiversity. Mitigation measures for agricultural soils include use of green cover, multispecies cover crops - especially during the winter- minimising compaction and adding soil organic matter.

Biodiversity and ecological conservation

3.10.119 In England, proposed enhancements should take account of the above factors and as set out in Section 5.4 of EN-1 aim to achieve environmental and biodiversity net gain in line with the ambition set out in the Environmental Improvement Plan and any relevant measures and targets, including statutory targets set under the Environment Act or elsewhere.[89]

3.10.120 This might include maintaining or extending existing habitats and potentially creating new important habitats, for example by installing cultivated strips/plots for rare arable plants, rough grassland margins, bumble bee plant mixes, and wild bird seed mixes.

3.10.121 Applicants are advised to develop an ecological monitoring programme to monitor impacts upon the flora of the site and upon any particular ecological receptors (such as bats and wintering birds). Results of the monitoring will then inform any changes needed to the

[88] The Defra Construction Code at: (See https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils -on-construction-sites)"

[89] For projects in Wales, section 6.4 of Planning Policy Wales and any related guidance should be followed.

land management of the site, including, if appropriate, any livestock grazing regime.

Landscape, visual and residential amenity

3.10.122 Applicants should consider the potential to mitigate landscape and visual impacts through, for example, screening with native hedges, trees and woodlands.

3.10.123 Applicants should aim to minimise the use and height of security fencing. Where possible applicants should utilise existing features, such as hedges or landscaping, to assist in site security or screen security fencing.

3.10.124 Applicants should minimise the use of security lighting. Any lighting should utilise a passive infra-red (PIR) technology and should be designed and installed in a manner which minimises impact.

Glint and glare

3.10.125 Applicants should consider using, and in some cases the Secretary of State may require, solar panels to comprise of (or be covered with) anti-glare/anti-reflective coating with a specified angle of maximum reflection attenuation for the lifetime of the permission.

3.10.126 Applicants may consider using screening between potentially affected receptors and the reflecting panels to mitigate the effects.

3.10.127 Applicants may consider adjusting the azimuth alignment of or changing the elevation tilt angle of a solar panel, within the economically viable range, to alter the angle of incidence. In practice this is unlikely to remove the potential impact altogether but in marginal cases may contribute to a mitigation strategy.

Cultural Heritage

3.10.128 The ability of the applicants to microsite specific elements of the proposed development during the construction phase should be an important consideration by the Secretary of State when assessing the risk of damage to archaeology.

3.10.129 Where requested by the applicant, the Secretary of State should consider granting consents which allow for the micrositing within a specified tolerance of elements of the permitted infrastructure so that precise locations can be amended during the construction phase if unforeseen circumstances, such as the discovery of previously unknown archaeology, arise.

Construction including traffic and transport noise and vibration

3.10.130 In some cases, the local highway authority may request that the Secretary of State impose controls on the number of vehicle

movements to and from the solar farm site in a specified period during its construction and, possibly, on the routeing of such movements particularly by heavy vehicles.

3.10.131 Where the Secretary of State agrees that this is necessary, requirements could be imposed on development consent.

3.10.132 Where cumulative effects on the local road network or residential amenity are predicted from multiple solar farm developments, it may be appropriate for applicants for various projects to work together to ensure that the number of abnormal loads and deliveries are minimised, and the timings of deliveries are managed and coordinated to ensure that disruption to residents and other highway users is reasonably minimised.

3.10.133 It may also be appropriate for the highway authority to set limits for and coordinate these deliveries through active management of the delivery schedules through the abnormal load approval process.

3.10.134 Once consent for a scheme has been granted, applicants should liaise with the relevant local highway authority (or other coordinating body) regarding the start of construction and the broad timing of deliveries. Applicants may need to agree a planning obligation to secure appropriate measures, including restoration of roads and verges.

3.10.135 Further it may be appropriate for any non-permanent highway improvements carried out for the development (such as temporary road widening) to be made available for use by other subsequent solar farm developments.

Secretary of State decision making

Factors influencing site selection and design

Agriculture land classification and land type

3.10.136 The Secretary of State should take into account the economic and other benefits of the best and most versatile agricultural land. The Secretary of State should ensure that the applicant has put forward appropriate mitigation measures to minimise impacts on soils or soil resources.

Technical considerations

Project lifetime and decommissioning

3.10.137 The Secretary of State should ensure that the applicant has put forward outline plans for decommissioning the generating station when no longer in use and restoring the land to a suitable use (taking into account paragraphs 2.10.59 and 2.10.60).

3.10.138 Where the consent for a solar farm is to be time-limited, the DCO should impose a requirement setting that time-limit from the date the solar farm starts to generate electricity.

3.10.139 Such a requirement should also secure the decommissioning of the generating station after the expiration of its permitted operation to ensure that inoperative plant is removed after its operational life.

3.10.140 An upper limit of 40 years is typical, although applicants may seek consent without a time period or for differing time-periods for operation.

3.10.141 The time limited nature of the solar farm, where a time limit is sought as a condition of consent, is likely to be an important consideration for the Secretary of State.

3.10.142 The Secretary of State should consider the period of time the applicant is seeking to operate the generating station as well as the extent to which the site will return to its original state when assessing impacts such as landscape and visual effects and potential effects on the settings of heritage assets and nationally designated landscapes.

Impacts

3.10.143 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

3.10.144 The Secretary of State should consider any impacts which it determines are relevant and important to its decision.

Biodiversity and ecological conservation

3.10.145 Water management is a critical component of site design for ground mount solar plants. Where previous management of the site has involved intensive agricultural practice, solar sites can deliver significant ecosystem services value in the form of drainage, flood attenuation, natural wetland habitat, and water quality management.

3.10.146 The Secretary of State must consider the worst-case effects in its consideration of the application and consent.

3.10.147 Where developments are proposed on peat, to ensure the development will result in minimal disruption to the ecology, or release of CO_2 and that the carbon balance savings of the scheme are maximised, the Secretary of State should be satisfied that the solar farm layout and construction methods have been designed to minimise soil disturbance during construction and maintenance of roads, tracks, and other infrastructure.

Landscape, visual and residential amenity

3.10.148 The Secretary of State will consider the landscape and visual impact of any proposed solar PV farm, taking account of any sensitive visual

receptors, and the effect of the development on landscape character, together with the possible cumulative effect with any existing or proposed development. Nationally designated landscapes (National Parks, The Broads and Areas of Outstanding Beauty) are afforded extra protection due their statutory purpose. Development in these areas needs to satisfy policy as set out in EN-1 Section 5.10.

Glint and glare

3.10.149 Solar PV panels are designed to absorb, not reflect, irradiation. However, the Secretary of State should assess the potential impact of glint and glare on nearby homes, motorists, public rights of way, and aviation infrastructure (including aircraft departure and arrival flight paths).

3.10.150 Whilst there is some evidence that glint and glare from solar farms can be experienced by pilots and air traffic controllers in certain conditions, there is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms.

Cultural Heritage

3.10.151 Solar farms are generally consented on the basis that they will be time-limited in operation. The Secretary of State should therefore consider the length of time for which consent is sought when considering the impacts of any indirect effect on the historic environment, such as effects on the setting of designated heritage assets.

Construction including traffic and transport noise and vibration

3.10.152 Once solar farms are in operation, traffic movements to and from the site are generally very light, in some instances as little as a few visits each month by a light commercial vehicle or car. Should there be a need to replace machine components, this may generate heavier commercial vehicle movements, but these are likely to be infrequent.

3.10.153 The Secretary of State is unlikely to give any more than limited weight to traffic and transport noise and vibration impacts from the operational phase of a project.

3.11 Tidal Stream Energy

Introduction

3.11.1 Tidal stream developments will typically include an array of individual turbines fixed directly to the seabed or suspended from floating structures that are in turn fixed to seabed via anchor cables.

3.11.2 Tidal stream developments may also include a variety of associated infrastructural elements, such as intra-array and inter-array electrical cables, export cables, offshore substations, and land-side grid-connection infrastructure.

3.11.3 Tidal stream technologies are in the early stages of commercial development, with 10MW of installed capacity in the UK as of 2022. However, the cost of tidal stream energy could fall significantly in the coming years, allowing projects above the 100MW NSIP threshold to come forward by the late 2020s.

3.11.4 In view of the limited commercial-scale deployments to date, there is some uncertainty about the severity of the impact, if any, that tidal stream arrays may have on the marine ecosystem.

3.11.5 It is to be expected, however, that by the time that supra-100MW projects come forward for planning consent, there will be a significantly more robust evidence base for applicants and assessors to draw upon, including data accrued from the extensive monitoring undertaken at intermediate-scale developments.[90]

3.11.6 Where appropriate, and as indicated throughout this NPS, applicants should demonstrate how they have taken account of this evidence base in designing their proposal, and any impact avoidance or mitigation plans associated with it.

Applicant assessment

Factors influencing site selection and design

3.11.7 General factors influencing site selection by applicants are set out at Section 2.3 of this NPS.

3.11.8 The specific criteria considered by applicants, and the role that plays in site selection, will vary from project to project.

[90] For example array-produced underwater noise and electromagnetic fields, as well as the collision or avoidance risk posed by tidal stream turbines to marine mammals, fish, and bird species.

Offshore Energy Strategic Environmental Assessment

3.11.9 In proposing sites for tidal stream energy NSIPs applicants should demonstrate that their choice of site takes into account not only the findings of the government's Offshore Energy Strategic Environmental Assessment 2016 (SEA)[91] and its successors, but also relevant industry research and modelling[92], and evidence obtained from monitoring carried out as part of the scoping, construction, and operation of intermediate-scale tidal stream arrays.

Other offshore infrastructure and activities

3.11.10 There may be constraints imposed on the siting or design of tidal stream developments. For guidance applicants should consult paragraphs 2.8 in the offshore wind chapter of this NPS.

Seabed geology and foundation conditions

3.11.11 Applicants should ensure that their turbine foundation design is technically suitable for the prevailing seabed conditions.

3.11.12 Applicants should ensure the foundation design does not create unacceptably adverse effect on marine biodiversity, the marine physical environment, or marine heritage assets, in accordance with the requirements detailed below and in EN-1.

Technical considerations

Network connection

3.11.13 Applicants should ensure that the form, routing, and design of their connection to the electricity network(s) is consistent with the considerations set out at Section 4.10 of EN-1 and in EN-5. Applicants should also demonstrate that their proposals are compliant with the guidelines on assessing the singular and cumulative impact of cabling and associated infrastructure in the marine and nearshore environment set out at Section 2.8 of EN3.

[91] The 2016 SEA concluded that that although small tidal stream arrays may have detectable hyper-localised effects, these effects are not likely to be significant at distance. See https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process

[92] Recent modelling suggests that larger arrays in excess of 100MW have the theoretical potential to give rise to significant and far-ranging impacts, albeit the presence and intensity of these impacts are strongly conditioned by assumptions about location, layout, and size of the array. See e.g. Lossent J, Lejart M, Folegot T, Clorennec D, Di Iorio L, Gervaise C. Underwater operational noise level emitted by a tidal current turbine and its potential impact on marine fauna. Mar Pollut Bull. 2018 Jun;131(Pt A):323-334. doi: 10.1016/j.marpolbul.2018.03.024. Epub 2018 May 7. PMID: 29886954; and Gillespie D, Palmer L, Macaulay J, Sparling C, Hastie G. 2021 Harbour porpoises exhibit localized evasion of a tidal turbine. Aquat. Conserv.: Mar. Freshw. Ecosyst. 31, 2459– 2468. (doi:10.1002/aqc.3660). See also e.g. De Dominicis, M., Wolf, J., & O'Hara Murray, R. (2018). Comparative effects of climate change and tidal stream energy extraction in a shelf sea. Journal of Geophysical Research: Oceans, 123, 5041– 5067.

Flexibility in the project details

3.11.14 In some cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- the type of turbine;
- foundation;
- mooring;
- cabling to be installed;
- cable routing; and
- exact locations of offshore and/or onshore electrical substations.

3.11.15 Guidance on how applicants should manage flexibility is set out at 2.6 of this NPS.

Micrositing and microrouting

3.11.16 Micrositing/microrouting provides applicants with flexibility to accommodate any unforeseen events, such as the discovery of previously unknown marine archaeological objects that it would be preferable to leave in situ.

3.11.17 For guidance on micrositing/microrouting applicants should consult paragraphs 2.8.89 – 2.8.92 in the offshore wind chapter of this NPS.

Repowering

3.11.18 Where an operational tidal array reaches the end of its life, subject to obtaining the necessary lease from The Crown Estate or providing an existing lease is still valid, the owner of the tidal array may wish to "repower" the site with new turbines.

3.11.19 While there may be benefits to making use of an existing site, given the likely change in technology over the intervening time period, any repowering of sites is likely to involve tidal turbines of a different scale and nature. This could result in significantly different impacts as well as a different electricity generating capacity.

3.11.20 Applicants must submit a new consent application for any repowering of an existing site, this would be subject to EIA and HRA.

Decommissioning

3.11.21 Section 105 of the Energy Act 2004 enables the Secretary of State to require the submission of a decommissioning programme for a proposed tidal array, provided at least one of the statutory consents required has been given or has been applied for and is likely to be given.

3.11.22 Where requested by the Secretary of State applicants should submit a decommissioning programme[93], satisfying the requirements of s.105(8) of the Energy Act 2004 before any offshore construction works begin.

Impacts

3.11.23 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

3.11.24 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Biodiversity and ecological conservation

3.11.25 Generic biodiversity and ecology effects and receptors are covered in detail in Section 5.4 of EN-1.

3.11.26 The coastal change policy in Section 5.6 of EN-1 may also be relevant.

3.11.27 In addition, applicants should have regard to the specific ecological and biodiversity considerations that pertain to proposed offshore wind infrastructure developments, namely:

- fish;
- intertidal and subtidal seabed habitats and species;
- marine mammals;
- birds; and
- wider ecosystem impacts and interactions, such as foodwebs.

3.11.28 Applicants must undertake a detailed assessment of the offshore ecological, biodiversity and physical impacts of their proposed development, for all phases of the lifespan of that development, in accordance with the appropriate policy for offshore wind farm EIAs, HRAs and MCZ assessments (See Sections 4.2 and 5.4 of EN-1).

3.11.29 Applicants should demonstrate that their site selection, project design, and (where relevant) mitigation plans have been determined considering relevant evidence.

3.11.30 Applicants should explain why their decisions on siting, design, and impact mitigation are proportionate and well-targeted considering real-world evidence gathered from previous deployments including intermediate-scale tidal stream projects.

[93] See https://www.gov.uk/government/publications/decommissioning-offshore-renewable-energy-installations

3.11.31 Applicants need to consider environmental and biodiversity net gain as set out in Section 4.5 of EN-1).

3.11.32 Applicants should assess the potential of their proposed development to have net positive effects on marine ecology and biodiversity as well as negative.

3.11.33 Applicants are expected to have regard to guidance issued in respect of Marine Licence requirements.

3.11.34 Applicants should also have regard to Good Environmental Status (GES) under the UK Marine Strategy.[94]

Other impacts

3.11.35 There is not as yet sufficient evidence on the impact of tidal stream arrays to give technology-specific guidance for the following receptors:

- commercial fisheries and fishing;
- historic environments;
- navigation and shipping;
- oil, gas, carbon capture usage and storage and other offshore infrastructure and activities;
- physical environment;
- landscape, seascape and visual impacts; and
- designated landscapes.

3.11.36 For guidance on the proper assessment and mitigation of impacts on these receptors, applicants should consult the guidance contained within Section 5 of EN-1 and the relevant sections – where there are obvious similarities – of the guidance for offshore wind.

Mitigations

3.11.37 Careful design and siting of the development is likely to be the primary form of impact mitigation, along with the choice of construction and installation techniques.

[94] See https://moat.cefas.co.uk/introduction-to-uk-marine-strategy/

Secretary of State decision making

Technical considerations

Network connection

3.11.38 When considering grid connection issues, the Secretary of State should be mindful of the constraints of the regulatory regime for onshore and offshore electricity networks and consider how this affects the proposal put forward by the applicant.

3.11.39 Note that a proposed offshore electricity cable connecting the tidal stream array with onshore electricity infrastructure and/or any required offshore electricity substations may constitute associated development, depending on its scale and nature in relation to the tidal stream project. Where the Secretary of State is satisfied that such offshore infrastructure does constitute associated development and can form part of the application, it should be considered by the Secretary of State in accordance with this NPS and EN-5.

3.11.40 The Secretary of State should assess the form, routing, and design of the project's connection infrastructure in line with the considerations set out in Section 4.10 of EN-1 and in EN-5. The Secretary of State should also have regard to the guidelines on assessing the singular and cumulative impact of cabling and associated infrastructure in the marine and nearshore environment set out in Section 2.8 of EN-3.

Repowering

3.11.41 In determining an application for the repowering of a site, the proposed replacement scheme should be determined by the Secretary of State on its own merits.

Impacts

3.11.42 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

3.11.43 The Secretary of State should consider any impacts which they determine are relevant and important to its decision.

Biodiversity and ecological conservation

3.11.44 The Secretary of State should consider the effects of a proposed development on marine ecology and biodiversity, taking into account all relevant information made available by the applicant, SNCBs and any other relevant party.

3.11.45 The Secretary of State should be satisfied that, in the development of their proposal, the applicant has made appropriate, and extensive, use of the evidence base available to them, in particular gathered

from their previous deployments, including intermediate-scale tidal stream projects.

3.11.46 Where the Secretary of State determines that evidence could be supplemented for a given receptor (e.g. there is some doubt that intermediate-scale effects can be extrapolated to larger-scale arrays) the Secretary of State may impose monitoring requirements on the applicant in relation to the receptor.

3.11.47 In such cases, the Secretary of State must be satisfied that the applicant has given sufficient assurance that the results of that monitoring will be made publicly available for the benefit of the scientific community, and to enable future tidal stream applicants to draw upon those results in the design of their future projects.

3.11.48 The designation of an area as a protected site (including HRA sites, MCZs and SSSIs) does not necessarily restrict the construction or operation of tidal stream arrays in, near, or through that area (see also Sections 5.4 of EN-1). However, where adverse effects on site integrity/conservation objectives are predicted the Secretary of State should consider the extent to which the effects are temporary or reversible, and the timescales for recovery.

Other impacts

3.11.49 There is not as yet sufficient evidence on the impact of tidal stream arrays to give technology-specific guidance for the receptors set out above.

3.11.50 For guidance on the proper assessment and mitigation of impacts on these receptors, the Secretary of State should consult the guidance contained within Section 5 of EN-1 and the relevant sections – where there are obvious similarities – of the guidance for offshore wind.

4 Glossary

Permanent threshold shift (PTS):

A total or partial permanent loss of hearing caused by acoustic trauma. PTS results in irreversible damage to the sensory hair cells of the ear, and thus a permanent reduction of hearing acuity.

Temporary Threshold Shift (TTS):

Temporary loss of hearing as a result of exposure to sound over time. Exposure to high levels of sound over relatively short time periods will cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS are not well understood, but there may be some temporary damage to the sensory cells. The duration of TTS varies depending on the nature of the stimulus, but there is generally recovery of full hearing over time.

This publication is available from: www.gov.uk/beis

If you need a version of this document in a more accessible format, please email enquiries@beis.gov.uk. Please tell us what format you need. It will help us if you say what assistive technology you use.

Annex 6 - Extract from the Clean Power 2030 Action Plan

Case Study: Management of emerging risks for project delivery – wake effects

Wake effects occur when wind turbines disrupt airflow to other turbines and reduce the energy production of those projects.

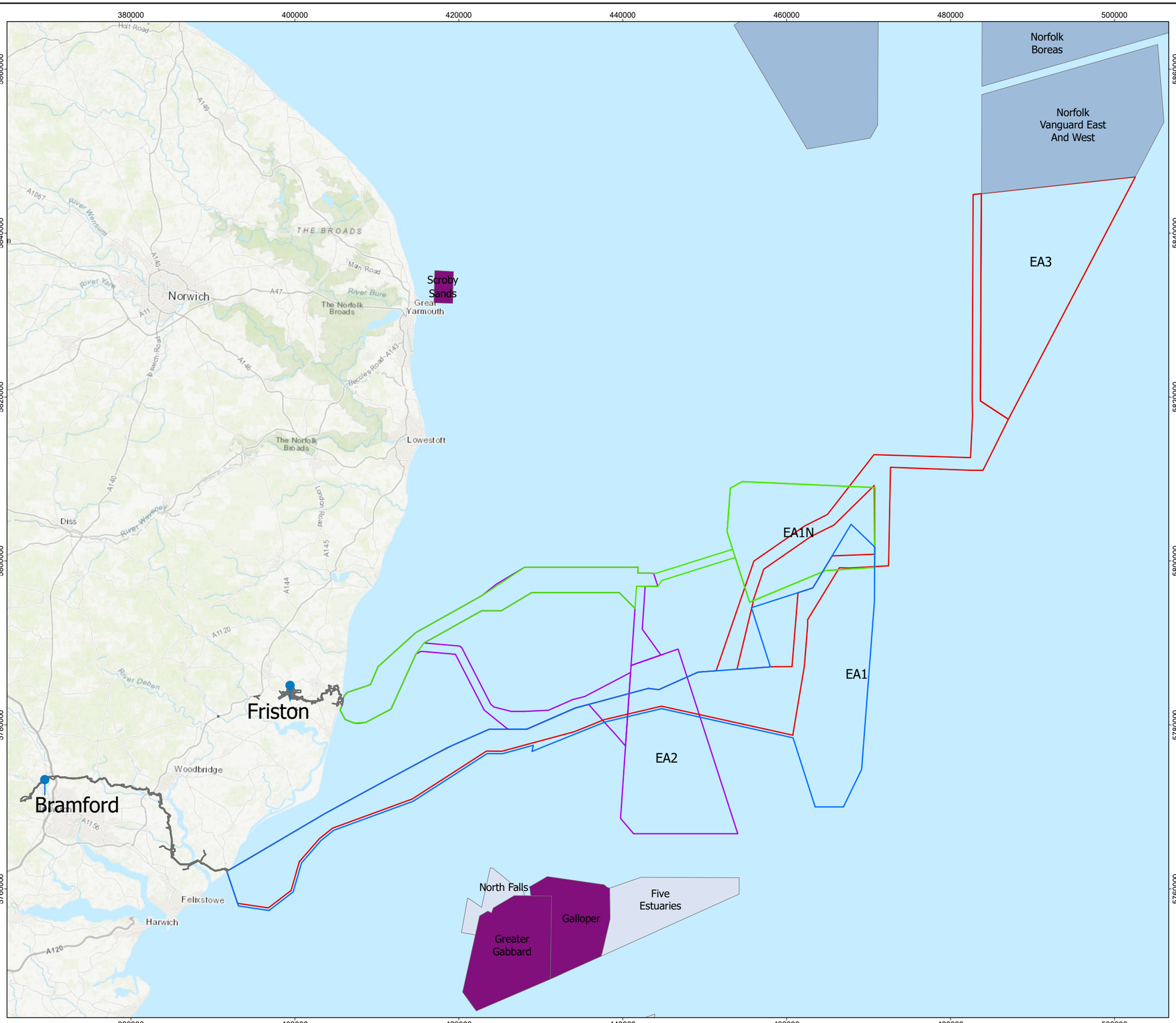
New projects with larger and/or a greater number of turbines have an even greater propensity to cause wake effects on existing downstream operational projects. Historically, this has been resolved outside the planning system, but a precedent was set with a wake condition in the 2023 Awel y Mor Development Consent Order, which said "No part of any wind turbine generator shall be erected as part of the authorised development until an assessment of any wake effects and subsequent design provisions to mitigate any such identified effects as far as possible has been submitted"[86].

As we radically accelerate the deployment of offshore wind in the UK to meet our 2030 target, we understand the uncertainty that this emerging issue has introduced both on operational windfarms and those in development, including the approximately 10 GW of pre-2030 offshore wind capacity currently in the planning system.

The Clean Power 2030 Unit would look to convene expert opinions from planners, engineers, academics, project delivery, data scientists and policy to understand the levers we can pull in this space, working with stakeholders like The Crown Estate, Crown Estate Scotland, the Planning Inspectorate, ORE Catapult and industry to gather the data and build an evidence base, looking for comparison mitigations with international partners and other industries.

[86] Statutory Instrument (2023), *'Infrastructure Planning: The Awel y Môr Offshore Wind Farm Order 2023'* (viewed in December 2024).

Annex 7 – East Anglia Zone Plan



EA1
EA1N
EA2
EA3
EA1 and EA3
EA1N and EA2

Offshore Wind Site Agreements (The Crown Estate)

- Active/In Operation
- Under Construction
- Consented
- Government Support on Offer
- In Planning
- Pre-planning Application
- Preferred Project – Subject to HRA

Notes:

N

0 5 10 15 20 Kilometres

REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
1	23/09/2021	JB	JB	--	--

DRAWING NUMBER	EAH-GEN-GIS-DRG-IBR-000405		
DATUM	WGS84	PROJECTION	UTM Zone 31N
SCALE	1:450,000	PAGE SIZE	A3
PROJECT TITLE	East Anglia HUB		
DRAWING TITLE	**Project Consented Boundaries**		

© COPYRIGHT NOTES
Service Layer Credits: National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
World Topographic Map: DoBH, OS, Esri, HERE, Garmin, USGS, NGA

This map has been produced to the latest known information at the time of issue, and has been produced for your information only. Please consult with the SPR Offshore GIS team to ensure the content is still current before using the information contained on this map. To the fullest extent permitted by law, we accept no responsibility or liability (whether in contract, tort (including negligence) or otherwise in respect of any errors or omissions in the information contained in the map and shall not be liable for any loss, damage or expense caused by such errors or omissions.

NOT TO BE USED FOR NAVIGATION

SCOTTISHPOWER RENEWABLES

Project: E:\EAOW\EAH_new\Offshore\Analysis\Human\Boundaries\Boundaries.aprx
Name: EAH-GEN-GIS-DRG-IBR-000405 Rev 2 Offshore Wind Farm and Export Cable Corridor

Annex 8 – Wake Loss Assessment

EAST ANGLIA 2 WIND FARM

Wakes and Blockage Impact Assessment of the proposed Five Estuaries Wind Farm on East Anglia 2 Wind Farm

East Anglia Two

Report No.: 00384599-R-01
Document revision: A
Date of issue: 2025-02-11

IMPORTANT NOTICE AND DISCLAIMER

1. This document is intended for the sole use of the Customer as detailed on page iii of this document to whom the document is addressed and who has entered into a written agreement with the DNV entity issuing this document ("DNV"). To the extent permitted by law, neither DNV nor any group company (the "Group") assumes any responsibility whether in contract, tort including without limitation negligence, or otherwise howsoever, to third parties (being persons other than the Customer), and no company in the Group other than DNV shall be liable for any loss or damage whatsoever suffered by virtue of any act, omission or default (whether arising by negligence or otherwise) by DNV, the Group or any of its or their servants, subcontractors or agents. This document must be read in its entirety and is subject to any assumptions and qualifications expressed therein as well as in any other relevant communications in connection with it. This document may contain detailed technical data which is intended for use only by persons possessing requisite expertise in its subject matter.

2. This document is protected by copyright and may only be reproduced and circulated in accordance with the conditions stipulated or referred to in this document and/or in DNV's written agreement with the Customer. No part of this document may be disclosed in any public offering memorandum, prospectus or stock exchange listing, circular or announcement without the express and prior written consent of DNV. Consent to reditribute this document shall not thereby imply that DNV has any liability to any recipient other than the Customer.

3. This document has been produced from information relating to dates and periods referred to in this document. This document does not imply that any information is not subject to change. Except and to the extent that checking or verification of information or data is expressly agreed within the written scope of its services, DNV shall not be responsible in any way in connection with erroneous information or data provided to it by the Customer or any third party, or for the effects of any such erroneous information or data whether or not contained or referred to in this document.

4. Any estimates or predictions are subject to factors not all of which are within the scope of the probability and uncertainties contained or referred to in this document and nothing in this document guarantees any particular performance or output.

DNV distribution

☐ OPEN. Unrestricted distribution, internal and external.

☐ INTERNAL use only. Internal DNV document.

☒ CONFIDENTIAL. Distribution within DNV according to applicable contract.*

☐ SECRET. Authorised access only.

*Distribution:

Information about the Customer (the "Customer")

Legal entity:	East Anglia TWO Ltd
Address:	3rd floor, 1 Tudor Street, London
Contact person:	[redacted]
Contact person e-mail:	[redacted]@iberdrola.fr

Information about DNV ("DNV")

Legal entity:	DNV Services UK Limited
Unit:	Renewables
Address:	5th Floor, Vivo Building, 30 Stamford Street, London, SE1 9LQ, United Kingdom
Phone number:	[redacted]
Contact person:	[redacted]
Contact person e-mail:	[redacted]@dnv.com

Information about this document (the "Report")

Project name:	East Anglia 2
Report title:	Wakes and Blockage Impact Assessment of the Proposed Five Estuaries Wind Farm on East Anglia 2
DNV document no.:	00384599-R-01
Document revision:	A
Issue date:	2025-02-11
Applicable contract(s) governing the provision of this Report:	Scope detailed in DNV proposal 00384599-P-01-A

DNV team

Prepared by:	Checked by:	Approved by:
Ben Williams Principal Engineer Wind Projects	Andrew Shiouxios Engineer Wind Projects	Chris Hansford Wind Projects

Copyright © DNV 2025. All rights reserved. Unless otherwise agreed in writing: (i) This publication or parts thereof may not be copied, reproduced or transmitted in any form, or by any means, whether digitally or otherwise; (ii) The content of this publication shall be kept confidential by the customer; (iii) No third party may rely on its contents; and (iv) DNV undertakes no duty of care toward any third party. Reference to part of this publication which may lead to misinterpretation is prohibited.

Revision log

Rev No.	Date	Reason for Issue	Prepared by	Verified by	Approved by
A	2025-02-11	First Issue	B. Williams	A. Shiouxios	C. Hansford

Table of contents

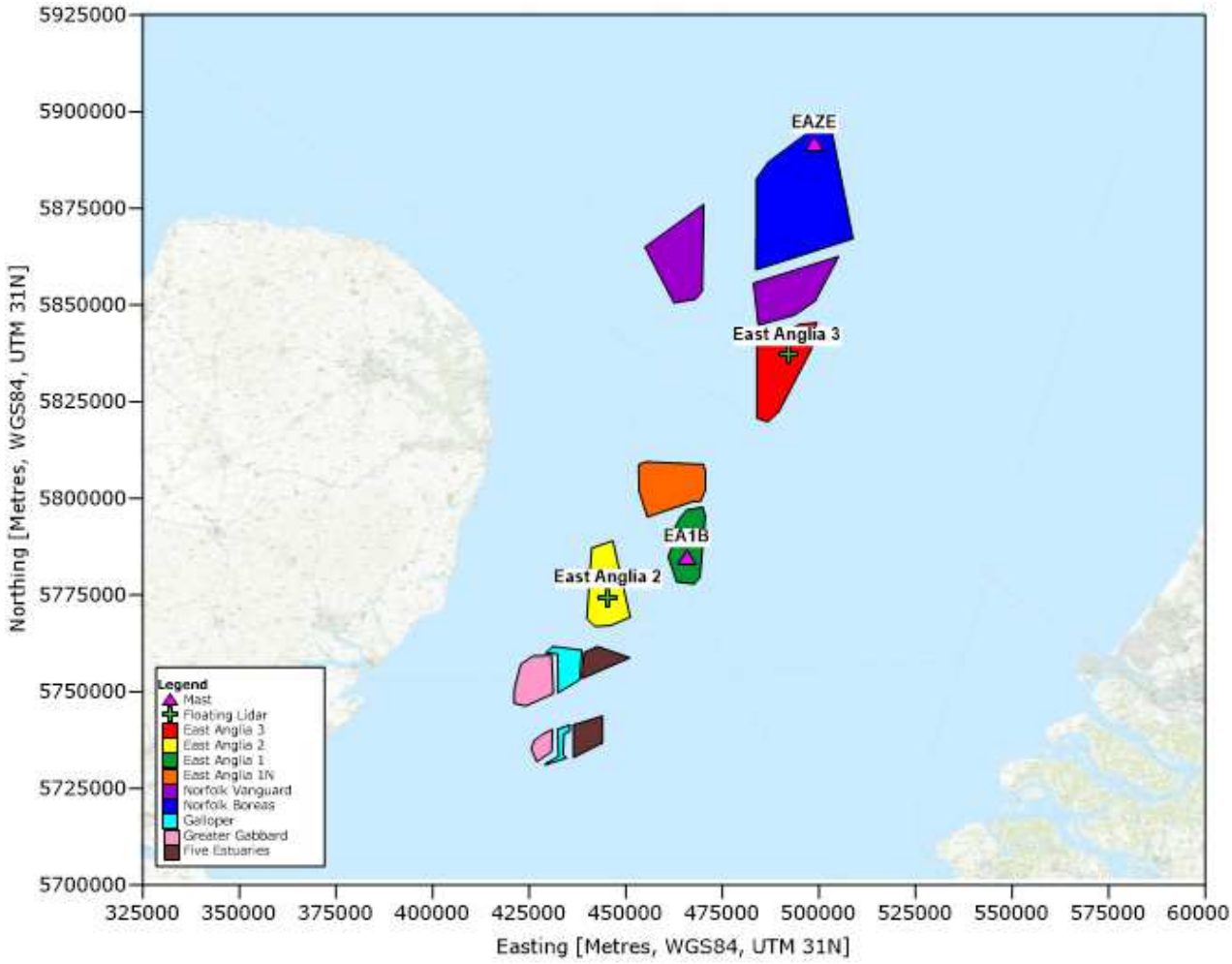
1 INTRODUCTION

East Anglia Two (the “Customer”) has requested that DNV provides an independent assessment of the external wakes and blockage effect of the proposed Five Estuaries offshore wind farm on the East Anglia 2 wind farm.

This document has been prepared pursuant to the DNV proposal 00384599-P-01-A /1/ and is subject to the terms and conditions contained therein.

A map of the proposed and operational wind farms is shown below.

Figure 1-1 The proposed Five Estuaries offshore wind farm and neighbouring wind farms



2 INPUTS

The Customer has supplied the following inputs used for this analysis /2/:

- Measured wind data at historical offshore masts EA1B and EAZE and measured wind data from a previously deployed floating Lidar device at the East Anglia 2 wind farm site. Summary details of these measurement datasets are provided in Table 3-1.
- A boundary for the Five Estuaries offshore wind farm turbine locations.
- Assumed power curves and thrust curves for the proposed Five Estuaries turbines. A 15 MW turbine with a 236 m rotor diameter and 143 m hub height has been assumed.
- Key technical information on the East Anglia 2 wind farm and on all other neighbouring wind farms shown in Figure 1-1, including turbine locations, turbine types, hub heights, power curves and thrust curves.

Where possible DNV has verified the supplied information against publicly available data.

3 ANALYSIS

DNV has estimated the wake and blockage impact using the steps detailed below.

3.1 Wind Analysis

3.1.1 Wind monitoring

Wind measurements have been undertaken in the area using two offshore masts and a floating Lidar device. The below table summarises the key information on the measurement devices.

Table 3-1 Measurements summary

Device	Measurement heights [m]		Period of measurements	Duration	Compliance with IEC mounting guidelines[1]	Calibrated by MEASNET facility?
	Wind speed	Wind direction		[Years]		
Mast EA1B	101.9[1,2], 98.9[2], 88.9[2], 78.9[2], 68.9[2], 58.9[2], 48.9[2], 38.9[2]	98.9, 88.9, 78.9, 68.9, 58.9, 48.9, 38.9	2013-09-04 to 2018-10-30	5.1	Yes	Yes
Mast EAZE	102.0[1,2], 99.0[2], 89.0[2], 79.0[2], 69.0[2], 59.0[2], 49.0[2], 39.0[2]	99.0, 89.0, 79.0, 69.0, 59.0, 49.0, 39.0	2013-09-04 to 2021-07-31	7.9	Yes	Yes
Floating Lidar EA2_FLD	30 m and then 40 m to 200 m in 20 m intervals		2020-07-11 to 2021-07-30	1.0	-	-

Notes:
1 Instruments are installed in accordance with guidelines issued by the IEC .
2 Primary anemometer or anemometers (if parallel measurements at same height available) are those used directly to initiate flow modelling process.
3 One of the primary anemometers at 50 m calibrated whilst the other is not.

3.1.2 Data processing and cleaning

The wind data supplied have been subject to a quality checking procedure by DNV to identify records which were affected by equipment malfunction and other anomalies.

East Anglia One, Galloper and Greater Gabbard wind farms were operational during the period of measurements of the EA2_FLD floating Lidar device. DNV has undertaken investigations to determine the effect that these operational wind farms have had on the measurements recorded EA2_FLD. These investigations indicate that the operational turbines create a very small wake impact on the wind measurements at EA2_FLD. DNV has applied directional wind speed corrections to the data recorded at EA2_FLD to correct for the wake effects from the operational wind farms. The wind speed corrections have been derived using the following procedure:

- DNV's WindFarmer: Analyst software has been used to predict the wake effect of the operational turbines on the wind speed at the location of EA2_FLD.
- A set of correction factors have been derived from the wake modelling results to predict the wind resource that would have been recorded at the location of EA2_FLD in the absence of the operational wind farms.

An all-directional correction of 0.3% of wind speed has been calculated for EA2_FLD. The corrections are applied to the measured wind speeds on a directional basis.

For the met masts, to remove mast effects in the measured wind speed data, selective averaging was undertaken of the data recorded at all anemometers where parallel measurements were available. The flow distortion effects have been removed with the selective averaging strategy that was applied.

The duration and data coverage for the measurements are summarised below. Wind data coverage is generally good. Overall data coverage levels for the key parameters and instruments on each mast are shown in the following table:

Table 3-2 Measurements summary

Device	Parameter	Instrument height [m]	Measurement period [yrs] [2]	Data coverage [%] [1]
EA1B	Wind speed	101.9	5.1	100.0
	Wind direction	88.9	5.1	99.8
EAZE	Wind speed	102.0	7.9	100.0
	Wind direction	99.0	7.9	99.5
EA2_FLD	Wind speed	140.0	1.0	84.5
	Wind direction	140.0	1.0	84.5

1 Wind speed coverage at the mast is based on the selectively averaged data at the two parallel mounted anemometers at 102 m.
2 Measurement period before data cleaning is undertaken

3.1.3 Long-term wind resource extrapolation

As mast EA1B and floating Lidar EA2_FLD are closest to the site, these devices are used to assess the long-term wind speed. The mast EAZE is used to synthesize additional data for the frequency distributions as discussed further below.

DNV reviewed reference wind data from a list of sources, including nine MERRA-2 grid cells and nine ERA5 grid cells closest to the Project site. It is important that the source of reference data is consistent over the period being considered. Reanalysis datasets (MERRA-2 and ERA5) make use of weather and atmospheric measurements from a number of sources including satellite observations. DNV has some concerns over the long-term consistency of these measurements prior to 1996 and prefers to confirm the consistency against measurements before this date. In the absence of suitable long-term measurements, and considering the adequate length of the dataset, reanalysis datasets were considered back to January 1996.

The most robust correlation against ERA5 grid data, with an R^2 value of 0.99, was observed for the correlation between the EA2 floating Lidar and ERA5 grid cell 52.2°N 2.1°E. For Mast EA1B the most robust correlation, with an R^2 value of 0.98, was observed for the correlation with the ERA5 grid cell 51.9°N 1.8°E. The long-term wind speed predictions were supported by predictions using the other grid cells.

The most robust correlation against the MERRA-2 grid data, with an R^2 value of 0.97, was observed for the correlation between the EA2 floating Lidar and MERRA-2 grid cell 52.0°N 2.5°E. For Mast EA1B the most robust correlation, with an R^2 value of 0.98, was observed for the correlation with the MERRA-2 grid cell 51.5°N 1.875°E. The long-term wind speed predictions were supported by predictions using the other grid cells.

Figure 3-1 below, presents the correlation of 10-daily mean wind speeds between the floating Lidar and the best correlating ERA5 node. In order to remove bias in the correlation due to uneven data coverage, only data concurrent at both the reference and site have been used to generate the 10-daily averages used in the correlation. In addition, 10-daily periods for which the data coverage is less than 90% have been excluded from the correlation.

Figure 3-1 Long-term correlation

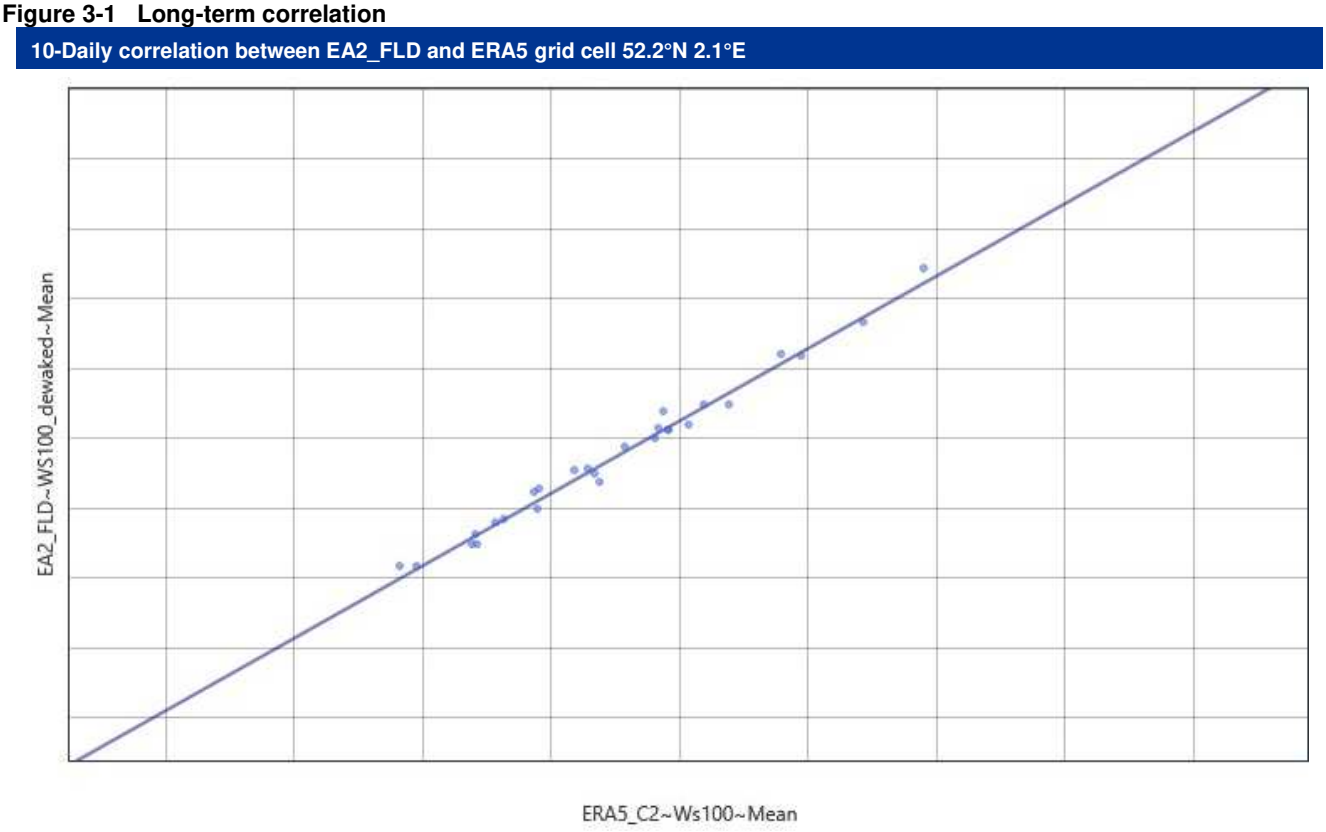
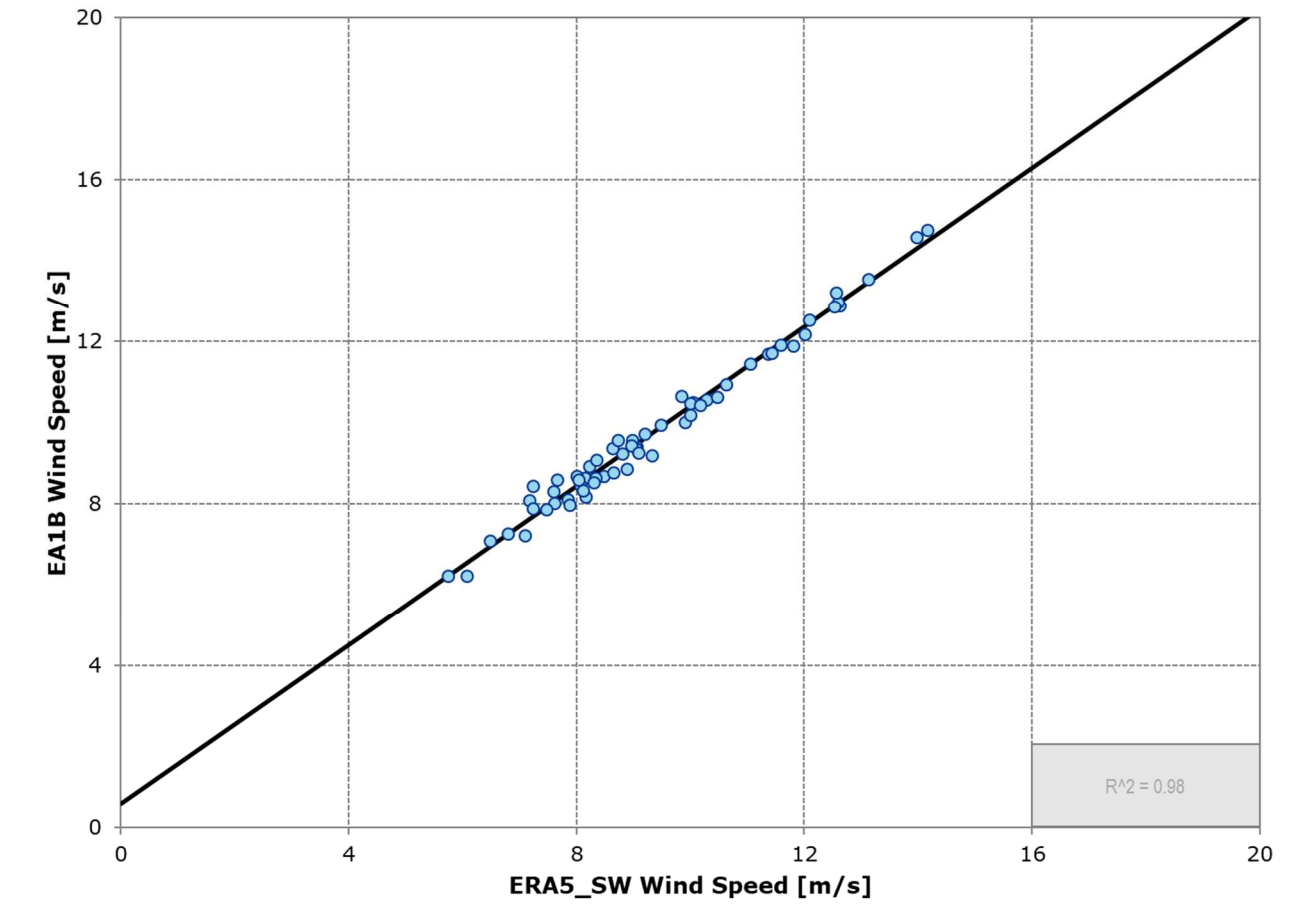


Figure 3-2 below presents the correlation of monthly mean wind speeds between mast EA1B and the best correlating ERA5 node. In order to remove bias in the correlation due to uneven data coverage, only data concurrent at both the reference and site have been used to generate the monthly averages used in the correlation. In addition, monthly periods for which the data coverage is less than 90% have been excluded from the correlation.

Figure 3-2 Long-term correlation



The slope and intercept of the correlations were applied to the monthly / 10-daily mean wind speeds recorded at the reference source to synthesise historical monthly / 10-daily mean wind speeds at Mast EA1B / EA2 FLD respectively. The measured and synthesised means were then combined, with priority given to measured data, to derive the long-term annual wind speeds. To avoid the introduction of bias into the long-term wind speed estimate from seasonally uneven data coverage, the following procedure was followed:

- The mean wind speed for each calendar month was determined from the valid measured and synthesised data in that calendar month over the period. This was taken as the monthly mean thereby assuming that the valid data are representative of any missing data.
- The mean wind speeds for each of the twelve months were averaged, weighted by the number of days in each month, to determine the long-term annual mean wind speed.

The long-term mean wind speeds derived from using the ERA-5 and MERRA-2 reference sources were averaged to give the combined mean wind speed from both reference sources.

The long-term wind speeds derived by this method are given in the following table:

Table 3-3 Long-term wind speed at the measurement sites

Device	Measurement Height	Measurement period	Period defining the long-term wind speed	Measured wind speed	Long-term wind speed	Long-term wind speed adjustment
	[m MSL]	[years]	[years]	[m/s]	[m/s]	[%]
EA2 FLD	100.0	1.0	25.6	9.7	9.5	-1.9
Mast EA1B	101.9	5.1	25.6	9.8	9.8	-0.3

Due to the only having 1 year of measurements available at the floating Lidar, DNV has included synthesised data from mast EAZE in the wind speed and direction frequency distributions of the floating Lidar. This involves a high-resolution correlation and synthesis approach. In this approach, the directionally averaged measured wind speeds at 102 m mast EAZE are binned into twelve 30-degree direction sectors and are compared to the concurrent wind speeds measured at 100 m at the floating Lidar on a ten-minute or hourly basis. Directional speed up factors are calculated and applied to the wind speed data recorded at mast EAZE to synthesise historical wind speed data at the floating Lidar.

Similarly, the measured direction data at mast EAZE are also correlated to direction data recorded at the floating Lidar to synthesise historical direction data at the floating Lidar.

These synthesised wind speed and direction data are then combined with the measured data at the floating Lidar to create a combined measured and synthesised time series covering a longer period than was originally available using measurements at the floating Lidar alone.

Checks on the quality of the correlation and synthesis procedure were undertaken for each step. All correlations used yielded acceptable results from this check, and therefore using the synthesis methodology described above, a time series of measured and synthesised wind speed data was obtained for the floating Lidar.

3.1.4 Vertical wind resource extrapolation

Wind shear determines the variation of wind speed with height above the sea. Accurately establishing this vertical wind speed profile depends on the installation height of the wind sensors, on the period of measured wind data available, and on the complexity of the atmospheric wind flow at the site.

To extrapolate the wind speed estimates from measurement height (the extrapolation base) to hub height (the extrapolation target), the average power law exponent at each device has been evaluated between all relevant measurement heights as presented in Table 3-4.

Table 3-4 Wind shear exponents

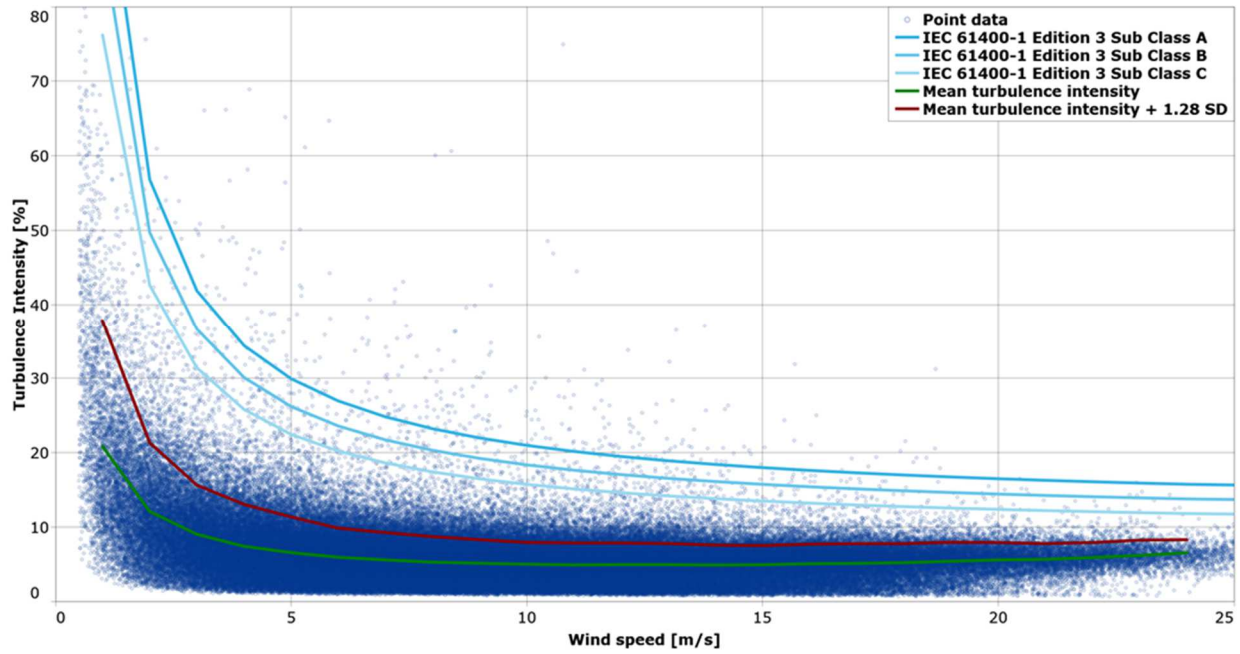
Device	Heights	Long-term wind speed at Measurement height	Measured wind shear exponent	Long-term wind speed at 143 m MSL
	[m]	[m/s]		[m/s]
EA2 FLD	100, 120, 140	9.5	0.08	9.8
Mast EA1B	79, 89, 99	9.8	0.07	10.0

Owing to the primary measurement height at the floating Lidar being close to the primary hub height, little vertical extrapolation of the long-term wind speed was required. The wind shear profile is consistent with the expectations for this location, and the profiles are in good agreement with one another.

3.1.5 Turbulence

The ambient turbulence at the wind farm is an input to the wind farm wake modelling. A profile of the measured turbulence from the historical Mast EA1B, corrected to the site location and assumed hub height of the Five Estuaries turbines is shown below.

Figure 3-3 Turbulence profile at 143 m MSL



3.2 Wind Flow Modelling

In order to predict the wind speeds at each of the turbines in the Five Estuaries offshore wind farm, as well as in each of the relevant neighbouring wind farms, the wind climate at the measurement devices must be extrapolated to the turbine locations.

To assess the horizontal wind speed variation between the measurement sites and the project, DNV has used The Crown Estate (TCE) offshore wind map of the UK /3/.

3.2.1 Final Wind Climate at Five Estuaries

The resulting long-term, hub height wind rose and frequency distribution at the Five Estuaries wind farm is shown below. The long-term hub height mean wind speed at the Five Estuaries site is given in Table 3-5.

Figure 3-4 Final wind climate at central location of the Five Estuaries wind farm at 143 m MSL

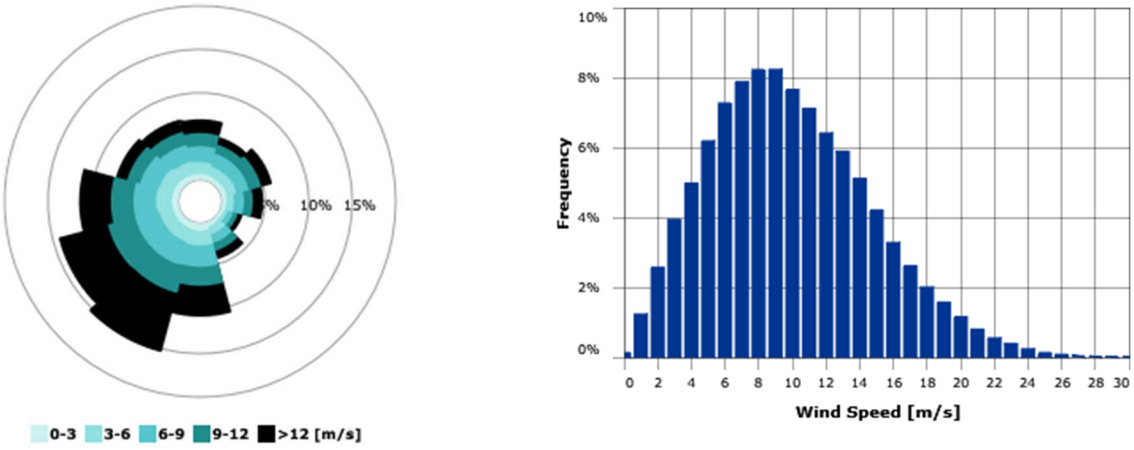


Table 3-5 Summary of the long-term mean wind speed at a central location of the Five Estuaries wind farm

Site	Height [m]	Wind speed [m/s]
Five Estuaries	143	9.9

3.3 Turbine interactions (Wakes and Blockage) Modelling

DNV software WindFarmer:Analyst was used to model the turbine interactions of the relevant wind farms.

The Customer provided a boundary for the Five Estuaries Wind Farm. DNV has created an indicative layout using a simple turbine spacing ellipse of 8 x 4 rotor diameters with the long axis aligned to the prevailing wind direction. The turbine coordinates are given in the Appendix A. Turbine power and thrust curves have been provided confidentially by the Customer and so have not been reported here.

The Customer has provided wind farm layouts, turbine types, hub heights, turbine power curves and thrust curves for East Anglia 2 wind farm, and for all other neighbouring wind farms, as shown in Figure 1. Where possible DNV has independently verified the accuracy of this information.

Using the wind climates defined in the previous step, the WindFarmer Eddy Viscosity (EV) wake model, with Large Wind Farm (LWF) correction for offshore conditions, was used, together with the WindFarmer CFD.ML blockage correction, to determine the turbine interaction effects of the Five Estuaries offshore wind farm on the East Anglia 2 offshore wind farm. The EV wake model is a widely used and well validated wake model. DNV has undertaken extensive validations of this wake model and the offshore specific settings used, /6/, /7/, /8/. The blockage model has also been extensively validated and uses offshore specific settings which have been validated for UK offshore conditions /8/. It is stressed however that uncertainty remains in the wake loss estimate, especially when estimating the wake losses for larger turbines and larger offshore wind farm clusters, beyond the envelope of previous wake validation studies.

4 RESULTS

The results of the wake impact assessment are given in Table 4-1 below. The results have been calculated by modelling the total external wake and blockage loss at the East Anglia 2 offshore wind farm both with and without the addition of the proposed Five Estuaries offshore wind farm, and by then comparing the results of these scenarios. The results below detail the estimated *additional* wake and blockage impact that the Five Estuaries turbines are expected to have on the East Anglia 2 turbines, over and above the impact that the other neighbouring wind farms are already expected to have. The table below also provides the standard deviation associated with the modelling of these additional turbine interaction losses, as an indication of the uncertainty in the modelling. It is noted that this uncertainty reflects the uncertainty in the modelling only and does not account for uncertainty regarding the input assumptions. The sensitivity of the results to the assumed inputs is discussed further in section 5.

Table 4-1 Turbine interaction impact of the Five Estuaries turbines on the East Anglia 2 turbines

Project	Additional Wake and blockage loss [%]	Uncertainty [%]
Five Estuaries impact on East Anglia 2	1.3	0.4

The additional wake and blockage loss is a normal distribution. The 1.3 % value is the central estimate for the additional loss and the 0.4 % uncertainty is the standard deviation of the distribution. This considers the uncertainty in the wake and blockage loss modelling but does not account for sensitivity of the result to changes in the inputs such as the assumed turbine model or wind farm layout.

5 DISCUSSION AND KEY POINTS

The following key points apply to this analysis -

- The analysis is based on extrapolating wind measurements at / nearby to East Anglia 2 wind farm, to the Five Estuaries site. This adds uncertainty to the analysis. The results may be different if measurements from the Five Estuaries site were made available and used.
- The analysis is based on an assumed turbine thrust curve, turbine coordinates and hub heights for the proposed Five Estuaries project. The results are sensitive to the input assumptions and would differ with different input assumptions.
- To test the sensitivity of the results to the assumed layout, DNV has undertaken a series of sensitivity tests, assessing the wake impact for different potential turbine locations for the Five Estuaries turbines. All turbine locations considered are with the site boundary, and the number of turbines is held constant. The additional wake and blockage loss at East Anglia 2 is within the range 1.2% - 1.4% for the different potential Five Estuaries turbine locations considered. The range of results is due to changes in how many turbines are assumed to be located in each of the northern and southern sections of the Five Estuaries project area.
- DNV have not assessed the sensitivity of the results to the turbine model and thrust curve assumptions but considers the assumed turbine model to be reasonable.
- DNV notes that whilst the wake and blockage models used are extensively validated for UK offshore wind conditions, the models have not been validated for turbines of this size, or for very large clusters of wind farms, such as the combined cluster of Galloper, Greater Gabbard and Five Estuaries. This is reflected in the uncertainty applied to the results. The uncertainty is considered typical for an offshore wind farm wake impact assessment.
- Further to the additional wake impact, the proposed Five Estuaries turbines will create extra, wake-added wind turbulence, which may impact the loading on the East Anglia 2 turbines.
- The additional wake and blockage impact presented in Table 4-1 is the average impact over all of the East Anglia 2 wind turbines. The impact ranges from up to 3.4% at turbines along the southern edge of East Anglia 2, to 0.2 % for turbines on the northern edge of East Anglia 2. The impact on turbines in the centre of the East Anglia 2 layout is on average 0.6%. The uncertainty of the wake and blockage prediction for any individual turbine is larger than the uncertainty for wind farm total wake and blockage loss.
- Potential next steps are to undertake additional analysis to assess the impact of possible variations to the Five Estuaries turbine layout and/or turbine size and further investigation into the distribution of the wakes and blockage effects as required.

6 REFERENCES

/1/ “Proposal for a Wakes and Blockage Impact Assessment of the Proposed Five Estuaries Wind Farms on the Neighbouring Wind Farms”, DNV proposal 00384599-P-01-A.

/2/ Data provided by the Customer to Ben Williams of DNV, via email on 2025-01-14.

/3/ “UK Offshore Wind Resource Dataset 2015”, The Crown Estate. http://www.marinedataexchange.co.uk/

/4/ Global Offshore Renewable Map | 4C Offshore, https://map.4coffshore.com/offshorewind/

/5/ Bleeg, J.; Purcell, M.; Ruisi, R.; Traiger, E. “Wind Farm Blockage and the Consequences of Neglecting Its Impact on Energy Production”. Energies 2018, 11, 1609. Available at http://www.mdpi.com/1996-1073/11/6/1609.

/6/ Beckford, T., “Offshore turbine interaction – wake validation and blockage”, WindEurope Resource Assessment 2019

/7/ “Far-distant offshore wakes: How far is too far and are we getting it right?”, WindEurope Technology Workshop 2022 Brussels, 24 June 2022, Ben Williams

/8/ Study: RWE and DNV to validate implications of long-distance “wake effects” from large offshore wind clusters. Available at: https://www.rwe.com/en/press/rwe-offshore-wind-gmbh/2023-03-10-rwe-and-dnv-to-validate-implications-of-long-distance-wake-effects-from-large-offshore-wind-clusters/.

APPENDIX A: WIND FARM SITE INFORMATION

Table A-1 Assumed turbine co-ordinates of the proposed Five Estuaries wind farm

WTG-ID	Easting[1] [m]	Northing[1] [m]	Wind turbine model	Hub height [m MSL]
1	434436	5734167	15 MW 236 m rotor dia.	143
2	434770	5736272	15 MW 236 m rotor dia.	143
3	435535	5735736	15 MW 236 m rotor dia.	143
4	435103	5738378	15 MW 236 m rotor dia.	143
5	435869	5737842	15 MW 236 m rotor dia.	143
6	436634	5737306	15 MW 236 m rotor dia.	143
7	437399	5736770	15 MW 236 m rotor dia.	143
8	438165	5736235	15 MW 236 m rotor dia.	143
9	435437	5740483	15 MW 236 m rotor dia.	143
10	436203	5739948	15 MW 236 m rotor dia.	143
11	436968	5739412	15 MW 236 m rotor dia.	143
12	437733	5738876	15 MW 236 m rotor dia.	143
13	438498	5738340	15 MW 236 m rotor dia.	143
14	439264	5737804	15 MW 236 m rotor dia.	143
15	440029	5737268	15 MW 236 m rotor dia.	143
16	436537	5742053	15 MW 236 m rotor dia.	143
17	437302	5741517	15 MW 236 m rotor dia.	143
18	438067	5740982	15 MW 236 m rotor dia.	143
19	438832	5740446	15 MW 236 m rotor dia.	143
20	439598	5739910	15 MW 236 m rotor dia.	143
21	440363	5739374	15 MW 236 m rotor dia.	143
22	441128	5738838	15 MW 236 m rotor dia.	143
23	441893	5738302	15 MW 236 m rotor dia.	143
24	442659	5737767	15 MW 236 m rotor dia.	143
25	439166	5742551	15 MW 236 m rotor dia.	143
26	439931	5742015	15 MW 236 m rotor dia.	143
27	440697	5741480	15 MW 236 m rotor dia.	143
28	441462	5740944	15 MW 236 m rotor dia.	143
29	442227	5740408	15 MW 236 m rotor dia.	143
30	442993	5739872	15 MW 236 m rotor dia.	143
31	441031	5743585	15 MW 236 m rotor dia.	143
32	441796	5743049	15 MW 236 m rotor dia.	143
33	442561	5742514	15 MW 236 m rotor dia.	143
34	443326	5741978	15 MW 236 m rotor dia.	143
35	438014	5753578	15 MW 236 m rotor dia.	143
36	438769	5752988	15 MW 236 m rotor dia.	143
37	438394	5755621	15 MW 236 m rotor dia.	143
38	439149	5755031	15 MW 236 m rotor dia.	143
39	439904	5754441	15 MW 236 m rotor dia.	143
40	440660	5753851	15 MW 236 m rotor dia.	143
41	438775	5757664	15 MW 236 m rotor dia.	143
42	439530	5757074	15 MW 236 m rotor dia.	143
43	440285	5756484	15 MW 236 m rotor dia.	143
44	441040	5755895	15 MW 236 m rotor dia.	143
45	441795	5755305	15 MW 236 m rotor dia.	143
46	442550	5754715	15 MW 236 m rotor dia.	143
47	439155	5759708	15 MW 236 m rotor dia.	143
48	439910	5759118	15 MW 236 m rotor dia.	143
49	440666	5758528	15 MW 236 m rotor dia.	143
50	441421	5757938	15 MW 236 m rotor dia.	143

WTG-ID	Easting[1] [m]	Northing[1] [m]	Wind turbine model	Hub height [m MSL]
51	442176	5757348	15 MW 236 m rotor dia.	143
52	442931	5756758	15 MW 236 m rotor dia.	143
53	443686	5756168	15 MW 236 m rotor dia.	143
54	444441	5755578	15 MW 236 m rotor dia.	143
55	441046	5760571	15 MW 236 m rotor dia.	143
56	441801	5759981	15 MW 236 m rotor dia.	143
57	442556	5759391	15 MW 236 m rotor dia.	143
58	443311	5758801	15 MW 236 m rotor dia.	143
59	444066	5758212	15 MW 236 m rotor dia.	143
60	444821	5757622	15 MW 236 m rotor dia.	143
61	445576	5757032	15 MW 236 m rotor dia.	143
62	446331	5756442	15 MW 236 m rotor dia.	143
63	443692	5760845	15 MW 236 m rotor dia.	143
64	444447	5760255	15 MW 236 m rotor dia.	143
65	445202	5759665	15 MW 236 m rotor dia.	143
66	445957	5759075	15 MW 236 m rotor dia.	143
67	446712	5758485	15 MW 236 m rotor dia.	143
68	447467	5757895	15 MW 236 m rotor dia.	143
69	448222	5757305	15 MW 236 m rotor dia.	143
70	448602	5759349	15 MW 236 m rotor dia.	143
71	449358	5758759	15 MW 236 m rotor dia.	143
72	450113	5758169	15 MW 236 m rotor dia.	143

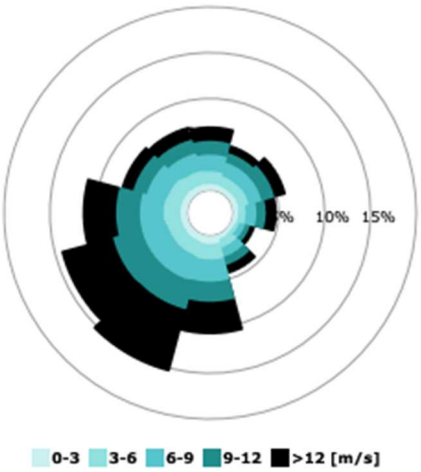
1. Co-ordinate system is UTM zone 30N ETRS89

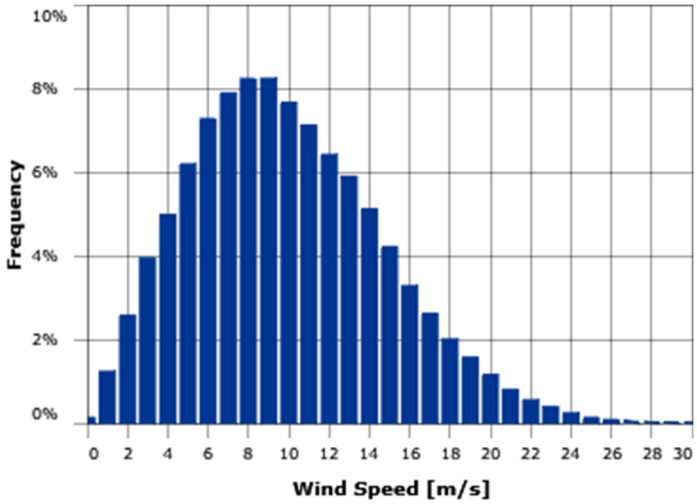
APPENDIX B: WIND CLIMATE

Table B-1 Long-term wind speed and frequency distribution at Five Estuaries site at 143 m MSL

Monthly and annual mean wind speeds

Month	Mean wind speed [m/s]	Valid wind speed data [months]	Valid direction data [months]
January	11.7	8.0	8.0
February	12.3	8.0	7.3
March	10.9	8.0	7.0
April	9.0	8.0	7.0
May	9.0	8.0	6.9
June	8.0	8.0	7.0
July	8.0	8.0	7.6
August	8.3	7.0	6.9
September	8.5	7.9	7.9
October	10.4	8.0	7.9
November	10.6	8.0	8.0
December	11.9	8.0	8.0
Annual	9.9		





APPENDIX C: ANALYSIS METHODOLOGY

C-1 Turbine interaction effects

Wind turbines extract energy from the wind and downstream there is a wake from the wind turbine where the wind speed is reduced. As the flow proceeds downstream, there is a spreading of the wake and the wake recovers towards free stream conditions. The wake effect loss is the aggregated influence on the energy production of the wind farm which results from the changes in wind speed caused by the impact of the turbines on each other. These effects are calculated using the WindFarmer computational model. The eddy viscosity model within WindFarmer is employed using a site specific definition of the turbulence intensity as an input, combined with a Large Wind Farm Wake Model correction, using offshore specific settings, developed by DNV /C1/, /C2/, /C3/.

In addition, turbine interaction includes lateral as well as upstream effects, which together contribute to a resistance, or blockage, on the wind flow, deflecting some of the flow above and around the wind farm. Consequently, the first-row turbines produce less than they each would operating in isolation. DNV has developed WindFarmer CFD.ML, a machine-learning based, surrogate model for DNV's state-of-the-art, high-fidelity CFD RANS model of wind farm flows, which is used to effectively model the impact of wind farm blockage /C4/.

C-2 References

/C1/ “WindFarmer 5, Theory Manual”, GL Garrad Hassan, January 2013.

/C2/ “WindFarmer 5, User Manual”, GL Garrad Hassan, January 2013.

/C3/ Schlez, W.; Neubert, A., " New Developments in Large Wind Farm Modelling", EWEC 2009, Marseilles, France.

/C4/ WindFarmer Documentation: CFD.ML Wake and Blockage Model https://myworkspace.dnv.com/download/public/renewables/windfarmer/manuals/latest/CalcRef/TurbineInteractions/CFDML/CFDML.html#overview-of-the-training-set

About DNV

DNV is the independent expert in risk management and assurance, operating in more than 100 countries. Through its broad experience and deep expertise DNV advances safety and sustainable performance, sets industry benchmarks, and inspires and invents solutions.

Whether assessing a new ship design, optimizing the performance of a wind farm, analyzing sensor data from a gas pipeline or certifying a food company's supply chain, DNV enables its customers and their stakeholders to make critical decisions with confidence.

Driven by its purpose, to safeguard life, property, and the environment, DNV helps tackle the challenges and global transformations facing its customers and the world today and is a trusted voice for many of the world's most successful and forward-thinking companies.