



Department for
Business, Energy
& Industrial Strategy

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

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1 Introduction

1.1 Background

- 1.1.1 Electricity generation from renewable sources of energy is an essential element of the transition to net zero. 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
- 1.1.2 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. 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.
- 1.1.3 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.
- 1.1.4 This NPS may be helpful to local planning authorities (LPAs) in preparing their local impact reports.

1.2 Role of this NPS in the wider planning system

- 1.2.1 In England and Wales this NPS may be a material consideration in decision making on 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 and will depend upon the extent to which the matters are already covered by applicable planning policy.
- 1.2.2 The Secretary of State may also receive applications for variations to existing consents for electricity generation infrastructure under section 36C of the Electricity Act 1989 for which this NPS may be a relevant consideration.
- 1.2.3 Paragraphs 1.2.3 and 4.4 of EN-1 provide details of how this NPS may be relevant to the decisions of the Marine Management Organisation (MMO) and

¹ <https://www.gov.uk/government/publications/modelling-2050-electricity-system-analysis>

how the Marine Policy Statement (MPS) may be relevant to the Secretary of State in decision making.

- 1.2.4 The MMO, as provided for in the Marine and Coastal Access Act 2009, will determine applications under section 36 and section 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.

1.3 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 to ensure our supply of energy always remains secure, reliable, affordable, and consistent with net zero emissions in 2050 for a wide range of future scenarios
- the need to meet our carbon budgets and Nationally Determined Contributions (NDCs), and support 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
- the key principles to be followed in the examination and determination of applications
- the role of the Appraisal of Sustainability (AoS) 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
- 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 Geographical coverage

- 1.4.1 This NPS, together with EN-1, is the primary decision-making policy document for the Secretary of State on nationally significant onshore renewable 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.
- 1.4.2 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).
- 1.4.3 In Scotland, the Secretary of State 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.
- 1.4.4 In Northern Ireland, planning consents for all nationally significant infrastructure projects are devolved to the Northern Ireland Executive, so the Secretary of State will not examine applications for energy infrastructure in Northern Ireland and the NPS will not apply there.

1.5 Period of validity and review

- 1.5.1 This NPS will remain in force in its entirety unless withdrawn or suspended in whole or in part by the Secretary of State. It will be subject to review by the Secretary of State to ensure that it remains appropriate. Information on the review process is set out in paragraphs 10 to 12 of the Annex to Communities and Local Government (CLG's) letter of 9 November 2009² and the Ministry for Housing, Communities and Local Government (MHCLG) guidance on Review of NPSs.³
- 1.5.2 For transitional provisions following review, see paragraph 1.6 of EN-1.

² <https://www.gov.uk/guidance/planning-guidance-letters-to-chief-planning-officers>

³ <https://www.gov.uk/guidance/planning-act-2008-guidance-on-the-process-for-carrying-out-a-review-of-existing-national-policy-statements>

1.6 Infrastructure covered by this NPS

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

- energy from biomass and/or waste (EfW) (>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)
- tidal stream (>100MW in England and >350MW in Wales)

1.6.2 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

1.6.3 This NPS does not cover onshore wind⁴. 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. 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.

1.7 Appraisal of Sustainability and Habitats Regulation Assessment⁵

1.7.1 All the energy NPSs have been subject to an Appraisal of Sustainability (AoS), as required by the Planning Act 2008. The AoSs also incorporate the analysis of likely significant environmental effects required by the Strategic Environmental Assessment (SEA) Regulations (The Environmental Assessment of Plans and Programmes) 2004.

1.7.2 The purposes and methods of the AoSs are explained in the draft of the AoS for EN-1 (AoS-1) which is published alongside this document. Their primary function is to inform consultation on the draft NPSs by providing an analysis of the environmental, social and economic impacts of implementing the energy NPSs. The key findings from AoS-1 are included in EN-1

⁴ Onshore wind farm planning applications are determined in accordance with the Town and Country Planning Act

⁵ Appraisal of Sustainability for the Revised Draft Electricity Networks available at <http://www.energynpsconsultation.decc.gov.uk>

1.7.3 In addition to those generic effects identified through the AoS and reported in AoS-1, a number of specific effects relating to EN-3 were identified, due to the type of technology promoted under this NPS.

1.7.4 Key points from the AoS for EN-3 (AoS-3) are:

- Renewable energy infrastructure development has similar effects to other types of energy infrastructure. Solar, biomass or energy from waste facilities will occupy land and as such potentially result in a whole range of terrestrial impacts. Offshore wind will, conversely, have impacts on marine and coastal environments.
- For the majority AoS objectives, the strategic effects of EN-3 are considered to match those identified in AoS-1.
- However, associated with additional detail provided about the Technologies in EN-3, non-generic effects were considered for eight AoS objectives (Carbon Emissions, Biodiversity, Water Environment, Landscape / Seascape, Air Quality, Health, Economy and Resources). The non-generic effects have been found to be generally negative across short, medium and long terms, though there are some elements of positivity in respect of the need to promote sustainable use of resources and natural assets.
- Consistency with the national target of reducing carbon emissions to Net Zero by 2050 is considered significantly negative over the short, medium and long terms for Energy from Waste, reflecting residual emissions from waste combustion plants, where carbon capture technologies are not used.
- Significant effects from renewable technologies can potentially affect biodiversity, landscape/ seascape, noise, commercial fishing, and commercial navigation routes. However, the effects are uncertain at this level of appraisal, as the actual effects are dependent on the sensitivity of the environment and the location and design of infrastructure.
- There are, however, a few positive specific effects associated with the technologies. Positive effects may occur on the fishing industry from offshore wind farms; on biodiversity from solar farms, where land is no longer managed intensively; on biodiversity from pumped hydro storage schemes, as a result of habitat creation and fish re-stocking; and on resources where residues from biomass or energy from plants can be recovered and re-used rather than being sent to landfill.
- Uncertainty is associated with this assessment, as at this level of appraisal, actual effects are dependent on the sensitivity of the environment and the location and design of infrastructure.

1.7.5 As required by the SEA Regulations, an assessment of reasonable alternatives has also been carried out in respect of EN-3. The alternative assessed against EN-3 was: only consent biomass or waste combustion plant with Combined Capture and Storage (CCS).

- 1.7.6 The key difference between this alternative and EN-3 would seem to be beneficial for the achievement of net zero, due to reduction of emissions from energy from waste and negative emissions through BECCS. This assessment is highly uncertain and would depend on what happens to the waste if not used within the power sector (as energy recovery from residual waste has a lower greenhouse gas impact than landfill) and the extent to which biomass may be more cost effective in decarbonising other sectors (such as heat and transport) over the long-term.
- 1.7.7 However, the use of carbon capture and storage with biomass and energy from waste could present a more sustainable alternative than the policies set out in EN-1 and EN-3, if implemented in a way which minimises unintended consequences. As set out in the Energy White Paper, published in December 2020, the government is 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. 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

Habitats Regulation Assessments

- 1.7.8 Habitats Regulation Assessments (HRA) have also been carried out and published for the non-locationally specific NPSs EN-1 to EN-5. As EN-1 to EN-5 do not specify locations for energy infrastructure, the HRA is a high-level strategic overview. Although the lack of spatial information within the EN-1 to EN-5 made it impossible to reach certainty on the effect of the plan on the integrity of any HRA Site, the potential for proposed energy infrastructure projects of the kind contemplated by EN-1 to EN-5 to have adverse effects on the integrity of such sites cannot be ruled out, based on following the precautionary principle. The HRA explains why the government considers that EN-1 to EN-5 are, nevertheless, justified by imperative reasons of overriding public interest, while noting that its conclusions are only applicable at the NPS level and are without prejudice to any project-level HRA, which may result in the refusal of consent for a particular application.

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 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.
- 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 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 significant need for new major energy infrastructure (see Section 3 of EN-1). EN-1 Section 3.3 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.
- 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 Secretary of State and others with background information on the criteria that applicants consider when choosing a site. 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 Secretary of State, following the general points set out in Section 4.1 of EN-1, will not grant consent in any given case. 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 for any proposed project located in Wales in relevant planning policy and advice issued by the

Welsh Assembly Government, will provide important information to applicants of nationally significant energy infrastructure projects (energy NSIPs). The Secretary of State 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 Secretary of State 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.

2.3 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 4.9 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 change, and that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime.

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:

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

2.3.4 Solar 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
- impact of higher temperatures

2.3.5 Offshore wind farms will not be affected by flooding, but applicants should particularly set out how the proposal would be resilient to storms.

- 2.3.6 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.

2.4 Consideration of “good design” for energy infrastructure

- 2.4.1 The Planning Act 2008 requires the Secretary of State to have regard, in designating an NPS, to the desirability of good design. Section 4.6 of EN-1 sets out the criteria for 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.

Biomass and Waste Combustion

2.5 Biomass and waste combustion: introduction

- 2.5.1 The combustion of biomass (fuels of recent biological origin as described in paragraph 2.6.1 below) 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.
- 2.5.2 In accordance with the waste hierarchy⁶, the recovery of energy from the combustion of waste, 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.
- 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
 - generate more than 50MW of electricity in England or 350MW in Wales.
- 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 4.7 of EN-1. Biomass generating stations should also be Carbon Capture Ready (CCR) and/or have Carbon Capture and Storage (CCS) technology applied.
- 2.5.5 Details of the government's policy on CCR and CCS is set out in Section 4.8 of EN-1. There is further information on CCR/CCS for biomass in this NPS.

2.6 Biomass and waste combustion impacts: fuels

- 2.6.1 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 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

⁶ 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.

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
- 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

2.6.2 The social, environmental and economic case for widespread deployment of biomass-fuelled plant depends on the sustainability of fuel used in it. The Renewables Obligation (RO)⁷, administered by the Office of Gas and Electricity Markets (Ofgem) and the Contracts for Difference (CfD) scheme are the main support mechanisms for renewable electricity in the UK. Further detail on the CfD scheme is set out in paragraph 2.4.2 in EN-1. In order 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.

2.6.3 The sustainability criteria include a minimum greenhouse gas (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. 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.

2.6.4 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 Secretary of State in deciding on any development consent applications. 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

⁷ The Renewables Obligations closed to all new generating capacity on 31 March 2017.
<https://www.ofgem.gov.uk/environmental-programmes/ro/about-ro/ro-closure>

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. The Secretary of State should therefore 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. 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. Where appropriate, the Secretary of State may include a requirement to this effect in the Development Consent Order (DCO).

- 2.6.5 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.
- 2.6.6 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 2.6.1. This may also include refuse derived fuel (RDF) and 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 Secretary of State should take account of any assessment in considering the application.
- 2.6.7 A proportion of the biodegradable waste may be classed as "renewable" for the purposes of Renewable Obligation Certificates (ROCs)⁸ eligibility and under the CfD scheme. However, this is not an issue of relevance to the Secretary of State.
- 2.6.8 All large installations are regulated by the Environment Agency (EA) or Natural Resources Wales (NRW) and must comply with strict emission limits set by the Environmental Permitting (England and Wales) Regulations 2016. Permits are not issued if the proposed installation will have unacceptable impacts on human health or the environment.

⁸ Definition of biomass in the Renewable Obligation Order 2009.

2.7 Biomass and waste combustion impacts: combustion plant types and scale

- 2.7.1 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 Secretary of State 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.
- 2.7.2 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.
- 2.7.3 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 2.5.2 above and in Section 3.3.33-4 of EN-1.

2.8 Biomass and waste combustion impacts: nature of applications

- 2.8.1 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
 - ancillary plant such as an electricity substation, civil engineering workshops and offices
- 2.8.2 Some development proposals may also incorporate additional features such as waste transfer facilities.
- 2.8.3 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 2011.

2.9 Biomass and waste combustion impacts: commercial aspects of waste combustion plant

- 2.9.1 Commercial issues are not likely to be an important matter for the Secretary of State's decision making, but are set out below to provide background on the considerations taken into account by applicants.
- 2.9.2 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.
- 2.9.3 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.

2.10 Biomass and waste combustion impacts: factors influencing site selection by applicants

- 2.10.1 Applicants should assure themselves that their applications satisfy the policies and considerations set out in Chapter 4 and Chapter 5 of EN-1, which detail the assessment principles and generic impacts in accordance with which applications relating to energy infrastructure are to be decided by the Secretary of State. Below is further guidance related to some specific considerations influencing site selection by applicants.

Grid connection

- 2.10.2 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.
- 2.10.3 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 EN-1 and EN-5.

Waste treatment capacity

- 2.10.4 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 municipal waste.
- 2.10.5 The proposed plant must not result in over-capacity of EfW waste treatment at a national or local level.

Transport infrastructure

- 2.10.6 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.
- 2.10.7 Government policy encourages multi-modal transport and the Secretary of State should expect materials (fuel and residues) to be transported by water or rail routes where possible (see Section 5.14 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 from the main highway network. If the 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.

Combined heat and power

- 2.10.8 The government's strategy for combined heat and power (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.
- 2.10.9 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 Secretary of State should seek further information from the applicant. 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 DTI9 in 2006.

Carbon capture readiness¹⁰

2.10.10 The government's policy and criteria on carbon capture readiness (CCR) for new combustion generating stations with a generating capacity at or over 300MW are set out in Section 4.8 of EN-1. They are relevant to proposed biomass plant at or over 300MW of generating capacity.

2.10.11 If an application does not demonstrate that CCR has been assessed according to this policy, the Secretary of State should seek further information from the applicant. The Secretary of State should not give development consent unless they are satisfied that the proposed development meets all the criteria for CCR set out in EN-1 and is, therefore, CCR.

2.10.12 The Secretary of State should impose requirements on any development 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
- submit update reports on the technical aspects of its CCR status to the Secretary of State. These reports should be required within three 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.

2.11 Biomass and waste combustion impacts: technical considerations for the Secretary of State

Flexibility in the project details

2.11.1 Generic information on flexibility is set out in Section 4.2 of EN-1. The Secretary of State should accept that biomass/waste combustion plant

⁹ 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.

¹⁰ 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.

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 Secretary of State, 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 4.2.6) 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 Secretary of State should allow for this uncertainty in its consideration of the application and consent.

2.12 Biomass and waste combustion: Secretary of State impact assessment principles

- 2.12.1 The Secretary of State should adhere to the following principles when examining and determining applications for biomass and relevant EfW infrastructure.
- 2.12.2 The impacts identified in Part 5 of EN-1 and this NPS are not intended to be exhaustive and the Secretary of State should therefore consider any impacts which they determine are relevant and important to its decision.

National designations

- 2.12.3 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 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 adverse effects on the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits.
- 2.12.4 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.

Green belts

- 2.12.5 Policy on energy infrastructure development in the green belt is set out in Section 5.11 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

- 2.12.6 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 Chapter 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).

2.13 Biomass and waste combustion impacts: air quality and greenhouse gas emissions

Introduction

- 2.13.1 Generic air emissions impacts other than CO₂ are covered in Section 5.2 of EN-1. In addition, there are specific considerations which apply to biomass and Energy from Waste (EfW) combustion plant as set out below.
- 2.13.2 Operational CO₂ emissions may be a significant adverse impact of biomass and EfW electricity generating stations. 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, therefore, 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.
- 2.13.3 In addition to the air quality legislation referred to in EN-1 (including the Environmental Permitting (England and Wales) Regulations 2016 (EPR) and the Air Quality Standards Regulations) the Waste Incineration Best Available Techniques (BAT) conclusions¹¹ are also relevant to waste combustion plant. This sets out specific emission limit values for waste combustion plants.

¹¹ Guidance for Best available techniques: environmental permits <https://www.gov.uk/guidance/best-available-techniques-environmental-permits>

Applicant's assessment

- 2.13.4 The applicant's ES 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).

Mitigation

- 2.13.5 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 Secretary of State does not need to consider equipment selection in its determination process.

Secretary of State decision making

- 2.13.6 Compliance with the EPR is enforced through the environmental permitting regime regulated by the Environment Agency (EA). Plants not meeting the requirements of the EPR would not be granted a permit to operate. The Secretary of State should refer to the policy in Section 4.11 of EN-1 relating to other regimes.
- 2.13.7 The pollutants of concern arising from the combustion of waste and biomass may include NO_x¹², SO_x¹³, NMVOCs¹⁴ 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.
- 2.13.8 Where a proposed waste combustion 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.
- 2.13.9 Similarly, where a proposed biomass combustion generating station meets the requirements of the EPR and relevant BAT conclusions and will not exceed the local air quality standards, the Secretary of State should not regard the proposed biomass infrastructure as having adverse impacts on health.

¹² Nitrogen oxides

¹³ Sulphur oxides.

¹⁴ Non-Methyl Volatile Organic Compounds

2.14 Biomass and waste combustion impacts: landscape and visual

Introduction

- 2.14.1 Generic landscape and visual effects are covered in detail in Section 5.10 of EN-1. This includes specific policy guidance for developments proposed within nationally designated landscapes. In addition, there are specific considerations which apply to biomass / waste combustion generating stations as set out below.
- 2.14.2 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 and quality.

Applicant's assessment

- 2.14.3 An assessment of the landscape and visual effects of the proposed infrastructure should be undertaken in accordance with the policy set out in 5.10 of EN-1.

Secretary of State decision making

- 2.14.4 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. 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.
- 2.14.5 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. Development proposals should consider the design of the generating station, including the materials to be used in the context of the local landscape character.
- 2.14.6 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.
- 2.14.7 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. 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.¹⁵

2.15 Biomass and waste combustion impacts: noise and vibration

Introduction

2.15.1 Generic noise and vibration impacts are covered in detail in Section 5.12 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:

- 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
- the external noise sources such as externally-sited air-cooled condensers that operate continuously during normal operation

Applicant's assessment

2.15.2 The ES should include a noise assessment of the impacts on amenity in case of excessive noise from the project as described in Section 5.12 in EN-1.

Mitigation

2.15.3 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.

2.15.4 Noise from features including sorting and transport of material during operation of biomass or EfW generating stations is unavoidable. Similarly,

¹⁵ Such as the 10 characteristics of good design which are set out in the National Design Guide <https://www.gov.uk/government/publications/national-design-guide> and the draft National Model Design Code and guidance notes <https://www.gov.uk/government/consultations/national-planning-policy-framework-and-national-model-design-code-consultation-proposals>

noise from apparatus external to the main generating station may be unavoidable. This can be mitigated through careful plant selection.

Secretary of State decision making

- 2.15.5 The Secretary of State should consider the noise and vibration impacts according to Section 5.12 in EN-1. It should be satisfied that noise and vibration will be adequately mitigated through requirements attached to the consent. The Secretary of State will need to take into consideration the extent to which operational noise will be separately controlled by the EA.
- 2.15.6 The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the aims set out in paragraph 5.12.10 of EN-1.

2.16 Biomass and waste combustion impacts: odour, insect and vermin infestation

Introduction

- 2.16.1 Generic impacts of dust, odour, artificial light, smoke, steam and insect infestation are set out in EN-1 Section 5.7. 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

- 2.16.2 The applicant should assess the potential for insect 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.

Mitigation

- 2.16.3 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.
- 2.16.4 To minimise potential for infestation, the time between reception, processing and combustion of waste may be limited by consent requirements.

Secretary of State decision making

- 2.16.5 The Secretary of State should satisfy itself that the proposal sets out appropriate measures to minimise impacts on local amenity from odour, insect and vermin infestation.

2.17 Biomass and waste combustion impacts: waste management

Introduction

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

- 2.17.3 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.
- 2.17.4 The application 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.
- 2.17.5 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.
- 2.17.6 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 Secretary of State.

Secretary of State decision making

2.17.7 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. 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. The Secretary of State should also consider whether a requirement, including monitoring, is appropriate to ensure compliance with the waste hierarchy.

2.18 Biomass and waste combustion impacts: residue management

Introduction

2.18.1 Generic waste management impacts are set out in Section 5.15 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.

2.18.2 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
- 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

2.18.3 The two residues from waste combustion generating stations cannot be mixed; they must be disposed of separately, under different regimes.

2.18.4 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.

- 2.18.5 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.
- 2.18.6 Waste management is covered in the Environmental Permit for operation of waste or biomass generating stations. (See Section 5.15 of EN-1.)

Applicant's assessment

- 2.18.7 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.
- 2.18.8 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.

Mitigation

- 2.18.9 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 Secretary of State 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.

Secretary of State decision making

- 2.18.10 The Secretary of State should consult the EA on the suitability of the proposals.
- 2.18.11 When the Secretary of State 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 from the need for residue disposal as well as other factors.
- 2.18.12 The Secretary of State should be satisfied that management plans for residue disposal satisfactorily minimise the amount that cannot be used for commercial purposes. The Secretary of State should give substantial positive weight to development proposals that have a realistic prospect of recovering residues.
- 2.18.13 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.

2.19 Biomass and waste combustion impacts: water quality and resources

Introduction

2.19.1 Generic water quality and resource impacts are set out in Section 5.16 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. 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
- the discharging of water containing chemical anti-fouling treatment for use in cooling systems may have adverse impacts on aquatic biodiversity

Applicant's assessment

2.19.2 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.

Mitigation

2.19.3 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.

Secretary of State decision making

- 2.19.4 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 EN-1.

Offshore Wind

2.20 Offshore wind: introduction

- 2.20.1 The government expects that offshore wind (including floating wind) will play a significant role in decarbonising the energy system and has set an ambitious target to have 40 GW of offshore wind capacity (including 1 GW 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 by 2050¹⁶.

2.20.2 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 2004¹⁷.

2.20.3 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 (fixed bottom or floating), onshore and offshore substations, anemometry masts, accommodation platforms and cabling.

2.20.4 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.

2.20.5 The applicant should identify the impacts of a proposal and these impacts, together with proposals for their avoidance, minimisation, mitigation, or compensation, should be set out in an Environmental Statement (ES) and

¹⁶ The Climate Change Act 2008 (2050 Target Amendment) Order 2019

¹⁷ 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.

Report to Inform Appropriate Assessment (if there are likely significant effects upon a protected site within the national site network) that should accompany each project application. The policy on ESs, HRAs and MCZ assessments is set out in Sections 4.2 and 5.4 of EN-1.

2.21 Offshore wind: offshore consenting process

Development Consent Order

- 2.21.1 A DCO is granted by the Secretary of State for developments over 100 MW in English waters and for developments over 350 MW in Welsh waters. Welsh Ministers are responsible for granting consent for developments up to 350 MW in Wales and in Welsh waters. Under Section 35 of the Planning Act 2008, the Secretary of State may also give a direction that other energy projects in English waters be treated as developments for which development consent is required.
- 2.21.2 The DCO provides permission to develop an offshore wind farm under the Planning Act 2008. Any DCO granted by the Secretary of State will include provision deeming the grant of a Marine Licence for operations carried out wholly in England and English waters. It is not possible to deem a Marine Licence as part of the DCO in Wales or Welsh waters.

Marine Licence

- 2.21.3 A Marine Licence is primarily concerned with the need to protect the environment and human health and to prevent interference with other legitimate uses of the sea.
- 2.21.4 Marine Licences are required for all the marine elements of a proposed wind development (up to Mean High Water Springs), including associated development such as the cabling and any offshore substations that are required.
- 2.21.5 The MMO is responsible for the enforcement and ongoing management of licence conditions, for operations carried out in English 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 or Welsh ministers have functions). Welsh ministers are responsible for marine licences for operations carried out in both inshore and offshore Welsh waters, under the Wales Act 2017. NRW are responsible for issuing, enforcing and ongoing management of the marine licence in Welsh waters. Further information on marine licence considerations are provided in paragraph 1.2.3 of EN-1.
- 2.21.6 The Secretary of State should liaise closely with the MMO on the proposed terms of any deemed marine licence.

2.22 Offshore wind: factors influencing site selection and design by applicant

Strategic Environmental Assessment

- 2.22.1 Through a series of Offshore Energy Strategic Environmental Assessments (SEAs), the government has assessed the environmental implications and spatial interactions of plans/ programmes for the expansion of offshore wind in the relevant parts of the UK Exclusive Economic Zone and the territorial waters of England and Wales. These assessments have reflected government policy on reducing greenhouse gas emissions, technological advances and the increasing offshore wind generation capacity, and devolution. In the light of the SEA processes, consultation responses and other available information, the government concluded that there were no overriding environmental considerations to prevent the achievement of the plans/programmes for offshore wind if measures were implemented to prevent reduce and offset significant adverse effects.
- 2.22.2 The next Offshore Energy SEA (OESEA4, anticipated to go to public consultation in late 2021) is expected to reflect the Energy White Paper “Powering our Net Zero Future” of December 2020¹⁸ and contribute to the UK target of up to 40GW of offshore wind generation capacity deployed by 2030 (including 1GW of floating offshore wind). The offshore wind technologies will include fixed and floating foundations and this will require careful, site-specific evaluation through the planning process.
- 2.22.3 The government is undertaking a rolling Offshore Energy SEA programme, including a research programme¹⁹ and data collection to facilitate future assessments. These future Offshore Energy SEAs and data will be relevant to applicants and to the Secretary of State when they become available.
- 2.22.4 Applicants should set out how they have drawn on the government’s Offshore Energy SEA in making their site selection.

Marine planning

- 2.22.5 Marine planning 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. Marine plans provide a transparent framework for consistent, evidence-based decision making and should be used by applicants to guide site selection. Marine plans will help applicants understand generic potential impacts of their proposal at an early

¹⁸ <https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future>

¹⁹ <https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-research-projects>

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.

Seabed leasing

- 2.22.6 The Crown Estate owns virtually the entire seabed out to the 12 nm territorial limit in England, Wales and Northern Ireland, including the rights to explore and utilise the natural resources of the UKCS (excluding oil, gas and coal). Therefore, it is necessary to obtain a lease 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 12 nm, the Energy Act 2004 gives The Crown Estate rights to issue licences for development beyond the territorial limit and within the REZ.
- 2.22.7 The Crown Estate Act 1961, section 1(3) states that, with regard to property and land, The Crown Estate commissioners must “maintain and enhance [The Crown Estate’s] value and the return obtained from it, but with due regard to the requirements of good management”.
- 2.22.8 The Crown Estate identifies potential development areas in accordance with the requirements of the Crown Estate Act 1961, other relevant legislation, government policy, plans and associated SEA work. The Crown Estate issues leases for offshore wind farms in tendering rounds. 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. The Crown Estate may also grant capacity extensions to existing wind farm leases, again in accordance with the above, and subject to applicants obtaining necessary consents. There are seven extension projects which have been granted development rights in the most recent extensions round.
- 2.22.9 Each of the leasing rounds was supported by a plan level HRA, which assessed the impact of the leasing round on protected sites. 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. 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 plan-level.
- 2.22.10 For the 4th leasing round, The Crown Estate undertook a tender process which selected six proposed new offshore wind projects in waters around England and Wales, to progress to a plan level HRA. Competent bidders were offered the opportunity to identify and propose project sites within four areas of seabed which were made available by The Crown Estate after extensive seabed analysis and consultation with stakeholders. Future offshore

development may occur in rounds, as piecemeal development or using any other development mechanism as required.

2.22.11 The Crown Estate has announced it is commencing work to design and deliver a new leasing opportunity for early commercial-scale floating wind projects in the Celtic Sea as part of The Crown Estate's commitment to enabling projects that can help deliver the government's 1 GW of floating wind by 2030 target.

Wind resource

2.22.12 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

2.22.13 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.

2.22.14 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 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.

Grid connection

2.22.15 As identified in EN-1, (paragraphs 3.3.51 - 3.3.58 and Section 4.10), it is expected that a more co-ordinated approach to transmission from multiple offshore windfarms to onshore networks will be adopted, compared with a radial connection approach for single windfarm projects. This will include connections via multi-purpose interconnectors (MPIs), which combine the connection of offshore wind with the function of market to market interconnectors.

2.22.16 It is expected that an increased number of proposals for transmission will be consented separately to those for the windfarm application. For some windfarm projects, the grid connection proposals in the application will therefore comprise an offshore grid connection to a transmission network taking power to shore or with an MPI.

2.22.17 MPIs can allow power flows from windfarms to two or more countries. They can be instrumental in providing the grid flexibility needed for the increased deployment of intermittent offshore renewable generation and its likely future export. They limit the need to curtail offshore wind generation when domestic demand has been met. MPIs can facilitate the transmission of offshore wind generation to shore and support the coordination of offshore infrastructure.

2.22.18 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 is a licensed activity regulated by Ofgem. Applicants must also follow the cable route protocol required by The Crown Estate²⁰.

Other offshore infrastructure

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

2.22.20 UKCS is a vital resource for the UK as it makes progress towards its net zero commitments. Decarbonising power generation and key industrial processes will increase demand on the UKCS from a range of sectors. The occurrence of competition 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. Prior to the submission of any DCO application involving the development of the seabed, applicants such as offshore wind developers should ensure via engagement with The Crown Estate that 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. Where applicable, the creation of statements of common ground between developers is recommended, including any evidence as to how potential conflicts might be mitigated. 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.

National designations

2.22.21 In sites with nationally recognised designations (SSSIs, National Nature Reserves, National Parks, the Broads, Areas of Outstanding Natural Beauty, Registered Parks and Gardens, and Marine Conservation Zones), 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

²⁰ The Crown Estate, 2019, Plan-Level Habitats Regulations Assessment for the 2017 Offshore Wind Farm Extensions, Cable Route Protocol

the qualities for which the area has been designated are clearly outweighed by the environmental, social and economic benefits. The Secretary of State should have regard to the aims and goals of the government's 25 Year Environment Plan²¹ and other existing and future measures and targets in England, including under the new strategy for nature.

- 2.22.22 The UK has a commitment to protect the marine environment with a network of well managed MPAs. MCZs together with HRA sites and marine elements of SSSIs form an ecologically coherent network of MPAs. Authorities with decision making powers must assess the impact, either alone or in combination, on designated sites of any plans or projects before consenting them. Therefore, applicants will need to consider whether their proposal will impact an MPA. Full details are provided in Sections 4.2 and 5.4 of EN-1.
- 2.22.23 Given the level of deployment required to meet 2030 and 2050 targets, it is likely that applicants will need to consider closely the levels of mitigation and/or compensation (both individually and in combination with other plans or projects) which may be needed to approve their projects. It is likely that this consideration may need to include proactive measures to reduce the impact of deployment e.g., noise abatement technology, collision avoidance methods, or compensation for habitat loss.
- 2.22.24 Applicants should always employ the avoid, mitigate, compensate hierarchy to avoid as far as possible the need to find compensatory measures for offshore developments affecting MPAs. 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 mitigate and reduce impacts should be employed for example using alternative piling or trenching techniques. Once all feasible alternatives and mitigation measures have been employed, applicants should explore possible compensatory measures to make good any adverse effects site integrity. Advice on such measures should be sought from the Statutory Nature Conservation Bodies and Defra at the earliest opportunity. Further details on compensation are provided in paragraphs 2.24.14 – 2.24.19 of this NPS and paragraphs 4.2.9 – 4.2.13 of EN-1.

Green belts

- 2.22.25 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

²¹ <https://www.gov.uk/government/publications/25-year-environment-plan>

the green belt. The policy on development in the green belt is set out in Section 5.11 of EN-1.

Other locational considerations

2.22.26 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 Section 3 of EN-1, the Secretary of State is not required to 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).

2.22.27 Where a number of offshore wind farms, or other developments or activities, have been proposed within an identified zone, applicants are also encouraged to consider working collaboratively with those other developers and sea users on shared mitigation, compensation and monitoring where appropriate.

2.22.28 The applicant will also need to assess impacts on civil and military radar and other aviation and defence interests (Section 5.5 of EN-1).

2.23 Offshore wind: technical considerations for the Secretary of State

Grid connection and onshore infrastructure

2.23.1 When considering grid connection issues, the Secretary of State should be mindful of the requirements of the regulatory regime for offshore transmission networks. As co-ordinated offshore transmission development will sometimes occur separate to that for wind farm development²², it is expected that usually an initial agreement will be reached regarding connection with the offshore transmission network operator or owner and/ or connection into the onshore transmission network. However, it is recognised that at the time of the application, this agreement may not have been finalised.

2.23.2 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 developer 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. The applicant should assess the effects of the cable and any associated infrastructure on the marine and coastal environment. Where the applicant does not know the precise location of the transmission cable connection to the offshore connection point or the

²² 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).

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. The ES for the proposed project should assess the effects of including this infrastructure within that corridor. Applicants must also follow the cable route protocol required by The Crown Estate.

- 2.23.3 All 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. Applicants should include details on how avoidance has been achieved, good design principles followed, proposals for mitigation and how environmental net gain will be achieved (as set out in the 25 Year Environment Plan). Further information is provided in Sections 4.2, and 4.4 – 4.6 of EN-1.
- 2.23.4 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)²³. 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. However, transmission to shore will become increasingly co-ordinated with other wind farms and offshore infrastructure, and in these cases may be consented separately to the wind farm(s).
- 2.23.5 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

- 2.23.6 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, possibly including:
- the precise location and configuration of turbines and associated development
 - the foundation type and size
 - the installation technique or hammer energy

²³ Guidance on associated development:
[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](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).

- the exact turbine tip height and rotor swept area
- the cable type and precise cable route
- the exact locations of offshore and/or onshore substations

2.23.7 In accordance with Section 4.2 of EN-1, the Secretary of State 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, 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 4.2.6) to ensure that the project as it may be constructed has been properly assessed (the Rochdale Envelope)²⁴. In this way the maximum adverse case scenario will be assessed and the Secretary of State should allow for this uncertainty in its consideration of the application and consent. See also paragraph 2.29.2 in relation to ornithological headroom.

Micrositing and microrouting

2.23.8 Any consent that is granted by the Secretary of State should be flexible to allow for necessary micrositing/microrouting 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.

2.23.9 Where micrositing/microrouting tolerance is requested by the applicant in any consent, given that the ES should assess a maximum adverse case scenario, the assessment should reflect the implications of any micrositing/microrouting as far as reasonably possible. The Secretary of State must be satisfied that there is sufficient space to microsite/microroute for any proposal to be acceptable as mitigation (e.g. any feature to avoid must not cover the full width of the assessed cable corridor).

Extensions

2.23.10 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. Following a

²⁴ Case law (for example Rochdale MBC Ex. Parte C Tew [2000] Env LR 1) 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.

plan level HRA, there are seven extension projects which have been granted development rights in the most recent extensions round.

2.23.11 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.

2.23.12 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.

Repowering

2.23.13 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.

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

Future monitoring

2.23.15 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, require the applicant to undertake environmental monitoring (e.g., ornithological surveys, geomorphological surveys) prior to and during construction and operation. Monitoring will measure and document the effects of the development and the efficacy of any associated mitigation or compensation. This enables an assessment of the accuracy of the original predictions and improves the evidence base for future mitigation and compensation measures enabling better decision-making in future EIAs and HRAs. The Secretary of State may consider that monitoring of any impact is appropriate. Monitoring should be presented in formal reports which must be made publicly available.

Decommissioning

2.23.16 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.

2.23.17 Where the Secretary of State decides to grant development consent for a proposed offshore wind farm, the Secretary of State should include a condition requiring the applicant to submit a decommissioning programme to the Secretary of State before any offshore construction works begin should be included. The decommissioning programme must satisfy the requirements of s.105(8) of the Energy Act 2004 and follow relevant guidance²⁵.

Environmental net gain

2.23.18 Environmental net gain is an approach to development that aims to leave the natural environment in a measurably better state than beforehand. Biodiversity net gain is an essential component of environmental net gain. Projects should consider and seek to incorporate improvements in natural capital, ecosystem services and the benefits they deliver when planning how to deliver biodiversity net gain. Biodiversity net gain is addressed in Section 4.5 of EN-1. The applicant should demonstrate that they have considered how their proposal can contribute towards biodiversity net gain in line with the ambition set out in the 25 Year Environment Plan.

Impact assessment principles

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

2.24 Offshore wind impacts: biodiversity

Introduction

2.24.1 Impacts on the physical environment may have indirect effects on marine biodiversity. Generic ecology and biodiversity effects are covered in detail in Section 5.4 of EN-1. The coastal change policy in Section 5.6 of EN-1 may also be relevant. In addition, there are specific considerations which apply to offshore wind energy infrastructure proposals as discussed below.

Biodiversity considerations to which applicants and the Secretary of State should have regard concerning offshore infrastructure include:

- fish

²⁵ <https://www.gov.uk/government/publications/decommissioning-offshore-renewable-energy-installations>

- seabed habitats and species (intertidal and subtidal)
 - marine mammals
 - birds
- 2.24.2 These considerations are described in Sections 2.26 – 2.30 by reference to both species and habitats, with impacts on the physical environment covered in Section 2.25.
- 2.24.3 Effects on commercial fish stocks are covered in Section 2.31.
- 2.24.4 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. 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 some species and habitats, leading to the requirement for both mitigation and compensation for effects to be acceptable.

Applicant's assessment

- 2.24.5 Assessment of impacts on offshore ecology, biodiversity and the physical environment 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, HRAs and MCZ assessments (Sections 4.2 and 5.4 of EN-1). Applicants will also need to consider environmental net gain as set out in the 25 Year Environment Plan (Section 4.5 of EN-1).
- 2.24.6 Consultation on the assessment methodologies, baseline data collection, and potential mitigation and compensation options should be undertaken at early stages with the statutory consultees as appropriate.
- 2.24.7 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. Reference must be made to relevant scientific research and literature. A range of research programmes are ongoing to investigate impacts of offshore wind farm development, including, but not

limited to: BEIS SEA Research Programme²⁶, ORJIP²⁷, ScotMER²⁸, the ORE Catapult²⁹ and OWEC³⁰.

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

2.24.9 Applicants are expected to have regard to guidance issued in respect of Marine Licence requirements.

Mitigation and monitoring

2.24.10 Mitigation will be possible in the form of careful design of the development itself and the construction techniques employed. General mitigation requirements and considerations are set out in Section 5.4 of EN-1.

2.24.11 Ecological monitoring will be appropriate 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. 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. 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 developer requirements.

Compensation

2.24.12 With increasing deployment of offshore wind farms, cumulative environmental impacts upon HRA sites and MCZs may not be able to be addressed by mitigation alone, therefore compensation measures may be required where adverse effects on site integrity and/or on conservation objectives cannot be ruled out. In such cases, derogation for Imperative Reasons of Overriding Public Interest (IROPI) and associated compensatory measures under the Habitats Regulations, or derogation where the benefit to the public clearly outweighs the risk of damage to the environment and associated measures of equivalent environmental benefit (MEEB) under Marine and Coastal Access Act, may be necessary to allow deployment to continue.

2.24.13 As set out in EN-1 (paragraphs 4.2.9 - 4.2.13) as a general principle, development should at the very least aim to avoid significant impacts to protected sites, including through mitigation and consideration of reasonable

²⁶ <https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-research-projects>

²⁷ <http://www.orjip.org.uk/>

²⁸ <https://www.gov.scot/policies/marine-renewable-energy/science-and-research/>

²⁹ <https://ore.catapult.org.uk/>

³⁰ <https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/energy/offshore-wind-a-sustainable-future/>

alternatives. Where such a significant impact cannot be avoided then appropriate compensation measures should be sought. In instances where the HRA determines that an energy infrastructure development proposal will result in significant adverse effects to a protected site, then the applicant should propose compensatory measures that compensate for those adverse effects identified.

- 2.24.14 If, during the pre-application stage, statutory nature advisors 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. Where such an indication is given later in the development consent process, the applicant should provide such information as soon as reasonably practical. This information includes, assessment of alternative solutions, a case for IROPI (or that the benefit to the public clearly outweighs the risk of damage to a MCZ) and appropriate securable environmental compensation. 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 'without prejudice' to the Secretary of State's final decision on the impacts of the potential development. 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.
- 2.24.15 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. Applicants should work with statutory nature conservation advisors and Defra to develop a compensation plan for all protected sites adversely affected by the development and include this plan with their application to the Secretary of State.
- 2.24.16 Where several developers are likely to have cumulative impacts on the same species or feature it may be appropriate to collaborate with each other on compensation measures. Applicants may also want to coordinate with other marine industry sectors also needing to find compensatory measures. Defra will be publishing guidance imminently to help applicants consider how compensation should be developed.
- 2.24.17 For many of the following 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.

Secretary of State decision making

- 2.24.18 The Secretary of State should consider the effects of a proposal on marine ecology, biodiversity and the physical environment taking into account all relevant information made available. The Secretary of State should be satisfied that the applicant has used up to date research within their assessment (for example, using results from scientific peer reviewed papers and the programmes listed in paragraph 2.24.7) and assessed through HRA/MCZ processes, the impact on any protected species or habitats.
- 2.24.19 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, where adverse effects on site integrity/conservation objectives are predicted, in coming to a decision, the Secretary of State should consider the extent to which the effects are temporary or reversible and the timescales for recovery.

2.25 Offshore wind impacts: physical environment

Introduction

- 2.25.1 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:
- 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 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.

Applicant's assessment

- 2.25.2 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 and how that might impact sensitive species and habitats.
- 2.25.3 Geotechnical investigations should form part of the assessment as this will enable design of appropriate construction techniques to minimise any adverse effects.

Mitigation

- 2.25.4 The Secretary of State should expect applicants to have considered the best ecological outcomes in terms of potential mitigation. These might include 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. Applicants should consult the statutory consultees on appropriate mitigation and monitoring.

Secretary of State decision making

- 2.25.5 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 Secretary of State should refer to relevant sections of this NPS and EN-1.
- 2.25.6 The Secretary of State 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.

2.26 Offshore wind impacts: fish

Introduction

- 2.26.1 Fish in the context of this NPS also includes elasmobranchs (sharks and rays) and shellfish (e.g., crabs). 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. 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.

Applicant's assessment

2.26.2 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
- protected areas (e.g. HRA sites and MCZs)

2.26.3 The assessment should also identify potential implications of underwater noise from construction and unexploded ordnance (both sound pressure and particle motion) and EMF on sensitive fish species.

Mitigation

2.26.4 Review of up-to-date research should be undertaken and all potential mitigation options presented. 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. 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. It is unknown whether exposure to multiple cables and larger capacity cables may have a cumulative impact on sensitive species. Therefore monitoring EMF emissions may provide the evidence to inform future EIAs. In the case of floating wind, the cables may hang freely in the water and thus potentially require alternative monitoring and mitigation.

2.26.5 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.

Secretary of State decision making

2.26.6 The use of rock armouring as mitigation does have advantages in reducing electromagnetic fields (EMF) for individual cables on fish species. However, the Secretary of State should also consider any negative impacts from rock armouring on benthic habitats and a balance between protection of various receptors must be made, with all mitigation and alternatives to rock armouring reviewed.

2.27 Offshore wind impacts: intertidal habitats and species

Introduction

- 2.27.1 The intertidal zone is the area between mean high water and mean low water. Intertidal habitat and ecology are often recognised through statutory nature conservation designations.
- 2.27.2 Export cable routes will cross the intertidal zone resulting in habitat loss, and temporary disturbance of intertidal flora and fauna.

Applicant's assessment

- 2.27.3 An assessment of the effects of installing cable across the intertidal zone should follow The Crown Estate's cable route protocol 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
 - Protected sites (e.g. HRA sites, MCZs and SSSIs)

Mitigation

- 2.27.4 Effects on intertidal habitat cannot be avoided entirely. Review of up-to-date research should be undertaken and all potential mitigation options presented. Landfall and cable installation and decommissioning methods should be designed appropriately to minimise effects on intertidal habitats, taking into account other constraints. Where applicable, use of horizontal directional drilling (HDD) should be considered as a method to avoid impacts on sensitive habitats and species.
- 2.27.5 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 zone are minimised and installation and decommissioning phases are coordinated to ensure that disturbance is also reasonably minimised. As

identified in EN-1, (paragraphs 3.3.50 - 3.3.58 and Section 4.10), it is expected that a more co-ordinated approach to transmission from multiple offshore windfarms to onshore networks will be adopted in the future, compared with a radial connection approach for single windfarm projects. This will include connection with multi-purpose interconnectors (MPIs).

Secretary of State decision making

- 2.27.6 The conservation status of intertidal habitat is of relevance to the Secretary of State.
- 2.27.7 The Secretary of State should be satisfied that cable installation and decommissioning has been designed sensitively, taking into account intertidal habitats.

2.28 Offshore wind impacts: marine mammals

Introduction

- 2.28.1 Construction activities, including installing wind turbine foundations by pile driving, geophysical surveys, and clearing the site and cable route of unexploded ordnance (UXOs) may reach noise levels which are high enough to cause disturbance, injury, or even death to marine mammals. All marine mammals are protected under Part 3 of the Habitats Regulations. In addition, whales, dolphins and porpoises (collectively known as cetaceans) are legally protected species. Therefore, 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), an application will have to be made for a wildlife licence³¹ to allow the activity to take place.
- 2.28.2 The development of offshore wind farms can also impact fish species, which can have indirect impacts on marine mammals if those fish are prey species. There is also the risk of collision with construction and maintenance vessels and potential entanglement risks from floating wind structures.

Applicant's assessment

- 2.28.3 Where necessary, assessment of the effects on marine mammals should include details of:
- likely feeding areas and impacts on prey species and prey habitat
 - known birthing areas / haul out sites for breeding and pupping
 - migration routes

³¹ <https://www.gov.uk/guidance/understand-marine-wildlife-licences-and-report-an-incident>

- protected areas (e.g. HRA sites and SSSIs)
- 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
- barrier risk

2.28.4 The scope, effort and methods required for marine mammal surveys should be discussed with the relevant statutory nature conservation body.

2.28.5 The applicant should discuss any proposed noisy activities with the relevant body and must reference the JNCC underwater noise guidance³² in relation to noisy activities (alone and in-combination with other plans or projects) within HRA sites. Where assessment shows 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 2.28.1 above, the applicant should look at possible alternatives or appropriate mitigation (detailed below).

Mitigation

2.28.6 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.

2.28.7 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.

2.28.8 Where noise impacts cannot be reduced to acceptable levels, other mitigation should be considered, including spatial/temporal restrictions on noisy activities, alternative foundation types, alternative installation methods and noise abatement technology. Review of up-to-date research should be undertaken and all potential mitigation options presented.

³² <https://hub.jncc.gov.uk/assets/2e60a9a0-4366-4971-9327-2bc409e09784>

Secretary of State decision making

2.28.9 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. Unless suitable noise mitigation measures can be imposed by requirements to any development consent the Secretary of State may refuse the application.

2.28.10 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.

2.29 Offshore wind impacts: birds

Introduction

2.29.1 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
- 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
- protected sites (e.g. SPAs)

2.29.2 Currently, cumulative impact assessments for ornithology are based on the consented Rochdale Envelope parameters of projects, rather than the 'as-built' parameters, which may pose a lower risk to birds. The Secretary of State will therefore require any consents to include provisions to define the final 'as built' parameters (which may not then be exceeded) so that these parameters can be used in future cumulative impact assessments. In parallel we will look to explore opportunities to reassess ornithological impact assessment of historic consents to reflect their 'as built' parameters. Any ornithological 'headroom' between the effects defined in the 'as built' parameters and Rochdale Envelope parameters can then be released. We will also consider the potential applicability of these principles to other consent parameters.

Applicant's assessment

- 2.29.3 The scope, effort and methods required for ornithological surveys should be discussed with the relevant statutory advisor, taking into consideration baseline and monitoring data from operational windfarms.
- 2.29.4 Collision risk modelling, as well as displacement and population viability assessments must be undertaken 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. Assessments should cover all aspects included in paragraph 2.29.1 above.

Mitigation

- 2.29.5 Review of up-to-date research should be undertaken 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.
- 2.29.6 Subject to other constraints, wind turbines should be laid out within a site, in a way that minimises collision risk. 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).
- 2.29.7 Construction vessels associated with offshore wind farms should, where practicable and compatible with operational requirements and navigational safety, avoid rafting seabirds during sensitive periods and follow agreed navigation routes to and from the site.
- 2.29.8 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.

Secretary of State decision making

- 2.29.9 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.
- 2.29.10 The conservation status of seabirds are 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.

2.30 Offshore wind impacts: subtidal habitats and species

Introduction

- 2.30.1 The subtidal zone is the area below low water springs which remains submerged at low tide. Subtidal habitat and ecology are often recognised through statutory nature conservation designations. Offshore wind construction and maintenance activities can cause loss and temporary disturbance of subtidal habitat and benthic ecology.

Applicant's assessment

- 2.30.2 The applicant should follow The Crown Estate's cable route protocol. 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 export cable routes and installation/maintenance methods, including predicted loss of habitat due to predicted scour and scour protection
- habitat disturbance from construction and maintenance/repair vessels' extendible 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
- potential impacts from EMF on benthic fauna
- impacts on protected sites (e.g. HRA sites and MCZs)

Mitigation

- 2.30.3 Construction, maintenance and decommissioning methods should be designed appropriately to minimise effects on subtidal habitats, taking into account other constraints. Review of up-to-date research should be undertaken and all potential mitigation options presented. Mitigation measures which the Secretary of State should expect the applicants to have considered may include:

- surveying and micrositing or re-routing of the export and inter-array cables to avoid adverse effects on sensitive 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
- the use of anti-fouling paint might be minimised on subtidal surfaces, to encourage species colonisation on the structures

2.30.4 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. As identified in EN-1, (paragraphs 3.3.50 - 3.3.58 and Section 4.10) and EN-5 (Section 2.5), it is expected that more co-ordinated approaches to transmission from multiple offshore windfarms to onshore networks will be adopted, compared with a radial connection approach for single windfarm projects. This will include connection with multi-purpose interconnectors (MPIs).

Secretary of State decision making

- 2.30.5 The conservation status of subtidal habitat and species are of relevance to the Secretary of State.
- 2.30.6 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.

2.31 Offshore wind impacts: commercial fisheries and fishing

Introduction

- 2.31.1 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 seabed
 - 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 seabed and left for a number of hours
 - dredging – towing several dredges either side of a vessel and through the seabed, typically for scallops but also other shellfish
 - fixed netting – using ‘fleets’ of nets anchored in some way to the seabed 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
 - potting – typically for crab, lobster and whelks using numbers of pots (a string of pots) anchored to the seabed
- 2.31.2 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 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.

- 2.31.3 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.
- 2.31.4 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 2.26 of this NPS with regard to the latter. The applicant should also speak to Defra and representatives of the fishing industry to explore possible coordination of activities.
- 2.31.5 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

- 2.31.6 Early consultation should be undertaken with the MMO, Defra, 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.
- 2.31.7 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.
- 2.31.8 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.
- 2.31.9 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.

Mitigation

- 2.31.10 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.
- 2.31.11 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.

Secretary of State decision making

- 2.31.12 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. This will include siting in relation to the location of prime fishing grounds. 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. 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. The Secretary of State should consider adverse or beneficial impacts on different types of commercial fishing on a case-by-case basis.
- 2.31.13 The Secretary of State should be satisfied that the applicant has sought to design the proposal having consulted the MMO, Defra 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.
- 2.31.14 The Secretary of State 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.

2.32 Offshore wind impacts: marine historic environment

Introduction

- 2.32.1 Impacts arising from offshore wind farm projects on the onshore historic environment effects are covered in Section 5.9 of EN-1. For offshore energy

infrastructure, there are further considerations for the marine historic environment.

2.32.2 Heritage assets and other remains of past human activity as described in Section 5.9 of EN-1, may exist offshore and within the intertidal area (the area between mean high and mean low water). 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.

2.32.3 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
- 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 in Section 2.25 of this NPS).

Applicant's assessment

2.32.4 Consultation with the relevant statutory consultees on the potential impacts on the marine historic environment should be undertaken by applicants at an early stage of development, taking into account any applicable guidance (e.g., offshore renewables protocol for archaeological discoveries³³).

2.32.5 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. 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. These studies should take into account any geotechnical or geophysical surveys that have been undertaken to aid the wind farm design.

2.32.6 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.

2.32.7 Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are located onshore, the effects should be assessed in accordance with the policy at Section 5.9 in EN-1.

³³ <https://www.wessexarch.co.uk/our-work/offshore-renewables-protocol-archaeological-discoveries>

Mitigation

- 2.32.8 The avoidance of important heritage assets to ensure their protection *in situ*, is the most effective form of protection. This can be achieved through the implementation of exclusion zones around known and potential 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 Environmental Statement produced to support an application for consent.
- 2.32.9 As set out in paragraphs 2.23.8 and 2.23.9 above, where requested by applicants, the Secretary of State should consider granting consents that allow for micrositing/microrouting 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.

Secretary of State decision making

- 2.32.10 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.

2.33 Offshore wind impacts: navigation and shipping

Introduction

- 2.33.1 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 because of the proposed offshore wind farm. To ensure safety of shipping, it is Government policy that wind farms should reduce risks to navigational safety to as low as reasonably practicable (ALARP), however consent may not be given to projects which pose unacceptable risks to navigational safety after all possible mitigation measures have been adopted.
- 2.33.2 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.
- 2.33.3 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.

2.33.4 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.

2.33.5 The use of the sea by recreational craft is also an important consideration. 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. In some circumstances, vessels from other countries may sail in waters within which offshore wind farms are sited.

Applicant's assessment

2.33.6 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.

2.33.7 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.

2.33.8 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.

2.33.9 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.

2.33.10 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

- cumulative and in-combination risks associated with the development and other developments (including other wind farms) in the same area of sea
- 2.33.11 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.
- 2.33.12 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.
- 2.33.13 The potential effect on recreational craft, such as yachts, should be considered in any assessment.

Extinguishing public rights of navigation

- 2.33.14 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. 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
 - are exercisable subject to such restrictions or conditions, or both, as are set out in the DCO
- 2.33.15 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.
- 2.33.16 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.
- 2.33.17 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.

Mitigation

- 2.33.18 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.

2.33.19 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.

Secretary of State decision making

2.33.20 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 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
- (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

2.33.21 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 ferries³⁴ and recreational users of the sea. Where after carrying 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. 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 proposal. The MCA, BEIS, and the commercial shipping sector should proactively engage with offshore wind farm developers and help identify mitigation measures, including alterations to navigation routes, to facilitate proposed offshore wind development.

2.33.22 Where a proposed offshore wind farm is likely to affect less strategically important shipping routes, a pragmatic approach should be employed by the Secretary of State. 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 Secretary of State should expect the applicant to minimise negative impacts to as low as reasonably

³⁴ "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.

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.

- 2.33.23 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.
- 2.33.24 Applicants will be required to demonstrate that risks to navigational safety will be reduced to ALARP. The Secretary of State should not consent applications which pose unacceptable risks to navigational safety after all possible mitigation measures have been considered.
- 2.33.25 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. 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.
- 2.33.26 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 Secretary of State to grant consent. The MCA will use the NRA as described in paragraphs 2.33.9 and 2.33.10 above when advising the Secretary of State on any mitigation measures proposed.
- 2.33.27 The Secretary of State 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.
- 2.33.28 In considering what interference, obstruction or danger to navigation and shipping is likely and its extent and nature, the Secretary of State 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.

2.34 Offshore wind impacts: other offshore infrastructure and activities

Introduction

- 2.34.1 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 other offshore infrastructure, such as telecommunication cables or oil and gas pipelines and platforms, are located or other activities, including oil and gas exploration/drilling, carbon dioxide pipelines and storage or marine aggregate dredging, take place.
- 2.34.2 Furthermore, it is likely that developers will apply 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 from industrial sources.
- 2.34.3 The use of the offshore area for most other offshore activities and all siting of new infrastructure is regulated. For example, the Oil and Gas Authority 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 pipelines, but in some circumstances new pipelines will need to be constructed.

Applicant's assessment

- 2.34.4 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. 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. Marine plans (paragraph 2.22.5 of this NPS and Section 4.4 of EN-1) will help applicants consider which activities may be most affected by their proposal and thus where to target their assessment.
- 2.34.5 Applicants should engage with interested parties in the potentially affected offshore sectors early in the development planning phase of the proposed offshore wind farm, with an aim to resolve as many issues as possible prior to the submission of an application.

- 2.34.6 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.

Mitigation

- 2.34.7 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.
- 2.34.8 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.

Secretary of State decision making

- 2.34.9 There are statutory requirements concerning automatic establishment of navigational safety zones relating to offshore petroleum developments³⁵.
- 2.34.10 Where a proposed offshore wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the Secretary of State. Much of this infrastructure is important to other offshore industries as is its contribution to the UK economy. In such circumstances the Secretary of State should expect the applicant to minimise negative impacts and reduce risks to as low as reasonably practicable.
- 2.34.11 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. The Secretary of State should not consent applications which pose unacceptable risks to safety after mitigation measures have been considered.
- 2.34.12 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.

³⁵ Section 21, Part 3 Petroleum Act 1987.

2.34.13 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.

2.35 Offshore wind impacts: seascape and visual effects

Introduction

2.35.1 Generic landscape and visual impacts are covered in Section 5.10 of EN-1. In addition, there are specific considerations which apply to offshore wind energy infrastructure proposals as set out below.

2.35.2 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. Seascape is a discrete area within which there is shared inter-visibility between land and sea.³⁶ In some circumstances it may be necessary to carry out a seascape and visual impact assessment (SLVIA³⁷) in accordance with the relevant offshore wind farm EIA policy. This will always be the case where a coastal National Park, the Broads or AONB, or a Heritage Coast is potentially affected.

Applicant's assessment

2.35.3 Relevant guidance should be followed including, but not limited to seascape character assessments³⁸ and marine plan seascape character assessments (e.g., northeast marine plan³⁹). Some applications for offshore wind farms that are submitted to the Secretary of State will be proposed at distances that mean that a project would not be visible from the shore. In these instances, the Secretary of State is likely to be able to conclude that an SLVIA will not be required.

³⁶ Definition taken from Appendix 3 of DTI (2005) Guidance on the Assessment of the Impact of Offshore Wind Farms: Seascape and Visual Impact Report.

³⁷ Seascape, Landscape and Visual Impact Assessment. See Landscape Institute Guidelines for Landscape and Visual impact Assessment Edition 3

³⁸ <https://www.gov.uk/government/publications/seascape-character-assessments-identify-and-describe-seascape-types>

³⁹ <https://www.gov.uk/government/publications/seascape-assessments-for-north-east-north-west-south-east-south-west-marine-plan-areas-mmo1134>

- 2.35.4 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, an SLVIA 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 Section 5.10 of EN-1.
- 2.35.5 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:
- 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, which limits the coasts capacity to absorb a development
 - how people perceive and interact with the coast and seascape
- 2.35.6 As part of the SLVIA, photomontages⁴⁰ will be required. Viewpoints to be used for the SLVIA should be selected in consultation with the statutory consultees at the EIA Scoping stage.
- 2.35.7 Magnitude and significance of change to both the identified seascape receptors (such as seascape and landscape units, visual receptors and designated landscapes) should be assessed in accordance with the standard methodology for SLVIA.
- 2.35.8 Where appropriate, cumulative SLVIA should be undertaken in accordance with the policy on cumulative assessment outlined in EN-1.

Mitigation

- 2.35.9 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. 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.

⁴⁰ See Landscape Institute Technical Advice Note. <https://www.landscapeinstitute.org/visualisation/>

Secretary of State decision making

2.35.10 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.

2.35.11 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
- taking 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

2.35.12 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.

Pumped Hydro Storage

2.36 Pumped hydro storage: introduction

- 2.36.1 Pumped hydro storage (PHS) 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.
- 2.36.2 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). No applications for hydroelectric power generation NSIPs are expected, but if such an application is made then the information in this section may be relevant.
- 2.36.3 Unlike hydroelectric power generation, PHS is not a net generator of electricity: any power generation must subsequently be balanced by consumption to return the water to the upper reservoir. 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. 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.
- 2.36.4 PHS can have significant impacts on local landscape, 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. PHS is most likely to be located in mountainous or hilly locations, and less likely to be situated in lowland areas.

2.37 Pumped hydro storage: technology details

- 2.37.1 PHS consists of two reservoirs, with a dam to hold back the flow of water from the upper reservoir. A pipeline (“penstock”) connects the upper reservoir to the generating station, which has another pipeline connecting it to the lower reservoir.
- 2.37.2 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. 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.

- 2.37.3 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.
- 2.37.4 PHS facilities range in size, with generating capacities typically <100 MW to 3000 MW. Schemes can typically deliver their full rated power for several hours before the upper reservoir is depleted and typically have a round-trip efficiency of 70-80%. Most schemes can ramp from zero to full load in a matter of minutes.

2.38 Pumped hydro storage: significance to renewable generation

- 2.38.1 Due to the losses in pumping the water, PHS is a net consumer of electricity. However, it is valuable to the electricity grid as it enables storage of electricity at times when supply exceeds demand. PHS can then be called on at short notice to provide electricity when demand exceeds supply. Few technologies that are commercial or have been demonstrated at scale are able to provide such storage services at the scale of PHS.
- 2.38.2 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. Therefore, PHS could be a key piece of infrastructure for enabling increased use of renewable generation.

2.39 Pumped hydro storage: factors influencing site selection by applicants

Site topography

- 2.39.1 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.

2.39.2 PHS schemes are likely to 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.

2.39.3 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.

Grid connection

2.39.4 The connection of the proposed PHS scheme into the relevant electricity network will be an important consideration for applicants. The grid connection text at Section 4.10 in EN-1 sets out the important issues.

2.39.5 PHS schemes typically connect to the electricity network at an intermediate voltage of 275 kV or 400 kV. 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.

Access

2.39.6 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. Section 5.14 of EN-1 advises on generic traffic and transport impacts. 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. PHS schemes are often located in remote, mountainous areas where access may be limited.

2.40 Pumped hydro storage: technical considerations for the Secretary of State

Flexibility in the project details

2.40.1 Generic information on flexibility is set out in Section 4.2 of EN-1. The Secretary of State should accept that PHS 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 Secretary of State, 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, particularly in the worse-case

scenario, (as set out in EN-1 paragraph 4.2.6) 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 Secretary of State should allow for this uncertainty in its consideration of the application and consent.

2.41 Pumped hydro storage: Secretary of State impact assessment principles

- 2.41.1 The Secretary of State should adhere to the following principles when examining and determining applications for PHS infrastructure.
- 2.41.2 The impacts identified in Part 5 of EN-1 and this NPS are not intended to be exhaustive and the Secretary of State should therefore consider any impacts which it determines are relevant and important to its decision.

National designations

- 2.41.3 In sites with nationally recognised designations (SSSIs, National Nature Reserves, National Parks, the Broads, Areas of Outstanding Natural Beauty, Registered Parks and Gardens, and Marine Conservation Zones), 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.
- 2.41.4 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 net zero as well as national targets for renewable energy supply.

Other locational considerations

- 2.41.5 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 Chapter 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).

2.42 Pumped hydro storage impacts: landscape and visual

Introduction

- 2.42.1 Generic landscape and visual effects are covered in detail in Section 5.10 of EN-1. In addition, there are specific considerations which apply to PHS schemes as set out below.
- 2.42.2 The Secretary of State should be satisfied that the design of the proposed PHS scheme is of appropriate quality and minimises adverse effects on the landscape character and quality.

Applicant's assessment

- 2.42.3 An assessment of the landscape and visual effects of the proposed infrastructure should be undertaken in accordance with the policy set out in 5.10 of EN-1.

Secretary of State decision making

- 2.42.4 PHS schemes have the potential to have significant impacts on the landscape, which 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
 - flooding of land to create the reservoir(s) (potentially covering an area of several hundred square metres)
- 2.42.5 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 dam and generating station, including the materials to be used in the context of the local landscape.
- 2.42.6 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, they should be located in a way that minimises their visual impact. The safety and stability of the heaps will also need to be continually managed.
- 2.42.7 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. 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.

- 2.42.8 The Secretary of State should expect applicants to 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.

2.43 Pumped hydro storage impacts: noise and vibration

Introduction

- 2.43.1 Generic noise and vibration impacts are covered in detail in Section 5.12 of EN-1. In addition, there are specific considerations which apply to PHS schemes. 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.

Applicant's assessment

- 2.43.2 The ES should include a noise assessment of the impacts on amenity in case of excessive noise from the project as described in Section 5.12 in EN-1.

Mitigation

- 2.43.3 As described in EN-1, the primary mitigation for noise for PHS schemes 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.
- 2.43.4 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.
- 2.43.5 Noise during construction, particularly from blasting, will be unavoidable. Careful consideration should be given to mitigating the impact of this on noise sensitive receptors.

Secretary of State decision making

- 2.43.6 The Secretary of State should consider the noise and vibration impacts according to Section 5.12 in EN-1, to ensure that noise and vibration will be adequately mitigated through requirements attached to the consent. The

Secretary of State will need to take into consideration the extent to which operational noise will be separately controlled by the EA.

- 2.43.7 The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the aims set out in paragraph 5.12.10 in EN-1.

2.44 Pumped hydro storage impacts: water quality and resources

Introduction

- 2.44.1 Generic water quality and resource impacts are set out in Section 5.16 of EN-1. 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. Specific impacts 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, 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 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.

Applicant's assessment

- 2.44.2 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 demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of water.

Mitigation

- 2.44.3 In addition to the mitigation measures set out in EN-1, design of the PHS scheme 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.

Secretary of State decision making

- 2.44.4 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 EN-1.

2.45 Pumped hydro storage impacts: biodiversity

Introduction

- 2.45.1 Generic biodiversity impacts are set out in Section 5.4 of EN-1. The design and construction of PHS schemes will have additional impacts on biodiversity. These may include:

- habitat loss resulting from flooding of land and/or clearing of vegetation
- soil removal for infrastructure causing alterations to landscape hydrology
- compromised water quality impacting aquatic flora and fauna, as described in 2.44.1

Applicant's assessment

- 2.45.2 Where the project is likely to have effects on biodiversity the applicant should undertake an assessment as required in EN-1, Section 5.4. The assessment is likely to need to take account of the ecological status of the water environment.

Mitigation

- 2.45.3 The mitigation measures set out in EN-1 should be followed. Additionally, it should be noted that PHS schemes can also provide benefits to local biodiversity, including through habitat creation and/or enhancement, fish re-stocking, and bankside planting. Some turbines may assist in increasing dissolved oxygen levels.

Secretary of State decision making

- 2.45.4 The Secretary of State should be satisfied that the applicant has demonstrated measures to minimise adverse impacts on biodiversity as described above and in EN-1.

2.46 Pumped hydro storage impacts: recreation

Introduction

- 2.46.1 As PHS schemes are likely to be located in hilly or mountainous areas, they are likely to have specific impacts on recreation. Impacts on the landscape and water courses could have adverse impacts on recreational activities such as watersports (e.g., canoeing) and fishing.

Applicant's assessment

- 2.46.2 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

- 2.46.3 PHS schemes should be designed to minimise impacts on existing recreational activities. It may be possible for the PHS scheme to be designed in such a way that these activities can be enhanced.

Secretary of State decision making

- 2.46.4 The Secretary of State should be satisfied that the applicant has demonstrated measures to minimise adverse impacts on recreational activities as described above.

Solar Photovoltaic Generation

2.47 Solar photovoltaic generation: introduction

2.47.1 Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation worldwide. Solar farms can be built quickly and, coupled with consistent reductions in the cost of materials and improvements in the efficiency of panels⁴¹, large-scale solar is now viable in some cases to deploy subsidy-free and at little to no extra cost to the consumer. 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.

2.47.2 Solar farm proposals are currently likely to consist of solar panel arrays, mounting structures, piles, inverters, transformers and cables. Associated infrastructure may also be proposed such as energy storage⁴² or security arrangements (which may encompass flood defences, fencing, lighting and surveillance). A typical solar panel for large-scale developments will measure 2msq with an output of around 450W. Along with associated infrastructure, generally 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, although this can vary significantly depending on the site and 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. Developers will be expected to consider the criteria for good design set out in EN1 Section 4.6 at an early stage when developing projects.

2.48 Solar photovoltaic generation: factors influencing site selection by applicant

2.48.1 The key considerations involved in the siting of a solar farm are likely to be influenced by factors set out in the following paragraphs.

Irradiance and site topography

2.48.2 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

⁴¹ <https://www.gov.uk/government/publications/beis-electricity-generation-costs-2020>

⁴² See paras 3.3.24 -3.3.27 in EN-1

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.

- 2.48.3 In order to maximise irradiance, applicants may choose a site and design its layout with variable and diverse panel 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

- 2.48.4 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 (Section 2.51) and Glint and Glare (Section 2.52) impact sections below.

Capacity of a site

- 2.48.5 In order for a solar farm to generate electricity efficiently, site layout must be designed so as to maximise irradiance levels, and the panel array spacing should also 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. However, this is a matter for the applicant.
- 2.48.6 Solar panels generate electricity in direct current (DC) form. A number of panels feed an external inverter, which is used to convert the 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).
- 2.48.7 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 solar farms are assessed on their DC capacity. 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. Therefore, from the date of designation of this NPS, for the purposes of Section 15, the combined capacity of the installed inverters (measured in AC) should be used for the purposes of determining solar site capacity. The capacity threshold is 50MW (AC) in England and 350MW (AC) in Wales.
- 2.48.8 It should also be noted that the 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 most solar panels and on average panels degrade at a rate of up to 1% each year. Applicants may account for this by overplanting solar panel arrays⁴³. Therefore, AC installed export capacity should not be seen as an appropriate tool to constrain the impacts of a solar farm. Other measurements, such as panel size, total area and percentage of ground cover should be used to set the maximum extent of development when determining the planning impacts of an application.

- 2.48.9 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. 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.

Grid connection

- 2.48.10 The connection of the proposed solar farm into the relevant electricity network will be an important consideration for applicants of solar. The grid connection text at Section 4.10 in EN-1 sets out the important issues.
- 2.48.11 Most 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 feasibility of a development and as such some larger developments may seek connection to the transmission network if there is available network capacity and/or supportive infrastructure. The connection voltage, availability of network capacity, and the distance from the solar farm to the existing network can have a significant effect on the commercial feasibility of a development proposal.
- 2.48.12 The applicant may choose a site based on nearby available grid export capacity. Locating solar farms at places with grid connection capacity enables the applicant to maximise existing grid infrastructure, minimise disruption to local community infrastructure or biodiversity and reduce overall costs. Where this is the case, consideration should be given to the cumulative impacts of situating a solar farm in proximity to other energy generating stations and infrastructure.

⁴³ "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 para 2.48.8 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 total number of panels installed on the site (i.e., the impacts of the overplanted site).

Agriculture land classification and land type

- 2.48.13 Solar is a highly flexible technology and as such can be deployed on a wide variety of land types. Where possible, ground mounted Solar PV projects should utilise previously developed land, brownfield land, contaminated land, industrial land, or agricultural land preferably of classification 3b, 4, and 5 (avoiding the use of “Best and Most Versatile” cropland where possible)⁴⁴. However, land type should not be a predominating factor in determining the suitability of the site location.
- 2.48.14 The Agricultural Land Classification (ALC) is the only approved system for grading agricultural quality in England and Wales and should be used to establish the ALC and identify the soil types to inform soil management at the construction, operation and decommissioning phases. This should be extended to the underground cabling and access routes. The soil survey may also inform the suitable beneficial use of the land during the operational phase. Criteria for grading the quality of agricultural land using the Agricultural Land Classification (ALC) of England and Wales is decided by Natural England⁴⁵ and considerations relating to land classification are expected to be made with reference to this guidance, or any successor to it.
- 2.48.15 Whilst the development of ground mounted solar arrays is not prohibited on sites of agricultural land classified 1, 2 and 3a, or designated for their natural beauty, or recognised for ecological or archaeological importance, the impacts of such are expected to be considered and are discussed under paragraphs 2.50 and 2.53. It is recognised that at this scale, it is likely that applicants’ developments may use some agricultural land, however applicants should explain their choice of site, noting the preference for development to be on brownfield and non-agricultural land.

Accessibility

- 2.48.16 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. Section 5.14 of EN-1 advises on generic traffic and transport impacts while those which are specific to solar farms are considered under Section 2.54 of this NPS. 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.

⁴⁴ Details of the Agricultural Land Classification are at : <http://publications.naturalengland.org.uk/publication/6257050620264448>

⁴⁵ Ibid

2.49 Solar photovoltaic generation: technical considerations for the secretary of state

- 2.49.1 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.

Access tracks

- 2.49.2 Applicants will sometimes need to construct access tracks to connect solar farms to the public road network. Applications should include the full extent of the access tracks necessary and an assessment of their effects. Developers will usually need to construct on-site access routes for operation and maintenance activities, such as footpaths, earthworks or landscaping. Applications should include the full extent of the access routes for operation and maintenance and their effects.

Site layout, design, and appearance

- 2.49.3 Developers will consider several factors when considering the location and layout of sites including levels of solar irradiance, proximity to available grid capacity to accommodate the scale of generation, predominance of open land, topography (a flat topography is often favoured), previous land use and ability to mitigate environmental impacts and any flood risk.
- 2.49.4 In terms of design and layout, developers 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.
- 2.49.5 Considering the likely extent of solar sites, it is possible that proposed developments may affect the provision of local footpath networks and public rights of way. Public rights of way may need to be temporarily stopped up to enable construction; however it should be the applicant's intention, where practicable and safe, to keep all public rights of way that cross the proposed development site open during construction and to protect users where a public right of way borders or crosses the site. Developers 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, but in particular across the operation of the site, and to minimise as much as possible the visual outlook from existing footpaths. It should be noted that sites may provide the opportunity to facilitate enhancements to the local footpath network and the adoption of new public rights of way through site layout and design of access.

- 2.49.6 It is anticipated that detail on how public rights of way would be managed to ensure they are safe to use is detailed in an outline Public Rights of Way Management Plan.
- 2.49.7 It is likely that extensive underground cabling will be required to connect the electrical assets of the site, such as from the substation to the panel arrays or storage facilities. In the case of underground cabling, developers are expected to provide a method statement describing cable trench design, installation methodology, as well as details of the operation and maintenance regime.

Security and lighting

- 2.49.8 Security of the site is likely to be a key consideration for developers. When considering sites, developers may wish to consider the availability of natural defences such as steep gradients, hedging and rivers. Perimeter security measures such as fencing, electronic security, CCTV and lighting may also be needed, with the measures chosen considered on a site-specific basis. 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, should be assessed.

Project lifetimes

- 2.49.9 Solar panels typically have a design life of between 25 and 30 years, although this can sometimes be longer, and can be decommissioned relatively easily and cheaply. Solar panel efficiency deteriorates over time and applicants may elect to replace panels during the lifetime of the site. Applicants may apply for consent for a specified period, based on the design life of the panels. 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 seek to extend the period of consent or be decommissioned and removed.
- 2.49.10 The nature and extent of decommissioning of a site can vary. Generally, the panel arrays and mounting structures will always be decommissioned with any underground cabling dug out to ensure that prior use of the site can continue.
- 2.49.11 Applications should set out what would 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 may be less harmful for the ecology of the site to keep or retain certain types of infrastructure. Furthermore, 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.
- 2.49.12 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. 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. A limit of 25 years is typical, although applicants may seek consent for differing time-periods for operation.

2.49.13 The time-limited nature of solar farms, where a time-limit is sought by an applicant as a condition of consent, is likely to be an important consideration for the Secretary of State 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. The extent to which the site will return to its original state may also be a relevant consideration.

Flexibility

2.49.14 Many different makes and models of solar panel arrays are available, each with differing size, mounting, and generating capacity. Associated infrastructure (such as inverters or transformers) may also vary depending on the model of the panels.

2.49.15 As set out in Chapter 4 of EN-1, at the time of application, solar farm operators may have multiple commercial agreements under consideration and may not know precisely which panels will be procured for the site until sometime after any consent has been granted. If panel details, or any other relevant information, are not available, then the applicant should assess the worst-case effects that the project could have (as set out in EN-1 paragraph 4.2.6) to ensure that the project as it may be constructed has been properly assessed. In this respect some flexibility should be provided in the consent.

2.49.16 In the case of solar farms, it is likely that this flexibility will be needed in relation to the dimensions of the panels and their layout and spacing. It may also be the case that applicants seek flexibility for the installation of energy storage, with the option to install further panels as a substitute. When this is the case, applications may include a range of options based on different panel numbers, types and layout, with and without storage. The maximum impact case scenario will be assessed and the Secretary of State will consider the maximum adverse effects in its consideration of the application and consent.

2.49.17 Where other 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. Where elements of the design of the scheme are unknown, the maximum impact case scenario should be assessed, and the Secretary of State should consider the maximum adverse effects in its consideration of the application and consent.

2.50 Solar photovoltaic generation impacts: biodiversity and nature conservation

Introduction

- 2.50.1 Generic biodiversity, ecology and geological impacts are covered in Section 5.4 of EN-1. In addition, there are specific considerations which apply to solar farms as set out below.

Applicant's assessment

- 2.50.2 The applicant's ecological assessments should identify any ecological risk from developing on the proposed site. Issues that may need assessment include habitats, ground nesting birds, wintering birds, bats, dormice, reptiles, great crested newts, water voles and badgers. The use of an advising ecologist during the design process can ensure that adverse impacts are mitigated, and biodiversity enhancements are maximised, although this is a decision for the individual applicant. 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.
- 2.50.3 The assessment should consider earthworks associated with construction compounds, access roads and cable trenching. Where such soil stripping occurs topsoil and subsoil should be stripped, stored, and replaced separately in order to minimise soil damage and to provide optimal conditions for site restoration. Soil handling may be informed through a soil and Agricultural Land Classification (ALC) survey, with detailed guidance available in Defra's guidance on Construction Code of Practice for the Sustainable Use of Soils on Construction Sites⁴⁶ or any subsequent updates.
- 2.50.4 The assessment 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 in order to minimise impact. If lighting is necessary, it should be minimised and directed away from areas of likely habitat.
- 2.50.5 The assessment 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

⁴⁶ [Construction Code of Practice for the Sustainable Use of Soils on Construction Sites \(2009\)](https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites)
<https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites>

for enabling mammal, reptile and other fauna access into the site if required to do so in the ecological report.

- 2.50.6 The assessment should consider the impacts of mobile arrays or trackers (if proposed) to avoid animals becoming trapped in moving parts.
- 2.50.7 The applicant's assessment may be accompanied by a Flood Risk Assessment. 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. 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. 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. Culverting existing watercourses/drainage ditches should be avoided. Where culverting for access is unavoidable, it should be demonstrated that no reasonable alternatives exist and where necessary it will only be in place temporarily for the construction period.
- 2.50.8 The assessment should consider enhancement, management, and monitoring of biodiversity. Solar farms have the potential to increase the biodiversity value of a site, especially if the land was previously intensively managed. In some instances, the increase in biodiversity caused by the repurposing of previously developed or intensively managed land for solar generation may equate to a net positive impact.
- 2.50.9 The applicant 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.

Mitigation

- 2.50.10 Proposed enhancements should take account of the above factors and as set out in Section 5.4 of EN1 and aim to achieve environmental and biodiversity net gain in line with the ambition set out in the 25 Year Environment Plan. This might include maintaining or extending existing habitats and potentially creating new important habitats, for example by instating: cultivated strips/plots for rare arable plants, rough grassland margins, bumble bee plant mixes, and wild bird seed mixes. It is advised that an ecological monitoring programme is developed to monitor impacts upon the flora of the site and upon any particular ecological receptors (e.g., bats and wintering birds). Results of the monitoring will then inform any changes needed to the land management of the site, including, if appropriate, any livestock grazing regime.

Secretary of State decision making

2.50.11 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. The maximum impact case scenario will be assessed, and the Secretary of State will consider the maximum adverse effects in its consideration of the application and consent.

2.50.12 In addition to Section 5.4 of EN-1 there are specific considerations which should inform Secretary of State decision-making where developments are proposed on peat. In these cases, the Secretary of State should be satisfied that the solar farm layout and construction methods have been designed to minimise soil disturbance when building and maintaining roads and tracks and other infrastructure. This is to ensure the development will result in minimal disruption to the ecology, or release of CO₂ and that the carbon balance savings of the scheme are maximised.

2.51 Solar photovoltaic generation impacts: landscape, visual and residential amenity

Introduction

2.51.1 Generic landscape and visual impacts are covered in Section 5.10 of EN-1. In addition, there are specific considerations which apply to solar panels, which are set out in the following paragraphs.

2.51.2 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. 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 zero.

Applicant's assessment

2.51.3 The applicant 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.

- 2.51.4 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/visual impact of solar PV arrays. 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.
- 2.51.5 The applicant should have regard in both the design layout of the solar farm, and future maintenance plans, to the retention of growth of vegetation on boundaries, including the opportunity for individual trees within the boundaries to grow on to maturity. The landscape and visual impact should be considered carefully at the pre-application stage. Existing hedges and established vegetation, including mature trees, should be retained wherever possible. Trees and hedges should be protected during construction. The impact of the proposed development on established trees and hedges should be informed by a tree survey or a hedge assessment as appropriate.

Mitigation

- 2.51.6 Applicants should consider the potential to mitigate landscape and visual impacts through, for example, screening with native hedges. Efforts should be made to minimise the use and height of security fencing. Where possible projects should utilise existing features, such as hedges or landscaping, to screen security fencing and use natural features, such as vegetation planting, to assist in site security. Projects 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.

Secretary of State decision making

- 2.51.7 The Secretary of State will consider 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.

2.52 Solar photovoltaic generation impacts: glint and glare

Introduction

- 2.52.1 Solar panels may reflect the sun's rays, 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.

Applicant's assessment

- 2.52.2 In some instances, it may be necessary to seek a glint and glare assessment as part of the application. This may need to account for 'tracking' panels if they are proposed as these may cause differential diurnal and/or seasonal impacts. The potential for solar PV panels, frames and supports to have a combined reflective quality should be assessed. This assessment needs to consider the likely reflective capacity of all of the materials used in the construction of the solar PV farm.

Mitigation

- 2.52.3 Applicants should consider using, and in some cases the Secretary of State may require, solar panels to be of a non-glare/ non-reflective type and the front face of the panels to comprise of (or be covered) with a non-reflective coating for the lifetime of the permission.

Secretary of State decision making

- 2.52.4 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 and motorists.
- 2.52.5 There is no evidence that glint and glare from solar farms interferes in any way with aviation navigation or pilot and aircraft visibility or safety. Therefore, the Secretary of State is unlikely to have to give any weight to claims of aviation interference as a result of glint and glare from solar farms.

2.53 Solar photovoltaic generation impacts: cultural heritage

Introduction

- 2.53.1 Historic environment impacts are covered in Section 5.9 of EN-1. However, with respect to solar farms, the following considerations also apply.
- 2.53.2 The impacts of solar PV developments on the historic environment will require expert assessment in most cases. Solar PV developments may affect heritage assets (sites, monuments, buildings, and landscape) both above and below ground. Above ground impacts may include the effects of applications on the setting of Listed Buildings and other designated heritage assets as well as on Historic Landscape Character. Below ground impacts may include direct impacts on archaeological deposits through ground disturbance associated with trenching, cabling, foundations, fencing, temporary haul routes etc. Equally archaeological finds may be protected by a solar PV farm as the site is removed from regular ploughing and shoes or low-level piling is stipulated.

Applicant's assessment

- 2.53.3 It is anticipated that the applicant's assessment will be informed by a consultation with the Historic Environment Record (HER). Alternatively, the applicant may contact the local authority for this information. 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 are expected to 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.
- 2.53.4 In some instances, field studies may include investigative work such as trial trenching beyond the boundary of the proposed site to assess the impacts of any underground cabling on archaeological assets. The extent of investigative work should be proportionate to the sensitivity of, and extent of proposed cabling in, the associated study area.
- 2.53.5 Applications should take account of the results of historic environment assessments in their design, for instance through the sensitive planning of installations. The applicant 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. 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 on such assets. Depending on their scale, design and prominence, a large-scale solar farm within the setting of a heritage asset may cause substantial harm to the significance of the asset. Visualisations may be required to demonstrate the effects of a proposed solar farm on the setting of heritage assets.

Mitigation

- 2.53.6 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. Therefore, where requested by the applicant, the Secretary of State should consider granting consents which allow for the micro siting 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.

Secretary of State decision making

- 2.53.7 Consistent with the generic policy on historic environmental impacts in EN1 (Section 5.9) the Secretary of State should be satisfied that solar farms and associated infrastructure have been designed sensitively taking into account known heritage assets and their status.
- 2.53.8 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.

2.54 Solar photovoltaic generation impacts: construction including traffic and transport noise and vibration

Introduction

- 2.54.1 Generic traffic and transport impacts are covered in EN-1, Section 5.14. In addition, there are specific considerations which apply to solar farms as set out below. Public perception of the construction phase of solar farm will derive mainly from the effects of traffic movements.
- 2.54.2 Many solar farms will be sited in areas served by a minor road network. Modern solar farms are large sites that are mainly comprised of small structures that can be transported separately and constructed on-site. It is likely that applicants will designate a construction compound on-site for the delivery and assemblage of the necessary components. Traffic is likely to involve smaller vehicles than typical onshore energy infrastructure but may be more voluminous. It is important that all sections of roads and bridges on the proposed delivery route can accommodate the weight and volume of the loads.

Applicant's assessment

- 2.54.3 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 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 Secretary of State. In these circumstances, the impact of additional vehicles on the likely potential routes should have been assessed.
- 2.54.4 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 proposed vehicles, or bridges sufficiently strong for the heavier components to be transported to the site. It is unlikely that sections of the route will require modification to allow for the transportation of components to the site, given the nature of solar developments, but any potential modifications should be identified, and potential effects assessed as part of the ES.

- 2.54.5 There may be several other energy infrastructure developments proposed that use a common port and/or access route and pass through the same towns. It is common for solar farms to locate where there is existing or surplus grid capacity, for instance. Where a cumulative impact is likely then a cumulative transport assessment should form part of the ES 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.

Mitigation

- 2.54.6 In some cases, the local highways 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 routing of such movements particularly by heavy vehicles. Where the Secretary of State agrees that this is necessary considering all representations, this could be achieved by imposing suitable requirements on development consent.
- 2.54.7 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 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.
- 2.54.8 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, including restoration of roads and verges. 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

- 2.54.9 Consistent with the generic policy set out in EN-1, the Secretary of State should be satisfied, taking into account the views of the relevant local highway authorities, that if there are abnormal loads proposed, they 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.
- 2.54.10 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. 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 Secretary of State.

Tidal Stream Energy

2.55 Tidal stream energy: introduction

- 2.55.1 Tidal stream energy technology is at an early commercial stage in the UK and may start to play a role over the next 5 years, in helping to secure the UK's ambition to achieve net zero by 2050. Although it is not currently cost-competitive with other renewable energy technologies, there are indications of the scope for significant future cost reductions. Tidal stream operational capacity in the UK is 10MW; however, there are several sites under development and a further 1,000MW sites are leased. There is a realistic chance of projects above 100MW coming forward for planning consent within the next 5-6 years.
- 2.55.2 Most tidal stream projects, unlike offshore wind, are likely to be located close to the coastline. There are two main UK sea areas where tidal stream arrays can be built:
- in UK territorial waters, which generally extend up to 12nm from the coast
 - 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 REZ as declared in the Energy Act 2004⁴⁷.
- 2.55.3 For clarification, any reference within this NPS to tidal stream infrastructure includes all the elements which may be part of an application, including tidal stream turbines, all types of mounting mechanisms (fixed bottom or floating), onshore and offshore substations, and cabling.
- 2.55.4 Tidal stream energy projects can be expected to have impacts on wildlife, underwater sound, seabed habitats (through damage/ alterations) and on distributions or movements of marine species but there is currently a lack of a robust evidence base related to environmental impacts. The extent to which generic impacts set out in EN-1 are relevant to a project will have to be assessed on a case-by-case basis. There are 21 tidal stream developers across the UK, most of which are small projects located at testing/ demonstration sites. It is possible that we will see projects of the order of 100MW or above from scaling up over the next few years. Consolidation of the evidence base can be achieved through the monitoring of environmental impacts of existing smaller projects to help inform further planning guidance (EN-3) versions.

⁴⁷ 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.

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

2.56 Tidal stream energy: consenting process

- 2.56.1 Welsh Ministers are responsible for issuing DCOs for renewable energy projects up to 350MW in Wales and in Welsh waters.

Marine licence

- 2.56.2 Any consent granted by BEIS will be able to include provision deeming the grant of a marine licence for operations carried out wholly in England and in English waters.
- 2.56.3 Welsh Ministers will be responsible for issuing marine licences for operations carried out in Wales and in Welsh waters.
- 2.56.4 Marine licences are primarily concerned with the need to protect the environment and human health, and to prevent interference with legitimate uses of the sea.
- 2.56.5 Marine licences are likely to be required for all the offshore elements of the proposed tidal stream array, including associated development such as the offshore cabling and any offshore substations that are required.
- 2.56.6 The 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).
- 2.56.7 The Planning Inspectorate should liaise closely with the MMO on the proposed terms of any marine licence.

2.57 Tidal stream energy: factors influencing site selection and design by applicant

Strategic Environmental Assessment

- 2.57.1 The Government's Offshore Energy Strategic Environmental Assessment 2016 (SEA) concluded that that individual and small arrays of tidal stream devices may have localised effects that are detectable but unlikely to be highly significant at distance from the devices. However recent modelling work has demonstrated the potential for significant, far reaching impacts, from larger

arrays of these devices depending on site location and size/layout of the array. Studies have indicated that impacts could be reduced at certain sites through careful siting, although uncertainty still arises as the models used only broadly represent the natural complexity of the water movements of an area.

- 2.57.2 Applicants should set out how they have drawn on the Government's Offshore Energy SEA in making their site selection.
- 2.57.3 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 Secretary of State as and when they become available.

The Crown Estate

- 2.57.4 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 UKCS (excluding oil, gas and coal). The seabed around England, Wales and Northern Ireland is managed by The Crown Estate, whereas the seabed around Scotland is managed by Crown Estate Scotland. It is therefore 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.
- 2.57.5 The Crown Estate Act 1961, Section 1(3) states that, with regard to property and land, The Crown Estate Commissioners must "maintain and enhance [The Crown Estate's] value and the return obtained from it, but with due regard to the requirements of good management". The Crown Estate identifies potential development areas in accordance with the requirements of The Crown Estate Act, government policy, plans and associated SEA work. In 2013, The Crown Estate agreed seabed rights for three new tidal stream demonstration zones, which would enable organisations to manage and sub-let parts of the seabed to a range of wave and tidal stream developers, and for five new tidal stream sites, each with the potential to deliver a project of between 10 and 30MW.

Tidal stream resource assessment

- 2.57.6 Predictability of tidal stream via condition monitoring and known tide variations is crucial to the level of availability of a project and its business case. However, collection of this data is not obligatory as the suitability of the tidal stream resource across the site and economics of the scheme are a matter for the technical and commercial judgement of the tidal stream applicant.

Foundation conditions

- 2.57.7 Devices will generally be anchored to fixed points in the seabed.
- 2.57.8 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 Secretary of State, 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 Secretary of State to assess such impacts.

Grid connection

- 2.57.9 The connection of a proposed tidal stream array into the relevant electricity network will be an important consideration for applicants. The grid connection text at Section 4.10 of EN-1 sets out the important issues here.
- 2.57.10 Applicants for consent for tidal stream energy projects 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

- 2.57.11 There may be constraints imposed on the siting or design of tidal stream arrays because of restrictions resulting from the presence of other offshore infrastructure or activities.

2.58 Tidal stream energy: technical considerations for the Secretary of State

Grid connection infrastructure

- 2.58.1 When considering grid connection issues, the Secretary of State 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.
- 2.58.2 Where the applicant has identified a precise route for the cable from tidal stream project site to a precise location for the onshore substation and

connection to the transmission network, the ES should assess the effects of the cable.

- 2.58.3 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.
- 2.58.4 Where the point of onshore connection is unknown at the time of the application, the applicant should assess a corridor from the tidal stream array to the shore that is a reasonably likely area for the cable and any offshore substation should be assessed as part of the EIA.
- 2.58.5 A proposed offshore electricity cable connecting the tidal stream array 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 tidal stream project⁴⁸. 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.
- 2.58.6 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

- 2.58.7 Owing to the nascent nature of tidal stream 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, possibly including:
- the precise location and configuration of turbines and associated development
 - the foundation type
 - the cable type and cable route
 - the exact locations of offshore and/or onshore substations
- 2.58.8 In accordance with Section 4.2 of EN-1, the Secretary of State should accept that tidal stream operators are unlikely to know precisely which turbines will be procured for the site until some time after any consent has been granted.

⁴⁸ “Planning Act 2008: associated development applications for major infrastructure projects”, can be found at <https://www.gov.uk/government/publications/planning-act-2008-associated-development-applications-for-major-infrastructure-projects>.

Where some details have not been included in the application to the Secretary of State, 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 4.2.6) 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 Secretary of State should allow for this uncertainty in its consideration of the application and consent.

Micrositing

- 2.58.9 Any consent that is granted by the Secretary of State should be flexible to allow for necessary micrositing of elements of the proposed tidal array 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.
- 2.58.10 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.

Repowering

- 2.58.11 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. 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 and a new consent application would be required.
- 2.58.12 In determining an application for the repowering of a site, the proposed replacement scheme should be determined by the Secretary of State on its individual merits.

Future monitoring

- 2.58.13 Owing to the relatively new and complex nature of tidal stream development, the Secretary of State should consider requiring the applicant to undertake monitoring prior to and during construction and during its operation to measure and document the effects of the development and the efficacy of any associated mitigation or compensation. This enables an assessment of the accuracy of the original predictions and may inform the scope of future EIAs.

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

Decommissioning

2.58.15 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.

2.58.16 Where the Secretary of State decides to grant consent for a proposed tidal stream array, a condition requiring the applicant to submit a decommissioning programme to the Secretary of State before any offshore construction works begin should be included. The decommissioning programme must satisfy the requirements of s.105(8) of the Energy Act 2004.

2.59 Tidal stream energy: Secretary of State impact assessment principles

2.59.1 The Secretary of State should adhere to the principles set out in paragraphs 2.11.1, 2.12.1 and 2.12.2 since these also apply to tidal array and associated infrastructure.

Green belts

2.59.2 Although tidal arrays themselves will not have a direct impact on green belts, it is possible that some elements of these projects, such as onshore substations may be proposed on green belt land, 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 5.11 of EN-1 and paragraph 2.12.5 of this NPS.

Other locational considerations

2.59.3 As most renewable energy resources can only be developed where the resource exists and where economically feasible, 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).

2.60 Tidal stream energy impacts: biodiversity and ecological conservation

Introduction

2.60.1 Generic ecology and biodiversity effects are covered in detail in Section 5.4 of EN-1. The coastal change policy in Section 5.6 of EN-1 may also be relevant. In addition, there are specific considerations which apply to offshore renewable energy infrastructure proposals, including tidal arrays as discussed below.

2.60.2 Biodiversity considerations to which applicants and the Secretary of State should have regard concerning offshore infrastructure include:

- fish
- seabed habitats – intertidal and subtidal
- marine mammals

2.60.3 The ecological effects of large tidal arrays during the construction and operational phases are not yet well understood. There is a paucity of knowledge regarding their impacts on the biodiversity of their surrounding environment. More studies are required to investigate the effect of large tidal arrays on biodiversity and the surrounding physical environment. There is the potential for physical disturbance to occur to varying degrees during the construction, routine operation and decommissioning of a tidal array. Construction and decommissioning are likely to cause significant though temporary physical disturbance to the local environment.

2.60.4 Continuous operation of large arrays could result in underwater noise and emission of electromagnetic fields, thus adversely impacting marine life. The possible collision with or avoidance of underwater turbine structures by marine life constitute further potential impacts associated with the operation of tidal arrays.

Applicant's assessment

2.60.5 Assessment of offshore ecology and biodiversity should be undertaken by the applicant for all stages of the lifespan of the proposed tidal arrays and in accordance with the appropriate policy for tidal arrays ESs.

2.60.6 Until more technology specific information is obtained, it is expected that biodiversity impacts will be broadly similar to offshore wind infrastructure (with the exception of birds in flight) and therefore applicants should consider the relevant paragraphs of the offshore wind section above. Consultation on the assessment methodologies should be undertaken at early stages with the statutory consultees as appropriate.

- 2.60.7 Any relevant data that has been collected as part of post-construction ecological monitoring from existing, operational tidal arrays farms should be referred to where appropriate.
- 2.60.8 The assessment should include the potential of the scheme to have both positive and negative effects on marine ecology and biodiversity.

Mitigation

- 2.60.9 Mitigation may be possible in the form of careful design of the development itself and the construction techniques employed.
- 2.60.10 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.

Secretary of State decision making

- 2.60.11 The Secretary of State should consider the effects of a proposal on marine ecology and biodiversity considering all relevant information made available to it.
- 2.60.12 The designation of an area as an HRA site does not necessarily restrict the construction or operation of tidal arrays in or near that area (see also Section 4.5 of EN-1).

2.61 Tidal stream energy impacts: other impacts

- 2.61.1 There is not yet sufficient evidence regarding impacts of tidal arrays to give separate guidance for the aspects listed below:
- commercial fisheries and fishing
 - historic environments
 - navigation and shipping
 - oil, gas, carbon capture usage & storage and other offshore infrastructure and activities
 - physical environment
 - seascape and visual impacts
- 2.61.2 However, large tidal stream arrays are likely to share most characteristics of offshore wind with regard to impacts in respect of the considerations above. Tidal array applicants should therefore refer to the relevant parts of the offshore wind section above for guidance on these impacts.

3 Glossary

This glossary sets out the most frequently used terms in this NPS. There is a glossary in each of the energy NPSs. The glossary set out in EN-1 may also be useful when reading this NPS.

Abbreviation	Definition
AD	Anaerobic Digestion
AoS	Appraisal of Sustainability
Associated infrastructure	Development associated with the NSIP as defined in Section 115 of the Planning Act 2008
Biomass	Material of recent biological origin derived from plant or animal matter
CCGT	Combined Cycle Gas Turbine
CfD	Contracts for Difference
CHP	Combined Heat and Power
CCS	Carbon Capture and Storage
Co-firing	Use of two fuel types (e.g. natural gas and biomass) in a thermal generating station
DCO	Development Consent Order made under the Planning Act 2008.
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
English Waters	Waters adjacent to England up to the 12 nm seaward limits of the territorial sea and in a REZ, except the Welsh zone or any part of a REZ in relation to which the Scottish Ministers have functions
EN-1	Overarching NPS for Energy
EP	Environmental Permit issued by EA
EPR	Environmental Permitting (England and Wales) Regulations 2016
ES	Environmental Statement
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

Abbreviation	Definition
Habitats Regulations	The Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species Regulations 2017
HRA	Habitats Regulations Assessment
HRA site	One of the sites set out in paragraph 5.4.8 of EN-1 for which an HRA will assess the implications of a plan or project
MCZ	Marine Conservation Zone: areas that protect a range of nationally important, rare or threatened habitats and species. MCZs are established under section 116(1) of the Marine and Coastal Access Act 2009
MHCLG	Ministry for Housing, Communities and Local Government
Mean High Water Springs (MHWS)	The averaged highest level of spring tides. Calculated by measuring the average of two successive high waters during those 24 hours (approximately once a fortnight) when the range of the tide is greatest
MMO	Marine Maritime Organisation: set up under the Marine and Coastal Access Act 2009
MPA	Marine Protected Area
MW	Megawatt = one million watts
NE	Natural England: the Statutory Nature Conservation Body for England
NRW	Natural Resources Wales: the Statutory Nature Conservation Body for Wales
NSIP	Nationally Significant Infrastructure Project
Ofgem	Office of Gas and Electricity Markets
RDF	Refuse derived fuel
REZ	The Renewable Energy Zone
RO	Renewables Obligation
SAC	Special Area of Conservation under the Habitats Regulations
SEA	Strategic Environmental Assessment (under the Environmental Assessment of Plans and Programmes Regulations 2004)
SLVIA	Seascape, Landscape and Visual Impact Assessment
SNCB	Statutory Nature Conservation Body: bodies responsible for advising the Government on, and the administration of, nature conservation. Bodies include Natural England (NE, England), Natural Resources Wales (NRW, Wales),

Abbreviation	Definition
	NatureScot (NS, Scotland) and the Joint Nature Conservation Committee (JNCC, UK wide)
SPA	Special Protection Area under the Habitats Regulations
SRF	Solid recovered fuel
SSSI	Site of Special Scientific Interest designated under the Wildlife and Countryside Act 1981
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
UKCS	United Kingdom Continental Shelf
Welsh Waters	Waters adjacent to Wales up to the 12 nm seaward limits of the territorial sea and the Welsh Zone of the REZ as defined by section 158 of the Government of Wales Act 2006

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