Department for
Energy Security
& Net Zero

Department for Energy Security & Net Zero

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

April 2025

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

Any enquiries regarding this publication should be sent to us at **energynps@energysecurity.gov.uk**

ISBN 978-1-5286-4584-3

E03028327 11/23

Printed on paper containing 40% recycled fibre content minimum

Printed in the UK by HH Associates Ltd. on behalf of the Controller of His Majesty's Stationery Office

Contents

1 Introduction

1.1 Background

1.1.1 There is an urgent need for new electricity generating capacity to meet our energy objectives.

1.1.2 Electricity generation from renewable sources is an essential element of the transition to Clean Power 2030 Mission, net zero and meeting our statutory targets for the sixth carbon budget (CB6). Our analysis suggests that demand for electricity is likely to increase significantly over the coming years and could more than double by 2050. This could require a fourfold increase in low carbon electricity generation, with most of this likely to come from renewables[1].

1.1.3 The Clean Power 2030 Action Plan sets out pathways for meeting targets in 2030 that will set the country well on the way to reach net zero by 2050. More low-cost renewables on the system will reduce household electricity bills and help to increase security of supply through domestic energy production.

1.1.4 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.

1.1.5 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.

1.1.6 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.

1.1.7 This NPS may be helpful to local planning authorities (LPAs) in preparing their local impact reports.

[1] See https://www.gov.uk/government/publications/modelling-2050-electricity-system-analysis

1.2 Role of this NPS in the wider planning system

1.2.1 Section 1.2 of EN-1 provides details on the role of this NPS in the wider planning system.

1.3 Relationship with EN-1

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

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.

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 electricity generating stations in England and Wales, and nationally significant offshore renewable electricity generating stations in waters in or adjacent to England or Wales up to the seaward limits of the territorial sea, or in the UK Renewable Energy Zone (REZ) (defined in section 84 (4) of the Energy Act 2004), except any part of a REZ in relation to which Scottish Ministers have functions.

1.4.2 The Secretary of State will only examine applications for electricity generating stations in Wales, in territorial waters adjacent to Wales or the Welsh zone of the REZ if their capacity is greater than 350 megawatts (MW).

1.4.3 The Secretary of State has no functions in relation to planning applications in Wales that do not relate to nationally significant infrastructure.

1.4.4 In Scotland, the Secretary of State will not examine applications for nationally significant electricity generating stations.

1.4.5 However, energy policy is generally a matter reserved to UK Ministers and this NPS may therefore be a relevant consideration in planning decisions in Wales and Scotland.

1.4.6 In Northern Ireland, planning consents for all nationally significant energy infrastructure projects are devolved to the Northern

Ireland Executive, so the Secretary of State will not examine applications for energy infrastructure in Northern Ireland.

1.5 Period of validity and review

1.5.1 See Section 1.5 of EN-1 for guidance on the period of validity and review of the energy NPS.

1.6 Infrastructure covered by this NPS

1.6.1 This NPS covers the following types of nationally significant renewable electricity generating stations:

- energy from biomass and/or waste including mixed waste containing non-renewable fractions (>50 MW in England and >350MW in Wales);
- pumped hydro storage (>50 MW in England and >350MW in Wales);
- solar photovoltaic (PV) (>100 MW[2] in England and >350MW in Wales);
- offshore wind (>100MW in England and >350MW in Wales);
- tidal stream (>100MW in England and >350MW in Wales); and
- onshore wind (>100 MW in England only[3]).

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 Similarly, it will apply to offshore transmission infrastructure projects in English waters which are directed into the NSIP regime under section 35 of the Planning Act 2008. This could include interconnectors, Offshore Hybrid Assets or 'bootstraps' to support the onshore network which are routed offshore. EN-5 also applies to offshore transmission infrastructure projects in English waters which are directed into the NSIP regime[4].

[2] Until the Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025 comes into force on 31 December 2025 this NPS will continue to have effect for solar PV generation of >50MW in England.
[3] The Wales Act 2017 devolved responsibility for development consent decisions in relation to all onshore wind generating stations in Wales.
[4] See EN-5 Section 1.6

1.6.4 This NPS does not cover other types of renewable electricity energy generation that are not at present technically viable over 50MW onshore, or over 100MW offshore.

1.6.5 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.

1.6.6 EN-1 (paragraphs 3.2.8 – 3.2.10) provides further information on assessing the need for other novel technologies or processes that may emerge during the life of this NPS.

1.7 Appraisal of Sustainability and Habitats Regulation Assessment

1.7.1 All the NPSs have been subject to an Appraisal of Sustainability (AoS) required by the Planning Act 2008 and the Environmental Assessment of Plans and Programmes Regulations 2004. A Habitats Regulations Assessment (HRA) has also been prepared in accordance with the Conservation of Habitats and Species Regulations 2017, and the Conservation of Offshore Marine Habitats and Species Regulations 2017.

1.7.2 These are published alongside this NPS and available at https://www.gov.uk/government/consultations/planning-for-new-energy-infrastructure-revisions-to-national-policy-statements.

2 General 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.

2.1.2 Part 5 of EN-1 sets out policy on the assessment of impacts which are common across a range of these technologies (generic impacts).

2.1.3 This NPS is concerned with impacts and other matters which are specific to biomass and energy from waste (EfW), offshore wind energy, pumped hydro storage, solar PV, tidal stream energy, and onshore wind, 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.

2.1.4 The policies set out in this NPS are additional to those on generic impacts set out in EN-1. Applicants should show how their application meets the requirements in EN-1 and this NPS, applying the mitigation hierarchy, as well as any other legal and regulatory requirements. This includes the assessment principles as set out in Part 4 of EN-1, and the consideration of impacts as set out in Part 5 of EN-1.

2.1.5 The Secretary of State should consider this NPS and EN-1 together. In particular, EN-1 sets out the government's conclusion that there is an urgent need for new major electricity infrastructure (see Part 3 of EN-1).

2.1.6 Section 3 of EN-1 includes assessments of the need for new major renewable electricity infrastructure. In the light of this, the Secretary of State should act on the basis that the need for infrastructure covered by this NPS has been demonstrated.

2.1.7 As stated in Section 4.2 of EN-1, to support the urgent need for new low carbon infrastructure, all onshore and offshore electricity generation covered in this NPS that does not involve fossil fuel combustion (that is, renewable generation, including anaerobic digestion plants, provided they meet existing definitions of low carbon) are considered to be Critical National Priority (CNP) infrastructure.

2.1.8 The assessment principles outlined in Section 4 of EN-1 continue to apply to CNP infrastructure. Applicants must show how any

likely significant negative effects would be avoided, reduced, mitigated or compensated for, following the mitigation hierarchy. Early application of the mitigation hierarchy is strongly encouraged, as is engagement with key stakeholders including SNCBs, both before and at the formal pre-application stage.

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 Government, will provide important information to applicants of nationally significant renewable energy projects.

2.2.2 Applicants should take these policies and guidance (including any relevant targets) into account and explain how their proposals fit with guidance or, alternatively, why they depart from them.

2.2.3 The Secretary of State should also have regard to these policies and guidance (including any relevant targets) in their decision making[5].

2.2.4 Whether an application conforms to the guidance or targets will not necessarily be a reason for approving or rejecting the application.

2.3 Factors influencing site selection and design

2.3.1 Factors influencing site selection by applicants for renewable energy generating stations are set out below.

2.3.2 The specific criteria considered by applicants and the weight they give to them will vary from project to project.

2.3.3 Where there are requirements on applicants or the Secretary of State to consider specific factors, these are made clear in the text.

2.3.4 The choices which applicants make in selecting sites reflect their assessment of the risk that the Secretary of State, following the general points set out in Section 4.1 of EN-1, will not grant consent in any given case.

2.3.5 It is for applicants to decide what applications to bring forward. In general, the government does not seek to direct applicants to

[5] See Section 1.4.3 of EN-1 regarding how the Secretary of State exercises functions in Wales.

particular sites for renewable energy infrastructure. In specific circumstances it may be appropriate to provide some direction or guidance, for example to areas of search or areas to avoid through Marine Plans, Strategic Environmental Assessments (SEAs) or The Crown Estate Leasing Rounds, in respect of marine renewable technology. All of the examples given consider marine specific aspects of many of the assessment principles set out in Part 4 of EN-1.

National designations

2.3.6 When considering applications for CNP Infrastructure in sites with nationally recognised designations (such as SSSIs, National Nature Reserves, National Parks, the Broads, National Landscapes, Registered Parks and Gardens, Listed Buildings and Scheduled Monuments, designated marine protected areas and World Heritage Sites), the Secretary of State will take as the starting point that the relevant tests in Sections 5.4 and 5.10 of EN-1 have been met, and any significant adverse effects on the qualities for which the area has been designated are clearly outweighed by the urgent need for this type of infrastructure.

2.3.7 The Secretary of State should have regard to the aims, goals and targets (including targets set under the Environment Act 2021) of the government's Environmental Improvement Plan[6] (), and other existing and future measures and targets in England, as well as Welsh policy, such as the Wales National Marine Plan, Planning Policy Wales and Technical Advice Note (TAN) 5,[7] the Wellbeing of Future Generations (Wales) Act 2015 and compliance with the Environment Act 2021[8].

2.3.8 In considering the impact on the historic environment as set out in Section 5.9 of EN-1 and whether the Secretary of State 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 Clean Power 2030 Mission and net zero target.

Other locational considerations

2.3.9 As most renewable energy resources can only be developed where the resource exists and where economically feasible, and because there are no limits on the need established in Part 3 of EN-1, the Secretary of State should not use a consecutive approach in the consideration of renewable energy projects (for

[6] See https://www.gov.uk/government/publications/environmental-improvement-plan
[7] https://gov.wales/technical-advice-note-tan-5-nature-conservation-and-planning
[8] See https://www.legislation.gov.uk/ukpga/2021/30/contents/enacted

example, by giving priority to the re-use of previously developed land for renewable technology developments).

2.3.10 The Secretary of State should also consider spatial plans, such as the Strategic Spatial Energy Plan upon endorsement by all relevant governments.

Seabed leasing

2.3.11 The Crown Estate owns and manages the seabed out to the 12 nautical miles (nm) territorial limit in England, Wales and Northern Ireland. The seabed around Scotland is managed by Crown Estate Scotland.

2.3.12 As well as owning the rights to explore and utilise waters up to 12nm, the Energy Act 2004 gives The Crown Estate rights to issue leases for development beyond the territorial limit and within the REZ.

2.3.13 Applicants must obtain a lease from The Crown Estate or Crown Estate Scotland prior to placing any offshore structures on, or passing cables over, the seabed and its foreshore.

Extensions

2.3.14 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. Similarly, they may offer capacity increases for existing wind farm leases.

2.3.15 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.

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

Marine Licensing

2.3.17 Marine Licences are required for all the marine elements of a proposed offshore development (up to mean high water springs), including associated development such as the cabling, offshore substations that are required, and any other aspects of a development that the appropriate licensing authority, such as the Marine Management Organisation (MMO) or Natural Resources Wales (NRW), may consider licensable under section 66 of the Marine and Coastal Access Act 2009 (MCAA).

2.3.18 Under section 58 of the MCAA the MMO makes all authorisation or enforcement decisions in accordance with marine plans and the Marine Policy Statement (MPS), unless relevant considerations indicate otherwise. This is also reflected in the MMO's input for the Secretary of State's consideration during the Development Consent Order (DCO) process.

2.3.19 Any DCO granted by the Secretary of State may include provisions deeming the grant of a Marine Licence for operations carried out wholly in England and English waters, or the Welsh Zone of the REZ.

2.3.20 The MMO is responsible for the enforcement, ongoing management and discharge of licence conditions, for operations carried out in English waters and the Northern Ireland offshore region[9].

2.3.21 It is not possible to deem a Marine Licence as part of the DCO in waters adjacent to Wales up to the 12nm seaward limits of the territorial sea. Welsh Ministers, through NRW, are responsible for issuing and enforcing marine licences for operations in Welsh waters.

2.3.22 In Scottish waters Marine Scotland is responsible for marine licensing.

2.3.23 The Secretary of State should liaise closely with the MMO, NRW, Marine Scotland where relevant, on the proposed terms of any deemed Marine Licence.

2.3.24 Applicants must approach the Marine Licensing regulator (MMO in England and NRW in Wales) early in the pre-application process to ensure that they are aware of any needs for additional marine licence consents alongside their DCO application.

2.3.25 As part of marine licensing, impacts on marine protected areas (MPAs) will be considered. Further guidance on marine licensing is set out in Section 1.2 of EN-1.

2.4 Climate change adaptation and resilience

2.4.1 Part 2 of EN-1 covers the government's energy and climate change strategy, including policies for mitigating climate change.

2.4.2 Section 4.10 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

[9] In Northern Ireland inshore waters to up 12nm Northern Ireland's Department of Agriculture, Environment and Rural Affairs is responsible for marine licensing.

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

2.4.3 Section 4.10 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.

2.4.4 Section 5.6 Coastal Change and Section 5.8 Flood Risk of EN-1 set out generic considerations that applicants and the Secretary of State should take into account in order to manage coastal change and flood risks.

Biomass

2.4.5 Biomass generating stations may be proposed for coastal or estuarine sites where climate change is likely to increase risks from flooding or rising sea levels, for example.

2.4.6 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; and
- Increased risk of coastal erosion.

Energy from Waste

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

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

Offshore wind

2.4.8 Whilst offshore wind farms will not be affected by flooding, applicants should demonstrate that any necessary land-side infrastructure (such as cabling and onshore substations) will be appropriately resilient to climate-change induced weather

phenomena. Similarly, applicants should particularly set out how the proposal would be resilient to storms.

Pumped Hydro Storage

2.4.9 Pumped Hydro Storage sites are likely to be proposed for hilly and mountainous locations where climate change is likely to increase risks from rain fall and flooding.

2.4.10 In such cases applicants should, in particular, set out how the proposal would be resilient to:

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

Solar photovoltaic

2.4.11 Solar photovoltaic (PV) sites may also be proposed in low lying exposed sites. For these proposals, applicants should consider, in particular, how plant will be resilient to:

- increased risk of flooding; and
- impact of higher temperatures.

Tidal Stream

2.4.12 Tidal turbines and their associated marine infrastructure will not be affected by flooding, sea level rises, or higher average temperatures. However, applicants should demonstrate that any necessary land-side infrastructure (such as landfall stations, transformers, and so on) will be appropriately resilient to climate-change induced weather phenomena.

Onshore wind

2.4.13 Onshore wind farms are typically proposed in high lying exposed sites and are unlikely to be affected by flooding, but where there is potential risk, applicants should set out how the layout of the infrastructure has been designed to be resilient.

2.4.14 Applicants should set out how the proposal would be resilient to increased storms.

2.5 Consideration of good design for energy infrastructure

2.5.1 Section 4.7 of EN-1 sets out the criteria for good design that should be applied to all energy infrastructure.

2.5.2 Proposals for renewable energy infrastructure should demonstrate good design, particularly in respect of landscape and visual amenity, opportunities for co-existence/co-location with other marine and terrestrial uses, and in the design of the project to mitigate impacts such as noise and effects on ecology and heritage.

2.5.3 Defra will consult on a series of Offshore Wind Environmental Standards (OWES) before drafting guidance. The OWES Guidance will aim to support the achievement of good design for offshore wind farms and / or offshore wind infrastructure which is detailed in paragraph 3.8.84.

2.6 Flexibility in the project details

2.6.1 Where details are still to be finalised, applicants should explain in the application which elements of the proposal have yet to be finalised, and the reason why this is the case.

2.6.2 Where flexibility is sought in the consent as a result, applicants should, to the best of their knowledge, assess the likely worst-case environmental, social and economic effects of the proposed development to ensure that the impacts of the project as it may be constructed have been properly assessed[10].

2.6.3 Full guidance on how applicants and the Secretary of State should manage flexibility is set out in Section 4.3 of EN-1.

[10] Case law, beginning with R v Rochdale MBC Ex p. Tew [2000] Env.L.R.1 establishes that while it is not necessary or possible in every case to specify the precise details of development, the information contained in the ES should be sufficient to fully assess the project's impact on the environment and establish clearly defined worst case parameters for the assessment. This is sometimes known as 'the Rochdale Envelope'. See https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/

2.7 Biomass and Waste Combustion

Introduction

2.7.1 The combustion of biomass for electricity generation plays an important role in meeting the UK's energy needs, and supports the decarbonisation of the sector. It also has a potentially significant role in supporting delivery towards the UK's net zero target when combined with carbon capture and storage.

2.7.2 In accordance with the waste hierarchy[11] energy recovery forms an element of residual waste management strategies in both England and Wales. CNP policy, as set out in Section 4.2 of EN-1, does not apply to applications for EfW projects.

2.7.3 The Biomass Policy Statement[12] sets out the strategic aims for the role of biomass across the economy in the short, medium, and long term in achieving our net zero target.

2.7.4 The Biomass Strategy[13] informs decisions on how biomass will be supported in the future, reviewing the amount of sustainable biomass available to the UK and how this resource could be best utilised across the economy to help achieve our net zero greenhouse gas (GHG) emissions target, and wider environmental targets.

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

- biomass derived from forest residues as co-products of conventional forestry management. This includes forest products generated during thinning, felling and coppicing of sustainably managed forests, parklands and trees from other green spaces. It also includes sawmill residues (often processed to produce wood pellets), other wood processing residues and parts of trees unsuitable for the timber industry;
- biomass from sustainable crops, as well as conventional food crops, this includes crops grown primarily for use in energy generation ('energy crops'), such as, short rotation coppice (SRC), short rotation forestry (SRF) or Miscanthus. Biomass can also be sourced from agricultural residues such as straw, husks and kernels; and

[11] Waste hierarchy as set out in Regulation 12 of the Waste (England and Wales) Regulations 2011, and also see Section 5.15 of EN-1.
[12] See https://www.gov.uk/government/publications/biomass-policy-statement-a-strategic-view-on-the-role-of-sustainable-biomass-for-net-zero
[13] See https://www.gov.uk/government/publications/biomass-strategy

- biomass from biodegradable waste and other similar materials including sewage sludge, animal manure, waste wood from construction, the biodegradable fraction of mixed municipal waste, and food waste that would otherwise be disposed of in landfill.

Applicant Assessment

Factors Influencing site selection and design

Waste treatment capacity

2.7.6 As the primary function of EfW[14] plants is to treat waste, applicants must demonstrate that proposed EfW plants will meet a clearly defined need to facilitate the diversion of non-recyclable waste sent to landfill, or enable the replacement of older, less efficient waste combustion facilities. In line with Defra's policy statement[15], development consent will not be granted for further EfW developments in England unless these criteria are met.

2.7.7 The Welsh Government has put in place a moratorium on all new EfW plants greater than 10MW generation capacity in Wales. Where proposed EfW developments in Wales exceed 350MW, these will continue to be considered by the Secretary of State under the Planning Act 2008.

Transport infrastructure

2.7.8 Biomass or EfW generating stations are likely to generate considerable transport movements. For example, a biomass or EfW plant that uses 500,000 tonnes of fuel per annum might require up to approximately 220 heavy goods vehicle (HGV) movements per day (Monday – Friday) to import the fuel. There will also be residues which will need to be regularly transported off site.

2.7.9 Government policy encourages multi-modal transport and it is expected that applicants will transport materials (fuel and residues) by water or rail routes where possible, with road transport expected where this is not feasible, or for shorter journeys.

2.7.10 Applicants should locate new biomass or waste combustion generating stations in the vicinity of existing transport routes wherever possible.

[14] In this context Energy from Waste includes conventional waste to energy facilities (i.e. electricity and heat generation) and Advanced Thermal Treatment and Advanced Conversion Technologies that process residual wastes to create a syngas or liquid fuel.
[15] Government to crack down on waste incinerators with stricter standards for new builds - GOV.UK

2.7.11 Although there may in some instances be environmental advantages to rail or water transport, whether such methods are viable is likely to be determined by the economics of the scheme.

2.7.12 Road transport may be required to connect the site to the rail network, waterway, or port. Therefore, any application should incorporate suitable access leading from the main highway network, including any new transport infrastructure required.

2.7.13 Consideration of transport modes should also consider the movement of captured carbon from these facilities where direct access to a storage network is unavailable.

Technical considerations

Combined heat and power (CHP)

2.7.14 Guidance on CHP is set out in Section 4.8 of EN-1, which sets out the requirements on applicants either to include CHP or to present evidence in the application that the possibilities for CHP have been fully explored.

2.7.15 Applications related to biomass and waste combustion as part of an EfW facility must detail how the plant will maximise the amount of heat available and provide heat to a heat network within three years of entering operation.

Carbon capture readiness (CCR)

2.7.16 The government recognises the need to prioritise biomass use to applications where it can deliver GHG emission reductions in hard-to-decarbonise sectors, without other viable alternatives, to comply with our net zero and wider environmental goals. One of these priority applications is the use of biomass to deliver negative emissions through Bioenergy with Carbon Capture & Storage (BECCS).

2.7.17 The Biomass Strategy established the role which BECCS could play in reducing carbon emissions across the economy and set out how the technology could be deployed.

2.7.18 Guidance on CCR and plans to transition to a new regime, Decarbonisation Readiness, are set out in Section 4.9 of EN-1.

2.7.19 CCR is currently relevant to proposed biomass plant at or over 300MW of generating capacity. CCR will come into force for new and substantially refurbished EfW developments from 28 February 2026.

Fuels

2.7.20 The social, environmental, and economic case for widespread deployment of biomass-fuelled plant depends on the sustainability of fuel used in it.

2.7.21 The Renewables Obligation (RO)[16], administered by the Office of Gas and Electricity Markets (Ofgem) and the Contracts for Difference (CfD) scheme[17] are the main support mechanisms for renewable electricity in the UK.

2.7.22 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.

2.7.23 The sustainability criteria include a minimum GHG emissions saving and general restrictions on the use of materials from land that is important on carbon or biodiversity grounds, such as primary forest, highly biodiverse grasslands, or peatlands and, for woody biomass, a requirement that the forests are managed sustainably.

2.7.24 In assessing the GHG emissions, applicants should take account of emissions associated with cultivation, processing, and transport of biomass for electricity generation and direct land use change. The criteria apply to both domestic and imported material.

2.7.25 As a part of the Biomass Strategy, government has committed to reviewing the UK's biomass sustainability criteria. Once final guidance is published, applicants for new installations are expected to comply with any new requirements.

Nature of applications

2.7.26 Applicants must provide details on the makeup of their proposed EfW/biomass combustion plant, which is likely to consist of the following:

- a main combustion plant building incorporating emissions abatement technologies, electricity generation units, a cooling assembly (variety of types and methods), and chimney stack(s);

16 The Renewables Obligations closed to all new generating capacity on 31 March 2017. See https://www.ofgem.gov.uk/environmental-programmes/ro/about-ro/ro-closure
17 Further detail on the CfD scheme is set out in paragraph 2.5.2-3 in EN-1.

- buildings necessary for fuel reception, storage, sorting and pre-treatment facilities; and
- ancillary plant such as an electricity substation, civil engineering workshops and offices.

2.7.27 Details should be provided on any development proposals that may also incorporate additional features such as waste transfer or treatment facilities.

2.7.28 Where EfW proposals for mixed waste incineration include material of animal origin, applicants may require ancillary development in order to comply with the requirements of the Animal By-Products (Enforcement) (England) Regulations 2013.

Commercial aspects of EfW plants

2.7.29 EfW 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 as a byproduct of this process. The commercial rationale for EfW plants will include both the gate fee received per tonne of waste handled and income received from energy recovery.

2.7.30 Like any combustion generating station, operators secure fuel through contracts. Local authorities issue municipal waste disposal contracts which are often long term (up to 25 years). Contracts to dispose of private sector wastes or local authority collected waste aggregated by private sector waste handlers are, generally, shorter (around 15 years). Applicants may decide to focus on either public or private sector waste treatment contracts, or a combination of the two.

Network connection

2.7.31 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.

2.7.32 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 4.11 in EN-1, any application to the Secretary of State must include information on how the generating station is to be connected and whether any environmental issues are likely to arise from that connection. Further advice on grid connections is presented in Section 4.11 of EN-1 and in EN-5.

Flexibility

2.7.33 In some cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- The composition, calorific value and availability of fuel;
- The precise details of all elements of the proposed development.

2.7.34 Guidance on how applicants should manage flexibility is set out in Section 4.3 of EN-1.

Impacts

2.7.35 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

2.7.36 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Air quality and greenhouse gas emissions

2.7.37 Applicants should include in the ES an assessment of the air emissions resulting from the proposed infrastructure and demonstrate compliance with the relevant regulations (see Section 5.2 and 5.3 of EN-1).

2.7.38 Applicants should include in the ES an assessment of the air emissions associated with delivery and movement of people, fuel and materials. This should include consideration of cumulative effects from construction, operation and vehicle movements.

2.7.39 Applicants should take into account the presence of Air Quality Management Areas, NO2 Programme Clean Air Plans and proximity to large numbers of people and vulnerable receptors (e.g. health facilities, care homes and schools) when considering site selection.

2.7.40 For combustion plant using CCS, the ES should reflect the latest evidence on the air quality impacts of carbon capture using amine-based solvents.

Landscape and visual

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

Noise and vibration

2.7.42 Sources of noise and vibration may include:

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

2.7.43 Applicants should include in the ES a noise assessment of the impacts on amenity in case of excessive noise from the project in line with guidance set out in Section 5.12 in EN-1.

Odour, insect and vermin infestation

2.7.44 Applicants should assess the potential for insect and vermin infestation and emissions of odour as set out in EN-1 Section 5.7, with particular regard to the handling and storage of waste for fuel.

Waste management

2.7.45 In accordance with the waste hierarchy, EfW developments in England must demonstrate that they will help lower the amount of non-recyclable waste sent to landfill or help enable the replacement of older, less efficient facilities.

2.7.46 Applicants should set out how they intend to ensure that recyclable materials, including those that may be recyclable in the future, will be separated and sent for appropriate treatment. In accordance with the waste hierarchy, recyclable material must not be combusted.

2.7.47 Applicants should undertake an assessment of the proposed waste combustion generating station, examining the conformity of the scheme with the management of waste in accordance with the waste hierarchy and the effect of the scheme on the relevant Waste Local Plan, or plans where a proposal is likely to involve more than one local authority.

2.7.48 Applicants should set out the extent to which the generating station and capacity proposed is compatible with, and supports the statutory, long-term residual waste reduction target for England, taking into account existing residual waste treatment capacity and that already in development. Applicants should also consider the declining availability of residual waste arisings in context of the government's commitment to transition to a circular economy.

2.7.49 Where appropriate, assessments should 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.

2.7.50 Where EfW developments are developed to enable the replacement of older, less efficient facilities, capacity should not necessarily be replaced like for like and must reflect updated waste management capacity needs.

2.7.51 The results of the assessment of the conformity with the waste hierarchy and the effect on relevant waste plans should be included in the application to the Secretary of State.

Residue management

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

- Incinerator bottom ash (IBA) is comprised mainly of non-combustible material from the combustion chamber. The quantity of IBA produced is dependent on the technology process and fuel type but might be as much as 20% (in terms of weight) of the waste throughput of the generating station; and
- air pollution control residue (APCR), a residue from flue gas emission abatement technology and usually 3-4% (in terms of weight) of the waste throughput of the generating station.

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

2.7.54 Biomass combustion generating stations will also produce both combustion and flue gas treatment residues which must not be mixed. Residues arising from biomass combustion generating stations are usually between 1% and 12% (in terms of weight) of the fuel capacity of the plant.

2.7.55 The regulation of waste disposal for waste combustion and flue gas residues from biomass combustion is intended to reduce the amount of waste that is sent to landfill. Waste combustion APCr is classified as a hazardous waste material and needs to be managed as such[18].

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

[18] See Regulation 19(1) Hazardous Waste Regulations 2005 for permitting on the mix of hazardous and non-hazardous waste.

2.7.57 Applicants should include the production and recovery or disposal of residues as part of the ES. Any proposals for recovery of ash and mitigation measures should be described.

2.7.58 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.

2.7.59 Applicants must ensure proposals do not result in an over-capacity of EfW waste treatment provision at a local or national level.

Water quality and resources

2.7.60 The design of water-cooling systems for EfW and biomass generating stations will have additional impacts on water quality, abstraction and discharge. This can affect marine ecosystems where cooling systems use seawater. These may include:

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

2.7.61 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.

2.7.62 Applicants should include specific measures to minimise fish impingement and/or entrainment, and the discharge of excessive heat to receiving waters, and should consider discharge profiles that minimise the impact on temperature and resultant dissolved oxygen levels.

2.7.63 As river and sea temperatures rise (as a result of already locked-in climate change) then the operational constraints necessary to protect ecosystems will also increase. Applicants should consider climate risks when designing water cooling systems, ensuring they are fit for the future.

Mitigation

Air quality and greenhouse gas emissions

2.7.64 Applicants should provide details on the air quality and emissions that will result from their plant, which may include NOx[19], SOx[20], NMVOCs[21] or particulates (PM2.5, PM10). They should detail the abatement technologies adopted, which should be those set out in the relevant sector guidance notes as produced by the Environment Agency (EA). The EA will determine if the technology selected for the waste/biomass combustion generating station is considered Best Available Technique (BAT), and that therefore the Secretary of State does not need to consider equipment selection in its determination process.

Landscape and visual

2.7.65 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.

2.7.66 Applicants should consider the design of the generating station, including the materials to be used in the context of the local landscape character.

2.7.67 Although micro-siting within the development area can help, mitigation is achieved primarily through aesthetic aspects of site layout and building design including size, external finish and colour of the generating station to minimise intrusive appearance in the landscape as far as engineering and technical requirements permit. The precise architectural treatment will need to be site-specific.

Noise and vibration

2.7.68 As described in paragraph 5.12.15 of EN-1, the primary mitigation for noise for biomass and EfW generating stations is through good design to enclose plant and machinery in noise-reducing buildings, wherever possible, and to minimise the potential for operations to create noise.

2.7.69 Noise from gas and steam turbines should be mitigated by attenuation of exhausts and steam release valves to reduce any risk of low-frequency noise transmission.

2.7.70 Noise from features including sorting and transport of material during operation of biomass or EfW generating stations is unavoidable. Similarly, noise from apparatus external to the main

[19] Nitrogen oxides.
[20] Sulphur oxides.
[21] Non-Methyl Volatile Organic Compounds.

generating station may be unavoidable. This can be mitigated through careful plant selection.

Odour, insect and vermin infestation

2.7.71 In addition to the mitigation measures set out in paragraph 5.7.8 of EN-1, reception, storage and handling of waste and residues should be carried out within defined areas, for example bunkers or silos, within enclosed buildings at EfW generating stations.

2.7.72 To minimise potential for infestation, operators are required to produce a written management system[22] as part of their environmental permit and this will include consideration of odour, insect and vermin management. The EA and NRW will regulate facilities against this plan.

Residue management

2.7.73 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.

2.7.74 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.

2.7.75 The management of hazardous waste will be considered by the EA or NRW through the Environmental Permitting regime.[23]

Water quality and resources

2.7.76 In addition to the mitigation measures set out in paragraphs 5.16.8 – 5.16.11 of EN-1, design of the cooling system should include intake and outfall locations that avoid or minimise adverse impacts.

Secretary of State decision making

Site selection and design

Transport infrastructure

2.7.77 Where existing access is inadequate and the applicant has proposed new infrastructure, the Secretary of State will need to be satisfied that the impacts of the new infrastructure are acceptable as set out in Section 5.14 of EN-1.

[22] The Environmental Protection (England and Wales) Regulations 2016
[23] The Environmental Permitting (England and Wales) Regulations 2016 https://www.legislation.gov.uk/uksi/2016/1154/contents

National designations

2.7.78 Paragraphs 2.3.6 – 2.3.8 in this NPS outline how the national designations will be considered by the Secretary of State in decision making.

Technical considerations

Fuels

2.7.79 Sustainability of the waste, 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.

2.7.80 The sustainability criteria will apply to both new and existing generating stations to the extent that they claim renewable electricity support. The RO and CfD regimes (and any successor to them) are critical elements in the business case of most biomass and bioliquid plants, so that in any given case the incentive effect of linking the support to the satisfaction of sustainability criteria may constitute an entirely adequate control on the sustainability of a plant's fuel sources. However, it is possible that the support may not be available for the whole of a plant's operational life, and it is also possible in principle that plants may be able to operate profitably without them at certain periods.

2.7.81 The Secretary of State should consider in each case whether it is appropriate to rely on the RO and CfD, or any successor incentive regime to ensure the sustainability of a plant's fuel over its whole life.

2.7.82 The Secretary of State should not grant consent to a proposed biomass or bioliquid-fuelled generating station unless they are 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.

2.7.83 Where appropriate, the Secretary of State may include a requirement to this effect in the DCO.

2.7.84 The Secretary of State should not grant consent to an EfW development where they are not convinced that the proposals will meet a clearly defined need to facilitate the diversion of non-recyclable waste away from landfill or enable the replacement of an older, less efficient waste combustion facility. The Secretary of State should also be satisfied that a proposed EfW development is feasible for the duration of its proposed lifecycle in light of

declining residual waste volumes and will not be reliant on material that is recyclable.

Combustion plant types and scale

2.7.85 EfW 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.

2.7.86 The Secretary of State should not be concerned about the type of technology used.

2.7.87 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.

2.7.88 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 this section and in paragraph 3.3.37 of EN-1.

Combined heat and power

2.7.89 The government's strategy for CHP is described in Section 4.8 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. Applications related to biomass and waste combustion as part of an EfW facility must detail how the plant will maximise the amount of heat available and provide heat to a heat network within three years of entering operation.

2.7.90 Given the importance which government attaches to CHP, for the reasons set out in EN-1 the Secretary of State will need to be satisfied that the applicant has provided appropriate evidence that CHP is included or that the opportunities for CHP have been fully explored. For non-CHP stations, the Secretary of State may also require that developers ensure that their stations are configured to allow heat supply at a later date as described in Section 4.8 of EN-1 and the guidance on CHP issued by then DTI in 2006[24].

[24] Guidance on background information to accompany notifications under Section 14(1) of the Energy Act 1976 and applications under Section 36 of the Electricity Act 1989. See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/43594/Power_station_proposals_-_guidance_2006.pdf

Impacts

2.7.91 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

2.7.92 The Secretary of State should consider any impacts which they determine are relevant and important to its decision.

Air quality and greenhouse gas emissions

2.7.93 Although a carbon assessment will be provided as part of the ES, the policies set out in Part 2 of EN-1 will apply. As set out in Section 5.3 of EN-1, the Secretary of State does not need to assess individual applications for planning consent against operational carbon emissions and their contribution to carbon budgets, net zero and the government's international climate commitments.

2.7.94 The Secretary of State should otherwise generally give air quality and emissions considerations substantial weight, following the guidance set out in Section 5.2 of EN-1.

2.7.95 Compliance with the Environmental Permitted Regulations (EPR) is enforced through the environmental permitting regime regulated by the EA. Plants not meeting the requirements of the EPR would not be granted a permit to operate.

2.7.96 The pollutants of concern arising from the combustion of waste and biomass may include NOx, SOx, NMVOCs and 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.

2.7.97 Where a proposed EfW plant or biomass generating station meets the requirements of the EPR and BAT conclusions and will not exceed the local air quality standards or adversely affect the delivery of the Environment Act 2021 PM2.5 targets, National Emission Ceiling Regulations emissions limits or other statutory limits, objectives or targets, the Secretary of State should consider the proposed waste generating station as having acceptable impacts on health.

2.7.98 Although Decarbonisation Readiness requirements will be assessed through the Environmental Permitting Regime the Secretary of State should be satisfied that facilities will be able to pass the "space requirement" feasibility test. Proposed EfW developments should be built in accordance with the government's Decarbonisation Readiness requirements once they come into force.

Landscape and Visual

2.7.99 The Secretary of State should be satisfied that the design of the proposed generating station is of appropriate quality and minimises adverse effects on the landscape character, visual amenity and quality.

2.7.100 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, and a stack of sufficient height to safeguard human health and minimise local impacts on the environment.

2.7.101 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.

2.7.102 The Secretary of State should expect applicants to seek to design the landscaping plan of EfW/biomass combustion generating station sites to visually enclose them at low level as seen from surrounding external viewpoints. This can make the scale of the generating station less apparent, and helps conceal its lower level, smaller scale features.

2.7.103 Earth bunds and mounds, tree planting or both may be used for softening 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.[25]

2.7.104 When having regard to the considerations in respect of other impacts set out Section 5.10 in EN-1 and this NPS, the Secretary of State is satisfied that the location is appropriate for the project, and that it has been designed sensitively (given the various siting, operational and other relevant constraints) to minimise harm to landscape and visual amenity, the visibility of a EfW plant or biomass electricity generating station should be given limited weight.

Noise and vibration

2.7.105 The Secretary of State should consider the noise and vibration impacts according to Section 5.12 in EN-1 and be satisfied that

[25] Such as the 10 characteristics of good design which are set out in the National Design Guide, see https://www.gov.uk/government/publications/national-design-guide and the draft National Model See https://www.gov.uk/government/consultations/national-planning-policy-framework-and-national-model-design-code-consultation-proposals

noise and vibration will be adequately mitigated through requirements attached to the consent.

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

2.7.107 The Secretary of State should not grant development consent unless it is satisfied that the proposals will meet the aims set out in 5.12 of EN-1.

Odour, insect and vermin infestation

2.7.108 The Secretary of State should be satisfied that the proposal sets out appropriate measures to minimise impacts on local amenity from odour, insect and vermin infestation.

Waste management

2.7.109 In line with Defra's current policy statement, the Secretary of State should not grant development consent for further EfW plants in England unless satisfied that the proposal will help lower the amount of non-recyclable waste sent to landfill, or enable the replacement of older, less efficient facilities.

2.7.110 The Secretary of State should be satisfied that the proposed EfW development will not prevent recyclable materials, including those that may be recyclable in the future, being separated and sent for appropriate treatment.

2.7.111 The Secretary of State should be satisfied, with reference to the relevant waste strategies and plans, that the proposed EfW plant 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.

2.7.112 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.

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

Residue management

2.7.114 The Secretary of State should give substantial weight to development proposals that have a realistic prospect of recovering materials as described in paragraphs 2.7.72 - 2.7.75 of this NPS.

2.7.115 The Secretary of State should consult the EA on the suitability of the proposals.

2.7.116 When the Secretary of State considers noise and vibration, release of dust and transport impacts, they should recognise that these impacts may arise from the need for residue disposal as well as other factors.

2.7.117 The Secretary of State should be satisfied that management plans for residue disposal satisfactorily minimise the amount that cannot be used for commercial purposes.

2.7.118 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 generating station/EfW plant and agrees that management plans suitably minimise the wider impacts from ash disposal, any residual ash disposal impacts should have limited weight.

Water quality and resources

2.7.119 The Secretary of State should be satisfied that the applicant has demonstrated measures to minimise adverse impacts on water quality and resources as described above and in Section 5.16 of EN-1.

2.8 Offshore Wind

Introduction

2.8.1 Offshore wind (including floating wind) is expected to play a significant role in meeting demand and decarbonising the energy system. This government is committed to accelerating the deployment of offshore wind to meet the Clean Power 2030 Mission, with an expectation that there will be a need for substantially more installed offshore capacity beyond 2030 to achieve net zero carbon emissions by 2050[26].

2.8.2 To meet its objectives government considers that all offshore wind developments are likely to need to maximise their capacity within the technological, environmental, and other constraints of the development.

2.8.3 There are two main UK sea areas where offshore wind farms can be built:

[26] The Climate Change Act 2008 (2050 Target Amendment) Order 2019

- in UK territorial waters, which generally extend up to 12nm from the coast; and
- beyond the 12nm limit where, under international law, the UK is able to construct wind farm installations or other structures to produce renewable energy in the REZ as declared in the Energy Act 2004[27].

2.8.4 Any reference within this NPS to offshore wind farm infrastructure includes all the elements which may be part of an offshore wind farm application including:

- wind turbines;
- all types of foundations (fixed bottom or floating);
- onshore and offshore substations;
- anemometry masts;
- accommodation platforms; and
- cabling (offshore transmission).

2.8.5 In addition, this section on offshore wind makes many references to cabling and offshore transmission. Applicants bringing forward proposals for that infrastructure should note all such references; cabling refers to all types of electricity network infrastructure including offshore transmission as well as the inter-array cables for a wind farm.

Consenting process

2.8.6 For guidance on DCOs and Marine Licences, applicants and the Secretary of State should consult paragraphs 2.3.17 - 2.3.25 of this NPS.

2.8.7 The rate of deployment of offshore wind, in particular in the North Sea, has meant that the cumulative effects on the environment from offshore wind have increased rapidly. Most recent DCOs have needed to include conditions related to benthic and avian compensation measures. However, it is becoming increasingly difficult for developers to source sufficient compensation measures to allow their consent to be granted and some projects which have received consent have found it difficult to discharge their compensation conditions.

2.8.8 Reducing delays in the planning process is essential to accelerate deployment of offshore wind and DESNZ are working closely with

[27] 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.

Defra to support them in delivering the Offshore Wind Environmental Improvement Package (OWEIP) to address environmental barriers. The OWEIP includes measures to:

- revise the Habitats Regulations and Marine Conservation Zone environmental assessment process for offshore wind to facilitate the delivery of compensation measures whilst maintaining valued protection for the marine environment;
- facilitate the delivery of strategic environmental compensation measures to offset environmental effects and reduce delays to projects, including development of a library of compensation measures, through the Collaboration on Offshore Wind Strategic Compensation (COWSC) programme;
- implement an industry-funded Marine Recovery Fund (MRF) or funds, that developers can choose to pay into to meet their environmental compensation obligations. It is anticipated that two funds will operate in the UK – one for projects consented in England, Wales and Northern Ireland, and one for projects consented in Scotland;
- develop OWES to reduce environmental impacts at the point of project design of wind farms and offshore transmission infrastructure, providing greater certainty and reducing delays in the consenting process;
- take steps to better manage marine noise from offshore wind deployment; and
- develop a strategic approach to environmental monitoring.

2.8.9 Various aspects of the OWEIP will be subject to public consultation and guidance will be produced in due course.

2.8.10 The OWEIP applies to “the planning, construction, operation or decommissioning of offshore wind electricity infrastructure” and the identification of an area for such an activity[28]. Infrastructure is defined in the Energy Act and includes offshore transmission infrastructure such as bootstraps.

Applicant assessment

Factors influencing site selection and design

2.8.11 General factors influencing site selection by applicants are set out at Section 2.3 of this NPS.

[28] The Energy Act Section 290

2.8.12 Specific considerations involved in the siting of an offshore wind development are additionally likely to be influenced by factors set out in the following paragraphs.

2.8.13 The specific criteria considered by applicants, and the role that they play in site selection, will vary from project to project.

Offshore Energy Strategic Environmental Assessment

2.8.14 In proposing sites for offshore wind and/or offshore transmission infrastructure, NSIP applicants should demonstrate that their choice of site takes into account the government's Offshore Energy SEA 4[29] and any successors to it.

2.8.15 The government is undertaking a rolling Offshore Energy SEA programme, including a research programme[30] and data collection to facilitate future strategic and project specific assessments to achieve the Clean Power 2030 Mission.

Marine Planning

2.8.16 Marine planning currently enables the increasing demands for use of the marine area to be balanced and managed in an integrated way that protects the marine environment whilst supporting sustainable development.

2.8.17 Marine plans provide a transparent framework for consistent, evidence-based decision making and should be used by applicants to guide site selection.

2.8.18 Marine plans will help applicants understand generic potential impacts of their proposal at an early stage e.g., in relation to other activities, or where there are MPAs. Further information is provided in Section 4.5 of EN-1.

2.8.19 The cross-Government Marine Spatial Prioritisation Programme will review how marine plans, the wider planning regime, legislation and guidance may need to evolve to ensure a more holistic approach to the use of the seas, and that this is taken to maximise co-existence/co-location possibilities.

Seabed leasing

2.8.20 The Crown Estate issues leases for offshore wind farms in tendering rounds. Applicants must obtain a lease prior to placing

[29] Applicants should note that the Offshore Energy SEA 4 consultation was published in 2022 and does not reflect current government policies. The spatial analysis indicated space for further generation capacity beyond the 40GW initially considered at that time. See https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4

[30] See https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-research-projects

an offshore wind structure on, or passing transmission export cables over, the seabed and its foreshore (see paragraphs 2.3.14 - 2.3.16 of this NPS for information on seabed leasing, extensions and capacity increases).

2.8.21 Rounds 1, 2 and 3 are closed and sites leased in those rounds are either operational; in construction; consented but yet to be constructed or awaiting determination. Leasing Round 4 is completed, with agreements for lease awarded in January 2023[31].

2.8.22 To date, each offshore wind leasing round has been supported by a plan-level HRA, which assesses the impact of the leasing round on protected sites[32]. It should also be noted that aspects of plan-level HRAs that remain relevant at the project-level, might be able to be relied upon to inform the project-level HRA, reducing the project-level effort and reducing duplication.

2.8.23 The assessment serves to provide a better understanding of the potential significant effects and to identify measures which can be put in place to avoid, mitigate, or reduce those significant effects at a plan level.

2.8.24 Where an assessment concludes that there will still be an adverse impact on the integrity of a protected site, a case for derogation can be considered. This must meet strict legal tests, which includes identifying compensatory measures.

2.8.25 Individual project lease agreements from The Crown Estate often include limits on development (such as a maximum generation capacity), which are used by The Crown Estate as a proxy to establish environmental effects at the plan level. Consistent with the government's objectives in this NPS, project developers should seek to maximise their capacity within the technological, environmental, and other constraints of the project. At the development consent stage, the Secretary of State will use detailed maximum project parameters to assess environmental impacts, and these will be reflected in the DCO. Such parameters may differ from the limits on development assumed by The Crown Estate in the agreement for lease e.g., as a rule, the Secretary of State will not include a maximum capacity limit within the DCO. Future offshore development may occur in rounds, as piecemeal development or using any other development mechanism as required.

2.8.26 Future leasing rounds may continue to be supported by separate plan-level HRA or, in appropriate cases, may be the subject of a

[31] See https://www.thecrownestate.co.uk/our-business/marine/Round4

[32] 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.

coordinated approach to the HRA, where there is overlap between the activities of more than one competent authority in relation to offshore development.

2.8.27 The Crown Estate is designing new leasing opportunities for floating wind projects in the Celtic Sea as part of the government's ambition to radically increase the deployment of offshore wind to help achieve the Clean Power 2030 Mission[33].

Wind resource

2.8.28 Available wind resource is critical to the economics of a proposed offshore wind farm.

2.8.29 To inform their economic modelling, applicants may collect wind speed data using an anemometry mast or similar. Such activities may require a marine licence.

2.8.30 Collection of this data is not obligatory as the suitability of the wind speed across the site and economics of the scheme are a matter for the technical and commercial judgement of the wind farm applicant not the Secretary of State.

Water depth and foundation conditions

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

2.8.32 The onus is on the applicant to ensure that the foundation design is technically suitable for the seabed conditions and that the application caters for any uncertainty regarding the geological conditions.

2.8.33 Whilst the technical suitability of the foundation design is not in itself a matter for the Secretary of State, the Secretary of State will need to be satisfied that the foundations will not have an unacceptable adverse effect on marine biodiversity, the physical environment or marine heritage assets.

Offshore-onshore network connection

2.8.34 As identified in paragraphs 3.3.68 – 3.3.88 and Section 4.11 of EN-1, and Section 2.12 of EN-5, a more co-ordinated approach to offshore-onshore transmission[34] is required.

[33] https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/floating-offshore-wind/
[34] In this context transmission means all cabling and associated infrastructure including onshore converter stations.

2.8.35 The previous standard approach to offshore-onshore connection involved a radial connection between single wind farm projects and the shore. A coordinated approach will involve the connection of multiple, spatially close, offshore wind farms and other offshore infrastructure, wherever possible, as relevant to onshore networks.

2.8.36 This will include connections via Offshore Hybrid Assets (OHA , which combine the connection of offshore wind with the function of point-to-point interconnectors.

2.8.37 Co-ordinated transmission proposals have principally been developed through, and as a consequence of, a process of ongoing reform[35] including through strategic network planning, such as the Holistic Network Design for onshore-offshore transmission, as outlined in EN-5. Further details are provided in EN-5, Section 2.12-2.15.

2.8.38 As part of the transition to more co-ordinated transmission, it is anticipated that some proposals for transmission could be consented separately to those for the wind farm (array) application.

2.8.39 For this to occur, an applicant will need to make a request to the Secretary of State. The Secretary of State would then decide whether to give direction under Section 35 of the Planning Act 2008.

2.8.40 For some wind farm projects, the electricity network connection proposals in the application could comprise a wind farm export cable to an offshore transmission connection point on part of an offshore transmission network taking power to shore or exported to another market as part of a multi-purpose interconnectors (MPIs), a type of OHA where the wind is in GB waters.

2.8.41 OHAs will enable direct power flow from wind farms to two or more countries. They will provide the electricity network with flexibility needed to integrate the increased deployment of intermittent offshore renewable generation into the system by:

- allowing market-to-market trading when there is additional capacity on the cable; and
- limiting the need to curtail offshore wind generation when domestic demand has been met by providing a direct route for export to neighbouring North Sea countries[36].

[35] Reforms took place initially under the Offshore Transmission Network Review (OTNR), see https://www.gov.uk/government/groups/offshore-transmission-network-review

[36] In this context ‘North Seas’ is used to refer to the North Sea and seas around the UK and Ireland.

2.8.42 This will provide system benefits, reduce costs to consumers and maximise market access for generators.

2.8.43 The design of wind farms, and offshore transmission (including interconnection and OHAs) projects should seek to be sufficiently flexible so that they are future-proofed as far as possible to enable future connections with different types of offshore transmission or wind farms respectively, where these are proposed to be spatially proximate.

Marine Protected Areas

2.8.44 The UK government has obligations to protect the marine environment with a network of well managed MPAs, which also includes Highly Protected Marine Areas (HPMAs). MCZs together with HPMAs, SACs SPAs, and Ramsar sites and marine elements of SSSIs form an ecologically coherent network of MPAs. The government has set a target for MPA condition under the Environment Act 2021.

2.8.45 Given the scale of offshore wind deployment required to meet the Clean Power 2030 Mission and net zero 2050 ambitions, applicants will need to give close consideration to impacts on MPAs, either alone or in combination, and employ the mitigation hierarchy and, if necessary, provide compensation (both individually and in combination with other plans or projects) which may be needed to approve their projects.

2.8.46 It is likely that mitigation may include proactive measures to reduce the impact of deployment e.g., micrositing of offshore transmission routes to avoid vulnerable habitats, alternatives to piling or trenching techniques, noise abatement technology, collision avoidance methods or, if necessary, compensation for habitat or species loss. See paragraphs 3.8.83 – 3.8.85 for Offshore Wind Environmental Standards.

2.8.47 Further guidance can be found in Sections 4.3 and 5.4 of EN-1.

2.8.48 The OWEIP includes a commitment to introduce mechanisms to support strategic compensatory measures, including for projects already in the consenting process (where possible), to offset environmental impacts and reduce delays to individual projects. Only once all feasible alternatives and mitigation measures have been employed, should applicants explore possible compensatory measures to make good any remaining significant adverse effects to site integrity.

2.8.49 Applicants are expected to seek advice from SNCBs and Defra for projects in England, in conjunction with relevant regulators, Local Planning Authorities and/or landowners, on potential mitigation and/or compensation requirements at the earliest

opportunity and comply with future statutory requirements and/or guidance once available.

Green belts

2.8.50 Although offshore wind farms themselves will not have a direct impact on green belts, it is possible that some elements of these projects may be proposed on green belt land, such as electricity network infrastructure, and comprise inappropriate development, which may impact on the openness of the green belt.

2.8.51 For guidance on developing on green belts applicants should consult Section 5.11 of EN-1.

Technical considerations

Network connection

2.8.52 Applicants should consider important issues relating to network connection at Section 4.11 of EN-1 and in EN-5. In particular, applicants should proceed in a manner consistent with the regulatory regime for offshore transmission networks established by Ofgem. The co-ordination of transmission is supported by reforms and regulatory changes to enable this, including as part of the previous Offshore Transmission Network Review (OTNR).

2.8.53 As co-ordinated offshore transmission development may sometimes occur separate to that for wind farm development (under reforms including through strategic network design exercises - see next paragraph) it is expected that an initial agreement will be reached regarding connection with the offshore transmission network developer (or operator) and/or connection into the onshore transmission network.

2.8.54 For many wind farm projects, including those from The Crown Estate Leasing Round 4 onwards, connection agreements will be limited to connection points proposed through strategic network design exercises such as those undertaken by the National Energy System Operator, including the Holistic Network Design for offshore-onshore transmission. Please see Section 2.7 and 2.8 of EN-5 for further details on strategic network designs.

2.8.55 Transmission cabling from offshore energy infrastructure can negatively impact (both during installation and over their lifetime) seabed habitats and protected sites.

2.8.56 It is expected that greater coordination of offshore-onshore transmission infrastructure is likely to reduce the cumulative environmental impacts and impacts on coastal communities by installing a smaller number of larger connections.

2.8.57 Where applicants seek consent for offshore transmission infrastructure separately from proposals for offshore wind development, for example OHAs or subsea 'onshore' transmission also referred to as bootstraps, (see Glossary and 2.12.3 in EN-5), consideration should be given at a strategic level to the overall environmental impacts of the offshore development and transmission infrastructure.

2.8.58 Early planning can help avoid the location of either wind farm or transmission infrastructure pushing the other into areas where environmental impacts could be increased.

2.8.59 The location of arrays and transmission infrastructure should be assessed strategically (especially where they are not covered by the same consent or marine licence), and the mitigation hierarchy should be used to address any environmental impact.

2.8.60 In addition, the applicant is expected to define the precise route for offshore transmission infrastructure, including the wind farm export cable to the offshore transmission network connection point or onshore connection point, the onshore and offshore locations of any associated infrastructure such as substations or the location of bootstraps / subsea 'onshore' transmission. Please refer to definitions of offshore transmission in EN-5 at 2.12.3 – 2.12.6.

2.8.61 The applicant should assess the effects of the offshore transmission and any associated infrastructure on the marine, coastal and onshore environment.

2.8.62 Where the applicant does not know the precise location of the offshore transmission cables and any associated infrastructure, a corridor should be identified within which the specific infrastructure is proposed to be located.

2.8.63 The ES for the proposed project should assess the effects of including this infrastructure within that corridor.

2.8.64 Applicants are expected to demonstrate compliance with mitigation measures identified by The Crown Estate in any plan-level HRA produced as part of its leasing rounds and with any future statutory requirements, guidance or mitigation measures developed to deliver the commitments in the OWEIP, including the OWES (see 3.8.91 – 3.8.93 in this NPS, which cover offshore wind electricity infrastructure.

2.8.65 Assessment of environmental effects of transmission infrastructure and any proposed offshore or onshore substations

should assess effects both alone and cumulatively with other existing and proposed infrastructure[37].

2.8.66 Applicants should include details on how avoidance has been achieved, good design principles have been followed and provide proposals for mitigation. If the development is in English and Welsh waters, they should also demonstrate that they have considered how their proposals can contribute towards environmental net gain. Further information is provided in Sections 4.3, and 4.5 to 4.7 of EN-1.

Flexibility in the project details

2.8.67 Owing to the complex nature of offshore wind farm development, many of the details of a proposed scheme may be unknown to the applicant at the time of the application to the Secretary of State. Such aspects may include:

- the precise location and configuration of turbines and associated development;
- the foundation type and size;
- the installation technique or hammer energy;
- the exact turbine blade tip height and rotor swept area;
- the cable type and precise cable or offshore transmission route;
- the exact locations of offshore and/or onshore substations;

2.8.68 Guidance on how applicants should manage flexibility is set out at Section 2.6 of this NPS and 4.3 of EN-1.

Micrositing and microrouting

2.8.69 Micrositing/microrouting provides developers with flexibility to accommodate any unforeseen events, such as the discovery of previously unknown marine archaeology that it would be preferable to leave in situ. It can also be used to avoid sensitive habitats and designated environmental features.

2.8.70 To inform micrositing/microrouting applicants should undertake high-resolution survey work and make provision for investigative work, such as archaeological examination, to assess the impacts of any proposed cables or foundation placement on potential heritage assets.

2.8.71 Applicants should submit an outline archaeological Written Scheme of Investigation (WSI) as part of the DCO application,

[37] Proposed infrastructure includes projects which have been granted planning consent but have yet to start construction, and projects which have entered the planning system but have yet to gain consent.

with a commitment to complete a project specific WSI post-consent in consultation with Historic England.

2.8.72 Where the applicant requests micrositing or microrouting tolerance, and insofar as it is reasonably possible to do so, the applicant should factor this tolerance into the Environmental Impact Assessment (EIA) of the development's worst-case scenario[38].

Repowering

2.8.73 Where an operational wind farm reaches the end of its life, subject to obtaining the necessary lease from The Crown Estate or providing an existing lease is still valid, the owner of the wind farm may wish to "repower" the site.

2.8.74 While there may be benefits to making use of an existing site, given the likely change in technology over the intervening time period, any repowering of sites is likely to involve wind turbines of a different scale and nature. This could result in significantly different impacts as well as a different electricity generating capacity.

2.8.75 Applicants must submit a new consent application for any repowering of an existing site, this would be subject to EIA and HRA, and MCZ assessment where applicable.

Future monitoring

2.8.76 Where requested by the Secretary of State applicants are required to undertake environmental monitoring (e.g., ornithological surveys, geomorphological surveys, archaeological surveys) prior to and during construction and operation.

2.8.77 Monitoring must measure and document the effects of the development and the efficacy of any associated mitigation or compensation.

2.8.78 This will enable an assessment of the accuracy of the original predictions and improve the evidence base for future mitigation and compensation measures, enabling better decision-making in future EIAs and HRAs.

2.8.79 Monitoring should be presented in formal reports which must be made publicly available. Monitoring data should be provided to The Crown Estate's Marine Data Exchange.

[38] In relation to uncertainty about routing details of the project, applicants should have regard to the concept of the 'Rochdale Envelope', as established in R v Rochdale Metropolitan Borough Council, ex parte Tew [2000] Env. L.R. 1 and subsequent caselaw.

2.8.80 Where appropriate, applicants are also encouraged to consider monitoring collaboratively with other developers and sea users. Work is ongoing between government and industry to support effective collaboration and the development of monitoring at a strategic level.

Decommissioning

2.8.81 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 Planning Act 2008) has been given or has been applied for and is likely to be given.

2.8.82 Where requested by the Secretary of State, applicants should submit a decommissioning programme, satisfying the requirements of section 105(8) of the Energy Act 2004[39] before any offshore construction works begin, to demonstrate a commitment to ensure any long-term environmental impacts are removed following decommissioning.

Offshore Wind Environmental Standards

2.8.83 As part of the OWEIP, the government committed to establishing OWES) to reduce environmental impacts at the point of offshore wind project design, reducing requirements for environmental compensation and providing greater certainty of suitable mitigation measures for offshore wind developers and SNCBs to reduce delays in the consenting process. OWES aim to support developers to take a more consistent approach to avoiding, reducing, and mitigating the impacts of offshore wind farm infrastructure.

2.8.84 Defra will consult on a series of OWES before drafting guidance, which sets out where and how Defra expects each measure to be applied to a development. Once the OWES guidance is issued, the Secretary of State will expect applicants to have applied the relevant measures to their applications.

2.8.85 Applicants should explain how their proposals comply with the guidance or, alternatively, the grounds on which a departure from them is justified. Any reasons for departure from the OWES should be detailed within the application documents, with details of any agreements made with statutory consultees.

[39] See https://www.gov.uk/government/publications/decommissioning-offshore-renewable-energy-installations

Impacts

2.8.86 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

2.8.87 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Biodiversity and ecological conservation

2.8.88 Generic biodiversity and ecology effects and receptors are covered in detail in Section 5.4 of EN-1.

2.8.89 The coastal change policy in Section 5.6 of EN-1 may also be relevant.

2.8.90 Impacts on the physical environment may have indirect effects on marine biodiversity (see paragraphs 3.8.114 – 3.8.117 of this NPS for further guidance).

2.8.91 In addition, applicants should have regard to the specific ecological and biodiversity considerations that relate to proposed offshore renewable energy infrastructure developments, namely:

- fish (see paragraphs 2.8.130 – 2.8.134 of this NPS);
- intertidal and subtidal seabed habitats and species (see paragraphs 2.8.108 and 3.8.116 of this NPS);
- marine mammals (see paragraphs 2.8.117 – 2.8.124 of this NPS);
- birds (see paragraphs 2.8.125 – 2.8.129 of this NPS); and
- wider ecosystem impacts and interactions, and other relevant protected migratory species.

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

2.8.93 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 and electricity networks infrastructure on the marine environment will increase impacts beyond identified thresholds for increasing numbers of species and habitats, leading to increased requirements for both mitigation and compensation for impacts to be acceptable.

2.8.94 Applicants must undertake a detailed assessment of the offshore ecological, biodiversity and physical impacts of their proposed

development, for all phases of the lifespan of that development, in accordance with the appropriate policy for offshore wind farm EIAs, HRAs and MCZ assessments (See Sections 4.3 and 5.4 of EN-1).

2.8.95 Applicants need to consider environmental and biodiversity net gain as set out in Section 4.6 of EN-1 and the Environment Act 2021.

2.8.96 Applicants should assess the potential of their proposed development to have net positive effects on marine ecology and biodiversity, as well as negative effects.

2.8.97 Applicants should consult at an early stage of pre-application with relevant statutory consultees and energy not-for-profit organisations/non-governmental organisations as appropriate, on the assessment methodologies, baseline data collection, and potential avoidance, mitigation and compensation options which should be undertaken.

2.8.98 In developing proposals applicants must refer to the most recent best practice advice originally provided by Natural England under the Offshore Wind Enabling Action Programme[40], and/or their relevant SNCB.

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

2.8.100 A range of research programmes are ongoing to investigate impacts of offshore wind farm development, including, but not limited to: DESNZ Offshore Energy SEA Research Programme[41], ORJIP[42], ScotMER[43], the ORE Catapult[44] and OWEC[45]. Applicants should explain why their decisions on siting, design, and impact mitigation are proportionate and well-targeted, referring to relevant scientific research and literature as appropriate.

2.8.101 Applicants are expected to have regard to guidance issued in respect of Marine Licence requirements and consult at an early stage of pre-application with the MMO or NRW.

2.8.102 Applicants should have regard to duties in relation to Good Environmental Status (GES) of marine waters under the UK

[40] See https://naturalengland.blog.gov.uk/2022/04/13/offshore-wind-best-practice-advice-to-facilitate-sustainable-development/
[41] See https://www.gov.uk/government/publications/uk-offshore-energy-strategic-environmental-assessment-research-projects
[42] See http://www.orjip.org.uk/
[43] See https://www.gov.scot/policies/marine-renewable-energy/science-and-research/
[44] See https://ore.catapult.org.uk/
[45] See https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/energy/offshore-wind-a-sustainable-future/

Marine Strategy[46] and MPA targets (including any interim target) in England, set under the Environment Act 2021.

2.8.103 The OWEIP committed to review the HRA and Marine Conservation Zone assessment process for offshore wind farm developments, and the Energy Act 2023 includes powers to implement this through secondary legislation. Further guidance on the reforms to be introduced by secondary legislation will be published once the secondary legislation is in force. Once final guidance is published, applicants will be expected to comply.

Physical environment

2.8.104 The construction, operation and decommissioning of offshore energy infrastructure, including the preparation and installation of the cable route and any electricity networks infrastructure 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 through change to wave climate and tidal currents on flood and coastal erosion risk management, marine ecology and biodiversity, marine archaeology, wind climate 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, and could affect sediment supply to sensitive coastal sites and impact biodiversity and seabed habitats;
- suspended solids – the release of sediment during construction, operation and decommissioning can cause indirect effects on marine ecology and biodiversity;
- sandwaves – the modification/clearance of sandwaves can cause direct physical (such as in affecting unknown archaeological remains) and ecological effects both at the

[46] See https://moat.cefas.co.uk/introduction-to-uk-marine-strategy/

seabed and within the water column due to disturbance and suspension of sediment, and potentially indirect effects (e.g., changes to seabed morphology in water depths where waves can influence the seabed, which can in turn affect wave climate and sediment transport); and

- water column – wind turbine structures can also affect water column features such as tidal mixing fronts or stratification due to a change in hydrodynamics and turbulence around structures.

2.8.105 Applicant assessments are expected to include predictions of the physical effects arising from modifications to hydrodynamics (waves and tides), sediments and sediment transport, and seabed morphology that will result from the construction, operation and decommissioning of the required infrastructure.

2.8.106 Assessments should also include effects such as the scouring that may result from the proposed development and how that might impact sensitive species and habitats.

2.8.107 Applicants should undertake geotechnical investigations as part of the assessment, enabling the design of appropriate construction techniques to minimise any adverse effects.

Intertidal and coastal habitats and species

2.8.108 The intertidal zone is the area between Mean High Water Springs and mean low water springs.

2.8.109 Intertidal habitat and ecology are often recognised through statutory nature conservation designations.

2.8.110 Coastal habitats (in the coastal fringe above the high-water mark) are also often protected, may also be affected and should undergo a similar review as part of the assessment detailed below.

2.8.111 Export cable and other offshore transmission routes will cross the intertidal/coastal zone potentially resulting in habitat loss, morphological change and temporary disturbance of intertidal flora and fauna.

2.8.112 Applicant assessments of the effects of installing offshore transmission infrastructure across the intertidal/coastal zone should demonstrate compliance with mitigation measures in any relevant plan-level HRA including those prepared by The Crown Estate as part of its leasing round, and include information, where relevant, about:

- any alternative landfall sites that have been considered by the applicant during the design phase and an explanation for the final choice;

- any alternative cable installation methods that have been considered by the applicant during the design phase and an explanation for the final choice;
- potential loss of habitat;
- disturbance during cable installation, maintenance/repairs and removal (decommissioning);
- increased suspended sediment loads in the intertidal zone during installation and maintenance/repairs;
- potential risk from invasive and non-native species;
- predicted rates at which the intertidal zone might recover from temporary effects, based on existing monitoring data; and
- protected sites.

Subtidal habitats and species

2.8.113 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, maintenance and decommissioning activities can cause loss and temporary disturbance of subtidal habitat and benthic ecology.

2.8.114 The applicant should demonstrate compliance with mitigation measures identified by The Crown Estate in any plan-level HRA produced as part of its leasing round. Applicants should follow guidelines for leasing transmission assets infrastructures, and any successor to it produced by The Crown Estate[47].

2.8.115 All work associated with cable installation including trenching, laying and surface protections are licenced through a Deemed Marine Licence as part of the DCO, with the exception of Welsh inshore waters, (defined as the region extending seaward 12nm from Mean High Water Springs to the territorial limit)[48] where a Marine Licence cannot be deemed. In all offshore wind farm cases however, applicants should be aware that the operation and maintenance of cables after construction may require new Marine Licences[49].

[47] https://www.thecrownestate.co.uk/media/3994/the-crown-estate-cable-route-identification-leasing-guidelines.pdf
[48] https://naturalresources.wales/permits-and-permissions/marine-licensing/do-i-need-a-marine-licence/?lang=en#:~:text=The%20Welsh%20inshore%20region%20extends,sea%20in%20the%20Welsh%20Zone.
[49] Any additional marine licence application associated with the DCO will be considered under The Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), namely Schedules A1 and A2, as to whether the application needs to have pre-application EIA screening undertaken for it

2.8.116 Applicant assessment of the effects on the subtidal environment should include:

- loss of habitat due to foundation type including associated seabed preparation, predicted scour, scour protection and altered sedimentary processes, e.g. sandwave/boulder/UXO clearance;
- environmental appraisal of inter-array and other offshore transmission and installation/maintenance methods, including predicted loss of habitat due to predicted scour and scour/cable protection and sandwave/boulder/UXO clearance;
- habitat disturbance from construction and maintenance/repair vessels' extendable legs and anchors;
- increased suspended sediment loads during construction and from maintenance/repairs;
- predicted rates at which the subtidal zone might recover from temporary effects;
- potential impacts from EMF on benthic fauna;
- potential impacts upon natural ecosystem functioning;
- protected sites; and
- potential for invasive/non-native species introduction.

Marine mammals

2.8.117 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.

2.8.118 All marine mammals are protected under Part 3 of the Habitats Regulations (cetaceans within Schedule 2 and seal species within Schedule 4). If construction and associated noise levels are likely to lead to an offence under Part 3 of the Habitats Regulations (which would include deliberately disturbing, injuring or killing), applicants will need to apply for a wildlife licence[50] to allow the activity to take place.

2.8.119 The development of offshore wind farms can also impact fish species (see paragraphs 2.8.130 – 2.8.134), which can have

[50] See https://www.gov.uk/guidance/understand-marine-wildlife-licences-and-report-an-incident; https://www.gov.uk/government/publications/european-protected-species-apply-for-a-mitigation-licence, and https://naturalresources.wales/permits-and-permissions/species-licensing/list-of-protected-species/marine-european-protected-species-licensing/?lang=en

indirect impacts on marine mammals if those fish are prey species.

2.8.120 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;
- protected sites;
- baseline noise levels;
- predicted construction and soft start noise levels in relation to mortality, permanent threshold shift (PTS), temporary threshold shift (TTS) and disturbance;
- operational noise;
- duration and spatial extent of the impacting activities including cumulative/in-combination effects with other plans or projects;
- collision risk;
- entanglement risk; and
- barrier risk.

2.8.121 The scope, effort and methods required for marine mammal surveys and impact assessments should be discussed with the relevant SNCB.

2.8.122 The applicant should discuss any proposed noisy activities with the relevant statutory body and must reference the joint JNCC and SNCB underwater noise guidance,[51] and any successor of this guidance, in relation to noisy activities (alone and in-combination with other plans or projects) within SACs, SPAs, and Ramsar sites, in addition to the JNCC mitigation guidelines[52] for piling, explosive use, and geophysical surveys. NRW has a position statement[53] on assessing noisy activities which should also be referenced where relevant. Defra's policy paper on reducing noise from piling from January 2025 onwards[54] should be considered and referenced alongside the position statement from JNCC, NE and Cefas on the use of noise reduction methods

[51] See https://hub.jncc.gov.uk/assets/2e60a9a0-4366-4971-9327-2bc409e09784
[52] See https://jncc.gov.uk/our-work/marine-mammals-and-noise-mitigation/
[53] Email Guidance.development@cyfoethnaturiolcymru.gov.uk (Position Statement reference PS 17)
[54] See https://www.gov.uk/government/publications/reducing-marine-noise/reducing-marine-noise

when piling[55], the position statement on minimising impacts from UXO clearance[56] and any successor to these documents.

2.8.123 Where the assessment identifies that noise from construction and UXO clearance may reach noise levels likely to lead to noise thresholds being exceeded (as detailed in the JNCC guidance) or an offence as described in paragraph 2.8.118 in this NPS the applicant must look at possible alternatives or appropriate mitigation.

2.8.124 The applicant should develop a Site Integrity Plan (SIP) or alternative assessments for projects in English and Welsh waters to allow the cumulative impacts of underwater noise to be reviewed closer to the construction date, when there is more certainty in other plans and projects.

Birds

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

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

2.8.126 Currently, cumulative impact assessments for ornithology are based on the consented Rochdale Envelope parameters of projects,[57] rather than the 'as-built' parameters, the latter which may pose a lower risk to birds. The applicant must ensure any draft consents include provisions to define the final 'as built' parameters (which may not then be exceeded). These parameters must be used in future cumulative impact assessments.

[55] See https://hub.jncc.gov.uk/assets/e1d38ce8-9bc6-4fb5-b867-f7f595caa25a
[56] See https://www.gov.uk/government/publications/marine-environment-unexploded-ordnance-clearance-joint-position-statement
[57] https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-nine-rochdale-envelope/

2.8.127 In parallel the government will look to explore opportunities to reassess ornithological impact assessment of historic consents to reflect their 'as built' parameters. Any ornithological 'headroom' assessed to exist between the effects defined in the 'as built' parameters and Rochdale Envelope parameters can then be released, with SNCB agreement.

2.8.128 Applicants are encouraged to make appropriate applications for amendments to their DCOs to secure reduced parameters and ornithological impacts. Government will also consider the potential applicability of these principles to other consent parameters.

2.8.129 Applicants should discuss the scope, effort and methods required for ornithological surveys with the relevant statutory advisor as early as possible, taking into consideration baseline and monitoring data from operational wind farms. Applicants must undertake collision risk modelling, as well as displacement and population viability assessments for certain species of birds. Applicants are expected to seek advice from SNCBs. Where necessary, applicants should assess collision risk using survey data collected from the site at the pre-application EIA stage. Applicant assessments should cover all aspects included in paragraph 2.8.11 – 2.8.214 of this NPS.

Fish

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

2.8.131 There is the potential for the construction, operation 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.

2.8.132 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.

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

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

2.8.134 Applicant assessments should identify the potential implications of underwater noise from construction and unexploded ordnance including, where possible, implications of predicted construction and soft start noise levels in relation to mortality, PTS, TTS and disturbance, and addressing both sound pressure and particle motion) and EMF on sensitive fish species.

Commercial fisheries and fishing

2.8.135 The UK fishing industry is diverse. The type and significance of impacts will therefore vary depending on the section of the fleet affected. Applicants should consider both direct impacts on fishing activity and indirect impacts such as displacement (on both the industry and Marine Protected Areas) and the ability of fishers to relocate.

2.8.136 Applicants should undertake early consultation with a cross-section of the fishing industry, as well as MMO, SNCBs, relevant Inshore Fisheries and Conservation Authorities (IFCAs), Defra and Welsh Government, to identify impacts, and actively encourage input from active fishers to provide evidence of their use of the area to support the impact assessments.

2.8.137 Where any part of a proposal involves a grid connection or transmission to shore or in the inshore area, appropriate inshore fisheries groups should also be consulted.

2.8.138 Offshore wind farms can have a negative impact on some fish stocks and fishing activity, and/or a positive impact on other fish stocks and/or other types of commercial fishing. Whilst the footprint of an offshore wind farm and any associated infrastructure may be a hindrance to certain types of commercial fishing activity such as trawling, other fishing activities, such as potting, may be able to take place within operational wind farms without unduly disrupting or compromising navigational safety.

2.8.139 Applicant assessments should include robust baseline data and detailed surveys of the effects on fish stocks of commercial interest, and any potential reduction or increase in such stocks that will result from the presence of the wind farm development and of any safety zones. The assessments should also provide evidence regarding any likely benefits or constraints on fishing activity within the project's boundaries.

2.8.140 Applicants will be expected to undertake dialogue with the fishing industry during the planning and design of individual offshore wind farm and transmission proposals to maximise the potential for co-existence/co-location and reduce potential displacement. Applicants should consider guidance on best practice for fisheries

liaison, which has been jointly agreed by the renewables industry and fishing community[58].

2.8.141 In some circumstances, transboundary issues may be a consideration as fishing vessels from other coastal states may fish in waters within which offshore wind farms are sited. Applicants should seek advice from Defra in such circumstances.

2.8.142 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. Where there is a possibility that safety zones will be sought, applicant assessments should include potential effects on commercial fishing. Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the Maritime and Coastguard Agency (MCA) as part of this process.

Marine historic environment

2.8.143 Heritage assets and other remains of past human activity may exist offshore and within the intertidal area (the area between mean high and mean low water). 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.

2.8.144 The marine historic environment can be affected by offshore wind farm and offshore transmission development in two principal ways:

- from direct effects arising from the physical siting of the development itself such as the installation of wind turbine foundations and electricity cables, or the siting of plant required during the construction phase of development; and
- from indirect changes to the physical marine environment (such as scour, coastal erosion or sediment deposition) caused by the proposed infrastructure itself or its construction (see the policy on physical environment at paragraphs 2.8.104 – 2.8.107 of this NPS).

2.8.145 Applicants should consult with the relevant statutory consultees, such as Historic England or Cadw, on the potential impacts on the marine historic environment at an early stage of development

[58] See https://www.thecrownestate.co.uk/en-gb/what-we-do/on-the-seabed/our-partnerships/the-fishing-liaison-with-offshore-wind-and-wet-renewables-group/

during pre-application, taking into account any applicable guidance (e.g., offshore renewables protocol for archaeological discoveries[59]).

2.8.146 Assessment of potential impacts upon the historic environment should be considered as part of the EIA process undertaken to inform any application for consent.

2.8.147 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 consider any geotechnical or geophysical surveys that have been undertaken to aid the wind farm and/or offshore transmission design.

2.8.148 Whilst it should be possible for a project to avoid designated heritage assets, the knowledge currently available about the historic environment in the inshore and offshore areas is limited, as much of the seafloor around our coasts and at sea has yet to be mapped or explored fully.

2.8.149 Applicants are required to determine how any known heritage assets might best be avoided. The applicant will be expected to conduct all necessary examination and assessment exercises using a variety of survey techniques to plan the development so as to optimise opportunities for avoidance.

2.8.150 Once a site has been chosen, it may be necessary to undertake further archaeological assessment, including field evaluation investigations prior to construction, to understand a known site's significance and full extent, and, to identify as yet unknown heritage assets when considering the options for detailed site development, in accordance with an archaeological written scheme of investigation included with the application.

2.8.151 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.

2.8.152 Where elements of a proposed project (whether offshore or onshore) may interact with historic environment features that are

[59] See https://www.wessexarch.co.uk/our-work/offshore-renewables-protocol-archaeological-discoveries
Commercial Renewable Energy Development and the Historic Environment: Historic England Advice Note 15 (Historic England 2021)
Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology 2007)
Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects (The Crown Estate and Wessex Archaeology 2021)

located onshore, applicants should assess the effects in accordance with Section 5.9 in EN-1.

Offshore wind impacts: navigation and shipping

2.8.153 Offshore wind farms and offshore transmission will occupy an area of the sea or seabed. For offshore wind farms in particular it is inevitable that there will be an impact on navigation in and around the area of the site. This is relevant to both commercial and recreational users of the sea who may be affected by disruption or economic loss because of the proposed offshore wind farm and/or offshore transmission.

2.8.154 To ensure safety of shipping, applicants should reduce risks to navigational safety to as low as reasonably practicable (ALARP), as described in paragraph 2.8.158 of this NPS.

2.8.155 There is a public right of navigation over navigable tidal waters, and 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.

2.8.156 Impacts on navigation can arise from the wind farm or other infrastructure and equipment creating a physical barrier during construction and operation.

2.8.157 There may be some situations where reorganisation of shipping traffic activity might be both possible and desirable when considered against the benefits of the wind farm and/or offshore transmission application, and such circumstances should be discussed with the government officials, and MCA, and other stakeholders, including Trinity House, as The General Lighthouse Authority consultee, and the commercial shipping sector. It should be recognised that alterations might require national endorsement and international agreement and that the negotiations involved may take considerable time and do not have a guaranteed outcome.

2.8.158 Applicants should engage with interested parties in the navigation sector early in the pre-application phase of the proposed offshore wind farm or offshore transmission to help identify mitigation measures[60] to reduce navigational risk to ALARP, to facilitate proposed offshore wind development. This includes the MMO or NRW in Wales, MCA, the relevant General Lighthouse Authority, such as Trinity House, the relevant industry bodies (both national and local) and any representatives of recreational users of the sea, such as the Royal Yachting Association (RYA), who may be

[60] https://www.gov.uk/government/publications/mgn-654-mf-offshore-renewable-energy-installations-orei-safety-response

affected. This should continue throughout the life of the development including during the construction, operation and decommissioning phases.

2.8.159 Engagement should seek solutions that allow offshore wind farms, offshore transmission, and navigation and shipping users of the sea to co-exist successfully.

2.8.160 The presence of the wind turbines can also have impacts on communication and shipborne and shore-based radar systems. See Section 5.5 in EN-1 for further guidance.

2.8.161 Prior to undertaking assessments, applicants should consider information on internationally recognised sea lanes, which is publicly available. Applicants should refer in assessments to any relevant, publicly available data available on the Maritime Database[61].

2.8.162 Applicants must 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.

2.8.163 The navigation risk assessment will for example necessitate:

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

2.8.164 In some circumstances applicants may seek declaration of a safety zone around wind turbines and other infrastructure, although these might not be applied until after consent to the wind farm has been granted.

2.8.165 The declaration of a safety zone excludes or restricts activities within the defined sea areas including navigation and shipping. Where there is a possibility that safety zones will be sought, applicant assessments should include potential effects on navigation and shipping. Where the precise extents of potential safety zones are unknown, a realistic worst-case scenario should be assessed. Applicants should consult the MCA for advice on

[61] See https://www.maritime-database.com/

maritime safety, and refer to the government guidance on safety zones[62] as a part of this process.

2.8.166 Applicants must undertake a detailed NRA, which includes Search and Rescue Response Assessment and emergency response assessment prior to applying for consent[63]. The specific Search and Rescue requirements will then be discussed and agreed post-consent.

Other offshore infrastructure and activities

2.8.167 There may be constraints imposed on the siting or design of offshore wind farms because of the presence of other offshore infrastructure, such as oil and gas, Carbon Capture, Usage and Storage (CCUS), co-location of electrolysers for hydrogen production, marine aggregate dredging, telecommunications, or activities such as aviation and recreation.

2.8.168 Given the scale of offshore wind deployment required to meet the Clean Power 2030 Mission and net zero 2050 ambitions, and the importance of the UK Continental Shelf (UKCS) in supporting progress towards net zero commitments there will be increasing demand on the UKCS which could give rise to conflicts. The occurrence of conflict between offshore development projects in the short term could restrict the capacity of the UKCS to support the variety of technologies required for the delivery of the Clean Power 2030 Mission and net zero.

2.8.169 Applicants should consult the government's Marine Plans (further detailed in Section 4.5 of EN-1) which are a useful information source of existing and known or potential activities and infrastructure.

2.8.170 Prior to the submission of an application involving the development of the seabed, applicants should engage with key stakeholders, such as The Crown Estate and statutory bodies to ensure they are aware of any current or emerging interests on or underneath the seabed which might give rise to a conflict with a specific application. This will ensure adequate opportunity to reduce potential conflicts and increase time to find a resolution.

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

[62] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/372561/Safety_Zones_DECC_2011.pdf

[63] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1034158/OREI_SAR_Requirements_v3.pdf

2.8.172 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.

2.8.173 Applicants are encouraged to work collaboratively with those other developers and sea users on co-existence/co-location opportunities, shared mitigation, compensation and monitoring where appropriate. Where applicable, the creation of statements of common ground between developers is recommended. Work is ongoing between government and industry to support effective collaboration and to find solutions to facilitate greater co-existence/co-location. Such stakeholder engagement should continue throughout the life of the development. As many offshore industries are regulated by government, the relevant Secretary of State should also be a consultee where necessary.

2.8.174 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 the Clean Power 2030 Mission and net zero.

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

Wake effects

2.8.176 As we make increasing use of the nation's offshore wind resource, the question of wake effects, where wind turbulence arises between neighbouring developments, has gained attention. As with any new development, applicants should consider the impact of their proposal on other activities and make reasonable endeavours to address these. At the design stage there are therefore clear merits for applicants to make an assessment of inter-array wake effects between their proposed developments, and nearby offshore wind generating stations that are planned, consented or operational.

Seascape and visual effects

2.8.177 Applicants should assess impact on seascape in addition to the landscape and visual effects as set out in Section 5.10 of EN-1.

2.8.178 As an island nation seascape 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 National Landcape) and as a defined special quality of the area supports the delivery of the designated area's statutory purpose; the conservation and enhancement of natural beauty. Seascape character is also an important consideration for stretches of coastline identified as Heritage Coasts.

2.8.179 Seascape is a discrete area, with a definable character which includes views of the coast or seas, and the adjacent marine environment which have cultural, historical and archaeological links with each other[64].

2.8.180 Applicants should follow relevant guidance including, but not limited to seascape and landscape character assessments,[65] landscape sensitivity assessments,[66] and marine plan seascape character assessments (e.g., NRW Marine Character Areas (with associated guidance)[67] and England's marine plans[68]).

2.8.181 Where a proposed offshore wind farm will be visible from the shore and would be within the setting of a nationally designated landscape with potential effects on the area's statutory purpose, a seascape, landscape and visual impact assessment (SLVIA[69]) should be undertaken. The assessment should be guided by the latest Offshore Energy SEA, including the White 2020 report[70]. The SLVIA should be proportionate to the scale of the potential impacts. This will always be the case where a coastal National Park, the Broads or National Landscape, or a Heritage Coast or their setting is potentially affected.

2.8.182 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 lighting conditions;

[64] Definition taken from the UK Marine Policy Statement 2011(UKMPS para. 2.6.5)
[65] https://www.gov.uk/guidance/landscape-and-seascape-character-assessments
[66] https://www.gov.uk/government/publications/landscape-sensitivity-assessment
[67]See https://naturalresources.wales/evidence-and-data/maps/marine-character-areas/?lang=en
[68] See https://www.gov.uk/government/publications/seascape-assessments-for-north-east-north-west-south-east-south-west-marine-plan-areas-mmo1134
East Marine Plans - GOV.UK (www.gov.uk)
Seascape assessment for the South marine plan areas (MMO 1037) - GOV.UK (www.gov.uk)

[69] Seascape, Landscape and Visual Impact Assessment. See Landscape Institute Guidelines for Landscape and Visual impact Assessment Edition 3
[70] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/896084/White_Consultants_2020_Seascape_and_visual_buffer_study_for_offshore_wind_farms.pdf

- the effects of navigation and hazard prevention lighting on dark night skies;
- individual landscape and visual characteristics of the coast and the special qualities of designated landscapes, such as World Heritage Sites and National Parks, which limits the coast's capacity to absorb a development; and
- how people perceive and interact with the coast and seascape.

2.8.183 As part of the SLVIA, photomontages will be required. Viewpoints to be used for the SLVIA should be selected in consultation with the statutory consultees at the EIA Scoping stage.

2.8.184 Applicants should assess the magnitude and significance of change to both the identified seascape receptors (such as seascape and landscape units, visual receptors and the special qualities of designated landscapes) in accordance with the standard methodology for SLVIA.

2.8.185 Where appropriate, cumulative SLVIA should be undertaken in accordance with the policy on cumulative assessment outlined in paragraphs 5.10.16 – 5.10.17 of EN-1.

Mitigation

2.8.186 Applicants must always employ the mitigation hierarchy, in particular to avoid as far as is possible the need to find compensatory measures for developments affecting SACs SPAs, and Ramsar sites and/or MCZs. It is essential that applicants involve SNCBs, other statutory environmental bodies (e.g. Historic England) and Defra, in conjunction with the relevant regulators, as early as possible in the planning process to enable discussions of what is and isn't a significant and/or adverse effect, subsequent implications, and, if required, mitigation and/or compensation.

2.8.187 At the earliest possible stage, alternative ways of working and use of technology should be employed to avoid environmental impacts. For example, construction vessels may be rerouted to avoid disturbing seabirds. Where impacts cannot be avoided, measures to reduce and mitigate impacts should be employed, for example using trenching techniques or noise abatement technology.

2.8.188 Applicants should undertake a review of up-to-date research and all potential avoidance, reduction and mitigation options presented for all receptors.

2.8.189 Only once all feasible avoidance, reduction and mitigation measures have been employed, should applicants explore

possible compensatory measures to compensate for any remaining significant adverse effects to site integrity.

2.8.190 Where several developers are likely to have cumulative impacts on the same species or feature it may be appropriate to collaborate on mitigation and compensation measures (see paragraphs 2.8.266 of this NPS for further guidance on compensation).

Biodiversity and ecological conservation

2.8.191 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.

2.8.192 See paragraphs 2.8.83 and 2.8.85 of this NPS for further guidance on OWES to enable developments to mitigate their impacts on the marine environment.

2.8.193 Applicants must develop an ecological monitoring programme to monitor impacts during the pre-construction, construction and operational phases to identify the actual impacts caused by the project and compare them to what was predicted in the EIA/HRA.

2.8.194 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.

2.8.195 Monitoring should be of sufficient standard to inform future decision-making. Increasing the understanding of the efficacy of alternatives and mitigation will deliver greater certainty on applicant requirements.

Physical environment

2.8.196 Applicants are expected to have considered the best ecological outcomes in terms of potential mitigation. These might include:

- avoidance of areas sensitive to physical effects;
- consideration of micro-siting of both the array and cables;
- alignment and density of the array;
- design of foundations;
- ensuring that sediment moved is retained as locally as possible;
- the burying of cables to a necessary depth;

- using scour protection techniques around offshore structures to prevent scour effects, or designing turbines to withstand scour, so scour protection is not required or is minimised.

2.8.197 Applicants should consult the statutory consultees on appropriate mitigation and monitoring.

Intertidal and coastal habitats and species

2.8.198 Effects on intertidal/coastal habitat cannot be avoided entirely.

2.8.199 Landfall and cable installation and decommissioning methods should be designed appropriately to minimise effects on intertidal/coastal habitats, taking into account other constraints.

2.8.200 Where applicable, use of horizontal directional drilling techniques (HDD) should be considered as a method to avoid impacts on sensitive habitats and species. Where HDD is proposed, the applicant should provide a mitigation plan to account for the possibility that HDD fails.

2.8.201 The applicant should explain their justification for the alternative plan and ensure this is the least impactful method possible.

2.8.202 Where cumulative effects on intertidal habitats are predicted as a result of the cumulative impact of multiple cable routes, applicants of various schemes are encouraged to work together to ensure that the number of cables crossing the intertidal/coastal zone are minimised, and installation and decommissioning phases are coordinated to ensure that disturbance is also reasonably minimised.

2.8.203 It is expected that a more co-ordinated approach to offshore-onshore transmission will be delivered. See paragraph 2.8.34 of this NPS.

Subtidal habitats and species

2.8.204 Applicants should design construction, maintenance and decommissioning methods appropriately to minimise effects on subtidal habitats, taking into account other constraints.

2.8.205 Mitigation measures which applicants are expected to have considered include:

- surveying and micrositing of the turbines, designing array layout, or re-routing of the export and inter-array cables to avoid adverse effects on sensitive/protected habitats, biogenic reefs or protected species;
- reducing as much as possible the amount of infrastructure that will cause habitat loss in sensitive/protected habitats;

- burying cables at a sufficient depth, taking into account other constraints, to allow the seabed to recover to its natural state; and
- the use of anti-fouling paint could be minimised on subtidal surfaces in certain environments, to encourage species' colonisation on the structures, unless this is within a soft sediment MPA and thus would allow colonisation by species that would not normally be present.

2.8.206 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.

2.8.207 It is expected that a more co-ordinated approach to offshore-onshore transmission will be delivered going forward. See paragraph 2.8.34 of this NPS.

Marine Mammals

2.8.208 Monitoring of the surrounding area before and during the piling procedure can be undertaken by various methods including marine mammal observers and passive acoustic monitoring. Active displacement of marine mammals outside potential injury zones can be undertaken using equipment, such as acoustic deterrent devices. Soft start procedures during pile driving may be implemented. This enables marine mammals in the area disturbed by the sound levels to move away from the piling before physical or auditory injury is caused.

2.8.209 Where noise impacts cannot be avoided, other mitigation should be considered, including alternative installation methods and noise abatement technology, spatial/temporal restrictions on noisy activities, alternative foundation types.

2.8.210 Applicants should undertake a review of up-to-date research and all potential mitigation options presented as part of the application, having consulted the relevant JNCC mitigation guidelines[71], in addition to Defra's policy paper on reducing noise[72], the position statement from JNCC, NE and Cefas on the use of noise reduction methods when piling[73] and any successor to these documents.

[71] See https://jncc.gov.uk/our-work/marine-mammals-and-noise-mitigation/
[72] See https://www.gov.uk/government/publications/reducing-marine-noise/reducing-marine-noise
[73] See https://hub.jncc.gov.uk/assets/e1d38ce8-9bc6-4fb5-b867-f7f595caa25a

Birds

2.8.211 Aviation and navigation lighting should be minimised and/or on demand (as encouraged in EN-1 Section 5.5) to avoid attracting birds, taking into account impacts on safety. Subject to other constraints, wind turbines should be laid out within a site, in a way that minimises collision risk.

2.8.212 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).

2.8.213 Construction vessels and post-construction maintenance vessel traffic associated with offshore wind farms and offshore transmission 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 and minimise the number of vessel movements overall.

2.8.214 The exact timing of peak migration events is inherently uncertain, although research is ongoing into estimates for peak migration periods for a number of bird species and detection technologies (e.g. using radar and integrated sensors) are improving. Currently, shutting down turbines within migration routes during estimated peak migration periods is unlikely to offer suitable mitigation, but this might be a possibility in the future.

Fish

2.8.215 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 inter-array and export cables.

2.8.216 Burial of the cable increases the physical distance between the maximum EMF intensity and sensitive species. However, what constitutes sufficient depth to reduce impact may depend on the geology of the seabed.

2.8.217 It is unknown whether exposure to multiple cables and larger capacity cables may have a cumulative impact on sensitive species. It is therefore important to monitor EMF emissions which may provide the evidence to inform future EIAs.

2.8.218 In the case of floating wind, the cables may hang freely in the water and thus potentially require alternative monitoring and mitigation.

2.8.219 Construction of specific elements can also be timed to reduce impacts on spawning or migration. Underwater noise mitigation can also be used to prevent injury and death of fish species.

Commercial fisheries and fishing

2.8.220 Any mitigation proposals should result from the applicant having detailed consultation with relevant representatives of the fishing industry, IFCAs, the MMO and the relevant Defra policy team in England and NRW and the relevant Welsh Government policy team in Wales.

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

Marine historic environment

2.8.222 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. These boundaries can be drawn around either discrete sites or more extensive areas identified in the ES produced to support an application for consent.

2.8.223 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.

2.8.224 Where requested by the applicant, the Secretary of State should consider granting consents which allow for micrositing / microrouting (see paragraphs 2.8.69 – 2.8.72 of this NPS) within a specified tolerance.

2.8.225 To ensure a programme of archaeological works has been secured, an outline WSI, covering the entirety of the defined project area and full duration of the project, that complies with the policy in this NPS, should be submitted within the application. This allows changes to be made to the precise location of infrastructure during the construction phase so that account can be taken of unforeseen circumstances, such as the discovery of marine archaeological remains.

Offshore wind impacts: navigation and shipping

2.8.226 Mitigation measures will include site configuration, lighting and marking of projects to take account of any requirements of the General Lighthouse Authority.

2.8.227 In some circumstances, the Secretary of State may wish to consider the potential to use requirements involving arbitration (between the applicant and third parties) as a means of resolving

how adverse impacts on other commercial activities will be addressed.

Other offshore infrastructure and activities

2.8.228 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.

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

Seascape and visual effects

2.8.230 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.

2.8.231 However, the siting layout of the turbines should be designed appropriately to minimise harm, considering other constraints such as ecological effects, safety reasons or engineering and design parameters.

Wake effects

2.8.232 Applicants should demonstrate that they have taken all reasonable steps to minimise as far as possible the impact of wake effects on other offshore industries. Whilst potential approaches will be dependent on each individual case this could include explaining how the configuration of a proposed offshore wind project has been evolved during the design process to reduce the impact, or how an applicant has managed the planned layout of an offshore wind turbine array to select layouts with reduced long-distance wake impact on other offshore industries or generating stations.

2.8.233 However, there is no expectation that wake effects can be wholly removed between developments, or that inter-project compensation arrangements are a necessary means to mitigate the impact of wake effects, although developers may opt to take such approaches outside of the planning process.

Compensatory measures

2.8.234 With increasing deployment of offshore wind farms and offshore transmission, environmental impacts upon SACs SPAs, Ramsar sites and MCZs (individually and as part of a network) may not be addressed by avoidance, reduction, or mitigation alone, therefore compensatory measures through derogation may be required at a plan or project level where adverse effects on site integrity and/or on conservation objectives cannot be ruled out.

2.8.235 For many receptors, the scale of offshore wind and offshore transmission developments, and potential in-combination effects, means compensation could be required and applicants must refer to the latest Defra compensation guidance when making their assessments.

2.8.236 If, during the pre-application stage, SNCBs indicate that the proposed development is likely to adversely impact a protected site, the applicant should include with their application such information as may reasonably be required to assess potential derogations under the Habitats Regulations or the Marine and Coastal Access Act 2009.

2.8.237 Where such an indication is given later in the development consent process, the applicant should share this information as soon as reasonably practical.

2.8.238 This information includes:

- assessment of alternative solutions, showing the relevant tests on alternatives have been met;
- a case showing that the relevant tests for IROPI have been met; and
- appropriate securable environmental compensation

2.8.239 Provision of such information will not be taken as an acceptance of adverse impacts, and if applicants dispute the likelihood of adverse effects they can provide this information as part of their application, 'without prejudice' to the Secretary of State's final decision on the impacts of the potential development.

2.8.240 If, in these circumstances, an applicant does not supply information required for the assessment of a potential derogation, consent may be refused as there will be no expectation that the Secretary of State will allow the applicant the opportunity to provide such information following the examination.

2.8.241 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 are encouraged to include all compensatory measures considered, with reasoning for why they have been discounted.

2.8.242 Applicants should work closely at an early stage in the pre-application process with SNCBs, and Defra, in conjunction with the relevant regulators, Local Planning Authorities, National Park Authorities, landowners and other relevant stakeholders to develop a compensation plan for all protected sites adversely affected by the development.

2.8.243 Before submitting an application, applicants should seek the views of the SNCB and Defra, as to the suitability, securability and effectiveness of the compensation plan to ensure that the overall coherence of the National Site Network for the impacted SAC/SPA/MCZ feature is protected. Consultation should also take place throughout the pre-application phase with key stakeholders (e.g. via the evidence plan process and use of expert topic groups).

2.8.244 In cases where such views are provided, the applicant should include a copy of this information with the compensation plan in their application for further consideration by the Examining Authority and Secretary of State.

Strategic compensation

2.8.245 The OWEIP contains a commitment to introduce strategic compensatory measures, to offset environmental impacts and reduce delays to individual projects.

2.8.246 Strategic compensation is defined as a measure or a series of measures that can be delivered at scale and/or extended timeframes, which cannot be delivered by individual offshore wind and/ or offshore transmission project developers in isolation. Any measure(s) would usually be led and delivered by a range of organisations, including government, industry and relevant stakeholders. Strategic compensation measures would normally be identified at a plan level and applied across multiple offshore wind projects to provide ecologically meaningful compensation to designated site habitats and species adversely impacted.

2.8.247 This may include central coordination for measures delivered across a series of projects or biogeographic region.

2.8.248 Applicants will be able to access mechanisms to support identification of suitable compensation, and facilitate delivery of strategic compensation measures where appropriate.

2.8.249 The government is still developing its policies on strategic compensation through OWEIP, and guidance will be published in due course.

2.8.250 The government will work collaboratively with industry and stakeholders to develop strategic compensation for projects currently in the consenting process (where possible) as well as for future developments.

2.8.251 Not every impact for every project will initially fall within the strategic compensation proposals, so applicants should continue to discuss with SNCBs and Defra the need for site specific or strategic compensation at the earliest opportunity.

2.8.252 Applicants should also coordinate with other marine industry sectors, e.g. oil and gas, who might also need to find compensatory measures. This will ensure compensatory measures are complementary and/or take advantage of opportunities to join together to deliver strategic compensation. Applicants should demonstrate they have consulted with those industries/stakeholders who are affected by any proposed compensation measures.

Secretary of State decision making

Factors influencing site selection and design

Water depth and foundation conditions

2.8.253 Whilst the technical suitability of the foundation design is not in itself a matter for the Secretary of State, the Secretary of State will need to be satisfied that the foundations will not have an unacceptable adverse effect on marine biodiversity, the physical environment or marine heritage assets.

Technical considerations

Network connection

2.8.254 When considering grid connection issues, the Secretary of State should be mindful of the requirements of the regulatory regime for onshore and offshore electricity networks, and consider how this affects the proposal put forward by the applicant.

2.8.255 A proposed offshore electricity transmission cable connecting the wind farm or wind farms with the onshore electricity network (noting that this may be an offshore transmission connection point), 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)[74].

2.8.256 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.

2.8.257 However, some proposals for transmission could be consented separately to the wind farm (array), see paragraphs 2.8.38 of this NPS and Section 1.3 in EN-1.

2.8.258 The Secretary of State should assess the onshore element(s) of the grid connection (e.g. electric lines, substations) in accordance with the guidelines and requirements contained in EN-5.

2.8.259 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

2.8.260 In addition to guidance set out at Section 2.6 of this NPS and Section 4.3 of EN-1, the Secretary of State should consider paragraph 2.8.127 of this NPS in relation to ornithological headroom in this NPS.

Micrositing and microrouting

2.8.261 Where requested by the applicant, any consent granted by the Secretary of State should be flexible enough to allow for such micrositing or microrouting changes as may be advised during and after the application stage. This allows for unforeseen events, such as the discovery of previously unknown marine archaeology that it would be preferable to leave in situ.

2.8.262 The Secretary of State must also be satisfied that there is sufficient space to microsite/microroute for any proposal to be acceptable as a mitigation (e.g. any feature to avoid must not cover the full width of the assessed cable corridor).

Repowering

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

[74] Guidance on associated development: See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/192681/Planning_Act_2008_Guidance_on_associated_development_applications_for_major_infrastructure_projects.pdf

Future monitoring

2.8.264 Owing to the complex nature of offshore wind development, and the difficulty in establishing the evidence base for marine environmental recovery, the Secretary of State should, where appropriate, request the applicant undertake environmental monitoring (e.g. ornithological surveys, geomorphological surveys, archaeological surveys) prior to and during construction and operation.

2.8.265 The Secretary of State may consider that monitoring of any impact is appropriate.

Decommissioning

2.8.266 For guidance on the decommissioning, the Secretary of State should consult paragraphs 3.8.10 and paragraphs 3.8.81 – 3.8.82 of this NPS.

Offshore wind environmental standards

2.8.267 Once the OWES Guidance is issued, the Secretary of State will expect applicants to have applied the relevant measures to their application.

2.8.268 The Secretary of State will consider an application for development consent in accordance with the OWES Guidance and/or its targets. Whether an application conforms to the OWES Guidance and/or targets (or any justification for departing from them) is likely to be material to the decision on development consent and, where relevant, will inform the Secretary of State's Habitats Regulations Assessment and Marine Conservation Zone assessment.

Impacts

2.8.269 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive. The Secretary of State should consider any impacts which it determines are relevant and important to its decision.

Biodiversity and ecological conservation

2.8.270 The Secretary of State should consider the effects of a proposed development on marine ecology and biodiversity, considering all relevant information made available by the applicant.

2.8.271 The Secretary of State should be satisfied that, in the development of their proposal, the applicant has made appropriate, and extensive, use of up-to-date evidence from previous deployments and research results from scientific peer reviewed papers, and the programmes listed in paragraph

3.8.108 of this NPS and assessed through HRA/MCZ processes (including the mitigation hierarchy), the impact on any protected species or habitats, as well as having regard to requirements set out in 5.4.39 of EN-1 (e.g. the Environment Act) and Good Environmental Status under the UK Marine Strategy.

2.8.272 The designation of an area as a protected site (including SACs, SPAs, and Ramsar sites, MCZs and SSSIs) does not necessarily restrict the construction or operation of offshore wind farms or offshore transmission in, near, or through that area (see also Sections 4.3 and 5.4 of EN-1). However, it may make consent for such construction more difficult to secure.

2.8.273 Where adverse effects on site integrity/conservation objectives are predicted, the Secretary of State should consider the extent to which the effects are temporary or reversible, and the timescales for recovery. The Secretary of State should also consider the extent to which the effects may impede achievement of the MPA target (including any interim target) set under the Environment Act 2021.

2.8.274 See paragraphs 3.8.91 and 3.8.299 of this NPS for further guidance on offshore wind environmental standards.

Physical environment

2.8.275 As set out in paragraph 2.8.112 of this NPS 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.

2.8.276 The Secretary of State must be satisfied that the design of the wind farm, offshore transmission and methods of construction, including use of materials, are such as to reasonably minimise the potential for impact on the physical environment. This could involve, for instance, the exclusion of certain foundations because of their impacts or minimising quantities of rock that are used to protect cables whilst taking into account other relevant considerations such as safety.

Fish

2.8.277 The use of external cable protection has been suggested as a mitigation for EMF (by increasing the distance between fish species and individual cables). However, the Secretary of State should also consider any negative impacts from external cable protection on benthic habitats, and a balance between protection of various receptors must be made, with all mitigation and alternatives reviewed.

Intertidal and coastal habitats and species

2.8.278 The Secretary of State should be satisfied that cable installation and decommissioning has been designed sensitively, considering intertidal/coastal habitats.

Marine Mammals

2.8.279 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 reasonably to minimise significant impacts on marine mammals.

2.8.280 Unless suitable noise mitigation measures have been used, or can be secured through requirements within a development consent the Secretary of State may refuse the application.

2.8.281 The conservation status of cetaceans and seals are of relevance and the Secretary of State should be satisfied that cumulative and in-combination impacts on marine mammals have been considered.

Birds

2.8.282 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.

2.8.283 The conservation status of seabirds is of relevance and the Secretary of State should take into account the views of the relevant statutory advisors, and be satisfied that cumulative and in-combination impacts on seabird species have been considered.

Subtidal habitats and species

2.8.284 The Secretary of State should be satisfied that activities have been designed considering sensitive subtidal environmental aspects, and discussions with the relevant conservation bodies have taken place.

Commercial fisheries and fishing

2.8.285 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.

2.8.286 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.

2.8.287 Where the Secretary of State considers the wind farm or offshore transmission would significantly impede protection of sustainable fisheries or fishing activity at recognised important fishing grounds, this should be attributed a correspondingly significant weight.

2.8.288 The Secretary of State should consider adverse or beneficial impacts on different types of commercial fishing on a case-by-case basis.

2.8.289 The Secretary of State should be satisfied that the applicant has sought to design the proposal having consulted the MMO or NRW in Wales, Defra or Welsh Government in Wales and representatives of the fishing industry with the intention of minimising the loss of fishing opportunity taking into account effects on other marine interests. Guidance has been jointly agreed by the renewables and fishing industries on how they should liaise, with the intention of allowing the two industries to co-exist successfully[75].

2.8.290 The Secretary of State will need to consider the extent to which disruption to the fishing industry, whether short term during pre-construction (e.g. surveying) or construction or long term over the operational period, including that caused by the future implementation of any safety zones, has been mitigated where reasonably possible.

2.8.291 Where an offshore wind farm or offshore transmission could affect a species of fish that is of commercial interest, but is also of ecological value, the Secretary of State should refer to paragraphs 2.8.215 – 2.8.221 of this NPS with regard to the latter.

Marine historic environment

2.8.292 The Secretary of State should be satisfied that any proposed offshore wind farm and/ or offshore transmission project has appropriately considered and mitigated for any impacts to the historic environment, including both known heritage assets, and discoveries that may be made during the course of development.

Navigation and shipping

2.8.293 The Secretary of State should not grant development consent in relation to the construction or extension of an offshore wind farm

[75] https://www.sff.co.uk/floww/

if it considers that interference with the use of recognised sea lanes essential to international navigation is likely to be caused by the development.

2.8.294 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 (UNCLOS) 1982; and

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

2.8.295 The Secretary of State should be satisfied that the site selection has been made with a view to avoiding or minimising disruption or economic loss to the shipping and navigation industries, with particular regard to approaches to ports and to strategic routes essential to regional, national and international trade, lifeline ferries[76] and recreational users of the sea.

2.8.296 Where after carrying out a site selection, a proposed development is likely adversely to 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.

2.8.297 Where a proposed offshore wind farm is likely to affect less strategically important shipping routes[77], the Secretary of State should take a pragmatic approach to considering proposals to minimise negative impacts.

2.8.298 The Secretary of State should be satisfied that risk to navigational safety is ALARP. It is government policy that wind farms and all types of offshore transmission[78] should not be consented where they would pose unacceptable risks to navigational safety after mitigation measures have been adopted.

2.8.299 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.

[76] "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.
[77] 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.
[78] Types of offshore transmission includes though is not limited to wind farm export cables, interconnectors, Offshore Hybrid Assets and subsea 'onshore' transmission also referred to as bootstraps.

2.8.300 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.

2.8.301 The Secretary of State should make use of advice from the MCA, who will use the NRA described in paragraphs 3.8.190 and 3.8.191 of this NPS.

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

2.8.303 The Secretary of State may include provisions, compliant with national maritime legislation and UNCLOS, 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.

2.8.304 The provisions may specify or describe rights of navigation which:

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

2.8.305 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.

2.8.306 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.

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

Other offshore infrastructure and activities

2.8.308 There are statutory requirements concerning automatic establishment of navigational safety zones relating to offshore petroleum developments[79].

2.8.309 Where a proposed offshore wind farm potentially affects other offshore infrastructure or activity, a pragmatic approach should be employed by the Secretary of State.

2.8.310 Much of this infrastructure is important to other offshore industries as is its contribution to the UK economy.

2.8.311 In such circumstances, the Secretary of State should expect the applicant to work with the impacted sector to minimise negative impacts and reduce risks to as low as reasonably practicable.

2.8.312 As such, the Secretary of State should be satisfied that the site selection and site design of a proposed offshore wind farm and offshore transmission 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.

2.8.313 The Secretary of State should not consent applications which pose intolerable risks to safety after mitigation measures have been considered.

2.8.314 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.

2.8.315 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.

Wake effects

2.8.316 Where an applicant has demonstrated that they have made an assessment of inter-array wake, taken all reasonable steps to minimise as far as possible the impact of wake effects and shown that they have made reasonable efforts to work collaboratively with those who may potentially be impacted, then the existence of a residual wake effect impact is unlikely to carry more than limited weight against a project in the planning process.

[79] Section 21, Part 3 Petroleum Act 1987.

Seascape and visual effects

2.8.317 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.

2.8.318 Where an application relates to a proposed development that is at such a distance that it would not be visible from the shore the Secretary of State may conclude that an SLVIA will not be required.

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

- it considers that an alternative layout within the identified site could be reasonably proposed which would minimise any harm, taking into account other constraints that the applicant has faced such as ecological effects, while maintaining safety or economic viability of the application; or
- it takes account of the sensitivity of the receptor(s) and impacts on the statutory purposes of designated landscapes as set out in Section 5.10 of EN-1; and decides that the harmful effects outweigh the benefits of the proposed scheme. See also Critical National Priority (Section 4.2 of this EN-1).

2.8.320 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.

2.9 Pumped Hydro Storage

Introduction

2.9.1 Electricity storage is essential for a net zero energy system, it stores electricity when it is abundant for periods when it is scarce, as well as providing a range of services to help maintain the resilience and stability of the grid.

2.9.2 The need for electricity storage is rising as we increase the volume of variable renewables and increase peak demand through the electrification of heat and transport. It will be critical to maintaining energy security as we shift away from gas over the 2020s-30s.

2.9.3 Pumped hydro storage (PHS) is a form of electricity storage that uses the difference in height between two reservoirs or other bodies of water to store energy. By transferring water from the upper reservoir to the lower reservoir through a turbine, power can be generated. Later, the water must then be pumped back to the upper reservoir using power from the grid or elsewhere.

2.9.4 This section of EN-3 refers specifically to PHS, not hydroelectric power generation (for example where the upper reservoir is filled naturally from a watercourse or rainfall, or a run-of-the-river scheme).

2.9.5 Opportunities for NSIP hydroelectric power generation are currently limited, but if such an application is made then the information in this section may be relevant.

2.9.6 Unlike hydroelectric power generation, PHS is not typically a net generator of electricity: any power generation must subsequently be balanced by consumption to return the water to the upper reservoir[80]. 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.

2.9.7 In general, PHS is likely to consume electricity when there is excess renewable generation on the system, and to generate electricity when renewable electricity is scarce. This helps to decarbonise the energy system by integrating more renewable electricity and providing greater flexibility.

2.9.8 PHS can have significant impacts on landscape and visual amenity, including on nationally designated landscapes. These potential impacts include:

- flooding of land to form the reservoirs;
- construction of a dam to hold back artificially large volumes of water; and
- significant infrastructure including pipework, turbine and pumping stations, electricity transmission lines and vehicular access.

2.9.9 PHS is most likely to be in mountainous or hilly locations, and less likely to be situated in lowland areas.

[80] In some cases some natural replenishment of the upper reservoir may occur, for example due to rainfall run-off, which may allow the PHS scheme to generate a small amount of electricity and thus be considered a net generator. However the amount of electricity generation arising from this is likely to be minimal compared to the overall station output.

Technology details

2.9.10 PHS consists of two reservoirs and different elevations. A pipeline ("penstock") connects the upper reservoir to the generating station, which has another pipeline connecting it to the lower reservoir.

2.9.11 PHS can be characterised as "open-loop", where one or both reservoirs is connected to a natural water source, or "closed-loop" where there is no connection to a natural water source.

2.9.12 The reservoirs may be formed in various ways, including the possible use of a dam to hold back water or flooding of former quarries.

2.9.13 The generating station includes one or more turbines that convert the flow of water into rotational energy. "Reaction" type turbines are typically used, although "impulse" type turbines can also be used. The choice of turbine could affect the power station performance, requirements for supporting equipment, and impacts on fish.

2.9.14 Often the turbines are reversible so can be used to pump the water back to the upper reservoir. However, in some cases separate pumps are used.

2.9.15 Each turbine is coupled to a generator to convert the rotational energy to electricity. A substation for electrical equipment such as transformers is also required. Where the purpose of this substation is entirely to support the operation of the PHS facility itself, it should be considered integral to the PHS facility, and not an associated development. Finally, the power station must be connected to the electricity grid using electricity lines.

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

Significance to renewable generation

2.9.17 Few technologies that are commercial or have been demonstrated at scale are able to provide storage services at the scale of PHS.

2.9.18 As the electricity grid sees increasing levels of generation from variable renewable generators such as offshore wind, onshore wind and solar power, there will be an increasing need for storage infrastructure to balance electricity supply and demand. PHS could therefore be a key piece of infrastructure for enabling increased use of renewable generation.

Applicant assessment

Factors influencing site selection and design

Site topography

2.9.19 Site topography is essential for PHS schemes, as they require two bodies of water at different heights (typically hundreds of metres apart in elevation). It may be possible to use natural bodies of water, especially for the lower reservoir.

2.9.20 PHS schemes may require at least one man-made reservoir, therefore requiring suitable land to be flooded, such as a valley or former quarry. The site may also require space to build a dam to hold back the water flow.

2.9.21 The site will also require a sufficient water source to fill the reservoirs. This may be from a single watercourse or wider rainfall catchment area.

Accessibility

2.9.22 Given the location of PHS schemes in remote, mountainous areas where access may be limited, applicants will need to consider the suitability of the access routes to the proposed site for both the construction and operation of the PHS scheme, with the former likely to raise more significant issues.

2.9.23 Construction of a new PHS scheme is likely to require a significant amount of civil engineering, potentially including the extraction of large amounts of material using heavy goods vehicles.

2.9.24 Applications should include the full extent of the access routes necessary and an assessment of their effects.

Technical considerations

Network connection

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

2.9.26 PHS schemes can play an essential role in maintaining grid stability, including at times where the grid is under stress (such as rapid changes in supply or demand). Therefore, it is critical that PHS schemes have grid connections with sufficient capacity. This may be especially challenging given the typically remote locations of PHS schemes.

2.9.27 Applicants should consider important issues relating to network connection at Section 4.11 of EN-1 and in EN-5.

2.9.28 Applicants will usually have assured themselves that a viable connection exists before submitting the development proposal to the Secretary of State, and where they have not done so they take that commercial risk.

Flexibility in the project details

2.9.29 In some cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- Detail of turbine machinery;
- Details of generator design; and
- Details of exact routes of buried cabling and grid connections.

2.9.30 Guidance on how applicants should manage flexibility is set out at Section 2.6 of this NPS.

Impacts

2.9.31 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

2.9.32 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Landscape and visual impact

2.9.33 PHS schemes have the potential to have significant impacts on the landscape and visual amenity (See EN-1 Section 5.10). The nature of these impacts will depend on the design of the system (for example open vs closed-loop systems), but may include:

- construction of a substantial concrete dam (potentially several hundred metres in length, depending on the scale of the PHS scheme);
- construction of the generating station (requiring a building in excess of 25m in height);
- substantial civil works for the scheme foundations and to dig the reservoir(s), generating significant amounts of spoil; and
- flooding of land or disused quarries/pits to create the reservoir(s) (potentially covering an area of several hundred square metres).

2.9.34 Construction of PHS schemes has the potential to generate large amounts of spoil, from the digging of foundations and the reservoirs themselves. If these spoil heaps are to be kept within the locality, applicants should ensure they are located in a way that minimises their visual impact.

2.9.35 Applicants must ensure the safety and stability of spoil heaps is continually managed.

2.9.36 Applicants should seek to landscape PHS sites visually to enclose them at a low level as seen from surrounding external viewpoints. The design of schemes located in or within the setting of designated landscapes should be sensitive to the natural beauty, special qualities and key characteristics of these landscapes. Such measures can make the scale of the scheme less apparent, and help to conceal its lower level, smaller scale features. Earth bunds and mounds, tree planting or both may be used for softening the landscape and visual intrusion, and may also help to attenuate noise from site activities.

Noise and vibration

2.9.37 During operation, noise may arise from the operation of the turbines and other power generation equipment. There is also likely to be considerable noise in the construction phase, where blasting is required to create reservoirs and penstocks.

2.9.38 Where the project is likely to have noise and vibration impacts the applicant must undertake an assessment as required in Section 5.12 of EN-1.

Water quality and resources

2.9.39 Both the construction of a PHS scheme (including creation of reservoirs) and operation of the scheme may have impacts on the water quality and resource.

2.9.40 The nature of these impacts will depend on the design of the system (for example open vs closed-loop systems), but may include:

- disposal of spoil from the scheme construction in the reservoirs may alter sedimentation rates and alter conditions for aquatic flora and fauna;
- altering the flow of watercourse and wider landscape hydrology, both upstream and downstream of the installation. This may affect the rate at which sediment is deposited, conditions for aquatic flora and potentially migratory fish species (e.g. salmon);
- fish impingement and/or entrainment – i.e. being drawn into the PHS turbines;
- discharging water of an altered quality or temperature than the received water, affecting the biodiversity of aquatic flora and fauna. In particular, pumping of water to the upper reservoir is likely to result in increased temperatures; and

- connecting two bodies of water that would otherwise be unconnected may create a route for the spread of invasive non-native species, especially in the case where the two waterbodies are in different hydrological catchments.

2.9.41 Where the project is likely to have effects on water quality or resources the applicant must undertake an assessment as required in Section 5.16. EN-1.

2.9.42 The assessment must demonstrate that appropriate measures will be put in place to avoid or minimise adverse impacts of abstraction and discharge of water.

Biodiversity and ecological conservation

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

2.9.44 The design and construction of PHS schemes will have additional impacts on biodiversity. These may include:

- alterations or loss of habitats resulting from flooding of land and/or clearing of vegetation;
- removal and damage of soil arising from alterations to landscape hydrology and/or construction of infrastructure; and
- compromised water quality impacting aquatic flora and fauna, as described in paragraphs 2.9.54 – 2.9.56 of this NPS.

Recreation

2.9.45 As PHS schemes are likely to be located in hilly or mountainous areas and have impacts on water courses they may have specific impacts on recreational activities such as water sports (e.g., canoeing) and fishing.

2.9.46 Where the project is likely to have impacts on recreational activities, the applicant should undertake a full assessment, accounting for the views of relevant representational bodies and taking measures to minimise adverse impacts.

Mitigation

Landscape and visual impact

2.9.47 Good design that contributes positively to the character and quality of the area will go some way to mitigate adverse landscape and visual effects.

2.9.48 Development proposals should consider the design of the generating station and dam (if required), including the materials to be used in the context of the local landscape character.

2.9.49 Mitigation is achieved primarily through aesthetic aspects of site layout and building design including size and external finish and colour of the infrastructure to minimise intrusive appearance in the landscape as far as engineering requirements permit.

2.9.50 In some cases it may be possible to house some of the station, including the generation station, underground or inside the dam. The precise architectural treatment will need to be site-specific.

Noise and vibration

2.9.51 As described in Section 5.12 of EN-1, the primary mitigation for noise for PHS schemes is through good design to enclose plant and machinery in noise-reducing buildings or underground, wherever possible, and to minimise the potential for operations to create noise.

2.9.52 Noise from the operation of the PHS generating stations may be unavoidable. Similarly, noise from apparatus external to the main generating station may be unavoidable. This can be mitigated through careful plant selection.

2.9.53 Noise during construction, particularly from blasting, will be unavoidable. Careful consideration should be given to mitigating the impact of this on noise sensitive receptors.

Water quality and resources

2.9.54 In addition to the mitigation measures set out in Section 5.16 of EN-1 the design of the PHS scheme should include intake and outfall locations that avoid or minimise adverse impacts.

2.9.55 There should also be specific measures to minimise fish impingement and/or entrainment and the discharge of excessive heat to receiving waters.

Biodiversity

2.9.56 In addition to the mitigation measures set out in Section 5.4 of EN-1 applicants should have consideration for the potential benefits to local biodiversity, including through habitat creation and/or enhancement, fish re-stocking, and bankside planting. Further, some turbines may assist in increasing dissolved oxygen levels.

Recreation

2.9.57 PHS schemes should be designed to minimise impacts on existing recreational activities, and consideration should be given to how schemes can be designed in such a way that enhances such recreational activities.

Secretary of State decision making

2.9.58 The impacts identified in Part 5 of EN-1, and in this NPS in paragraphs 2.9.31 – 2.9.46 and following, and above, are not intended to be exhaustive.

2.9.59 The Secretary of State should consider any impacts which it determines are relevant and important to its decision and be satisfied that the applicant has demonstrated measures to minimise adverse impacts.

2.10 Solar Photovoltaic Generation

Introduction

2.10.1 The UK has huge potential for solar power: it is a cheap, versatile, and effective technology.

2.10.2 Solar energy is at the heart of our Clean Power 2030 Mission. The government is committed to working with industry to radically increase our existing solar capacity by 2030 to boost growth across the country, create thousands of high-skill, future-proofed jobs and tackle the climate crisis.

2.10.3 The Clean Power 2030 Action Plan sets out a deployment range for solar PV of between 45 – 47GW by 2030 with scope to exceed the clean power capacity range, subject to system need, noting the potential of rooftop solar to boost deployment.

2.10.4 Government is supporting solar through the Contracts for Difference Scheme and will include it in future rounds.

2.10.5 Solar farms are one of the most established renewable electricity technologies in the UK and the cheapest form of electricity generation.

2.10.6 Solar farms can be built quickly and, coupled with consistent reductions in the cost of materials and improvements in the

efficiency of panels[81], large-scale solar is now viable in some cases to deploy subsidy-free.

2.10.7 Solar farm proposals are currently likely to consist of solar panel arrays, mounting structures, piles, inverters, transformers and cables.

2.10.8 Associated infrastructure may also be proposed and may be treated, on a case by case basis, as associated development, such as energy storage[82], electrolysers associated with the production of low carbon hydrogen, or security arrangements (which may encompass flood defences, fencing, lighting and surveillance).

2.10.9 Along with associated infrastructure, a solar farm requires between 2 to 4 acres for each MW of output. A typical 50MW solar farm will consist of around 100,000 to 150,000 panels and cover between 125 to 200 acres. However, this will vary significantly depending on the site, with some being larger and some being smaller. This is also expected to change over time as the technology continues to evolve to become more efficient. Nevertheless, this scale of development will inevitably have impacts, particularly if sited in rural areas.

Applicant assessment

Factors influencing site selection and design

2.10.10 The key considerations involved in the siting of a solar farm are likely to be influenced by factors set out in the following paragraphs, in addition to considerations specific to individual projects.

Irradiance and site topography

2.10.11 Irradiance will be a key consideration for the applicant in identifying a potential site as the amount of electricity generated on site is directly affected by irradiance levels. Irradiance of a site will in turn be affected by surrounding topography, with an uncovered or exposed site of good elevation and favourable south-facing aspect more likely to increase year-round irradiance levels. This in turn affects the carbon emission savings and the commercial viability of the site.

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

[81] See https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1179359/electricity-generation-costs-2023.pdf

[82] See paras 3.3.4 -3.3.7 in EN-1

aspects, and panel arrays may also follow the movement of the sun in order further to maximise the solar resource.

Network connection

2.10.13 Applicants should consider important issues relating to network connection at Section 4.11 of EN-1 and in EN-5. In particular, and where appropriate, applicants should proceed in a manner consistent with the regulatory regime for offshore transmission networks established by Ofgem, details of which are set out in EN-5.

2.10.14 Many solar farms are connected into the local distribution network. The capacity of the local grid network to accept the likely output from a proposed solar farm is critical to the technical and commercial feasibility of a development proposal.

2.10.15 Larger developments may seek connection to the transmission network if there is available network capacity and/or supportive infrastructure.

2.10.16 In either case the connection voltage, availability of network capacity, and the distance from the solar farm to the existing network[83] can have a significant effect on the commercial feasibility of a development proposal.

2.10.17 To maximise existing grid infrastructure, minimise disruption to existing local community infrastructure or biodiversity and reduce overall costs, applicants may choose a site based on nearby available grid export capacity.

2.10.18 Where this is the case, applicants should consider the cumulative impacts of situating a solar farm in proximity to other energy generating stations and infrastructure.

Proximity of a site to dwellings

2.10.19 Utility-scale solar farms are large sites that may have a significant zone of visual influence. The two main impact issues that determine distances to sensitive receptors are therefore likely to be visual amenity and glint and glare. These are considered in Landscape, Visual and Residential Amenity (paragraphs 2.10.93-2.10.101) and Glint and Glare (paragraphs 2.10.102 – 2.10.106) impact sections of this NPS.

[83] The route and type of terrain traversed by the cabling linking the solar project to the grid connection may also have an impact on the project's viability.

Agriculture land classification and land type

2.10.20 Solar is a highly flexible technology and as such can be deployed on a wide variety of land types.

2.10.21 While land type should not be a predominating factor in determining the suitability of the site location applicants should, where possible, utilise suitable previously developed land, brownfield land, contaminated land and industrial land. Where the proposed use of any agricultural land has been shown to be necessary, poorer quality land should be preferred to higher quality land avoiding the use of "Best and Most Versatile" agricultural land where possible. 'Best and Most Versatile agricultural land is defined as land in grades 1, 2 and 3a of the Agricultural Land Classification[84].

2.10.22 Whilst the development of ground mounted solar arrays is not prohibited on Best and Most Versatile agricultural land, or sites 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 2.10.73 – 92 and 2.10.107 – 2.10.126 of this NPS.

2.10.23 It is recognised that at this scale, it is likely that applicants' developments will use some agricultural land. Applicants should explain their choice of site, noting the preference for development to be on suitable brownfield, industrial and low and medium grade agricultural land.

2.10.24 Where sited on agricultural land, consideration may be given as to whether the proposal allows for continued agricultural use and/or can be co-located with other functions (for example, onshore wind generation, storage, hydrogen electrolysers) to maximise the efficiency of land use.

2.10.25 The Agricultural Land Classification (ALC) is the only approved system for grading agricultural quality in England and Wales and, if necessary, field surveys should be used to establish the ALC grades in accordance with the current, or any successor to it, grading criteria and identify the soil types to inform soil management at the construction, operation, and decommissioning phases in line with the Defra Construction Code.[85]

2.10.26 Applicants are encouraged to develop and implement a Soil Resources and Management Plan which could help to use and manage soils sustainably and minimise adverse impacts on soil

[84] Details of the Agricultural Land Classification are at:
http://publications.naturalengland.org.uk/publication/6257050620264448
https://www.gov.wales/agricultural-land-classification

[85] See https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils-on-construction-sites

health and potential land contamination. This should be in line with the ambition set out in the Environmental Improvement Plan to bring at least 40% of England's agricultural soils into sustainable management by 2028 and increase this up to 60% by 2030. This should include consideration of mitigation against impacts to peat soils where these are present

Accessibility

2.10.27 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.

2.10.28 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.

2.10.29 Developers will usually need to construct on-site access routes for operation and maintenance activities, such as footpaths, earthworks, or landscaping.

2.10.30 In addition, sometimes access routes will need to be constructed to connect solar farms to the public road network.

2.10.31 Applications should include the full extent of the access routes necessary for operation and maintenance and an assessment of their effects.

Public rights of ways

2.10.32 Proposed developments may affect the provision of public rights of way networks[86].

2.10.33 Public rights of way may need to be temporarily closed or diverted to enable construction, however, applicants should keep, as far as is practicable and safe, all public rights of way that cross the proposed development site open during construction and protect users where a public right of way borders or crosses the site.

2.10.34 Applicants are encouraged to design the layout and appearance of the site to ensure continued recreational use of public rights of way where possible during construction, and in particular during operation of the site.

[86] Public rights of way can include footpaths, bridleways, byways, restricted byways, National Trails and other rights of access to land. Further information is provided by the Land Registry at: https://www.landregistry-titledeeds.co.uk/frequently-asked-questions/information/public-rights-of-way.asp

2.10.35 Applicants are encouraged where possible to minimise the visual impacts of the development for those using existing public rights of way, considering the impacts this may have on any other visual amenities in the surrounding landscape[87].

2.10.36 Applicants should consider and maximise opportunities to facilitate enhancements to the public rights of way and the inclusion, through site layout and design of access, of new opportunities for the public to access and cross proposed solar development sites (whether via the adoption of new public rights of way or the creation of permissive paths), taking into account, where appropriate, the views of landowners.

2.10.37 Applicants should set out detail on how public rights of way would be managed to ensure they are safe to use in an outline Public Rights of Way Management Plan.

Security and lighting

2.10.38 Security of the site is a key consideration for developers. Applicants may wish to consider not only the availability of natural defences such as steep gradients, hedging and rivers but also perimeter security measures such as fencing, electronic security, CCTV and lighting, with the measures proposed on a site-specific basis.

2.10.39 Applicants should assess the visual impact of these security measures, as well as the impacts on local residents, including for example issues relating to intrusion from CCTV and light pollution in the vicinity of the site.

2.10.40 Applicants should consider the need to minimise the impact on the landscape and the visual impact of security measures.

Technical considerations

2.10.41 Applications for solar farms are likely to comprise a number of elements including solar panel arrays, piling, inverters, mounting structures, cabling, earthworks, and measures associated with site security, and may also include associated infrastructure such as energy storage and electrolysers associated with the production of low carbon hydrogen[88].

Capacity of a site

2.10.42 Solar panels generate electricity in direct current (DC) form. A number of panels feed an external inverter, which is used to

[87] For example, screening along public right-of-way networks to minimise the outlook into the Solar Park may, impact on the ability of users to appreciate the surrounding landscapes

[88] As set out in EN-1 1.3.5, where the need for a particular type of energy infrastructure is established in EN-1, but that type of infrastructure is outside the scope of one of the technology specific NPSs, EN-1 will have effect alone and will be the primary basis for Secretary of State's decision making.

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).

2.10.43 For the purposes of determining the capacity thresholds in Section 15 of the Planning Act 2008, all forms of generation other than solar are currently assessed on an AC basis, while a practice has developed where solar farms are assessed on their DC capacity.

2.10.44 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.

2.10.45 For the purposes of Section 15 of the Planning Act 2008, the maximum combined capacity of the installed inverters (measured in alternating current (AC)) should be used for the purposes of determining solar site capacity.

2.10.46 The capacity threshold is 100MW (AC) in England[89] and 350MW (AC) in Wales[90].

2.10.47 The installed generating capacity of a solar farm will decline over time in correlation with the reduction in panel array efficiency. There is a range of sources of degradation that developers need to consider when deciding on a solar panel technology to be used. Applicants may account for this by overplanting solar panel arrays[91].

2.10.48 AC installed export capacity should not be seen as an appropriate tool to constrain the impacts of a solar farm. Applicants should use other measurements, such as panel size, total area and percentage of ground cover to set the maximum extent of

[89] Until the Infrastructure Planning (Onshore Wind and Solar Generation) Order 2025 comes into force on 31 December 2025 this NPS will continue to have effect for solar PV generation of >50MW in England.

[90] The combined maximum AC capacity of the installed inverters may only exceed the aforementioned thresholds for the sole purpose of overcoming reactive power consumption within the solar farm between the inverters and the connection point.

[91] "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. This allows developers to take account of degradation in panel array efficiency over time, thereby enabling the grid connection to be maximised across the lifetime of the site. Such reasonable overplanting should be considered acceptable in a planning context so long as it can be justified and the electricity export does not exceed the relevant NSIP installed capacity threshold throughout the operational lifetime of the site and the proposed development and its impacts are assessed through the planning process on the basis of its full extent, including any overplanting.

development when determining the planning impacts of an application.

2.10.49 Nothing in this section should be taken to change any development consent or other planning permission granted prior to the amendment of this NPS. Any such permission should be interpreted on the basis upon which it was examined and granted.

2.10.50 In particular, any permissions granted on the basis of a DC installed generating capacity should be built on that basis, unless an amendment is made to that permission and the difference in impacts is considered.

Site layout design, and appearance

2.10.51 Applicants should consider the criteria for good design set out in Section 4.7 of EN-1 at an early stage when developing projects.

2.10.52 As set out above applicants will consider several factors when considering the design and layout of sites, including proximity to available grid capacity to accommodate the scale of generation, orientation, topography, previous land–use, and ability to mitigate environmental impacts and flood risk.

2.10.53 For a solar farm to generate electricity efficiently the panel array spacing should seek to maximise the potential power output of the site. The type, spacing and aspect of panel arrays will depend on the physical characteristics of the site such as site elevation.

2.10.54 In terms of design and layout, applicants may favour a south-facing arrangement of panels to maximise output although other orientations may be chosen. For example, an east-west layout, whilst likely to result in reduced output compared to south-facing panels on a panel-by-panel basis, may allow for a greater density of panels to compensate and therefore for generation to be spread more evenly throughout the day.

2.10.55 It is likely that underground and overhead cabling will be required to connect the electrical assets of the site, such as from the substation to the panel arrays or storage facilities.

2.10.56 In the case of underground cabling, applicants are expected to provide a method statement describing cable trench design, installation methodology, as well as details of the operation and maintenance regime.

Project lifetime

2.10.57 Applicants should consider the design life of solar panel efficiency over time when determining the period for which consent is required. An upper limit of 40 years is typical, although applicants may seek consent without a time-period or for differing time-periods of operation.

2.10.58 Time limited consent, where granted, is described as temporary because there is a finite period for which it exists, after which the project would cease to have consent and therefore must seek to extend the period of consent or be decommissioned and removed[92].

2.10.59 Solar panel efficiency deteriorates over time and applicants may elect to replace panels during the lifetime of the site.

Decommissioning

2.10.60 Solar panels can be decommissioned relatively easily and cheaply. The nature and extent of decommissioning of a site can vary. Generally, it is expected that the panel arrays and mounting structures will be decommissioned, and underground cabling dug out to ensure that prior use of the site can continue.

2.10.61 Applicants should set out what would be decommissioned and removed from the site at the end of the operational life of the generating station, considering instances where it may be less harmful for the ecology of the site to keep or retain certain types of infrastructure, for example underground cabling, and where there may be socio-economic benefits in retaining site infrastructure after the operational life, such as retaining pathways through the site or a site substation.

Flexibility in the project details

2.10.62 In many cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- the type, number and dimensions of the panels;
- layout and spacing;
- the type of inverter or transformer; and
- whether storage will be installed (with the option to install further panels as a substitute).

2.10.63 Applicants should set out a range of options based on different panel numbers, types and layout, with and without storage.

2.10.64 Guidance on how applicants should manage flexibility is set out at Section 2.6 of this NPS.

[92] As detailed in paragraph 4.3.3 of EN-1, all proposals for projects subject to the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 require an assessment of the likely significant effects of such a project, covering long-term, permanent and temporary impacts.

Impacts

2.10.65 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

2.10.66 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Biodiversity, ecological, geological conservation and water management

2.10.67 Generic environmental, biodiversity, ecology, geological and water management impacts are covered in Section 4.3 (Environmental Principles), Section 4.6 (Environmental and Biodiversity Net Gain), Section 5.4 (Biodiversity and Geological Conservation) and Section 5.8 (Flood Risk) of EN-1.

2.10.68 The applicant's ecological assessments should identify any ecological risk from developing on the proposed site.

2.10.69 Issues that need assessment may include habitats, ground nesting birds, wintering and migratory birds, bats, dormice, reptiles, great crested newts, water voles and badgers.

2.10.70 The applicant should use an advising ecologist during the design process to ensure that adverse impacts are avoided, minimised or mitigated in line with the mitigation hierarchy, and biodiversity enhancements are maximised.

2.10.71 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.

2.10.72 Applicants should consider earthworks associated with construction compounds, access roads and cable trenching.

2.10.73 Where soil stripping occurs, topsoil and subsoil should be stripped, stored, and replaced separately to minimise soil damage and to provide optimal conditions for site restoration. Further details on minimising impacts on soil and soil handling are above at paragraphs 2.10.25 and 2.10.26.

2.10.74 Applicants should consider how security and lighting installations may impact on the local ecology. Where pole mounted CCTV facilities are proposed the location of these facilities should be carefully considered to minimise impact. If lighting is necessary, it should be minimised and directed away from areas of likely habitat.

2.10.75 Applicants should consider how site boundaries are managed. If any hedges/scrub are to be removed, further surveys may be necessary to account for impacts. Buffer strips between perimeter

fencing and hedges may be proposed, and the construction and design of any fencing should account for enabling mammal, reptile and other fauna access into the site if required to do so in the ecological report.

2.10.76 Where a Flood Risk Assessment has been carried out this must be submitted alongside the applicant's ES. This will need to consider the impact of drainage. As solar PV panels will drain to the existing ground, the impact will not, in general, be significant.

2.10.77 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.

2.10.78 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.

2.10.79 Culverting existing watercourses/drainage ditches should be avoided.

2.10.80 Where culverting for access is unavoidable, applicants should demonstrate that no reasonable alternatives exist and where necessary it will only be in place temporarily for the construction period.

2.10.81 Solar farms have the potential to increase the biodiversity value of a site, especially if the land was previously intensively managed. In some instances, this can result in significant benefits and enhancements beyond biodiversity net gain, which result in wider environmental gains which is encouraged.

2.10.82 For projects in England, applicants should consider enhancement, management, and monitoring of biodiversity in line with the ambition set out in the Environmental Improvement Plan and any relevant measures and targets, including statutory targets set under the Environment Act 2021 or elsewhere.

2.10.83 In Wales, applicants should consider the guidance set out in section 6.4 of Planning Policy Wales.

2.10.84 Applicants should consider whether they need to provide geotechnical and hydrological information (such as identifying the presence of peat at each site) including the risk of landslide connected to any development work.

Landscape, visual and residential amenity

2.10.85 Generic landscape and visual impacts are covered in Section 5.10 of EN-1.

2.10.86 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.

2.10.87 However, whilst it may be the case that the development covers a significant surface area, in the case of ground-mounted solar panels it should be noted that with effective screening and appropriate land topography, the area of a zone of visual influence could be appropriately minimised.

2.10.88 Landscape and visual impacts should be considered carefully pre-application. Potential impacts on the statutory purposes of nationally designated landscapes and their settings should form a part of the pre- application process.

2.10.89 Applicants should carry out a landscape and visual assessment (LVIA) and report it in the ES. Photomontage visualisations may be required to demonstrate the effects of a proposed solar farm, on sensitive or valued landscapes, particularly designated landscapes, the setting of heritage assets and any nearby residential areas or viewpoints.

2.10.90 Applicants should follow the criteria for good design set out in Section 4.7 of EN-1 when developing projects and will be expected to direct considerable effort towards minimising the landscape and visual impact of solar PV arrays especially within nationally designated landscapes.

2.10.91 Whilst there is an acknowledged need to ensure solar PV installations are adequately secured, required security measures such as fencing should consider the need to minimise the impact on the landscape and visual impact (see paragraphs 2.10.46 – 2.10.48 of this NPS).

2.10.92 The applicant should consider as part of the design, layout, construction, and future maintenance plans how to protect and retain, wherever possible, the growth of vegetation on site boundaries, as well as the growth of existing hedges, established vegetation, including mature trees within boundaries. Applicants should also consider opportunities for individual trees within the boundaries to grow on to maturity.

2.10.93 The impact of the proposed development on established trees and hedges should be informed by a tree survey and arboricultural / hedge assessment as appropriate.

Glint and glare

2.10.94 Solar panels are specifically designed to absorb, not reflect, irradiation[93]. However, solar panels may reflect the sun's rays at certain angles, causing glint and glare. Glint is defined as a momentary flash of light that may be produced as a direct reflection of the sun in the solar panel. Glare is a continuous source of excessive brightness experienced by a stationary observer located in the path of reflected sunlight from the face of the panel. The effect occurs when the solar panel is stationed between or at an angle of the sun and the receptor.

2.10.95 Applicants should map receptors qualitatively to identify potential glint and glare issues and determine if a glint and glare assessment is necessary as part of the application.

2.10.96 When a quantitative glint and glare assessment is necessary, applicants are expected to consider the geometric possibility of glint and glare affecting nearby receptors, and provide an assessment of potential impact and impairment based on the angle and duration of incidence and the intensity of the reflection.

2.10.97 The extent of reflectivity analysis required to assess potential impacts will depend on the specific project site and design. This may need to account for 'tracking' panels if they are proposed as these may cause differential diurnal and/or seasonal impacts.

2.10.98 When a glint and glare assessment is undertaken, the potential for solar PV panels, frames and supports to have a combined reflective quality may need to be assessed, although the glint and glare of the frames and supports is likely to be significantly less than the panels.

Historic Environment

2.10.99 The impacts of solar PV developments on the historic environment will require expert assessment in most cases and may have effect both above and below ground.

2.10.100 Above ground impacts may include the effects on the setting of Listed Buildings and other designated heritage assets as well as on Historic Landscape Character.

2.10.101 Below ground impacts, although generally limited, may include direct impacts on archaeological deposits through ground disturbance associated with trenching, cabling, foundations, fencing, temporary haul routes etc.

93 Most commercially available solar panels are designed with anti-reflective glass or are produced with anti-reflective coating and have a reflective capacity that is generally equal to or less hazardous than other objects typically found in the outdoor environment, such as bodies of water or glass buildings.

2.10.102 Equally, solar PV developments may have a positive effect, for example archaeological assets may be protected by a solar PV farm as the site is removed from regular ploughing and shoes or low-level piling is stipulated[94].

2.10.103 Generic historic environment impacts are covered in Section 5.9 of EN-1.

2.10.104 Applicant assessments should be informed by information from Historic Environment Records (HERs)[95] or the local authority.

2.10.105 Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, the applicant should submit an appropriate desk-based assessment and, where necessary, a field evaluation. These should be carried out using expertise where necessary and in consultation with the local planning authority, and should identify archaeological study areas and propose appropriate schemes of investigation, and design measures, to ensure the protection of relevant heritage assets.

2.10.106 In some instances, field studies may include investigative work (and may include trial trenching beyond the boundary of the proposed site) to assess the impacts of any ground disturbance, such as proposed cabling, substation foundations or mounting supports for solar panels on archaeological assets.

2.10.107 The extent of investigative work should be proportionate to the sensitivity of, and extent of, proposed ground disturbance in the associated study area.

2.10.108 Applicants should take account of the results of historic environment assessments in their design proposal.

2.10.109 Applicants should consider what steps can be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals on views important to their setting.

2.10.110 As the significance of a heritage asset derives not only from its physical presence but also from its setting, careful consideration should be given to the impact of large-scale solar farms which depending on their scale, design, and prominence, may cause substantial harm to the significance of the asset.

2.10.111 Applicants may need to include visualisations to demonstrate the effects of a proposed solar farm on the setting of heritage assets.

[94] The results of pre-determination archaeological evaluation inform the design of the scheme and related archaeological planning conditions.
[95] For more information on HERs see https://historicengland.org.uk/advice/technical-advice/information-management/hers/

Construction including traffic and transport noise and vibration

2.10.112 Modern solar farms are large sites that are mainly comprised of small structures that can be transported separately and constructed on-site, with developers designating a compound on-site for the delivery and assemblage of the necessary components.

2.10.113 Many solar farms will be sited in areas served by a minor road network. Public perception of the construction phase of solar farms will derive mainly from the effects of traffic movements, which is likely to involve smaller vehicles than typical onshore energy infrastructure but may be more voluminous.

2.10.114 Generic traffic and transport impacts are covered Section 5.14 of EN-1.

2.10.115 Applicants should assess the various potential routes to the site for delivery of materials and components where the source of the materials is known at the time of the application, and select the route that is the most appropriate.

2.10.116 Where the exact location of the source of construction materials, such as crushed stone or concrete is not known at the time of the application, applicants should assess the worst-case impact of additional vehicles on the likely potential routes.

2.10.117 Applicants should ensure all sections of roads and bridges on the proposed delivery route can accommodate the weight and volume of the loads and width of vehicles. Although unlikely, where modifications to roads and/or bridges are required, these should be identified, and potential effects addressed in the ES.

2.10.118 Where a cumulative impact is likely because multiple energy infrastructure developments are proposing to use a common port and/or access route and pass through the same towns and villages, applicants should include a vision-led transport assessment to manage cumulative impacts as part of the ES. This should consider the impacts of abnormal traffic movements relating to the project in question in combination with those from any other relevant development. Consultation with the relevant local highways authorities is likely to be necessary.

Mitigations

Agriculture Land classification and land type

2.10.119 The Defra Construction code of practice for the sustainable use of soils on construction sites[96] provides guidance on ensuring that damage to soil during construction is mitigated and minimised. Mitigation measures focus on minimising damage to soil that remains in place, and minimising damage to soil being excavated and stockpiled. The measures aim to preserve soil health and soil structure to minimise soil carbon loss and maintain water infiltration and soil biodiversity. Mitigation measures for agricultural soils include use of green cover, multispecies cover crops - especially during the winter - minimising compaction and adding soil organic matter. Mitigation of impacts to peat soils should include water table management and minimising soil disturbance.

Biodiversity and ecological conservation

2.10.120 In England, proposed enhancements should take account of the above factors and as set out in Sections 4.6 and 5.4 of EN-1 aim to achieve environmental and biodiversity net gain in line with the ambition set out in the Environmental Improvement Plan and any relevant measures and targets, including statutory targets set under the Environment Act 2021 or elsewhere[97].

2.10.121 This might include maintaining or extending existing habitats and potentially creating new important habitats, for example by installing cultivated strips/plots for rare arable plants, rough grassland margins, bumble bee plant mixes, and wild bird seed mixes.

2.10.122 Applicants are advised to develop an ecological monitoring programme to monitor impacts upon the flora of the site and upon any particular ecological receptors (such as bats and wintering birds). Results of the monitoring will then inform any changes needed to the land management of the site, including, if appropriate, any livestock grazing regime.

Landscape, visual and residential amenity

2.10.123 Applicants should consider the potential to mitigate landscape and visual impacts through, for example, screening with native hedges, trees and woodlands.

2.10.124 Applicants should aim to minimise the use and height of security fencing. Where possible applicants should utilise existing

[96] The Defra Construction Code at: (See https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils
-on-construction-sites)"

[97] For projects in Wales, section 6.4 of Planning Policy Wales and any related guidance should be followed.

features, such as hedges or landscaping, to assist in site security, or screen security fencing.

2.10.125 Applicants should minimise the use of security lighting. Any lighting should utilise a passive infra-red (PIR) technology and should be designed and installed in a manner which minimises impact.

Glint and glare

2.10.126 Applicants should consider using, and in some cases the Secretary of State may require, solar panels to comprise of (or be covered with) anti-glare/anti-reflective coating with a specified angle of maximum reflection attenuation for the lifetime of the permission.

2.10.127 Applicants may consider using screening between potentially affected receptors and the reflecting panels to mitigate the effects.

2.10.128 Applicants may consider adjusting the azimuth alignment of, or changing the elevation tilt angle of, a solar panel within the economically viable range, to alter the angle of incidence. In practice this is unlikely to remove the potential impact altogether but in marginal cases may contribute to a mitigation strategy.

Historic Environment

2.10.129 The ability 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.

2.10.130 Where requested by the applicant, the Secretary of State should consider granting consents which allow for the micrositing within a specified tolerance of elements of the permitted infrastructure, so that precise locations can be amended during the construction phase if unforeseen circumstances, such as the discovery of previously unknown archaeology, arise.

Construction including traffic and transport noise and vibration

2.10.131 In some cases, the local highway authority may request that the Secretary of State impose controls on the number of vehicle movements to and from the solar farm site in a specified period during its construction and, possibly, on the routeing of such movements particularly by heavy vehicles.

2.10.132 Where the Secretary of State agrees that this is necessary, requirements could be imposed on development consent.

2.10.133 Where cumulative effects on the local road network or residential amenity are predicted from multiple solar farm developments, it

may be appropriate for applicants for various projects to work together to ensure that the number of abnormal loads and deliveries are minimised, and the timings of deliveries are managed and coordinated to ensure that disruption to residents and other highway users is reasonably minimised.

2.10.134 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.

2.10.135 Once consent for a scheme has been granted, applicants should liaise with the relevant local highway authority (or other coordinating body) regarding the start of construction and the broad timing of deliveries. Applicants may need to agree a planning obligation to secure appropriate measures, including restoration of roads and verges.

2.10.136 Further, it may be appropriate for any non-permanent highway improvements carried out for the development (such as temporary road widening) to be made available for use by other subsequent solar farm developments.

Secretary of State decision making

Factors influencing site selection and design

Agriculture land classification and land type

2.10.137 The Secretary of State should take into account the economic and other benefits of the best and most versatile agricultural land. The Secretary of State should ensure that the applicant has put forward appropriate mitigation measures to minimise impacts on soils or soil resources.

Technical considerations

Project lifetime and decommissioning

2.10.138 The Secretary of State should ensure that the applicant has put forward outline plans for decommissioning the generating station when no longer in use and restoring the land to a suitable use (taking into account paragraphs 2.10.68 and 2.10.69).

2.10.139 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.

2.10.140 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.

2.10.141 An upper limit of 40 years is typical, although applicants may seek consent without a time period or for differing time-periods for operation.

2.10.142 The time limited nature of the solar farm, where a time limit is sought as a condition of consent, is likely to be an important consideration for the Secretary of State.

2.10.143 The Secretary of State should consider the period of time the applicant is seeking to operate the generating station, as well as the extent to which the site will return to its original state, when assessing impacts such as landscape and visual effects and potential effects on the settings of heritage assets and nationally designated landscapes.

Impacts

2.10.144 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

2.10.145 The Secretary of State should consider any impacts which it determines are relevant and important to its decision.

Biodiversity, ecological, geological conservation and water management

2.10.146 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.

2.10.147 The Secretary of State must consider the worst-case effects in its consideration of the application and consent.

2.10.148 Where developments are proposed on peat, to ensure the development will result in minimal disruption to the ecology, or release of CO_2, and that the carbon balance savings of the scheme are maximised, the Secretary of State should be satisfied that the solar farm layout and construction methods have been designed to minimise soil disturbance and other peatland impacts during construction and maintenance of roads, tracks, and other infrastructure and where possible are compatible with raised water table management.. Where developments are located in Wales, the Secretary of State may take into account the policies set out in the National Peatlands Action Programme, 2020-2025 (cyfoethnaturiol.cymru)[98] and Future Wales the National Plan 2040 - Policy 18.

[98] See: National Peatlands Action Programme, 2020-2025

Landscape, visual and residential amenity

2.10.149 The Secretary of State will consider the landscape and visual impact of any proposed solar PV farm, taking account of any sensitive visual receptors, and the effect of the development on landscape character, together with the possible cumulative effect with any existing or proposed development. Nationally designated landscapes (National Parks, The Broads and National Landscapes) are afforded extra protection due their statutory purpose. Development in these areas needs to satisfy policy as set out in EN-1 Section 5.10.

Glint and glare

2.10.150 Solar PV panels are designed to absorb, not reflect, irradiation. However, the Secretary of State should assess the potential impact of glint and glare on nearby homes, motorists, public rights of way, and aviation infrastructure (including aircraft departure and arrival flight paths).

2.10.151 Whilst there is some evidence that glint and glare from solar farms can be experienced by pilots and air traffic controllers in certain conditions, there is no evidence that glint and glare from solar farms results in significant impairment on aircraft safety. Therefore, unless a significant impairment can be demonstrated, the Secretary of State is unlikely to give any more than limited weight to claims of aviation interference because of glint and glare from solar farms.

Historic Environment

2.10.152 Solar farms are generally consented on the basis that they will be time-limited in operation. The Secretary of State should therefore consider the length of time for which consent is sought when considering the impacts of any indirect effect on the historic environment, such as effects on the setting of designated heritage assets.

Construction including traffic and transport noise and vibration

2.10.153 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.

2.10.154 The Secretary of State is unlikely to give any more than limited weight to traffic and transport noise and vibration impacts from the operational phase of a project.

2.11 Tidal Stream Energy

Introduction

2.11.1 Tidal stream developments will typically include an array of individual turbines fixed directly to the seabed or suspended from floating structures that are in turn fixed to seabed via anchor cables.

2.11.2 Tidal stream developments may also include a variety of associated infrastructural elements, such as intra-array and inter-array electrical cables, export cables, offshore substations, and land-side grid-connection infrastructure.

2.11.3 Tidal stream technologies are in the early stages of commercial development, with 10MW of installed capacity in the UK as of 2022. However, the cost of tidal stream energy could fall significantly in the coming years, allowing projects above the 100MW NSIP threshold to come forward by the late 2020s.

2.11.4 In view of the limited commercial-scale deployments to date, there is some uncertainty about the severity of the impact, if any, that tidal stream arrays may have on the marine ecosystem.

2.11.5 It is to be expected, however, that by the time that supra-100MW projects come forward for planning consent, there will be a significantly more robust evidence base for applicants and assessors to draw upon, including data accrued from the extensive monitoring undertaken at intermediate-scale developments[99].

2.11.6 Where appropriate, and as indicated throughout this NPS, applicants should demonstrate how they have taken account of this evidence base in designing their proposal, and any impact avoidance or mitigation plans associated with it.

Applicant assessment

Factors influencing site selection and design

2.11.7 General factors influencing site selection by applicants are set out at Section 2.3 of this NPS.

2.11.8 The specific criteria considered by applicants, and the role that plays in site selection, will vary from project to project.

[99] For example array-produced underwater noise and electromagnetic fields, as well as the collision or avoidance risk posed by tidal stream turbines to marine mammals, fish, and bird species.

Offshore Energy Strategic Environmental Assessment

2.11.9 In proposing sites for tidal stream energy NSIPs, applicants should demonstrate that their choice of site takes into account not only the findings of the government's Offshore Energy Strategic Environmental Assessment 2016 (SEA)[100] and its successors, but also relevant industry research and modelling[101], and evidence obtained from monitoring carried out as part of the scoping, construction, and operation of intermediate-scale tidal stream arrays.

Other offshore infrastructure and activities

2.11.10 There may be constraints imposed on the siting or design of tidal stream developments. For guidance applicants should consult Section 2.8 in the offshore wind chapter of this NPS.

Seabed geology and foundation conditions

2.11.11 Applicants should ensure that their turbine foundation design is technically suitable for the prevailing seabed conditions.

2.11.12 Applicants should ensure the foundation design does not create unacceptably adverse effects on marine biodiversity, the marine physical environment, or marine heritage assets, in accordance with the requirements detailed below and in EN-1.

Technical considerations

Network connection

2.11.13 Applicants should ensure that the form, routing, and design of their connection to the electricity network(s) is consistent with the considerations set out at Section 4.11 of EN-1 and in EN-5. Applicants should also demonstrate that their proposals are compliant with the guidelines on assessing the singular and cumulative impact of cabling and associated infrastructure in the

[100] The 2016 SEA concluded that that although small tidal stream arrays may have detectable hyper-localised effects, these effects are not likely to be significant at distance. See https://www.gov.uk/guidance/offshore-energy-strategic-environmental-assessment-sea-an-overview-of-the-sea-process

[101] Recent modelling suggests that larger arrays in excess of 100MW have the theoretical potential to give rise to significant and far-ranging impacts, albeit the presence and intensity of these impacts are strongly conditioned by assumptions about location, layout, and size of the array. See e.g. Lossent J, Lejart M, Folegot T, Clorennec D, Di Iorio L, Gervaise C. Underwater operational noise level emitted by a tidal current turbine and its potential impact on marine fauna. Mar Pollut Bull. 2018 Jun;131(Pt A):323-334. doi: 10.1016/j.marpolbul.2018.03.024. Epub 2018 May 7. PMID: 29886954; and Gillespie D, Palmer L, Macaulay J, Sparling C, Hastie G. 2021 Harbour porpoises exhibit localized evasion of a tidal turbine. Aquat. Conserv.: Mar. Freshw. Ecosyst. 31, 2459– 2468. (doi:10.1002/aqc.3660). See also e.g., De Dominicis, M., Wolf, J., & O'Hara Murray, R. (2018). Comparative effects of climate change and tidal stream energy extraction in a shelf sea. Journal of Geophysical Research: Oceans, 123, 5041– 5067.

marine and nearshore environment set out at Section 2.8 of this NPS.

Flexibility in the project details

2.11.14 In some cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- the type of turbine;
- foundation;
- mooring;
- cabling to be installed;
- cable routing; and
- exact locations of offshore and/or onshore electrical substations.

2.11.15 Guidance on how applicants should manage flexibility is set out at 2.6 of this NPS.

Micrositing and microrouting

2.11.16 Micrositing/microrouting provides applicants with flexibility to accommodate any unforeseen events, such as the discovery of previously unknown marine archaeology that it would be preferable to leave in situ.

2.11.17 For guidance on micrositing/microrouting applicants should consult paragraphs 2.8.76 – 2.8.79 in the offshore wind chapter of this NPS.

Repowering

2.11.18 Where an operational tidal array reaches the end of its life, subject to obtaining the necessary lease from The Crown Estate or providing an existing lease is still valid, the owner of the tidal array may wish to “repower” the site with new turbines.

2.11.19 While there may be benefits to making use of an existing site, given the likely change in technology over the intervening time period, any repowering of sites is likely to involve tidal turbines of a different scale and nature. This could result in significantly different impacts as well as a different electricity generating capacity.

2.11.20 Applicants must submit a new consent application for any repowering of an existing site. This would be subject to EIA and HRA.

Decommissioning

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

2.11.22 Where requested by the Secretary of State applicants should submit a decommissioning programme[102], satisfying the requirements of section105(8) of the Energy Act 2004 before any offshore construction works begin.

Impacts

2.11.23 The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

2.11.24 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Biodiversity and ecological conservation

2.11.25 Generic biodiversity and ecology effects and receptors are covered in detail in Section 5.4 of EN-1.

2.11.26 The coastal change policy in Section 5.6 of EN-1 may also be relevant.

2.11.27 In addition, applicants should have regard to the specific ecological and biodiversity considerations that pertain to proposed offshore wind infrastructure developments, namely:

- fish;
- intertidal and subtidal seabed habitats and species;
- marine mammals;
- birds; and
- wider ecosystem impacts and interactions, such as foodwebs.

2.11.28 Applicants must undertake a detailed assessment of the offshore ecological, biodiversity and physical impacts of their proposed development, for all phases of the lifespan of that development, in accordance with the appropriate policy for EIAs, HRAs and MCZ assessments (See Sections 4.3 and 5.4 of EN-1).

[102] See https://www.gov.uk/government/publications/decommissioning-offshore-renewable-energy-installations

2.11.29 Applicants should demonstrate that their site selection, project design, and (where relevant) mitigation plans have been determined considering relevant evidence.

2.11.30 Applicants should explain why their decisions on siting, design, and impact mitigation are proportionate and well-targeted considering real-world evidence gathered from previous deployments including intermediate-scale tidal stream projects.

2.11.31 Applicants need to consider environmental and biodiversity net gain as set out in Section 4.6 of EN-1).

2.11.32 Applicants should assess the potential of their proposed development to have net positive effects on marine ecology and biodiversity as well as negative effects.

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

2.11.34 Applicants should also have regard to Good Environmental Status (GES) under the UK Marine Strategy[103].

Other impacts

2.11.35 There is not as yet sufficient evidence on the impact of tidal stream arrays to give technology-specific guidance for the following receptors:

- commercial fisheries and fishing;
- historic environments;
- navigation and shipping;
- oil, gas, carbon capture usage and storage and other offshore infrastructure and activities;
- physical environment;
- landscape, seascape and visual impacts; and
- nationally designated landscapes.

2.11.36 For guidance on the proper assessment and mitigation of impacts on these receptors, applicants should consult the guidance contained within Section 5 of EN-1 and the relevant sections – where there are obvious similarities – of the guidance for offshore wind in this NPS.

[103] See https://moat.cefas.co.uk/introduction-to-uk-marine-strategy/

Mitigations

2.11.37 Careful design and siting of the development is likely to be the primary form of impact mitigation, along with the choice of construction and installation techniques.

2.11.38 Applicants must always employ the mitigation hierarchy, in particular to avoid as far as is possible the need to find compensatory measures for coastal, inshore and offshore developments affecting designated sites.

Secretary of State decision making

Technical considerations

Network connection

2.11.39 When considering grid connection issues, the Secretary of State should be mindful of the constraints of the regulatory regime for onshore and offshore electricity networks and consider how this affects the proposal put forward by the applicant.

2.11.40 Note that a proposed offshore electricity cable connecting the tidal stream array with onshore electricity infrastructure and/or any required offshore electricity substations may constitute associated development, depending on its scale and nature in relation to the tidal stream project. Where the Secretary of State is satisfied that such offshore infrastructure does constitute associated development and can form part of the application, it should be considered by the Secretary of State in accordance with this NPS and EN-5.

2.11.41 The Secretary of State should assess the form, routing, and design of the project's connection infrastructure in line with the considerations set out in Section 4.11 of EN-1 and in EN-5. The Secretary of State should also have regard to the guidelines on assessing the singular and cumulative impact of cabling and associated infrastructure in the marine and nearshore environment set out in Section 2.8 of this NPS.

Repowering

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

Impacts

2.11.43 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

2.11.44 The Secretary of State should consider any impacts which they determine are relevant and important to its decision.

Biodiversity and ecological conservation

2.11.45 The Secretary of State should consider the effects of a proposed development on marine ecology and biodiversity, taking into account all relevant information made available by the applicant, SNCBs and any other relevant party.

2.11.46 The Secretary of State should be satisfied that, in the development of their proposal, the applicant has made appropriate, and extensive, use of the evidence base available to them, in particular gathered from their previous deployments, including intermediate-scale tidal stream projects.

2.11.47 Where the Secretary of State determines that evidence could be supplemented for a given receptor (e.g. there is some doubt that intermediate-scale effects can be extrapolated to larger-scale arrays) the Secretary of State may impose monitoring requirements on the applicant in relation to the receptor.

2.11.48 In such cases, the Secretary of State must be satisfied that the applicant has given sufficient assurance that the results of that monitoring will be made publicly available for the benefit of the scientific community, and to enable future tidal stream applicants to draw upon those results in the design of their future projects.

2.11.49 The designation of an area as a protected site (including SACs, SPAs, Ramsar sites, MCZs and SSSIs) does not necessarily restrict the construction or operation of tidal stream arrays in, near, or through that area (see also Section 5.4 of EN-1). Where adverse effects on site integrity/conservation objectives are likely, the Secretary of State should consider the extent to which the effects are temporary or reversible, the timescales for recovery and the need for mitigation or, if necessary, compensation.

Other impacts

2.11.50 There is not as yet sufficient evidence on the impact of tidal stream arrays to give technology-specific guidance for the receptors set out above.

2.11.51 For guidance on the proper assessment and mitigation of impacts on these receptors, the Secretary of State should consult the guidance contained within Section 5 of EN-1 and the relevant sections – where there are obvious similarities – of the guidance for offshore wind in this NPS.

2.12 Onshore wind

Introduction

2.12.1 Onshore wind farms are one of the most established renewable electricity technologies in the UK. It is a mature, efficient and low-cost generating technology that plays an important role in the UK's energy mix.

2.12.2 The deployment of onshore wind farms is critical in meeting the government's Clean Power 2030 Mission. The Clean Power Action Plan estimates the need for 27-29GW of operational onshore wind capacity by 2030.

2.12.3 Onshore wind farm proposals are likely to consist of wind turbines, access tracks, crane pads, borrow pits (small temporary quarries), substations, underground connecting cables and anemometers.

2.12.4 Onshore wind farms may also be co-located with solar panels or other types of generation technology.

2.12.5 Associated infrastructure may also be proposed and may be treated, on a case-by-case basis, as associated development, such as energy storage and electrolysers associated with the production of low carbon hydrogen.

2.12.6 Onshore wind farm proposals are likely to involve turbines from between 4.5MW of generating capacity up to 7.5 MW individually. The total number of turbines comprising a wind farm of 100 MW capacity or greater covered by this NPS is therefore likely to be thirteen or more. This is 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. However, any significant impacts are most likely to be localised within the vicinity of the site.

Applicant assessment

Factors influencing site selection by applicant

2.12.7 The key considerations involved in the siting of an onshore wind farm are likely to be influenced by several factors set out in the following paragraphs. Factors will also include relevant impacts from Section 5 of EN-1 and the impacts set out from paragraph 3.12.48 (Impacts) of this NPS, in addition to considerations specific to individual projects.

Predicted wind speed

2.12.8 The primary determining factor for the application in identifying a potential site will be predicted wind resource as the electricity generated on site is directly affected by the wind speed. Wind speed increases with height above ground level, with exposed topography typically more favourable. The amount of electricity generated increases disproportionately with increases in the wind speed, as wind power increases with the cube of the wind speed (i.e. doubling the wind speed results in eight times the power). This in turn affects the carbon emission savings and the commercial viability of the site.

2.12.9 Applicants may have installed temporary anemometry masts (or similar) or used Light Detection and Ranging (LIDAR) systems on the site for 12 months or more to ascertain precise onsite wind speeds prior to submitting the wind farm application. It is the decision of individual applicants as to whether this is necessary.

Network connection

2.12.10 Applicants should consider important issues relating to network connection at Section 4.11 of EN-1 and in EN-5. In particular, and where appropriate, applicants should proceed in a manner consistent with the regulatory regime for offshore transmission networks established by Ofgem.

2.12.11 Many onshore wind farms are connected into the local distribution network. The capacity of the local grid network to accept the likely output from a proposed onshore wind farm is critical to the technical and commercial feasibility of a development proposal.

2.12.12 Larger developments may seek connection to the transmission network if there is available network capacity and/or supportive infrastructure.

2.12.13 In either case, the connection voltage, availability of network capacity, and the distance from the onshore wind farm to the existing network can have a significant effect on the commercial feasibility of a development proposal.

2.12.14 To maximise existing grid infrastructure, minimise disruption to existing local community infrastructure, biodiversity or archaeological sites and reduce overall costs, applicants may choose a site based on available grid export capacity.

2.12.15 Where this is the case, applicants must assess the cumulative impacts of situating an onshore wind farm in proximity to other energy generating stations and infrastructure.

Proximity of site to dwellings

2.12.16 Commercial scale wind turbines are large structures and will typically have tip heights that range from 150m to around 200m although advances in technology may result in larger machines (and therefore greater tip heights) coming on the market. As such, appropriate distances should be maintained between wind turbines and sensitive receptors.

2.12.17 The main impact issues that determine the acceptable separation distances are visual, effects on the setting of heritage assets, and noise. These are considered in the Landscape and visual (paragraph 3.12.88), Historic environment (paragraph 3.12.75), and Noise and vibration (paragraph 3.12.96) impact sections below.

Accessibility

2.12.18 Applicants should consider the suitability of the access routes to the proposed site for the construction, operation, maintenance and decommissioning of the wind farm with construction likely generating more temporary effects.

2.12.19 Given that potential onshore wind farm sites are likely to be in rural areas, access for the delivery of turbine components and associated infrastructure during construction can be an important consideration for wind farm siting.

2.12.20 Developers will usually need to construct on-site access routes for construction, operation and maintenance activities, such as footpaths, earthworks, or landscaping.

2.12.21 In addition, sometimes access routes will need to be constructed to connect wind farms to the public road network.

2.12.22 Applications should include the full extent of the access routes necessary for construction (including for abnormal indivisible loads), operation and maintenance and an assessment of their effects.

Public rights of ways

2.12.23 Proposed developments may affect the public rights of way network[104].

2.12.24 Public rights of way may need to be temporarily closed or diverted to enable construction, however, applicants should keep, as far as is practicable and safe, all public rights of way that cross the

[104] Public rights of way can include footpaths, bridleways, byways, restricted byways, National Trails and other rights of access to land. Further information is provided by the Land Registry at: https://www.landregistry-titledeeds.co.uk/frequently-asked-questions/information/public-rights-of-way.asp

proposed development site open during construction and protect users where a public right of way borders or crosses the site.

2.12.25 Applicants should design the layout and appearance of the site to ensure continued use of public rights of way where possible during construction, and in particular during operation of the site.

2.12.26 Applicants are encouraged where possible to minimise the localised visual impacts of the development for those using existing public rights of way, noting this may be challenging given the extent of the public rights of way network. Providing suitable, case by case, distances from public rights of way is one approach that could be taken during the design process.

2.12.27 Applicants should consider and maximise opportunities to facilitate enhancements to the public rights of way and the inclusion, through site layout and design of access, of new opportunities for the public to access and cross the proposed onshore wind development sites (whether via the adoption of new public rights of way or the creation of permissive paths), taking into account, where appropriate, the views of landowners.

2.12.28 Applicants should set out detail on how public rights of way would be managed to ensure they are safe to use in an outline Public Rights of Way Management Plan.

Technical considerations

Site layout design, and appearance

2.12.29 Applicants should consider the criteria for good design set out in EN-1 Section 4.7 at an early stage when developing projects.

2.12.30 Applicants will consider several factors when considering the design and layout of sites, including wind speeds, topography, proximity to available grid capacity to accommodate the scale of generation, proximity to dwellings, accessibility, and ability to avoid, mitigate or compensate impacts, such as environmental, landscape or noise.

2.12.31 In order for wind turbines to generate electricity efficiently, the turbines must be placed at a sufficient distance from one another within the site. This is to minimise the impacts of ‘wake effects’, where turbines that are downstream of others see reduced wind speeds and increased turbulence, which reduces the energy generation of the wind farm. The spacing will depend on the prevailing wind conditions and the physical characteristics of the site. A spacing of between 3-7 rotor diameters is normally required, however, this is a matter for the applicant.

2.12.32 It is likely that underground and overhead cabling will be required to connect the electrical assets of the site, such as from the substation to the wind turbines or storage facilities.

2.12.33 In the case of underground cabling (and associated works), applicants should provide a method statement describing cable trench design and groundworks, installation methodology, as well as details of the operation and maintenance regime, informed by sufficient assessment to positively manage environmental outcomes.

Project lifetime

2.12.34 Applicants should consider the design life of wind turbines when determining the period for which consent is required. Modern onshore wind turbines are now considered to have a significantly longer design life than the expected 25 years of early generation models. Therefore, it is expected that applicants may seek consent for at least 35 years, although applicants may seek consent without a time-period or for differing time-periods of operation.

2.12.35 Time limited consent, where granted, is described as temporary because there is a finite period for which it exists, after which the project would cease to have consent and therefore must seek to extend the period of consent, be decommissioned and removed, or seek consent to repower.

Decommissioning

2.12.36 The nature and extent of decommissioning of a site can vary. Generally, the wind turbines themselves will always be decommissioned with the concrete foundations in the ground dug out to a certain depth to ensure that former or new uses of the site can continue.

2.12.37 Applicants should set out what would be decommissioned and removed from the site at the end of the operational life of the generating station, considering instances where it may be less harmful for the environment of the site to keep or retain certain types of infrastructure, for example underground cabling, and where there may be socio-economic benefits in retaining site infrastructure after the operational life, such as retaining pathways through the site or a site substation.

Flexibility in the project details

2.12.38 In many cases, not all aspects of the proposal may have been settled in precise detail at the point of application. Such aspects may include:

- Dimensions of turbines, including hub height and rotor diameter;
- Type, number and generating capacity of wind turbines;

- The precise location, configuration and spacing of turbines and associated infrastructure;
- The need and size for external cabins adjacent to the wind turbines to house transformers.

2.12.39 Where flexibility is needed, applicants should set out a range of options based on different turbine numbers, types and layout, with and without storage.

2.12.40 Guidance on how applicants should manage flexibility is set out at Section 2.6 of this NPS and in Section 4.3 of EN-1.

Micrositing

2.12.41 Micrositing provides developers with flexibility to accommodate any unforeseen events, such as the discovery of unknown deep peat or archaeology that it would be preferable to leave in situ.

2.12.42 Where the applicant requests micrositing, and insofar as it is reasonably possible to do so, the applicant should factor this tolerance into the EIA and should assess a worst-case scenario[105].

Repowering

2.12.43 Where an operational wind farm reaches the end of its life, the owner of the wind farm may wish to 'repower' the site rather than decommission it.

2.12.44 While there may be benefits to making use of an existing site, given the likely change in technology over the intervening time period, any repowering of sites is likely to involve wind turbines of a different scale and nature. This could result in different, additional or more significant adverse impacts as well as a different electricity generating capacity.

2.12.45 Applicants must submit a new consent application for any repowering of an existing site, and this must comply with the relevant application requirements such as EIA and HRA.

Future monitoring

2.12.46 Applicants should set out environmental monitoring plans (e.g., bird and bat surveys) for the site prior to and during construction and operation.

2.12.47 Monitoring must measure and document the effects of the development and the efficacy of any associated mitigation or

[105] In relation to uncertainty about routing details of the project, applicants should have regard to the concept of the 'Rochdale Envelope', as established in R v Rochdale Metropolitan Borough Council, ex parte Tew [2000] Env. L.R. 1 and subsequent caselaw.

compensation and should be used to inform adaptive management plans where necessary.

2.12.48 This will enable an assessment of the accuracy of the original predictions and improve the evidence base for future mitigation and compensation measures, enabling better decision-making in future EIAs and HRAs.

Impacts

2.12.49 The impacts identified in Part 5 of EN-1 and below, are not intended to be exhaustive.

2.12.50 Applicants should provide information on relevant impacts as directed by this NPS and the Secretary of State.

Biodiversity and ecology

2.12.51 Generic environmental, biodiversity, and ecology impacts are covered in Section 4.3 (Environmental Principles), Section 4.6 (Environmental and Biodiversity Net Gain), Section 5.4 (Biodiversity and Geological Conservation) of EN-1.

2.12.52 In addition, applicants should have regard to the specific biodiversity, ecological, hydrological and environmental considerations that relate to the proposed onshore wind development set out at paragraphs 3.12.68 – 3.12.78 of this NPS, namely:

- Birds and bats; and
- Peat.

2.12.53 The applicant's ecological assessments should identify any ecological risk from developing on the proposed site.

2.12.54 The applicant should use an advising ecologist during the design process to ensure that adverse impacts are avoided, mitigated or compensated in line with the mitigation hierarchy, and biodiversity enhancements are maximised.

2.12.55 The assessment should be informed by a 'desk study' of existing ecological records, an evaluation of the likely impacts of the onshore wind farm upon ecological features and should specify measures to avoid, mitigate or compensate these impacts.

2.12.56 Applicants should consider enhancement, management, and monitoring of biodiversity in line with the ambition set out in the Environmental Improvement Plan and any relevant measures and targets, including statutory targets set under the Environment Act 2021 or elsewhere

2.12.57 Onshore wind farms have the potential to increase the biodiversity value of a site, especially if the land was previously intensively managed. In some instances, this can result in significant benefits and enhancements beyond biodiversity net gain, which result in wider environmental gains which is encouraged.

Soils, geological conservation and water management

2.12.58 Generic geological and water management impacts are covered in Section 5.4 (Biodiversity and Geological Conservation) and Section 5.8 (Flood Risk) of EN-1.

2.12.59 Applicants should consider earthworks associated with construction compounds, access roads and cable trenching.

2.12.60 Where soil stripping occurs, topsoil and subsoil should be stripped, stored, and replaced separately to minimise soil damage and to provide optimal conditions for site restoration.

2.12.61 The Agricultural Land Classification (ALC) is the only approved system for grading agricultural quality in England and Wales and, if necessary, field surveys should be used to establish the ALC grades in accordance with the current, or any successor to it, grading criteria[106] and identify the soil types to inform soil management at the construction, operation, and decommissioning phases in line with the Defra Construction Code.[107]

2.12.62 Applicants are encouraged to develop and implement a Soil Resources and Management Plan which could help to use and manage soils sustainably and minimise adverse impacts on soil health and potential land contamination. This should be in line with the ambition set out in the Environmental Improvement Plan to bring at least 40% of England's agricultural soils into sustainable management by 2028 and increase this up to 60% by 2030.

2.12.63 Where access tracks are required, permeable tracks should be used, and Sustainable Drainage Systems (SuDS), such as swales and infiltration trenches, should be used to control any run-off where recommended. Tracks and drains can have significant impacts on the structure and hydrology of peat[108], and

[106] Details of the Agricultural Land Classification are at: http://publications.naturalengland.org.uk/publication/6257050620264448

[107] The Defra Construction Code: https://www.gov.uk/government/publications/code-of-practice-for-the-sustainable-use-of-soils
-on-construction-sites)

[108] Natural England (2013), The impacts of tracks on the integrity and hydrological function of blanket peat (NEER002) - https://publications.naturalengland.org.uk/publication/5724597

designs should seek to avoid, and then mitigate any such impacts.

2.12.64 Sites should be configured or selected to avoid the need to impact on existing drainage systems and watercourses.

2.12.65 Culverting existing watercourses/drainage ditches should be avoided. Where culverting for access is unavoidable, applicants should demonstrate that no reasonable alternatives exist and where necessary it will only be in place temporarily for the construction period.

2.12.66 Applicants should provide geotechnical and hydrological information (such as identifying the presence of peat at each site and impacts on soil and hydrology) including the risk of landslide connected to any development work. Where relevant, this should also include the potential risks to flood defences.

Birds and bats

2.12.67 Generic biodiversity and species impacts are covered in Section 5.4 of EN-1 and paragraphs 3.12.51 – 3.12.57 of this NPS.

2.12.68 However, with respect to onshore wind farms, the following considerations also particularly apply.

2.12.69 Onshore wind farms have the potential to particularly impact on birds and bats, such as in areas spanning migration or commuting routes or important feeding, breeding and roosting areas of bird and bat species known to be at risk.

2.12.70 There is a risk of harm, either through disturbance, habitat loss or collision. Applicants must conduct a thorough assessment of impacts on birds and bats. The level of assessment effort should be determined in accordance with best practice and take into account the proximity of ecological receptors.

2.12.71 Applicants should discuss the scope, effort and methods required for assessments with the relevant statutory advisor, taking into consideration baseline and monitoring data from operational wind farms.

2.12.72 It may be appropriate for the assessment to include collision risk modelling for certain species of birds or to estimate the mortality rate for certain species of bat. Applicants are expected to seek advice from SNCBs.

2.12.73 New advice on assessing the risks to bats is available from NatureScot[109]. This advice applies to England, and replaces previous guidance published by Natural England (TIN051),

[109] Nature Scot, Bats and onshore wind turbines - survey, assessment and mitigation - https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation

Chapter 10 of the Bat Conservation Trust publication Bat Surveys: Good Practice Guidelines, and tailors the generic Eurobats guidance. NatureScot and Natural England also provide advice relating to birds[110], including survey requirements[111].

Peat

2.12.74 Onshore wind farm sites within England may be proposed on peatland. Peat soils are rich in carbon and disturbance can lead to climate impacts. Peatlands are sensitive habitats that are important for many species of flora and fauna. In some instances, soil disturbance may lead to change in the local hydrological regime which can affect biodiversity and the water environment. Applicants should therefore seek and rule out other locations before siting developments on peatland.

2.12.75 Where developments are proposed on peatlands, applicants should conduct a detailed peat survey[112].

2.12.76 New guidance is available from NatureScot[113] on a good practice approach to development on peatlands. Where the survey has identified the presence of peat, applicants should demonstrate adherence to these principles in development design. For example, infrastructure should be sited on areas of shallower peat, and soil disturbance should be minimised.

2.12.77 Applicants should take all opportunities to identify habitat enhancement opportunities in development design.

Historic environment

2.12.78 Generic historic environment impacts are covered in Section 5.9 of EN-1.

2.12.79 However, with respect to onshore wind farms, the following considerations also apply.

2.12.80 The impacts of onshore wind developments on the historic environment will require expert assessment in most cases and may have effect both above and below ground.

2.12.81 Above ground impacts may include the effects on the setting of Scheduled Monuments, Listed Buildings and Registered Landscapes, Gardens and Battlefields, and if necessary,

[110] Nature Scot, Wind farm impacts on birds - https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation

[111] Natural England, Wild birds: surveys and monitoring for onshore wind farms - https://www.gov.uk/guidance/wild-birds-surveys-and-monitoring-for-onshore-wind-farms Wild birds: surveys and monitoring for onshore wind farms - https://www.gov.uk/guidance/wild-birds-surveys-and-monitoring-for-onshore-wind-farms

[112] http://www.gov.scot/Topics/Business-Industry/Energy/Energy-sources/19185/17852-1/CSavings/Peatland2017

[113] https://www.nature.scot/doc/good-practice-during-wind-farm-construction

Conservation Areas. Impacts on other designated heritage assets as well as on Historic Landscape Character also require assessment as appropriate. Any impact on World Heritage Sites should also be assessed with reference to the UNESCO toolkit for Heritage Impact Assessment[114].

2.12.82 Below ground impacts, may include direct impacts on archaeological deposits such as through ground disturbance associated with trenching, cabling, foundations and temporary haul routes.

2.12.83 Applicant assessments should be informed by appropriate expertise and information from Historic Environment Records (HERs) and/or the local planning authority.

2.12.84 Where a site on which development is proposed includes, or has the potential to include, heritage assets with archaeological interest, the applicant should submit an appropriate desk-based assessment and, where necessary, a field evaluation. These should be carried out using appropriate expertise where necessary and in consultation with the local planning authority and Historic England as appropriate. This should identify archaeological study areas and propose appropriate schemes of investigation, and design measures, to ensure the protection of relevant heritage assets.

2.12.85 In a few cases, field studies may include investigative work (and may include trial trenching beyond the boundary of the proposed site) to assess the impacts of any ground disturbance, such as proposed cabling or substation foundations on archaeological assets.

2.12.86 The extent of investigative work should be proportionate to the sensitivity of, and extent of, proposed ground disturbance in the associated study area. The level of detail should be proportionate to the assets' importance and no more than is sufficient to understand the potential impact of the proposal on their significance.

2.12.87 Applicants should take account of the results of historic environment assessments in their design proposal.

2.12.88 Applicants should consider what steps can be taken to ensure heritage assets are conserved in a manner appropriate to their significance, including the impact of proposals including their setting.

2.12.89 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 onshore wind farms which

[114] https://historicengland.org.uk/content/documents/advice/he-briefing-unesco-guidance-toolkit-hia-2022

depending on their scale, design, and prominence, may have implications for the significance of the asset.

2.12.90 Applicants may need to include visualisations to demonstrate the effects of the proposed onshore wind farm on the setting of heritage assets. Visualisations may be required to understand the potential impact of the proposal on the significance of heritage assets.

Landscape, visual and residential amenity

2.12.91 Generic landscape and visual impacts are covered in Section 5.10 of EN-1.

2.12.92 Landscape impact concerns to what extent a proposed development will become a key characteristic of the landscape. Visual impacts concern the degree to which a proposed development will become a feature in particular views. In determining the landscape and visual impacts of a development, considerations might include direct and indirect effects, cumulative impacts, and temporary or permanent impacts, as well as factors such as establishing where a development is visible from, key viewpoints, the people who experience the views, the protection afforded to the landscape and the nature of the views.

2.12.93 Nationally designated landscapes (National Parks, the Broads and National Landscapes) collectively referred to as Protected Landscapes, are particularly sensitive to large scale on shore wind development. Assessing impacts on these areas must reflect their importance and take account of their statutory purposes. The natural beauty, special qualities and key characteristics of these landscapes are especially important.

2.12.94 The approach to assessing cumulative landscape and visual impact of large-scale onshore wind farms is likely to be the same as assessing other onshore energy infrastructure. Onshore wind farms are likely to be in higher areas with exposed topography and as such may have a wider zone of visual influence than other types of onshore energy infrastructure.

2.12.95 To inform landscape and visual impact assessments, the following information should be considered:

- Maps of zones of visual influence can help to indicate the likely extent of visibility;
- Mapping common transport and access routes through a landscape can help to identify viewpoints;
- Visualisations of the proposed development, in the form of standard photomontages, can help to indicate setting of the development;

- Landscape Character Assessments and Landscape Sensitivity Studies; and
- Protected Landscape Management Plans which provide information on the natural beauty, special qualities and key characteristics of these designated landscapes.

2.12.96 Further information on conducting landscape and visual impact assessments is provided by Natural England[115].

2.12.97 Applicants should carry out a landscape and visual assessment and report it in the ES. Visualisations and photomontages will be required to demonstrate the likely effects of a proposed onshore wind farm on the setting of heritage assets and any nearby residential areas or viewpoints. An assessment of the potential impacts on the statutory purposes of protected landscapes should form a part of the pre-application process.

2.12.98 Applicants should follow the criteria for good design set out in Section 4.7 of EN-1 when developing projects and will be expected to direct considerable effort towards minimising the landscape and visual impact of onshore wind farms especially within nationally designated landscapes and their settings.

Noise and vibration

2.12.99 Generic information on the assessment of noise and vibration impacts, including noise associated with the construction, operation and decommissioning of most energy infrastructure, are covered in detail in Section 5.11 of EN-1. In addition, there are specific considerations which apply to the operation of onshore wind turbines as discussed below.

2.12.100 Operational wind turbines will generate increases in noise levels (whether from machinery, for example aerodynamic noise from turbines, or from associated sources, such as traffic) although the relative noise impact diminishes with distance. The noise associated with the construction and decommissioning of the proposed infrastructure, including construction traffic, is covered in EN-1.

2.12.101 The ES should include a noise assessment as set out in Section 5.11 of EN-1. However, the noise created by wind turbines in operation is related to wind speed and is different to general industrial noise and an additional assessment of this noise should be made.

[115] Natural England, An approach to landscape sensitivity assessment – to inform spatial planning and land management - https://www.gov.uk/government/publications/landscape-sensitivity-assessment

2.12.102 The method of assessing the impact of noise from a wind farm on nearby residents is described in the report, 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97)[116]. This was produced by the Working Group on Noise from Wind Turbines Final Report, September 1996 and the report recommends noise limits that seek to protect the amenity of wind farm neighbours. Therefore, noise limits will often influence the separation of wind turbines from residential properties.

2.12.103 The applicant's assessment of noise from the operation of the wind turbines should use ETSU-R-97[117], taking account of the latest industry good practice[118]. This should include any guidance on best practice that the government may from time to time publish.

Shadow flicker

2.12.104 Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off - known as 'shadow flicker'. Only properties within 130 degrees either side of north, relative to the turbines can be affected at these latitudes in the UK – turbines do not cast long shadows on their southern side.

2.12.105 As a general rule, there is unlikely to be a significant impact at distances greater than ten rotor diameters from a turbine. Where wind turbines have been proposed within ten rotor diameters of an existing occupied building, a shadow flicker assessment should be carried out by the applicant. The maximum potential number of hours that shadow flicker could occur at each affected occupied building should be calculated, using industry good practice. There are several computer programs that will calculate precisely the maximum number of hours each year that shadow flicker could occur at individual properties, including specific days of the year, times of the day and duration of each potential episode.

[116] All references to ETSU-R-97 in this section should be taken to include any successor or supplementary guidance to it endorsed or published by the Government. See https://assets.publishing.service.gov.uk/media/5a798b42ed915d07d35b655a/ETSU_Full_copy__Searchable_.pdf

[117] Notwithstanding the date of this report, the Government is satisfied on the balance of subsequent scientific research that its key conclusions (and in particular the limits it recommends) remain a sound basis for planning decisions.

[118] Such as *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* by the Institute of Acoustics (2013) - https://www.ioa.org.uk/publications/wind-turbine-noise

Traffic and transport

2.12.106 Generic traffic and transport impacts are covered in Section 5.14 of EN-1.

2.12.107 Modern wind turbines are large structures and some components, notably the rotor blades, can currently only be transported to sites as complete structures.

2.12.108 Many onshore wind farms will be sited in areas served by a minor road network. During the construction phase, public perception is likely to be shaped by the impact of increased traffic due to additional vehicles, in particular HGVs, using local roads that may not always be suitable for them.

2.12.109 Applicants should assess the various potential routes to the site for delivery of materials and components (including abnormal indivisible loads) where the source of the materials is known at the time of the application and select the route that is the most appropriate.

2.12.110 Where the exact location of the source of construction materials, such as crushed stone or concrete is not known at the time of the application, applicants should assess the worst-case impact of additional vehicles on the likely potential routes.

2.12.111 Applicants should ensure all sections of roads and bridges on the proposed delivery route can accommodate the weight, size and volume of the loads and width of vehicles. Where modifications to roads and/or bridges are required, these should be identified, and potential effects assessed and reported in the ES.

2.12.112 Where a cumulative impact is likely because multiple developments are proposing to use a common port and/or access route and pass through the same towns and villages, applicants should include a vision-led transport assessment to manage the cumulative impacts as part of the ES. This should consider the impacts of abnormal traffic movements relating to the project in question in combination with those from any other relevant development. Applicants should consult with the relevant local highways authorities.

Mitigations

Biodiversity and geological conservation

2.12.113 Proposed mitigations should take account of the above factors and as set out in Sections 4.6 and 5.4 of EN-1 and aim to achieve environmental and biodiversity net gain in line with the ambition set out in the Environmental Improvement Plan and any relevant

measures and targets, including statutory targets set under the Environment Act 2021 or elsewhere.

2.12.114 This may include maintaining or extending existing habitats and potentially creating new important habitats.

2.12.115 Applicants should develop an ecological monitoring programme to monitor impacts upon the flora of the site and upon any particular ecological receptors (such as bats and birds). Results of the monitoring will then inform any changes needed to the land management of the site.

Birds and bats

2.12.116 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).

2.12.117 Applicants should undertake avoidance, mitigation or compensatory measures for other impacts such as habitat loss or displacement.

Peat

2.12.118 The onshore wind farm should be laid out and construction methods should be designed to minimise soil and hydrology disturbance during construction and maintenance of roads, tracks, and other infrastructure.

2.12.119 Applicants should undertake avoidance, management, mitigation or compensatory measures for impact on peatland habitats. For example, restoring disturbed peatland habitats and carrying out additional nature restoration on or off-site.

Historic environment

2.12.120 The avoidance of important heritage assets to ensure their protection in situ, is the most effective form of protection.

2.12.121 This can be achieved through the implementation of exclusion zones around known and potential heritage assets which preclude development activities within their boundaries.

2.12.122 These boundaries can be drawn around either discrete sites or more extensive areas identified in the ES produced to support an application for consent.

Landscape and visual

2.12.123 Applicants should mitigate the main landscape and visual impacts to a localised level through design layout or through, for example, screening with natural topography, trees and woodlands.

2.12.124 Mitigating adverse effects on the statutory purposes of protected landscapes will be very challenging.

2.12.125 It is unlikely that either the number or scale of wind turbines can be changed without significantly affecting the electricity generating output of the wind farm. Therefore, mitigation in the form of reduction in scale may not be feasible.

Noise and vibration

2.12.126 Mitigation should be inherent in good design of a wind farm. Applicants should consider the distance and placement of turbines in relation to residential buildings or other sensitive receptors to mitigate noise impacts.

Shadow flicker

2.12.127 Modern wind turbines can be controlled so as to avoid shadow flicker when it has the potential to occur. Individual turbines can be controlled to avoid shadow flicker at a specific property or group of properties on sunny days, for specific times of the day and on specific days of the year. Where the possibility of shadow flicker exists, mitigation can be secured through the use of conditions.

2.12.128 Turbines can also cause flashes of reflected light, which can be visible for some distance. It is possible to ameliorate the flashing, but it is not possible to eliminate it.

Traffic and transport

2.12.129 In some cases, the local highway authority may request that the Secretary of State impose controls on the number of vehicle movements to and from the onshore wind farm site in a specified period during its construction and, possibly, on the routeing of such movements particularly by heavy vehicles.

2.12.130 Where the Secretary of State agrees that this is necessary, requirements could be imposed on development consent.

2.12.131 Where cumulative effects on the local road network or residential amenity are predicted from multiple infrastructure developments, it may be appropriate for applicants for various projects to work together to ensure that the number of abnormal loads and deliveries are minimised, and the timings of deliveries are

managed and coordinated to ensure that disruption to residents and other highway users is reasonably minimised.

2.12.132 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.

2.12.133 Once consent for a scheme has been granted, applicants should liaise with the relevant local highway authority (or other coordinating body) regarding the start of construction and the broad timing of deliveries. Applicants may need to agree a planning obligation to secure appropriate measures, including restoration of roads and verges.

2.12.134 In some instances, it may be necessary for the applicant to undertake modifications to the highway to facilitate delivery of components and/or minimise disruption to other highway users. Further, it may be appropriate to request that the applicant undertake a “dry-run” of the delivery of the largest components to ensure delivery is possible in a way that minimises disruption. Requirements for strengthening bridges may also be requested by the relevant highway authority.

2.12.135 Further, it may be appropriate for any non-permanent highway improvements carried out for the development (such as temporary road widening) to be made available for use by other subsequent onshore wind farm developments.

Secretary of State decision making

Technical considerations

Project lifetimes and decommissioning

2.12.136 The Secretary of State should ensure that the applicant has put forward outline plans for decommissioning the generating station when no longer in use and restoring the land to a suitable use, noting precise details may not be available until the exact type of turbines used are finalised.

2.12.137 Where the consent for an onshore wind farm is to be time-limited, the DCO should impose a requirement setting that time-limit from the date the onshore wind farm starts to generate electricity.

2.12.138 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.

2.12.139 It is expected that applicants may seek consent for at least 35 years, although applicants may seek consent without a time-period or for differing time-periods of operation.

2.12.140 Where a time limit is sought as a condition of consent, the time limited nature of the onshore wind farm is likely to be an important consideration for the Secretary of State.

2.12.141 The Secretary of State should consider the period of time the applicant is seeking to operate the generating station, as well as the extent to which the site will return to its original state, when assessing impacts such as landscape and visual effects and potential effects on the settings of heritage assets and nationally designated landscapes.

Micrositing

2.12.142 Where requested by the applicant, any consent granted by the Secretary of State should be flexible enough to allow for such micrositing changes as may be advised during and after the consent stage. This allows for unforeseen events, such as the discovery of previously unknown deep peat or archaeology that it would be preferable to leave in situ.

2.12.143 The Secretary of State must also be satisfied that there is sufficient space to microsite for any proposal to be acceptable as a mitigation. As noted above, the need or ability to microsite should not be a substitute for sufficient site investigation to inform decision making and design of avoidance or mitigation

Repowering

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

Future monitoring

2.12.145 Owing to the complex nature of onshore wind development, the Secretary of State should, where appropriate, request the applicant undertake environmental monitoring (e.g. bird and bat surveys) prior to and during construction and operation.

2.12.146 The Secretary of State may consider that monitoring of any impact is appropriate.

Impacts

Biodiversity and geological conservation

2.12.147 The Secretary of State should consider the effects of a proposed development on ecology and biodiversity, considering all relevant information made available by the applicant and from SNCBs.

2.12.148 The Secretary of State should be satisfied that in the development of their proposal, the applicant has made appropriate, and extensive, use of on-site assessments and up-to-date evidence from previous deployments and research results from scientific peer reviewed papers, and assessed through HRA processes (including the mitigation hierarchy) the impact on any protected species or habitats, as well as having regard to requirements set out in 5.4.39 of EN-1 (e.g. the Environment Act 2021).

2.12.149 The designation of an area as a protected site (including SACs, SPAs, Ramsar sites and SSSIs) does not necessarily restrict the construction or operation of onshore wind farms in, near, or through that area (see also Sections 4.3 and 5.4 of EN-1). However, it may make consent for such construction more difficult to secure.

2.12.150 Where adverse effects on site integrity/conservation objectives are predicted, the Secretary of State should consider the extent to which the effects are temporary or reversible, and the timescales for recovery.

Birds and bats

2.12.151 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.

Peat

2.12.152 Where developments are proposed on peat, 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, the Secretary of State should be satisfied that the onshore wind farm layout and construction methods have been designed to minimise soil disturbance and other peatland impacts during construction and maintenance of roads, tracks, and other infrastructure.

2.12.153 The Secretary of State may instruct applicants to provide geotechnical and hydrological information in support of applications, identifying the presence of peat at each site,

including the risk of landslide connected to any development work.

2.12.154 Where developments impact on peatlands, the Secretary of State must be satisfied that avoidance, management, mitigation or compensatory mechanisms are sufficiently robust.

Historic environment

2.12.155 Onshore wind 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 effect on the historic environment, such as effects on the significance of designated heritage assets. Wider discussion of the decision-making process is set out in Section 5.9 of EN-1.

2.12.156 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 heritage assets.

2.12.157 Where requested by the applicant, the Secretary of State should consider granting consents which allow for the micrositing within a specified tolerance of elements of the permitted infrastructure. This is so that precise locations, which are agreed with the local planning authority and/or Historic England, can be amended during the construction phase if unforeseen circumstances, such as the discovery of previously unknown archaeology, arise. The envelope in which micrositing could occur should be informed by proportionate investigations. The ability to microsite should not be a substitute for sufficient assessment to inform decision making and appropriate design and mitigation.

Landscape and visual

2.12.158 The Secretary of State will consider the landscape and visual impact of the proposed onshore wind 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.

2.12.159 This should recognise that modern onshore wind turbines used in commercial wind farms are large, moving structures, and such impacts are to be expected from their construction and operation. The arrangement of wind turbines should be carefully designed within a site to minimise effects on the landscape and visual amenity while meeting technical, ecological and operational siting requirements and other constraints. Where impacts are localised and/or appropriate design mitigation has been applied, the Secretary of State should consider these as acceptable.

2.12.160 Nationally designated landscapes and their settings (National Parks, The Broads and National Landscapes) are afforded extra protection due to their statutory purpose. Development in these areas needs to satisfy policy as set out in EN-1 Section 5.10.

Noise and vibration

2.12.161 The Secretary of State should consider noise and vibration impacts according to Section 5.11 of EN-1 and use ETSU-R-97, or any updated versions of this guidance that may be produced, to satisfy itself that the noise from the operation of the wind turbines is within acceptable levels.

2.12.162 Where the correct methodology has been followed and a wind farm is shown to comply with ETSU-R-97 recommended noise limits, the Secretary of State should give no weight to adverse noise impacts from the operation of the wind turbines.

2.12.163 Where a wind farm cannot demonstrate compliance with the recommended noise limits set out in ETSU-R-97, the Secretary of State will need to consider refusing the application unless suitable noise mitigation measures can be imposed by requirements to the development consent.

2.12.164 There is no evidence that ground transmitted low frequency noise from wind turbines occurs at a sufficient level to be harmful to human health. Therefore, the Secretary of State should give no weight to claims of harm to human health as a result of ground transmitted low frequency noise.

Shadow flicker

2.12.165 Modern wind turbines can be controlled such that the operation of individual wind turbines at the periods when shadow flicker has the potential to occur at a specific property or group of properties can be inhibited on sunny days, for those properties, for the specific times of the day, and on specific days of the year.

2.12.166 In circumstances where a wind turbine has the potential to affect a property but can be controlled to inhibit shadow flicker, the Secretary of State should give no weight to the shadow flicker impacts on that property.

2.12.167 Where wind turbines are proposed that are ten rotor diameters and beyond from properties, the Secretary of State should consider that the impacts are sufficiently diminished so as to have no significant impact on that property.

2.12.168 Shadow flicker frequencies are not in the region known to induce seizures in sufferers of epilepsy (which is above 3 hertz[119]), and

[119] Epilepsy Society (2023) - https://epilepsysociety.org.uk/about-epilepsy/epileptic-seizures/seizure-triggers/photosensitive-epilepsy

as such, where the frequency of potential flashes will not exceed 3 hertz, the Secretary of State should give no weight to any claims of effects on epileptics from onshore wind turbines. Research on the subject concludes that the shadows cast by one turbine on another should not be viewable by the public if the cumulative flash rate exceeds three per second and if the turbine blades are not reflective[120].

Traffic and transport

2.12.169 The Secretary of State should be satisfied, taking into account the views of the relevant local highway authorities, that abnormal loads can be safely transported in a way that minimises inconvenience to other road users and that the environmental effects of this and other construction traffic, after mitigation, are acceptable.

2.12.170 Once onshore wind farms are in operation, traffic movements to and from the site are generally very light, in some instances as little as a few visits each month by a light commercial vehicle or car. Should there be a need to replace machine components, this may generate heavier commercial vehicle movements, but these are likely to be infrequent.

2.12.171 The Secretary of State should give limited weight to traffic and transport noise and vibration impacts from the operational phase of a project.

[120] Harding, G. Harding P, and Wilkins, A. (2008) Wind turbines, flicker, and photosensitive epilepsy: Characterizing the flashing that may precipitate seizures and optimizing guidelines to prevent them.

3 Glossary

Critical national priority/CNP:

A policy set out at Section 4.2 of EN-1 which applies a policy presumption that, subject to any legal requirements (including under section 104 of the Planning Act 2008), the urgent need for CNP Infrastructure to achieve our energy objectives, together with the national security, economic, commercial, and net zero benefits, will in general outweigh any other residual impacts not capable of being addressed by application of the mitigation hierarchy. CNP Infrastructure is defined as nationally significant low carbon energy. Low carbon infrastructure means:

- for electricity generation, and all onshore and offshore enabling electricity generation that does not involve fossil fuel combustion (that is, renewable generation, including anaerobic digestion plants, provided they meet existing definitions of low carbon; and nuclear energy generation), as well as natural gas fired generation which is carbon capture ready.
- for electricity grid infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works. This is not limited to those associated specifically with a particular generation technology, as all new grid projects will contribute towards greater efficiency in constructing, operating and connecting low carbon infrastructure to the National Electricity Transmission System.
- for other energy infrastructure, fuels, pipelines and storage infrastructure, which fits within the normal definition of “low carbon”, such as hydrogen distribution, and carbon dioxide distribution.
- for energy infrastructure which are directed into the NSIP regime under section 35 of the Planning Act 2008, and fit within the normal definition of “low carbon”, such as interconnectors, Offshore Hybrid, or ‘bootstraps’ to support the onshore network which are routed offshore.
- Lifetime extensions of nationally significant low carbon infrastructure, and repowering of projects.

Electricity networks infrastructure:

Electricity transmission systems (long distance transfer through 400kV and 275kV lines) and distribution systems (lower voltage lines from 132kV to 230V from transmission substations to the end-user). This may be overhead, underground or offshore, though offshore transmission is only subject to the Planning Act 2008 in circumstances identified in EN-5 at 1.6.4; and Associated infrastructure e.g. substations.

Grid:

Electricity networks infrastructure

National Landscapes:

Areas legally designated as areas of outstanding natural beauty under the National Parks and Access to the Countryside Act 1949 and Countryside and Rights of Way Act 2000.

NESO:

National Energy System Operator

OHA:

Offshore Hybrid Asset

Offshore transmission:

Offshore transmission is used in the NPS to cover the following types of infrastructure:

- interconnectors – an electricity interconnector is a subsea high voltage transmission cable capable of conveying electricity between two electricity markets, usually two countries;
- Offshore Hybrid Assets – a novel type of electricity asset that combines offshore wind with point-to-point-interconnection. They are split into two types:
    - Non-Standard Interconnectors – where wind in another country connects to an interconnector;
    - Multi-Purpose Interconnectors – where GB wind connects to an interconnector.
    - subsea ‘onshore’ transmission which reinforces the onshore transmission network though is located offshore. An example of this is a ‘bootstrap’ which is an offshore transmission cable between two points on the onshore network though located subsea/ offshore.

Permanent threshold shift (PTS):

A total or partial permanent loss of hearing caused by acoustic trauma. PTS results in irreversible damage to the sensory hair cells of the ear, and thus a permanent reduction of hearing acuity.

Temporary Threshold Shift (TTS):

Temporary loss of hearing as a result of exposure to sound over time. Exposure to high levels of sound over relatively short time periods will cause the same amount of TTS as exposure to lower levels of sound over longer time periods. The mechanisms underlying TTS are not well understood, but there may be some temporary damage to the sensory cells. The duration of TTS varies depending on the nature of the stimulus, but there is generally recovery of full hearing over time.

Vision-led approach:

An approach to transport planning based on setting outcomes for a development based on achieving well-designed, sustainable and popular places, and providing the transport solutions to deliver those outcomes as opposed to predicting future demand to provide capacity (often referred to as ‘predict and provide’).

This publication is available from: www.gov.uk/desnz

If you need a version of this document in a more accessible format, please email energynps@energysecurity.gov.uk Please tell us what format you need. It will help us if you say what assistive technology you use.