Department for Energy Security & Net Zero

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National Policy Statement for Electricity Networks Infrastructure (EN-5)

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1 Introduction

1.1 Background

1.1.1 The security and reliability of the UK's current and future energy supply is highly dependent on having an electricity network which will enable the new electricity generation, storage, and interconnection infrastructure that our country needs to meet the rapid increase in electricity demand required to transition to net zero, while maintaining energy security.

1.1.2 A significant amount of new network infrastructure is required in the near term to directly support the government's ambition to deploy up to 50GW of offshore wind capacity (including up to 5GW floating wind) by 2030. There is an expectation that there will be a need for substantially more installed offshore capacity beyond this to achieve net-zero by 2050.

1.1.3 The electricity network infrastructure to support the government's offshore wind ambition is as important as the offshore wind generation infrastructure. Without the development of the necessary networks to carry offshore wind power to where it is needed in the UK, the offshore wind ambition cannot be achieved.

1.1.4 In addition to offshore wind, new networks infrastructure is needed in support of the development of generation by other technologies, including those in EN-3.

1.1.5 As identified in EN-1, government has concluded that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure. This includes: for electricity grid infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations. 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. These are viewed by the government as being CNP infrastructure and should be progressed as quickly as possible.

1.1.6 To support the above, the network must be effectively planned to ensure that the appropriate investment and right kind of technology is brought online at the right time, in the right places.

1.1.7 To facilitate this, strategic network planning exercises[1] set out to ensure strategic and co-ordinated onshore and offshore transmission network planning, considering the networks as a whole, with individual transmission projects subsequently brought forward in line with these network designs.

1.1.8 This approach aims to ensure network development can allow decarbonisation targets to be met in the most efficient and timely manner. It considers and seeks to strike an appropriate balance between costs to consumers, timely delivery and the minimisation of community and environmental impacts of new network infrastructure from an early stage of network planning.

1.1.9 This National Policy Statement (NPS), taken together with the Overarching NPS for Energy (EN-1), provides the primary policy for decisions taken by the Secretary of State on applications it receives for electricity networks infrastructure (see Section 1.6 of this NPS).

1.1.10 The way in which NPSs guide the Secretary of State's decision making, and the matters which the Secretary of State is required by the Planning Act 2008 (the 2008 Act) to take into account in considering applications, are set out in Sections 1.1 and 4.1 of EN-1.

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

1.1.12 This NPS may be helpful to local planning authorities in preparing their local impact reports.

1.2 Role of this NPS in the wider planning system

1.2.1 Section 1.2 of EN-1 provides detail 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 and EN-3.

[1] These were originally developed under the DESNZ-led Offshore Transmission Network Review (OTNR) and the Ofgem-led Electricity Transmission Network Planning Review (ETNPR) and undertaken by the National Grid Electricity System Operator (ESO). As a result of the ETNPR, the proposed Centralised Strategic Network Planning (CSNP) model is to be managed by the Future System Operator, once established, taking on responsibilities from the ESO.

1.3.2 This NPS does not seek to repeat the material set out in EN-1 or EN-3. EN-1 applies to all applications covered by this NPS unless stated otherwise. The policy in EN-3 on offshore wind in particular contains details relevant to offshore transmission.

1.4 Geographical coverage

1.4.1 This NPS, together with EN-1, is the primary decision-making guidance document for the Secretary of State when considering development consent applications for Nationally Significant Infrastructure Projects (NSIPs) for electricity networks infrastructure in England and Wales as described in Section 1.3.

1.4.2 However, the Secretary of State will not examine applications for overhead lines associated with the construction or extension of a devolved Welsh generating station[2] where the nominal voltage of the associated line is expected to be no greater than 132kV.The Secretary of State has no functions in relation to planning applications in Wales that do not relate to nationally significant infrastructure.

1.4.3 In Scotland, the Secretary of State will not examine applications for nationally significant generating stations or electricity network infrastructure. However, energy policy is generally a matter reserved to UK Ministers and this NPS may therefore be a relevant consideration in planning decisions in Wales and Scotland, particularly given the increase in Scotland to England onshore and offshore network connections required to meet the government's net zero target.

1.4.4 In Northern Ireland, planning consents for 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 NPSs.

[2] A generating station of a type defined in section 37(2B) of the Electricity Act 1989 granted planning permission or consented to on or after the day on which section 39 of the Wales Act 2017 came into force.

1.6 Infrastructure covered by this NPS

1.6.1 Infrastructure for electricity networks generally can be divided into two main elements:

- transmission systems (the long-distance transfer of electricity through 400kV and 275kV lines), and distribution systems (lower voltage lines from 132kV to 230V from transmission substations to the end-user) which can either be carried on towers/monopoles, or undergrounded; and associated infrastructure, e.g. substations (the essential link between generation, transmission,
- and the distribution systems that also allows circuits to be switched or voltage transformed to a useable level for the consumer) and converter stations to convert DC power to AC power and vice versa. These are particularly relevant to the conversion of long-distance offshore DC transmission to AC, when it arrives onshore for distribution.

1.6.2 This NPS covers above ground electricity lines:

i. whose nominal voltage is expected to be 132kV or above (other than a 132kV line associated with the construction or extension of a devolved Welsh generating station);

ii. whose length is greater than 2km;

iii. that are not a replacement line falling within Section 16(3)(ab) of the 2008 Act; and

iv. that are not otherwise exempted for reasons set out in Sections 16(3)(b) and (c), (3A) and (3B) of the 2008 Act.

1.6.3 It should be noted that electricity networks infrastructure is often referred to as ‘grid’ infrastructure by many and that term is used in other NPSs. In EN-5 the term ‘electricity networks’ is used.

1.6.4 In addition, this NPS will apply to other kinds of electricity networks infrastructure including offshore transmission of any type (defined at section 2.12.4)[3], underground cables at any voltage, associated infrastructure as referred to above and lower voltage overhead lines, where that infrastructure becomes subject to the 2008 Act in the following circumstances:

[3] Different types of offshore transmission infrastructure are being proposed for development as part of the transition to an onshore - offshore grid. Please refer to paragraph 2.12.3 for a full definition of offshore transmission including interconnectors, Multi-Purpose Interconnectors and transmission which forms part of the onshore network though which is located offshore.

i. if it constitutes associated development for which consent is sought along with an NSIP such as an offshore wind generating station or relevant overhead line[4]; or

ii. if the Secretary of State gives a direction under Section 35 of the 2008 Act (for developments which, when completed, will be wholly in one or more of the areas specified in subsection 35(3)) that it should be treated as an NSIP and requires a development consent order (DCO)[5].

1.6.5 In recognition of the substantial amount of new offshore transmission and associated infrastructure being brought forward for consent, some of which may be subject to the 2008 Act, as above, and its connection to the onshore network, this NPS includes policy on offshore-onshore transmission in sections 2.12 – 2.15.

1.7 Appraisal of Sustainability and Habitats Regulations Assessment

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

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.

[4] If an associated development, applicants should also refer to the relevant technology specific NPS, for example EN-3 should also be referred to when a project is associated with an offshore wind generating station.
[5] See EN-1 section 1.3 for further information on section 35 of the Planning Act 2008. See EN-3 section 1.6 in relation to offshore transmission infrastructure projects in English waters which are directed into the NSIP regime under section 35 of the Planning Act 2008.

2 Assessment and Technology-Specific Information

2.1 Introduction

2.1.1 As set out in Section 1.3, this NPS is additional to EN-1. Therefore, applicants and the Secretary of State should consider this NPS and EN-1 together. 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. In addition, for offshore-onshore transmission, applicants and the Secretary of State should consider relevant policy in EN-3, as identified in sections 2.12 – 2.15 below.

2.1.2 When evaluating the impacts of electricity networks infrastructure in particular, all of the generic impacts detailed in EN-1 are likely to be in play, even if only during specific phases of the development (such as construction), or at one specific part of the development (such as a substation).

2.1.3 This NPS has additional policy on:

- factors influencing site selection and design;
- biodiversity and geological conservation;
- landscape and visual;
- noise and vibration;
- Electric and Magnetic Fields; and
- Sulphur Hexafluoride.

2.1.4 Decommissioning of electricity networks is not specifically covered in this NPS. Generally, nationally significant electricity networks are likely to have an ongoing function, but will be subject to maintenance, reinforcement works and for assets to be replaced when they come to the end of their lifespan.

2.1.5 As stated in Section 4.2 of EN-1, to support the urgent need for new low carbon infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations, are considered to be CNP infrastructure. 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.

2.1.6 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 Factors influencing site selection and design

2.2.1 The Secretary of State should bear in mind that the initiating and terminating points – or development zone – of new electricity networks infrastructure is not substantially within the control of the applicant[6].

2.2.2 Siting is determined by:

- the location of new generating stations or other infrastructure requiring connection to the network, and/or
- system capacity and resilience requirements determined by the Electricity System Operator.

2.2.3 These twin constraints, coupled with the government's legislative commitment to net zero by 2050, strategic commitment to new interconnectors with neighbouring North Seas countries[7] and an ambition of up to 50GW of offshore wind generation by 2030, means that very significant amounts of new electricity networks infrastructure is required, including in areas with comparatively little build-out to date.

2.2.4 However, a strategic and holistic approach to onshore and offshore network planning, as set out in paragraphs 2.7 – 2.8, will identify the most efficient way of meeting decarbonisation targets and should reduce the overall amount of network infrastructure required.

2.2.5 Additionally, applicants retain control in managing the identification of routing and site selection between the identified initiating and terminating points or within the development zone[8].

[6] The exception to this is where the applicant is also responsible for the development of associated generation where the initiating point is substantially within the control of the applicant but the terminating point is not.
[7] In this context 'North Seas' is used to refer to the North Sea and seas around the UK and Ireland.
[8] Under the Offshore Transmission Network Review, two key workstreams Early Opportunities and 'Pathway to 2030' including the Holistic Network Design supported the identification of offshore-onshore transmission routes.

2.2.6 Moreover, the locational constraints identified above do not, of course, exempt applicants from their duty to consider and balance the site-selection considerations set out below, much less the policies on good design and impact mitigation detailed in sections 2.4-2.9.

2.2.7 The connection between the initiating and terminating points of a proposed new electricity line will often not be via the most direct route. Siting constraints, such as engineering, environmental or community considerations will be important in determining a feasible route.

2.2.8 There will usually be a degree of flexibility in the location of the development's associated substations, and applicants should consider carefully their location, as well as their design.

2.2.9 In particular, the applicant should consider such characteristics as the local topography, the possibilities for screening of the infrastructure and/or other options to mitigate any impacts. (See Section 2.10 below and Section 5.10 in EN-1.)

2.2.10 As well as having duties under Section 9 of the Electricity Act 1989, (in relation to developing and maintaining an economical and efficient network), applicants must take into account Schedule 9 to the Electricity Act 1989, which places a duty on all transmission and distribution licence holders, in formulating proposals for new electricity networks infrastructure, to "have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest; and …do what [they] reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside or on any such flora, fauna, features, sites, buildings or objects."[9]

2.2.11 Depending on the location of the proposed development, statutory duties under Section 85 of the Countryside and Rights of Way Act 2000, Section 11A of the National Parks and Access to the Countryside Act 1949 (as amended by Section 62 of the Environment Act 1995), and Section 17A of the Norfolk and Suffolk Broads Act 1988 may be relevant. Applicants should note amendments to each of these provisions contained in Section 245 of the Levelling Up and Regeneration Act 2023.

2.2.12 Transmission and distribution licence holders are also required under Schedule 9 to the Electricity Act 1989 to produce and publish a

[9] This assumes that the developer in question is also a licence-holder under the terms of the Electricity Act 1989. In the rare case that the developer is not a licence-holder, the developer will nonetheless be influenced by the duties laid out in Section 9, even though they are not themselves under obligation. Subsequent references to the 'developer', or to the 'applicant', in the context of duties under the Electricity Act, should be read in this light.

statement setting out how they propose to perform this duty generally.

2.3 Climate change adaptation and resilience

2.3.1 Section 4.10 of EN-1 sets out the generic considerations that applicants and the Secretary of State should take into account in order to ensure that electricity networks infrastructure is resilient to the effects of climate change.

2.3.2 As climate change is likely to increase risks to the resilience of some of this infrastructure, from flooding for example, or in situations where it is located near the coast or an estuary or is underground, applicants should in particular set out to what extent the proposed development is expected to be vulnerable, and, as appropriate, how it has been designed to be resilient to:

- flooding, particularly for substations that are vital to the network; and especially in light of changes to groundwater levels resulting from climate change;
- the effects of wind and storms on overhead lines;
- higher average temperatures leading to increased transmission losses;
- earth movement or subsidence caused by flooding or drought (for underground cables); and
- coastal erosion – for the landfall of offshore transmission cables and their associated substations in the inshore and coastal locations respectively.

2.3.3 Section 4.10 of EN-1 advises that the resilience of the project to the effects of climate change must be assessed in the Environmental Statement (ES) accompanying an application. For example, future increased risk of flooding would be covered in any flood risk assessment (see Sections 5.8 in EN-1). Consideration should also be given to coastal change (see sections 5.6 in EN1).

2.4 Consideration of good design for energy infrastructure

2.4.1 The Planning Act 2008 requires the Secretary of State to have regard, in designating an NPS, and in determining applications for development consent to the desirability of good design.

2.4.2 Applicants should consider the criteria for good design set out in EN-1 Section 4.7 at an early stage when developing projects[10].

2.4.3 However, the Secretary of State should bear in mind that electricity networks infrastructure must in the first instance be safe and secure, and that the functional design constraints of safety and security may limit an applicant's ability to influence the aesthetic appearance of that infrastructure.

2.4.4 While the above principles should govern the design of an electricity networks infrastructure application to the fullest possible extent – including in its avoidance and/or mitigation of potential adverse impacts (particularly those detailed in Sections 2.9 below) – the functional performance of the infrastructure in respect of security of supply and public and occupational safety must not thereby be threatened.

2.5 Environmental and Biodiversity Net Gain

2.5.1 When planning and evaluating the proposed development's contribution to environmental and biodiversity net gain, it will be important – for both the applicant and the Secretary of State – to supplement the generic guidance set out in EN-1 (Section 4.6) with recognition that the linear nature of electricity networks infrastructure can allow for excellent opportunities to:

i. reconnect important habitats via green corridors, biodiversity stepping zones, and reestablishment of appropriate hedgerows; and/or

ii. connect people to the environment, for instance via footpaths and cycleways constructed in tandem with environmental enhancements.

2.6 Land Rights and Land Interests

2.6.1 In order to be lawfully able to install, inspect, maintain, repair, adjust, alter, replace or remove an electricity line (above or below ground), its related equipment (such as monopoles, pylons/transmission towers, transformers and cables), and/or its associated mitigation or enhancement schemes, applicants must:

i. own the land on, over, or under which the relevant activity is to take place; or

ii. hold sufficient rights over or interests in that land (typically in the form of an easement); or

[10] An applicant should also consider principles outlined in EN-3 section 2.8 where relevant to offshore network.

iii. have permission for the activity from the present owner or occupier of that land (typically in the form of a wayleave)[11].

2.6.2 Where the applicant does not own or wish to own the land in question, it should try to reach a voluntary agreement giving it sufficient rights and/or permissions to undertake the relevant work[12].

2.6.3 As a last resort, where it does not succeed in reaching the agreement that it requires, the network company may, as part of its application to the Secretary of State, seek to acquire rights compulsorily over the land in question by means of a provision in the DCO.

2.6.4 In such cases (i.e. where the compulsory acquisition of rights is sought) permanent arrangements are strongly preferred over voluntary wayleaves (which could, for example, be terminable on notice by the landowner) in virtue of their greater reliability and economic efficiency and reflecting the importance of the relevant infrastructure to the nation's net zero goals.

2.6.5 The applicant may also seek the compulsory acquisition of land. This will not normally be necessary where lines and cables are installed but may be sought where other forms of electricity networks infrastructure (such as new substations) are required.

2.6.6 As detailed in Section 4.1.8 of EN-1, where the use of land at a specific location is required to facilitate the development by providing for mitigation, landscape enhancement and biodiversity net gain, an applicant may, as part of its application to the Secretary of State, seek the compulsory acquisition of that land, or rights over that land. The Secretary of State will consider any such application under the provisions of the Planning Act 2008 and any associated guidance.[13]

2.6.7 Ahead of securing land rights or interests for transmission infrastructure development itself, an applicant will, in many cases, need to obtain access to land to conduct technical and environmental surveys to inform their development proposals. Some of these will be seasonal species surveys meaning there are limited opportunities during the course of the year in which they can be undertaken; timely access for surveys can have a significant impact on overall project timelines.

[11] Note that for offshore bootstraps and offshore transmission infrastructure there is a separate regime of seabed leasing and marine licensing requirements.
[12] Note, as set out in Compulsory purchase and compensation guidance, compulsory purchase is intended as a last resort and acquiring authorities are expected to try to acquire land by agreement before resorting to compulsory purchase. They can seek to acquire the land by agreement at any time and should attempt to do so before and/or alongside taking steps to acquire land by compulsion (https://www.gov.uk/guidance/compulsory-purchase-and-compensation-guide-1-procedure).
[13] https://www.gov.uk/government/publications/planning-act-2008-procedures-for-the-compulsory-acquisition-of-land

2.7 Holistic planning

2.7.1 EN-1 explains in Section 4.10 that the Planning Act 2008 aims to create a holistic planning regime, such that the cumulative effects of the same project can be considered together. Co-ordinated applications typically bring economic efficiencies and reduced environmental impact.

2.7.2 Accordingly, the government envisages that, wherever reasonably possible, applications for new generating stations and their related infrastructure should be contained in a single application to the Secretary of State[14]. However, a consolidated approach of this kind may not always be possible, nor represent the most efficient strategy for delivery of new infrastructure.

2.7.3 This could be, for example, due to the differing lengths of time needed to prepare the applications for submission to the Secretary of State, or because a network application relates to multiple generation projects (which could be onshore or offshore), or because the works involved are strategic reinforcements required for a number of reasons.

2.7.4 It may also be the case that the networks infrastructure application and the application for a related generating station will of necessity come from different legal entities, or from entities subject to different commercial and regulatory frameworks.

2.7.5 It will also be common for applications to be submitted for the general purpose of reinforcing the network, which will be critical to deliver especially in light of the drive towards net zero, including the ambition for up to 50GW of offshore wind by 2030, and a CNP (see EN-3).

2.8 Strategic Network Planning

2.8.1 A more strategic approach to network planning will ensure that network development keeps pace with renewable generation and anticipates future system needs. Strategic network planning, such as through the Holistic Network Design and its follow up exercises or through forthcoming Centralised Strategic Network plans, helps reduce the overall impact of infrastructure by identifying opportunities for coordination, where appropriate, and taking a holistic view of both the onshore and offshore network. Network plans will take account of

[14] Note that a principal exception to this will be for the development of the associated onshore components of co-ordinated offshore transmission. Some of the latter may be consented as planned co-ordinated transmission projects, serving multiple wind farms (with projects potentially regional in scale, including Multi-Purpose Interconnector (MPI) projects), may potentially require separate consents from the offshore wind generation.

environmental and community impacts, alongside deliverability and economic cost, from the outset.

2.8.2 A strategic approach to network planning proposed through the Centralised Strategic Network Planning (CSNP) process[15] will identify strategic investments intended to facilitate achieving net zero and decarbonisation targets[16].

2.8.3 In these cases (i.e. where the application is a reinforcement project in its own right and does not accompany an application for a generating station, or is not underpinned by a contractually-supported agreement to provide an as-yet-unconsented generating station with a connection), the Secretary of State should have regard to the need case for new electricity networks infrastructure set out in Section 3.3 of EN-1.

2.8.4 The Secretary of State should also take into account that Transmission Owners (TOs) and Distribution Network Operators (DNOs) are required under Section 9 of the Electricity Act 1989 to bring forward efficient and economical proposals in terms of network design.

2.8.5 TOs and DNOs are also required to facilitate competition in the generation and supply of electricity, and electricity distributors have a statutory duty to provide a connection where requested.

2.8.6 Given that individual electricity lines are only component parts of a country-spanning network, it may arise that a single application covers works to be undertaken at different geographical locations[17].

2.8.7 Where it can be demonstrated that such a set of works will reinforce the network as a whole, or reinforce the network to accommodate a subset of new connections, the Secretary of State should be willing – in line with the need statement set out in Section 3.3 of EN-1 – to accept an application seeking development consent for the entire set of works.

2.8.8 Applicants should ensure that any such applications are kept to a scale which they can manage within the statutory timescales and discuss putative applications of this kind with the Planning Inspectorate before formally submitting an application.

[15] Centralised Strategic Network Planning was originally proposed under the Ofgem-led Electricity Transmission Network Planning Review (ETNPR).
[16] See EN-1 section 3.3
[17] See EN-1 section 4.3

2.9 Applicant assessment

Impacts

2.9.1 This section should be read in conjunction with Part 5 (Generic Impacts) of EN-1. The impacts identified in Part 5 of EN-1, and below, are not intended to be exhaustive.

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

Biodiversity and Geological Conservation

2.9.3 Electricity networks infrastructure pose a particular potential risk to birdlife including large birds, such as swans and geese, and perching birds. These may collide with overhead lines and risk being electrocuted. Large birds may also be electrocuted when landing or taking off by completing an electric circuit between live and ground wires. Even perching birds can be killed as soon as their wings touch energised parts of the infrastructure.

2.9.4 Applicants should consider measures to make lines more visible such as bird flappers and diverters which are covered in more detail in paragraphs 2.10.3 and 2.10.4..

2.9.5 The applicant will need to consider whether the proposed line will cause such problems at any point along its length and take this into consideration in the preparation of the ES (see Section 4.3 of EN-1).

2.9.6 Particular consideration should be given to feeding and hunting grounds, migration corridors and breeding grounds, where they are functionally linked to sites designated or allocated under the 'national site network' provisions of the Conservation of Habitats and Species Regulations[18].

Landscape and Visual Impact

2.9.7 While the government does not believe that the development of overhead lines is incompatible in principle with applicants' statutory duty under Schedule 9 to the Electricity Act 1989, to have regard to visual and landscape amenity and to reasonably mitigate possible impacts thereon, in practice new overhead lines can give rise to adverse landscape and visual impacts.

2.9.8 These impacts depend on the type (for example, whether lines are supported by towers or monopole structures), scale, siting, and degree of screening of the lines, as well as the characteristics of the landscape and local environment through which they are routed.

[18] See EN-1 Section 5.4.

2.9.9 New substations, sealing end compounds (including terminal towers), and other above-ground installations that serve as connection, switching, and voltage transformation points on the electricity network may also give rise to adverse landscape and visual impacts.

2.9.10 Cumulative adverse landscape, seascape and visual impacts may arise where new overhead lines are required along with other related developments such as substations, wind farms, and/or other new sources of generation.

2.9.11 Landscape and visual benefits may arise through the reconfiguration, rationalisation, or undergrounding of existing electricity network infrastructure. Though mitigation of the landscape and visual impacts arising from overhead lines and their associated infrastructure is usually possible, it may not always be so, and the impossibility of full mitigation in these cases does not countermand the need for overhead lines.

2.9.12 However, in nationally designated landscapes (for instance, National Parks, The Broads and Areas of Outstanding Natural Beauty) even residual impacts may well make an overhead line proposal unacceptable in planning terms. (See Section 2.9.20 below for guidance on this case.)

2.9.13 Where possible, applicants should ensure that the principles detailed in Sections 2.11.16-2.11.19 below are embodied in the design of their proposed overhead line route and its associated infrastructure. Applicants should also offer proposals (for instance those detailed in Section 2.10 below) for additional mitigation.

2.9.14 Where the nature or proposed route of an overhead line will likely result in particularly significant landscape and visual impacts, as would be assessed through landscape, seascape and visual impact assessment, the applicant should demonstrate that they have given due consideration to the costs and benefits of feasible alternatives to the overhead line. This could include – where appropriate – re-routing, underground or subsea cables and the feasibility e.g. in cost, engineering or environmental terms of these. Applicants should note the position on nationally designated landscapes at section 2.9.20 below.

2.9.15 The ES should set out details of this consideration, including the applicant's rationale for eschewing feasible alternatives to the overhead line, and the mitigation cost-calculation methodology that this rationale may rely upon.

2.9.16 The Holford Rules – guidelines for the routing of new overhead lines – were originally set out in 1959. These guidelines, intended as a common-sense approach to overhead line route design, were

reviewed and updated by the industry in the 1990s, and they should be embodied in the applicants' proposals for new overhead lines[19].

2.9.17 In brief, the Holford Rules state that applicants should:

- avoid altogether, if possible, the major areas of highest amenity value, by so planning the general route of the line in the first place, even if total mileage is somewhat increased in consequence;
- avoid smaller areas of high amenity value or scientific interest by deviation, provided this can be done without using too many angle towers, i.e. the bigger structures which are used when lines change direction;
- other things being equal, choose the most direct line, with no sharp changes of direction and thus with fewer angle towers;
- choose tree and hill backgrounds in preference to sky backgrounds wherever possible. When a line has to cross a ridge, secure this opaque background as long as possible, cross obliquely when a dip in the ridge provides an opportunity. Where it does not, cross directly, preferably between belts of trees;
- prefer moderately open valleys with medium or moderate levels of tree cover where the apparent height of towers will be reduced, and views of the line will be broken by trees;
- where country is flat and sparsely planted, and unless specifically preferred otherwise by relevant stakeholders, keep the high voltage lines as far as possible independent of smaller lines, converging routes, distribution poles and other masts, wires and cables, so as to avoid a concentration of lines or 'wirescape'; and
- approach urban areas through industrial zones, where they exist; and when pleasant residential and recreational land intervenes between the approach line and the substation, carefully assess the comparative costs of undergrounding.

2.9.18 The Horlock Rules – guidelines for the design and siting of substations – were established by National Grid in 2009 in pursuance of its duties under Schedule 9 to the Electricity Act 1989. These principles should be embodied in applicants' proposals for the infrastructure associated with new overhead lines[20].

[19] The rules are not published as a single work, but they are referred to in a number of planning publications including *Visual Amenity Aspects of High Voltage Transmission* by George A. Goulty (1989) and *Planning Overhead Power Line Routes* by RJB Carruthers (1987) Research Studies Press Ltd, Letchworth. Notes and explanations of the Holford Rules are available on the National Grid website https://www.nationalgrid.com/sites/default/files/documents/13795-The%20Holford%20Rules.pdf

[20] The Horlock Rules are available at https://www.nationalgrid.com/sites/default/files/documents/13796-The%20Horlock%20Rules.pdf

2.9.19 In brief, the Horlock Rules state that applicants should:

- consider environmental issues from the earliest stage to balance the technical benefits and capital cost requirements for new developments against the consequential environmental effects in order to keep adverse effects to a reasonably practicable minimum.
- seek to avoid altogether internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the system connections[21].
- protect as far as reasonably practicable areas of local amenity value, important existing habitats and landscape features including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas.
- take advantage of the screening provided by land form and existing features and the potential use of site layout and levels to keep intrusion into surrounding areas to a reasonably practicable minimum.
- keep the visual, noise and other environmental effects to a reasonably practicable minimum.
- consider the land use effects of the proposal when planning the siting of substations or extensions.
- consider the options available for terminal towers, equipment, buildings and ancillary development appropriate to individual locations, seeking to keep effects to a reasonably practicable minimum.
- use space effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation.
- make the design of access roads, perimeter fencing, earth-shaping, planting and ancillary development an integral part of the site layout and design, so as to fit in with the surroundings.
- in open landscape especially, high voltage line entries should be kept, as far as possible, visually separate from low voltage lines and other overhead lines so as to avoid a confusing appearance.
- study the inter-relationship between towers and substation structures and background and foreground features so as to reduce the prominence of

[21] Internationally and nationally designated areas of highest amenity, cultural or scientific value are: National Parks; Areas of Outstanding Natural Beauty; Heritage Coasts; World Heritage Sites; Ramsar Sites; Sites of Special Scientific Interest; National Nature Reserves; Special Protection Areas; Special Areas of Conservation. Care should be taken in relation to all historic sites with statutory protection e.g. Scheduled Monuments, Battlefields and Listed Buildings. Please see EN-1 section 5.9 for further guidance on Historic Environment.

structures from main viewpoints. Where practicable the exposure of terminal towers on prominent ridges should be minimised by siting towers against a background of trees rather than open skylines.

Undergrounding and subsea cables

2.9.20 Although it is the government's position that overhead lines should be the strong starting presumption for electricity networks developments in general, this presumption is reversed when proposed developments will cross part of a nationally designated landscape (i.e. National Park, The Broads, or Area of Outstanding Natural Beauty).

2.9.21 In these areas, and where harm to the landscape, visual amenity and natural beauty of these areas cannot feasibly be avoided by re-routing overhead lines, the strong starting presumption will be that the applicant should underground the relevant section of the line.

2.9.22 However, undergrounding will not be required where it is infeasible in engineering terms, or where the harm that it causes (see section 2.11.4) is not outweighed by its corresponding landscape, visual amenity and natural beauty benefits. Regardless of the option, the scheme through its design, delivery, and operation, should seek to further the statutory purposes of the designated landscape. These enhancements may go beyond the mitigation measures needed to minimise the adverse effects of the scheme.

2.9.23 Additionally, cases will arise where – though no part of the proposed development crosses a designated landscape – a high potential for widespread and significant adverse landscape and/or visual impacts along certain sections of its route may result in recommendations to use undergrounding for relevant segments of the line or alternatively consideration of using a route including subsea cabling.

2.9.24 In these cases, and taking account of the fact that the government has not laid down any further rule on the circumstances requiring use of underground or subsea cables, the Secretary of State must weigh the feasibility, cost, and any harm of the undergrounding or subsea option against:

- the adverse implications of the overhead line proposal;
- the cost and feasibility of re-routing overhead lines or mitigation proposals for the relevant line section; and

- the cost and feasibility of the reconfiguration, rationalisation, and/or use of underground or subsea cabling of proximate existing or proposed electricity networks infrastructure[22].

2.9.25 In such cases the Secretary of State should only grant development consent for underground or subsea sections of a proposed line over an overhead alternative if they are satisfied that the benefits accruing from the former proposal clearly outweigh any extra economic, social, or environmental impacts that it presents, the mitigation hierarchy has been followed, and that any technical obstacles associated with it are surmountable. In this context it should consider:

- the landscape and visual baseline characteristics of the setting of the proposed route, in particular, the impact on high sensitivity visual receptors (as defined in the current edition of the Landscape Institute's Guidelines for Landscape and Visual Impact Assessment), residential areas, designated landscapes, valued landscapes, designated heritage assets and Heritage Coasts (including, where relevant, impacts on the setting of designated features and areas), noting the policy in EN-1 section 5.4.53 on regional and local designations;
- the additional cost of the proposed underground or sub-sea alternatives, including their significantly higher lifetime cost of repair and later uprating;
- the potentially very disruptive effects of undergrounding on local communities, habitats, archaeological and heritage assets, marine environments, soil (including peat soils), hydrology, geology, and, for a substantial time after construction, landscape and visual amenity. (Undergrounding an overhead line will mean digging a trench along the length of the route, and so such works will often be disruptive – albeit temporarily – to the receptors listed above than would an overhead line of equivalent rating);
- the potentially very disruptive effects of subsea cables on the seabed and the species that live in and on it, including physical damage to and full loss

[22] Proposed underground or subsea cables do not require development consent under the Planning Act 2008, but they may form part of a scheme of new infrastructure which is the subject of an application under the Act, and requirements or obligations regarding undergrounding may feature as a means of mitigating some of the adverse impacts of a proposal which does require and is granted development consent. Although subsea cables may not require a development consent order (DCO), they may still be subject to a marine licence, as per the requirements of Part 4 of the Marine and Coastal Access Act 2009. Where a subsea cable is within 0-12 nautical miles (UK territorial sea) it will always require a marine licence to both lay and remove the cable, and for undertaking non-emergency maintenance and repair works during its life. Cable protection always requires a marine licence wherever it occurs at in UK marine waters, including outside of the territorial sea even when laying the cable itself does not require consent. For cables that do require a marine licence (e.g., transmission or Multi-Purpose Interconnector cables) for laying, non-emergency maintenance and removal, this licence will apply for their full extent within English waters. Further information on marine considerations can be found in EN-1 Section 4.5.

of seabed habitats[23]. Cable protection can also be required where cables cross each other, or where they cannot be buried deep enough to protect them from becoming exposed. Such protection causes additional impacts that are often greater than those of the cable itself due to the large areas covered. There can also be issues where subsea cables make landfall, as much coastal land is protected habitat with environmental and heritage designations and landfall connections could cause additional disruption to coastal communities and the environment;

- the applicant's commitment, as set out in their ES, to mitigate the potential detrimental effects of undergrounding works on any relevant agricultural land and soils (including peat soils), particularly regarding Best and Most Versatile land, including development and implementation of a Soil Resources and Management Plan. Such a commitment must guarantee appropriate handling of soil, backfilling, and return of the land to the baseline Agricultural Land Classification (ALC), thus ensuring no loss or degradation of agricultural land. Such a commitment should be based on soil and ALC surveys in line with the 1988 ALC criteria and due consideration of the Defra Construction Code of Practice for Sustainable Use of Soils on Construction Sites.

Noise and Vibration

2.9.26 All high voltage transmission lines have the potential to generate noise under certain conditions.

2.9.27 Line noise is most commonly caused by corona noise when the conductor surface electric stress exceeds the inception level for corona discharge[24] activity which is released as acoustic energy and radiates into the air as sound. Transmission line conductors are normally designed to operate below this threshold.

2.9.28 Surface contamination on a conductor or accidental damage during transport or installation can cause local enhancement of electric stress and initiate discharge activity leading to the generation of additional noise.

2.9.29 The highest noise levels generated by a line generally occur during rain.

2.9.30 Water droplets may collect on the surface of the conductor and initiate corona discharges with noise levels being dependent on the

[23] https://www.ospar.org/documents?d=32910

[24] Corona discharge is an electrical discharge brought on by the ionization of a fluid (such as air) surrounding a conductor, which occurs when the strength of the electric field exceeds a certain value, but conditions are insufficient to cause complete electrical breakdown or arcing.

level of rainfall. Fog may also give rise to increased noise levels, although these levels are lower than those during rain.

2.9.31 After a prolonged spell of dry weather without rain to wash the conductors, contamination may accumulate at sufficient levels to result in increased noise. After heavy rain, these discharge sources are washed away and the line will resume normal quieter operating sound.

2.9.32 Surface grease on conductors can also give rise to audible noise effects as grease is able to move slowly under the influence of an electric field, tending to form points which then initiate discharge activity. Surface grease is likely to occur along the entire length of a conductor. Hence there may be many potential discharge sources and, consequently, a higher noise level.

2.9.33 This will only occur if substandard grease has been used during manufacture or if the conductor has been overheated by carrying excessive electrical load. This can be mitigated through good design or by replacement.

2.9.34 Transmission line audible noise is generally categorised as ‘crackle’ or ‘hum’, according to its tonal content.

2.9.35 Crackle may occur alone, but hum will usually occur only in conjunction with crackle. Crackle is a sound containing a random mixture of frequencies over a wide range, typically 1kHz to 10kHz. No individual pure tone can be identified for any significant duration. Crackle has a generally similar spectral content to the sound of rainfall. Hum is only likely to occur during rain when rates of rainfall exceed 1mm/hr. Hum is a sound consisting of a single pure tone or tones.

2.9.36 Noise may also arise from discharges on overhead line fittings such as spacers, insulators and clamps. Such noise should be mitigated through good design.

2.9.37 Audible noise effects can also arise from substation equipment such as transformers, quadrature boosters and mechanically switched capacitors.

2.9.38 Transformers are installed at many substations, and generate low frequency hum. Whether the noise can be heard outside a substation depends on a number of factors, including transformer type and the level of noise attenuation present (either engineered intentionally or provided by other structures).

2.9.39 For the assessment of noise from substations, standard methods of assessment and interpretation using the principles of the relevant British Standards[25] are satisfactory.

2.9.40 For the assessment of noise from overhead lines, the applicant must use an appropriate method to determine the sound level produced by the line in both dry and wet weather conditions, in addition to assessing the impact on noise-sensitive receptors.

2.9.41 For instance, the applicant may use an appropriate noise modelling tool or tools for the prediction of overhead line noise and its propagation over distance, such as an ISO 9613-2 or Technical Report TR(T)94.

2.9.42 When assessing the impact of noise generated by overhead lines in wet weather relative to existing background sound levels, the applicant should consider the effect of varying background sound levels due to rainfall.

2.9.43 The Secretary of State is likely to regard it as acceptable for the applicant to use a methodology that demonstrably addresses these criteria.

Electric and Magnetic Fields (EMFs)

2.9.44 Power frequency EMFs arise from generation, transmission, distribution and use of electricity and will occur around power lines and electric cables and around domestic, office or industrial equipment that uses electricity.

2.9.45 EMFs comprise electric and magnetic fields. Electric fields are the result of voltages applied to electrical conductors and equipment. Fences, shrubs and buildings easily block electric fields. Magnetic fields are produced by the flow of electric current; however, unlike electric fields, most materials do not readily block magnetic fields. The intensity of both electric fields and magnetic fields diminishes with increasing distance from the source.

2.9.46 All overhead power lines produce EMFs. These tend to be highest directly under a line and decrease to the sides at increasing distance. Although putting cables underground eliminates the electric field, they still produce magnetic fields, which are highest directly above the cable. EMFs can have both direct and indirect effects on human health, aquatic and terrestrial organisms.

2.9.47 The direct effects occur in terms of impacts on the central nervous system resulting in its normal functioning being affected. Indirect effects occur through electric charges building up on the surface of the body producing a microshock on contact with a grounded object, or vice versa, which, depending on the field strength and other

[25] For example, BS4142.

exposure factors, can range from barely perceptible to being an annoyance or even painful.

2.9.48 To prevent these known effects, the International Commission on Non-Ionizing Radiation Protection (ICNIRP) developed health protection guidelines in 1998 for both public and occupational exposure. These are expressed in terms of the induced current density in affected tissues of the body, 'basic restrictions', and in terms of measurable 'reference levels' of electric field strength (for electric fields), and magnetic flux density (for magnetic fields). The relationship between the (measurable) electric field strength or magnetic flux density and induced current density in body tissues requires complex dosimetric modelling.

2.9.49 The reference levels are such that compliance with them will ensure that the basic restrictions are not reached or exceeded. Exceeding the reference levels does not necessarily mean that the basic restrictions will not be met; this would be a trigger for further investigation into the specific circumstances.

2.9.50 For protecting against indirect effects, the ICNIRP 1998 guidelines give an electric field reference of 5kV m-1 for the general public and keeping electric fields below this level would reduce the occurrence of adverse indirect effects for most individuals to acceptable levels. When this level is exceeded, there is a suite of measures that may be called upon in particular situations, including provision of information, earthing and screening, alongside limiting the field. In some situations, there may be no reasonable way of eliminating indirect effects.

2.9.51 The levels of EMFs produced by power lines in normal operation are usually considerably lower than the ICNIRP 1998 reference levels. For electricity substations, the EMFs close to the sites tend to be dictated by the overhead lines and cables entering the installation, not the equipment within the site.

2.9.52 The Stakeholder Advisory Group on extremely low frequency electric and magnetic fields (ELF EMFs) (SAGE) was set up to provide advice to government on possible precautionary measures that might be needed to limit public exposure to electric and magnetic fields associated with electricity supply. The government response to recommendations made in SAGE's first interim assessment sets out those measures that will be taken as a result of the recommendations[26].

2.9.53 The National Institute for Health Protection's (NIHP) Centre for Radiation, Chemical and Environmental Hazards (CRCE) provides

[26] https://webarchive.nationalarchives.gov.uk/ukgwa/20130104042702/http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_107124

advice on standards of protection for exposure to non-ionizing radiation, including the ELF EMFs arising from the transmission and use of electricity.

2.9.54 In March 2004, the National Radiological Protection Board (now part of NIHP CRCE), published advice on limiting public exposure to electromagnetic fields. The advice recommended the adoption in the UK of the EMF exposure guidelines published by ICNIRP in 1998.

2.9.55 These guidelines also form the basis of the Control of Electromagnetic Fields at Work Regulations 2016. Resulting from these recommendations, government policy is that exposure of the public should comply with the ICNIRP 1998 guidelines. The electricity industry has agreed to follow this policy. Applications should show evidence of this compliance as specified in 2.10.11.

2.9.56 The balance of scientific evidence over several decades of research has not proven a causal link between EMFs and cancer or any other disease. The NIHP CRCE keeps under review emerging scientific research and/or studies that may link EMF exposure with various health problems and provides advice to the Department of Health and Social Care on the possible need for introducing further precautionary measures.

2.9.57 The Department of Health and Social Care's Medicines and Healthcare Products Regulatory Agency does not consider that transmission line EMFs constitute a significant hazard to the operation of pacemakers.

2.9.58 There is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMFs has any agriculturally significant consequences.

Sulphur Hexafluoride

2.9.59 Sulphur Hexafluoride (SF6) is an insulating and arc-suppressant gas used in high-voltage switchgear for electricity networks.

2.9.60 It is also an extraordinarily potent greenhouse gas, and fugitive emissions from electricity networks infrastructure are an object of increasing environmental concern, especially in light of the UK's commitment to net zero by 2050.

2.9.61 Applicants should at the design phase of the process consider carefully whether the proposed development could be reconceived to avoid the use of SF6-reliant assets.

2.9.62 Where the development cannot be so conceived, the applicant must provide evidence of their reasoning on this point. Such evidence will include, for instance, an explanation of the alternatives considered, and a case why these alternatives are technically infeasible or require bespoke components that are grossly disproportionate in terms of cost.

2.9.63 In particular, an accounting of the cost differential between the SF6-reliant asset and the appropriate SF6-free alternative should be provided.

2.9.64 Where applicants, having followed the above procedure, do propose to put new SF6-reliant assets onto the electricity system, they should design a plan for the monitoring and control of fugitive SF6 emissions consistent with the Fluorinated gas (F-gas) Regulation and its successors.

2.10 Mitigation

2.10.1 The applicant should consider and address routing and avoidance/minimisation of environmental impacts both onshore and offshore at an early stage in the development process[27].

Biodiversity and Geological conservation

2.10.2 Careful siting of a line away from, or parallel to, but not across, known flight paths can reduce the numbers of birds colliding with overhead lines considerably.

2.10.3 Making lines more visible by methods such as the fitting of bird flappers and diverters to the earth wire, which swivel in the wind, glow in the dark and use fluorescent colours designed specifically for bird vision can also reduce the number of deaths. The design and colour of the diverters will be specific to the conditions – the line and pylon/transmission tower specifications and the species at risk.

2.10.4 Electrocution risks can be reduced through the design of lattice steel tower crossarms, insulators and the construction of other parts of high voltage power lines so that birds find no opportunity to perch near energised power lines on which they might electrocute themselves.

Landscape and Visual

2.10.5 In addition to good design in accordance with the Holford and Horlock rules (please see paragraphs 2.9.16 - 2.9.19), and the consideration of undergrounding or rerouting the line where possible, the principal opportunities for mitigating adverse landscape and visual impacts of electricity networks infrastructure are:

[27] This section should be read in conjunction with the relevant sections of EN-1, including (but not limited to) sections 4.4 (Marine Considerations), 5.4 (Biodiversity and Geological conservation), 5.8 (Historic Environment), 5.9 (Landscape and Visual), and 5.11 (Noise and Vibration).

- consideration of network reinforcement options (where alternatives exist) which may allow improvements and/or extensions to an existing line rather than the building of an entirely new line;
- selection of the most suitable type and design of support structure in order to minimise the overall visual impact on the landscape. In particular, ensuring that towers are of the smallest possible footprint and internal volume; and
- the rationalisation, reconfiguration, and/or undergrounding of existing electricity networks infrastructure in the vicinity of the proposed development.

2.10.6 Additionally, there are more specific measures that might be taken, and which the Secretary of State could mandate through DCO requirements if appropriate, as follows:

- landscape schemes, comprising off-site tree and hedgerow planting, are sometimes used for larger new overhead line projects to mitigate potential landscape and visual impacts, softening the effect of a new above ground line whilst providing some screening from important visual receptors. These may be implemented with the agreement of the relevant landowner(s), or the developer may compulsorily acquire the land or land rights in question. Advice from the relevant statutory authority may also be needed; and
- screening, comprising localised planting in the immediate vicinity of residential properties and principal viewpoints can also help to screen or soften the effect of the line, reducing the visual impact from a particular receptor.

2.10.7 As set out in the paragraphs above, where landscape schemes and/or screening mitigation of the kind described above is required, rights over the land necessary for such measures may be compulsorily acquired as part of the DCO.

2.10.8 Furthermore, since long-term management of the selected mitigation schemes is essential to their mitigating function, a management plan, developed at least in outline at the conclusion of the examination, and which sets out proposals within a realistic timescale, should secure the integrity and benefit of these schemes. This should also uphold the landscape commitments made to achieve consent, alongside any pertinent commitments to environmental and biodiversity net gain.

Noise and vibration

2.10.9 Applicants must consider the following measures:

- the positioning of lines to help mitigate noise;

- ensuring that the appropriately sized conductor arrangement is used to minimise potential noise;
- quality assurance through manufacturing and transportation to avoid damage to overhead line conductors which can increase potential noise effects;
- ensuring that conductors are kept clean and free of surface contaminants during stringing/installation; and
- the selection of quieter cost-effective plants.

2.10.10 In addition, the ES should include information on planned maintenance arrangements. Where detail is not included, the Secretary of State should consider stipulating appropriate maintenance arrangements by way of requirements attached to any grant of development consent.

Electric and Magnetic Fields (EMFs)

2.10.11 The applicant should consider the following factors:

- height, position, insulation and protection (electrical or mechanical as appropriate) measures subject to ensuring compliance with the Electricity Safety, Quality and Continuity Regulations 2002;
- that optimal phasing of high voltage overhead power lines is introduced wherever possible and practicable in accordance with the Code of Practice to minimise EMFs; and
- any new advice emerging from the Department of Health and Social Care relating to government policy for EMF exposure guidelines.

2.10.12 Where it can be shown that the line will comply with the current public exposure guidelines and the policy on phasing, no further mitigation should be necessary.

2.10.13 Where EMF exposure is within the relevant public exposure guidelines, re-routeing a proposed overhead line purely on the basis of EMF exposure or undergrounding a line solely to further reduce the level of EMF exposure are unlikely to be proportionate mitigation measures.

Sulphur Hexafluoride

2.10.14 The climate-warming potential of SF6 is such that applicants should, as a rule, avoid the use of SF6 in new developments.

2.10.15 Where no proven SF6-free alternative is commercially available, and where the cost of procuring a bespoke alternative is grossly disproportionate, the continued use of SF6 is acceptable, provided

that emissions monitoring and control measures compliant with the F-gas Regulation and/or its successors are in place.

2.11 Secretary of State decision making

Impacts Biodiversity and Geological conservation

2.11.1 Where biodiversity impacts are identified, including those associated with bird collision with overhead lines, the Secretary of State should be satisfied that all feasible options for mitigation have been considered and evaluated appropriately.[28]

Landscape and Visual

2.11.2 The Secretary of State should be satisfied that the development, so far as is reasonably possible, complies with the Holford and Horlock Rules (please see paragraphs 2.9.16 - 2.9.19) or any updates to them.

2.11.3 The Secretary of State should also be satisfied that all feasible options for mitigation – including the rationalisation, reconfiguration, or undergrounding of existing electricity networks infrastructure, have been considered and evaluated appropriately.

2.11.4 In circumstances where it can be demonstrated that a mitigation measure and/ or technological approach is appropriate and/ or necessary for a project, including to limit landscape and visual impact as set out above, the Secretary of State should take this into account in decision making.

2.11.5 Nationally designated landscapes have specific statutory purposes which help ensure their continued protection. The Secretary of State should have special regard to nationally designated landscapes, where the general presumption in favour of overhead lines should be reversed to favour undergrounding.

2.11.6 Away from these protected landscapes and in locations where there is a high potential for widespread and significant adverse landscape and/or visual impacts, the Secretary of State should be satisfied that the applicant has provided evidence to support a decision on whether undergrounding is or is not appropriate, having considered this on a case-by-case basis, weighing the considerations in paragraph 2.9.24 above.

Noise and vibration

2.11.7 The Secretary of State should ensure that appropriate assessment methodologies have been used in the evidence presented to it, and

[28] See EN-1 Section 5.4.

that the appropriate mitigation options have been considered and adopted. Where the applicant can demonstrate that appropriate mitigation measures will be put in place, the residual noise impacts are unlikely to be significant.

2.11.8 Consequently, noise from overhead lines is unlikely to lead to the Secretary of State refusing an application, but it may need to consider the use of appropriate requirements in the DCO to ensure noise is minimised as far as is practicable.

Electric and Magnetic Fields (EMFs)

2.11.9 This NPS does not repeat the detail of the ICNIRP 1998 guidelines on restrictions or reference levels. The government has developed with the electricity industry a Code of Practice, 'Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice', published in February 2011 that specifies the evidence acceptable to show compliance with ICNIRP 1998 guidelines and is also in line with the terms of the 1999 EU Council Recommendation on EMF exposure.

2.11.10 Before granting consent to an overhead line application, the Secretary of State should be satisfied that the proposal is in accordance with the guidelines, considering the evidence provided by the applicant and any other relevant evidence. It may also need to take expert advice from the Department of Health and Social Care.

2.11.11 Industry currently applies optimal phasing[29] to 275kV and 400kV overhead lines voluntarily wherever operationally possible, which helps to minimise the effects of EMF. The government has developed with industry a voluntary Code of Practice, 'Optimum Phasing of high voltage double-circuit Power Lines – A Voluntary Code of Practice'[30], published in March 2012, that defines the circumstances where industry can and will optimally phase lines with a voltage of 132kV and above.

2.11.12 Where the applicant cannot demonstrate that the line will be compliant with the Electricity Safety, Quality and Continuity Regulations 2002, with the exposure guidelines as specified in the Code of Practice on compliance, and with the policy on phasing as specified in the Code of Practice on optimal phasing then the Secretary of State should not grant consent.

[29] Many overhead power lines have two circuits, each consisting of three conductor bundles or 'phases' carried on the same pylons. Each circuit produces an electro-magnetic field, and the cumulative field depends on the relative order of the three phases of each circuit. This is referred to as 'phasing' and the lowest magnetic fields to the sides of the line are produced by an arrangement called 'transposed phasing'.

[30] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/48309/1255-code-practice-optimum-phasing-power-lines.pdf

2.11.13 Undergrounding of a line would reduce the level of EMFs experienced, but high magnetic field levels may still occur immediately above the cable. It is the government's policy that power lines should not be undergrounded solely for the purpose of reducing exposure to EMFs.

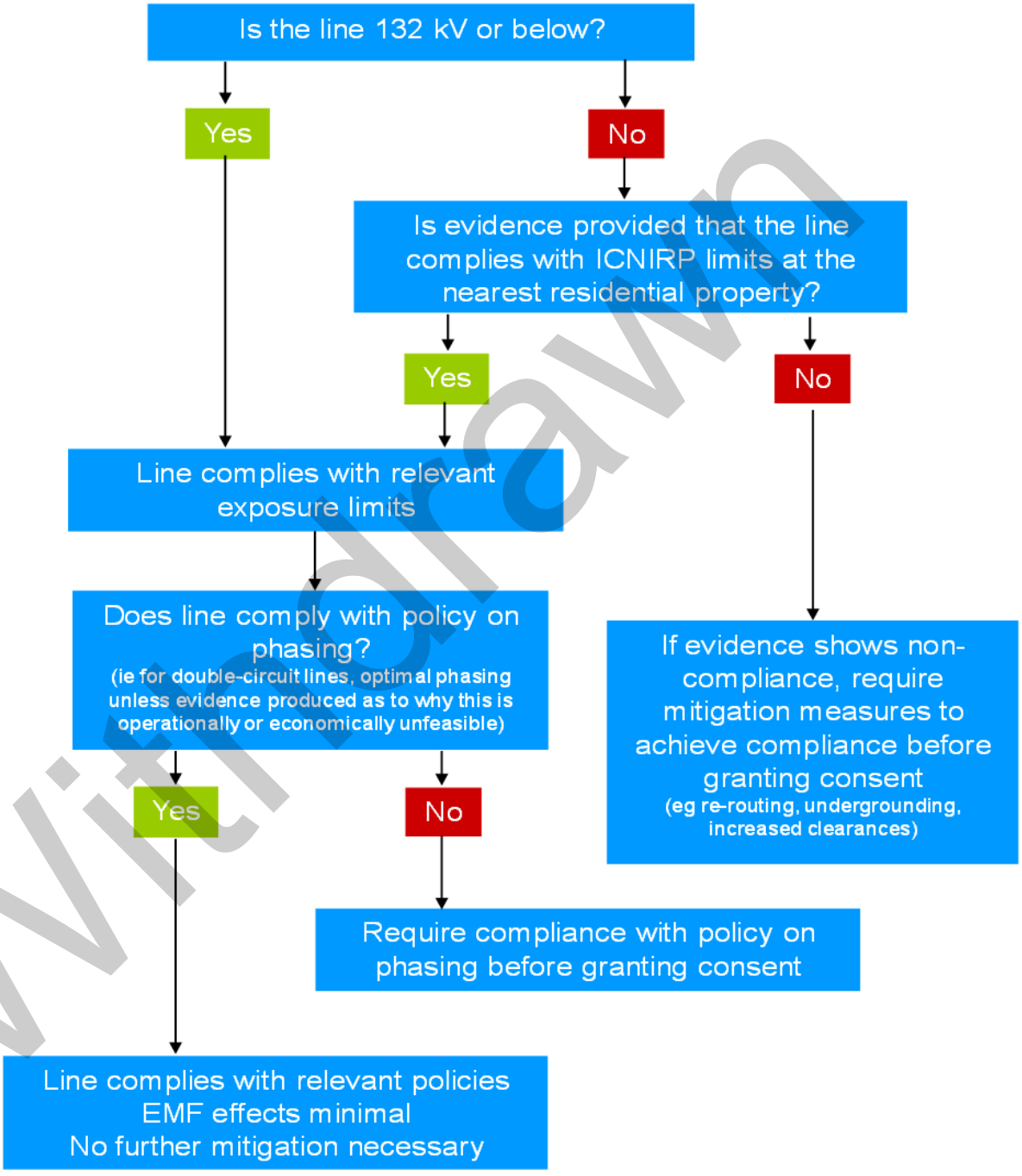
2.11.14 In order to avoid unacceptable adverse impacts of EMFs from electricity network infrastructure on aviation, the Secretary of State will take account of statutory technical safeguarding zones defined in accordance with Planning Circular 01/03[31], or any successor, when considering recommendations for DCO applications. More detail on this issue can be found in Section 5.5 of EN-1.

2.11.15 Where a statutory consultee on the safeguarding of technical facilities identifies a risk that the EMF effect of electricity network infrastructure would compromise the effective and safe operation of such facilities, the potential impact and siting and design alternatives will need to have been fully considered as part of the application.

2.11.16 The diagram below shows a basic decision tree for dealing with EMFs from overhead power lines.

[31] Safeguarding Aerodromes, Technical Sites and Military Explosive Storage Areas - https://www.gov.uk/government/publications/safeguarding-aerodromes-technical-sites-and-military-explosives-storage-areas

Simplified Route Map for dealing with EMFs



Sulphur Hexafluoride

2.11.17 The Secretary of State should grant consent for an electricity networks development only if the applicant has demonstrated either:

i. that the development will not use SF6; or

ii. (a) that there is no proven commercially available alternative to the use of SF6; and

(b) that a bespoke SF6-free alternative would be grossly disproportionate in terms of cost; and

(c) that emissions monitoring and control measures compliant with the F-gas Regulation and/or its successors are in place.

2.12 Special assessment principles for offshore-onshore transmission

2.12.1 Details in this section are in addition to those set out in EN-3 on the network connections for offshore wind including different types of offshore transmission. These include EN-3 sections 2.8.34 – 2.8.43 and 2.8.59-2.8.73 on network connections, 2.8.76 -2.8.79 on micro-siting and 2.8.90-2.8.92 on Offshore Wind Environmental Standards which include offshore transmission and should be considered together with the details below.

2.12.2 The scale of offshore transmission infrastructure required to support the government's 50GW offshore wind development ambition has significant implications for the onshore network.

2.12.3 A substantial amount of new onshore network infrastructure, including network reinforcements, is required to enable transmission of the domestic and international offshore power flows coming onshore or power being exported to neighbouring North Seas countries.

2.12.4 As identified in EN-1, it is important that the network planning for offshore transmission is much more closely co-ordinated with the planning and development of the onshore transmission network than previously. This includes all types of offshore transmission including interconnectors, multi-purpose interconnectors (MPIs) and subsea 'onshore' transmission or 'bootstraps' reinforcing the onshore

transmission network.[32] Further details on the different types of offshore transmission are provided in the Glossary.

2.12.5 The above offshore-onshore transmission co-ordination work is undertaken through a process of ongoing reform with the key outcomes including the Holistic Network Design and its subsequent follow up exercises for offshore-onshore transmission and subsequent strategic network planning exercises such as the Centralised Strategic Network Plan led by National Grid Electricity System [33] and/or the Future Systems (once established).

2.12.6 In addition, a more co-ordinated approach to designing offshore transmission is expected to be adopted compared with the previous standard approach of radial routes to shore. This applies to spatially close groups of offshore windfarms, subsea 'onshore' transmission or bootstraps, interconnectors and multi-purpose interconnectors.

Critical National Priority

2.12.7 As highlighted in EN-1 government has concluded that there is a CNP for the provision of nationally significant low carbon infrastructure. This includes for electricity grid infrastructure, all power lines in scope of EN-5 including network reinforcement and upgrade works, and associated infrastructure such as substations. 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. This includes infrastructure identified in the Holistic Network Design and subsequent strategic network design exercises, see Section 2.13 below.

[32] In this context, offshore transmission means all cabling and associated infrastructure up to and including the (typically onshore) interface point with the main National Electricity Transmission System (NETS). It also includes subsea 'onshore' transmission, also referred to as 'bootstraps' These are electricity network reinforcements (i.e. a cable and associated transmission infrastructure) for the purpose of transmitting power between points on the National Electricity Transmission System (NETS). Whilst they are part of the 'onshore' network for most regulatory and legal purposes, bootstraps differ from other network reinforcements in that they are physically located in the sea.

[33] The Holistic Network Design was undertaken as part of the offshore transmission reform work under the Offshore Transmission Network Review (OTNR) which completed in 2023: https://www.gov.uk/government/groups/offshore-transmission-network-review . Co-ordinated transmission proposals were principally developed under three temporal workstreams under the OTNR. The Early Opportunities projects workstream supported co-ordinated transmission projects brought forward voluntarily by developers as Pathfinders for those projects which had already received connection agreements. For other less developed offshore wind projects, their connection to a transmission network was determined through a new Holistic Network Design (HND) under the 'Pathway to 2030' workstream. The Future Framework for offshore transmission considered the long-term. In addition, multi-purpose interconnector (MPI) proposals formed part of the work of the OTNR across all timeframes.

Consenting process

2.12.8 As part of the transition to a more coordinated approach, it is anticipated that some proposals for transmission may be consented separately to those for the windfarm (array) application.

2.12.9 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 a direction under Section 35 of the Planning Act 2008 (see paragraph 1.6.4 and EN-1, paragraphs 1.3.7 and 3.2.9-3.2.10).

2.12.10 In some instances, applications comprising packages of co-ordinated offshore transmission infrastructure could be brought forward through the use of Section 35 powers.

2.12.11 A Section 35 direction by the Secretary of State could also be given in respect of interconnector and 'bootstrap' projects where the NSIP consenting route is sought by the applicants of those projects.

2.13 Offshore-onshore transmission: Applicant assessment

Consideration of strategic network design

2.13.1 The strategic network designs such as those led or enabled by National Grid Electricity System Operator (ESO) will usually form the basis for identifying proposals for co-ordinated transmission. This includes the Holistic Network Design (HND) for offshore-onshore transmission prepared by ESO[34].

2.13.2 The HND and subsequent network design and planning exercises[35] identify and establish the transmission capabilities needed, both onshore and offshore, to support offshore wind developments. These include the onshore connection points for offshore transmission and potential future Multi-Purpose Interconnector opportunities. Government recognises the work undertaken in the HND; the HND

[34] The Holistic Network Design for offshore-onshore transmission is available here: https://www.nationalgrideso.com/future-energy/the-pathway-2030-holistic-network-design. In future, there may be co-ordinated design proposals for multi-purpose interconnector (MPI) projects, the early development of which may be supported by National Grid Electricity System Operator.

[35] These include follow up design exercises to the Holistic Network Design and transitions to the proposed Centralised Strategic Network Planning approach under the Electricity Transmission Network Planning Review (ETNPR), see 1.1.6. Ahead of that transition, National Grid ESO's Network Options Assessment (NOA) Refresh 2022 confirms the needs case for the onshore reinforcements forming part of the HND strategic network design. Further detailed environmental and community impact assessments will be required in determining the precise location of cable routes and other infrastructure for the onshore network reinforcements needed to support the delivery of the Government's 2030 offshore wind ambition and net zero targets. This NPS recognises the needs case for the infrastructure identified in the NOA required to achieve the 50GW ambition for offshore wind by 2030 and that this infrastructure will need to be subject to the appropriate environmental (including community/ socio-economic) impact assessments.

and subsequent network design exercises are likely to contain information that is important and relevant in the consideration of applications for infrastructure resulting from those exercises[36].

2.13.3 The work of the HND and its subsequent follow up exercises considered the objectives for designs to be economic and efficient, deliverable and operable, minimise impact on the environment and minimise the impact on the local communities for the offshore transmission aspects. Through this work steps have already been taken to reduce avoidable cumulative impacts. Assessment of projects coming forward from this design should acknowledge these prior steps.

2.13.4 It is recognised that proposed projects which have progressed through strategic network design exercises have been considered for strategic co-ordination through those exercises. However, any opportunities for subsequent local co-ordination between projects, irrespective of whether they have been through those exercise, should be considered in project development. This is in addition to considerations on co-ordinating delivery in construction, see section 2.14.2.

2.13.5 In addition, it is recognised that the HND and subsequent network design exercises, may on occasion, identify a radial solution, i.e. a direct route from an offshore wind farm to shore, not proposed to co-ordinate with another project at the time of network design.

2.13.6 In the case of infrastructure identified through the HND, and subsequent network design exercises applicants should identify any variations to or developments from that work and justify these in accordance with the same objectives or criteria above, i.e. economic and efficient, deliverable and operable, minimise impact on the environment and minimise the impact on the local communities, giving these four criteria equal weight.

2.13.7 On occasion, network designs may be amended as necessary as a result of new information or other changes (such as where a project within a coordinated design is no longer being progressed).

2.13.8 Any such changes approved through an appropriate change control process are likely to result in information that is important and relevant consideration

Coordinated approach, including for Early Opportunities' projects with firm connections agreements prior to the Holistic Network Design

2.13.9 Radial offshore transmission options to single windfarms should only be proposed where options assessment work identifies that a co-

[36] Government anticipates updating the policy on the consideration of Centralised Strategic Network Plans in decision making in due course and once details on the approach to CSNP are finalised.

ordinated solution is not feasible. For projects which had firm connection agreements in place prior to completion of the HND (formerly known as 'Early Opportunities' projects)[37], co-ordinated design work should be brought forward by applicants.

2.13.10 The identification of co-ordinated solution options, and any radial option, should consider the criteria for designs to be deliverable and operable[38], economic and efficient, minimise impact on the environment and minimise impact on the local communities. Options should seek to identify the most appropriate balance between these criteria.

2.13.11 The coordinated solutions assessed should seek to be ambitious in the degree of co-ordination, wherever possible. This includes taking account of geographically proximate projects including opportunities to connect wind farms and multi-purpose interconnectors and/or bootstraps with each other that are planned or foreseen in the near future. Evidence should demonstrate that this has been considered in the assessment of options.

2.13.12 Applicants bringing forward offshore transmission projects are expected to consider future demand when considering the location and route of their proposals. This may involve consenting offshore platforms, converter stations or substations which facilitate future coordination.

2.13.13 If, through the coordinated options assessment work, a radial route is deemed to be the only feasible solution, applicants should evidence each co-ordination option and the accompanying assessment. These assessments should detail the application of the criteria identified above versus the radial counterfactual. In these instances, the Secretary of State should have regard to the need case set out in Section 3.3 of EN-1.

Impacts

2.13.14 Co-ordinated transmission proposals, including multi-purpose interconnectors and other types of offshore transmission (see Glossary), are expected to reduce the overall environmental and community impacts associated with bringing offshore transmission onshore compared to an uncoordinated, radial approach. These reduced impacts could, for example, relate to: fewer landing sites

[37] Under the OTNR Early opportunities' workstream, developers who voluntarily participated in this process were supported by National Grid ESO in undertaking assessment work to identify co-ordinated options. Projects that had a firm connection agreement at the time of ESO's Open Letter on Early Opportunities projects in September 2021 were considered to be under the OTNR Early Opportunities workstream. Where developers are not part of this workstream, it is expected that they will provide evidence of assessment work taking account of the considerations above and seeking to identify the most appropriate balance between them.

[38] In this instance, deliverable and operable includes consideration of the need to bring forward co-ordination transmission solutions in support of the 2030 ambition for offshore wind. For the Holistic Network Design (HND), the 2030 ambition was considered as part of the work developing the HND.

and reduced landfall impacts; reduced overall cable length and impacts; and fewer cable corridors and reduced impacts from these.

2.13.15 Similarly, the related onshore infrastructure required in conjunction with the offshore transmission to enable offshore wind to be connected at its onshore grid connection point is expected to reduce the overall environmental and community impacts. This is in comparison with that which would be required for radial connections from single offshore windfarms to the shore.

2.13.16 For onshore infrastructure, reduced impacts could, for example, relate to fewer or co-located substations and converter stations and transmission lines as well as demonstrating how environmental and community impacts have been avoided as far as possible.

2.13.17 Applicants are expected to be able to indicate how co-ordination including reduction in impacts have been considered drawing on work of others, including that led or enabled by National Grid Electricity System Operator (ESO).

2.13.18 For those projects not covered by the strategic network planning undertaken by the ESO and which have received a connection agreement, applicants should seek to demonstrate the reduced overall impacts from co-ordination (as identified at section 2.13.14 above) and how the onshore connection locations have been identified. These projects are expected to demonstrate the reductions in environmental and community impact achieved through co-ordination compared with radial solutions.

2.13.19 There may be exceptional circumstances where multiple co-ordinated solutions have been explored and all those solutions would lead to adverse impacts (for example adverse effects on an environmentally protected site[39]) and where these could be avoided through radial connections. In these circumstances radial connections may be more appropriate. Evidence of the co-ordinated solutions assessed and likely adverse impacts would need to be provided by the applicant to clearly substantiate this. This includes demonstration of consideration of alternative co-ordination solutions which may not be in proximate locations.

2.13.20 Applicants should refer to policy text in EN-3 (including section 2.8) and EN1 (including sections 4.4 and 5.4) regarding consideration of impacts and cumulative impacts in the environment, as well as policy text in the remainder of this policy statement regarding consideration of impacts onshore.

[39] This could be a site under UK or internationally legislation such as e.g. Marine Protected Areas or Ramsar sites.

Coastal connections

2.13.21 The sensitivities of many coastal locations and of the marine environment as well as the potential environmental, community and other impacts in neighbouring onshore areas must be considered in the identification onshore connection points.

2.13.22 Onshore connection points for offshore transmission bringing power from offshore wind farms must be considered as part of the overall offshore transmission network design and in conjunction with the onshore network by the body responsible for the design[40].

2.13.23 Onshore connection locations for offshore transmission must seek to minimise environmental and other impacts, both onshore and in the marine environment and including to local communities.

2.14 Offshore-onshore transmission: mitigation

2.14.1 Adverse impacts on Marine Protected Areas (MPAs) have caused consenting delays, and in some cases a need for compensatory measures under the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Habitats and Species Regulations 2017, or measures of equivalent environmental benefit under the Marine and Coastal Access Act 2009. Therefore, applicants should consider and address routing and avoidance/minimisation of environmental impacts both onshore and offshore at an early stage in the development process. Applicants should also facilitate delivery of strategic compensation measures where appropriate (see paragraphs 2.8.276 -2.8.283 of EN-3).

2.14.2 In the assessments of their designs, applicants should demonstrate:

- how environmental, community and other impacts have been considered and how adverse impacts have followed the mitigation hierarchy i.e. avoidance, reduction and mitigation of adverse impacts through good design;
- how enhancements to the environment post construction will be achieved including demonstrating consideration of how proposals can contribute towards biodiversity net gain (as set out in Section 4.5 of EN-1 and the Environment Act 2021), as well as wider environmental improvements in line with the Environmental Improvement Plan and environmental targets (paragraph 4.2.29 of EN-1);
- how the construction planning for the proposals has been co-ordinated with that for other similar projects in the area on a similar timeline;

[40] In most cases this will be the National Grid Electricity System Operator though could also be another body.

- how enhancements to the landscape and environmental assets may contribute to overall landscape and townscape quality as set out in EN-1 4.6.13 and 5.10.23;
- how the mitigation hierarchy has been followed, in particular to avoid the need for compensatory measures for coastal, inshore and offshore developments affecting SACs SPAs, and Ramsar sites and MCZs as set out in EN-3 2.8;
- For designated landscapes the principal mitigation measure, as established by the Holford Rules, should be to seek to avoid landfall in these areas.

2.15 Offshore-onshore transmission: Secretary of State decision-making

2.15.1 Coordinated approaches to delivering offshore and onshore transmission to minimise overall environmental, community, and other impacts, as set out above, must be considered[41]. The Secretary of State must be satisfied that applicants have explained the steps they have taken to do this, the options that have been considered and the approach they have taken to coordination as set out in above at section 2.13. This evidence is expected to draw substantially on the work under the Offshore Transmission Network Review[42] and relevant strategic network design exercises, together with any additional supporting evidence applicants consider relevant. The Secretary of State should also be satisfied that options for coordination have been considered and evaluated appropriately.

[41] Please also see EN-3 section 2.8.
[42] Including under the OTNR 'Early Opportunities' workstream

3 Glossary

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

Term	Definition
AC	Alternating current
ALC	Agricultural Land Classification
AONB	Area of Outstanding Natural Beauty
AoS	Appraisal of Sustainability
Associated infrastructure	Development associated with the NSIP as defined in Section 115 of the Planning Act
CRCE	Centre for Radiation, Chemical and Environmental Hazards
DC	Direct current
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DNOs	Distribution Network Operators
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 at 1.6.4; and Associated infrastructure e.g. substations.
ELF EMFs	Extremely low frequency electric and magnetic fields
EMFs	Electric and magnetic fields

EN-1	Overarching NPS for Energy
ES	Environmental Statement
ESO	National Grid Electricity Systems Operator
Generic impacts	Potential impacts of any energy infrastructure projects, the general policy for consideration of which is set out in Part 5 of EN-1
Grid	Electricity networks infrastructure, see above
HRA	Habitats Regulations Assessment
ICNIRP	The International Commission on Non-Ionizing Radiation Protection
kV	Kilovolts – 1000 volts
Mitigation hierarchy	A term to incorporate the avoid, reduce, mitigate, compensate process that applicants need to go through to protect the environment and biodiversity.
MPI	Multi-purpose interconnector
Network reinforcement	Uprating/upgrading and improving or replacement of existing lines
NIHP	National Institute for Health Protection
North Seas	In this context 'North Seas' refers to the North Sea and seas around the UK and Ireland
NPS	National Policy Statement
NSIP	Nationally significant infrastructure project
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; • multi-purpose interconnectors (MPIs) which combine offshore wind with market-to-market interconnection;

	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.
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 achieving 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. 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 and other plants that convert residual waste into energy, including combustion, provided they meet existing definitions of low carbon; and nuclear 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, and associated infrastructure such as substations. 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 is 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, Multi-Purpose

	Interconnectors, or 'bootstraps' to support the onshore network which are routed offshore. • Lifetime extensions of nationally significant low carbon infrastructure, and repowering of projects.
SAGE	Stakeholder Advisory Group on extremely low frequency electric and magnetic fields
SF6	Sulphur hexafluoride
Substation	An assembly of equipment in an electric power system through which electric energy is passed for transmission, transformation, distribution, or switching
TOs	Transmission Owners

This publication is available from: www.gov.uk/government/publications/national-policy-statement-for-electricity-networks-infrastructure-en-5

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