UK Government

National Policy Statement for Fusion Energy Generation (EN-8)

Appraisal of sustainability – report

Department for Energy Security and Net Zero (2026)

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Introduction

This document is the Appraisal of Sustainability (AoS) report for the draft new National Policy Statement (NPS) for Fusion Energy Infrastructure EN-8, published for consultation by the Secretary of State for the Department for Energy Security and Net Zero (DESNZ).

The main function of this report is to set out the likely significant effects on the environment of developing fusion energy infrastructure, as well as indicating how the NPS is consistent with the principles of sustainable development more generally.

The AoS report is designed to inform consultation on the draft Fusion Energy NPS with which it is being published. It should be noted that this draft Fusion Energy NPS is part of a suite of Energy NPS's which are as follows:

- EN-1: Overarching National Policy Statement for Energy
- EN-2: National Policy Statement for Natural Gas Generating Infrastructure
- EN-3: National Policy Statement for Renewable Electricity Generation
- EN-4: National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines
- EN-5: National Policy Statement for Electricity Networks Infrastructure
- EN-6: National Policy Statement for new Nuclear Generation greater than 1GW and deployable by 2025
- EN-7: National Policy Statement for new Nuclear Generation.

AoS was carried out previously on EN-1 to EN-5 (in 2023) and EN-7 (in 2024) and this has helped to inform this assessment. Note that EN-1, EN-3 and EN-5 were updated again in 2025 and this update was also subject to AoS. As such, this AoS report should be read in conjunction with the full suite of NPS and in particular with the updated Overarching NPS for Energy (EN-1) published on 6 January 2026, which sets out national policy on energy and energy infrastructure and planning guidance for developers of nationally significant energy infrastructure projects.

The approach adopted in the AoS is consistent with the requirements of Strategic Environmental Assessment (SEA) and has been expanded to include a wider range of issues, such as socio-economic issues, normally found within an AoS.

Habitats Regulations Assessment (HRA) has been undertaken in parallel to the AoS and its results incorporated into the AoS as appropriate, though it has been reported separately to this AoS report, in order to meet the requirements of the Habitats Regulations.

The background and context to the Fusion Energy National Policy Statement EN-8

National Policy Statements (NPSs) set out the government's objectives and policy for the development of nationally significant infrastructure in a particular sector and provide the framework within which the Planning Inspectorate makes recommendations to the relevant Secretary of State as to whether major infrastructure development should proceed or not. NPSs are designated under the Planning Act 2008 and apply to infrastructure that is defined as a "Nationally Significant Infrastructure Project" (NSIP) under the Planning Act or is treated as development for which Development Consent is required according to Section 35 and 35Z of the Planning Act. Their function is to state clearly how government policy applies to development consent, removing discussion of the merits of such policy from the examination process so that permitting decisions can be made on the basis of planning considerations alone.

There are currently seven NPSs relevant to energy (EN-1 to EN-7) applying in England and Wales. EN-1 acts as the overarching NPS to five technology NPSs (EN-2 Natural Gas Generating Infrastructure, EN-3 Renewable Electricity Generation, EN-4 Gas Supply Infrastructure and Gas and Oil Pipelines, EN-5 Electricity Networks Infrastructure, EN-6 new Nuclear generation over 1GW deployable by 2025 and EN-7 new Nuclear generation).

The new NPS, specifically for fusion energy infrastructure (EN-8), will give bespoke, effective, and clear guidance to the Planning Inspectorate (PINS), developers and regulators to support the examination of Development Consent Order (DCO) applications for such type of infrastructure.

As with the approach to energy infrastructure development set out in the other NPSs (apart from EN-6), the Fusion Energy NPS will not have any sites proposed for development. While all fusion energy infrastructure will have some common characteristics, different technologies and designs may have different requirements such as access to water for cooling. Due to these different requirements, specifying suitable sites in draft EN-8 could lead to some sites that are suitable for some fusion energy infrastructure being ruled out because they are not suitable for all. As such, and in order to provide developers with maximum flexibility when identifying potential sites, specific sites are not proposed in draft EN-8.

What is fusion energy as set out in draft EN-8?

Fusion has the potential to provide an abundant source of low carbon energy by replicating the process which occurs at the centre of stars and powers the sun. Light atomic nuclei, of elements such as hydrogen, fuse together to form heavier ones, such as helium, and a large amount of energy is released.

The generation of usable energy using fusion would have several distinct advantages:

- Fuel abundance: the fuels used in fusion reactions are abundant. Deuterium is readily extracted from seawater, and tritium is produced using lithium;
- Baseload power: fusion energy does not depend on external factors such as wind or sun, making it continuously deployable at point of need;
- High fuel efficiency: fusion produces more energy per gram of fuel than any other process that could be achieved on Earth;
- Carbon-free: helium is the product of the fusion process – no carbon or other greenhouse gases are produced in the fusion reaction;
- No chain reaction: fusion is not based on a chain reaction; specific conditions of heat and pressure need to be maintained for fusion to occur. Therefore, in the event of any technical problems, a fusion facility could be immediately switched off and the process would stop itself within seconds or less;
- Shorter lived waste: fusion energy infrastructure will not lead to the disposal of the very long lived, high level radioactive waste associated with nuclear spent fuel from a fission power plant.

Why is the fusion technology set out in draft EN-8 needed?

The need for domestic large-scale clean energy is increasing to meet growing demand and to build resilience to threats posed by global climate change and challenges to energy security. There is an increased focus by governments internationally on energy sources that are cheap, abundant and reliable which do not depend on other nations for either electricity generation or supply chains.

This drives a global imperative to explore and progress all credible options for clean energy supply both to meet net zero commitments and in sustaining decarbonisation post 2050.

Renewables and nuclear fission have an important role to play as part of a portfolio of solutions but alone may not provide global long-term energy security. Fusion has the potential to complement these and provide low carbon, secure, continuous, and abundant energy. The benefits of fusion energy for the UK not only include the potential for a low carbon and reliable base load energy source for the future but the potential to deliver economic and social benefits through the creation of jobs, attracting investment into the UK and the development of high-value skills. All of these elements make energy generating facilities which utilise fusion technology, of national significance.

Why is there a need for EN-8?

Due to the differences between fusion and fission and the need to ensure an efficient planning process for fusion facilities, the Government committed to developing proposals for a Fusion Energy National Policy Statement (NPS). The Government recognised that the currently

assumed planning process for fusion energy facilities in England and Wales would be inefficient and make fusion an outlier compared to complex technologies that produce electricity, but it would be inappropriate to incorporate fusion as part of the newly adopted nuclear EN-7.

In addition, private industry is planning to build commercial facilities in the 2030s which requires siting and construction to start this decade. Companies are already starting to identify potential sites for these facilities. The planning process and considerations required to gain development consent will heavily influence designs, and so clarity needs to be provided well before detailed designs are completed. Regulatory certainty will also be a key consideration of investors and companies when deciding where to invest and where to build. An NPS gives a clear market signal to global investors that the UK is providing a stable regulatory and planning base on which long-term investment can be made.

Nationally Significant Infrastructure Projects (NSIPs), such as energy generating facilities utilising fusion technology, require a type of consent known as 'development consent' under procedures governed by the Planning Act 2008. For such a project, the Planning Inspectorate (PINS) examines the application and will make a recommendation to the relevant Secretary of State, who will make the decision on whether to grant or to refuse development consent.

As noted, the overarching National Policy Statement for Energy, EN-1, sets out the need case for certain energy infrastructure and general assessment principles. Draft EN-8, the fusion energy NPS, sets out the assessment principles and considerations that applicants will have to address when considering the siting of their fusion energy facilities.

A separate process that also has implications for the AoS is the management of higher activity radioactive waste that will be produced by some fusion energy infrastructure. Higher activity radioactive waste includes both high level waste (HLW), intermediate level waste (ILW) and some low level waste (LLW). Although fusion power plants will not produce any HLW, they will generate some ILW and LLW. The expectation is that waste in the ILW category will be 'less hazardous ILW' as discussed in the 2024 UK policy framework "Managing radioactive substances and nuclear decommissioning: UK policy framework"[1]. In addition, some radioactive materials may require storage on the fusion site prior to classification as waste and disposal. The UK Government's policy position is that before development consents for new fusion energy infrastructure are granted, the Government will need to be satisfied that effective arrangements exist or will exist to manage and dispose of any waste they will produce. The Government expects that developers consider and account for the long-term management of radioactive waste, including storage of radioactive materials prior to classification as waste, transportation, and disposal methods.

Fusion could also produce hazardous waste such as waste involving beryllium, lead, lithium or tungsten but the amount and nature of that waste will vary by fusion technology. This type of waste is not unique to fusion, and neither is the quantity likely to be produced, but EN-8, the

[1] assets.publishing.service.gov.uk/media/6632371769098ded31fca7c1/managing-radioactive-substances-and-nuclear-decommissioning-uk-policy-framework.pdf

fusion energy NPS, will set a requirement to ensure that developers consider the planning requirements to safely manage any hazardous materials.

What will a generating facility utilising fusion technology look like?

While experimental fusion energy technology is now well-developed, the fusion energy infrastructure currently being developed are all prototypes. There is therefore no precedent on the layout and characteristics for fusion energy infrastructure. However, the general characteristics and operational requirements are known and have been used to inform this AoS.

At the heart of every fusion energy facility is the device where the fusion reactions occur. Different fusion technologies use different methods to initiate and confine these fusion reactions, and some use a combination of approaches.

The two primary methods:

- Magnetic confinement relies on powerful external magnetic fields to confine and control a superheated plasma containing the fusion reactions.
- Inertial confinement uses an energy source, for example lasers, to rapidly heat and compress a small fuel pellet to extremely high pressures and temperatures to reach fusion conditions thereby releasing a burst of fusion energy [2]

Irrespective of the method used, the fusion reactions take place in a vacuum and so all fusion energy infrastructure will include a vacuum vessel and systems to create and maintain this vacuum.

Depending on the fusion technology being used, systems are also needed to support the magnets to confine the plasma for magnetic confinement or to create the high pressures for inertial confinement (e.g. lasers).

All fusion energy infrastructure currently planned for deployment in the UK is expected to use deuterium and tritium as fusion fuels, although other options are being explored internationally.

Fusion energy infrastructure using deuterium and tritium as fusion fuels are likely to need to breed tritium fuel from the fusion reactions. This is typically done through use of a lithium breeder blanket.

[2] See more detailed explanation in the Consultation on a new National Policy Statement for Fusion Energy, May 2024 at https://assets.publishing.service.gov.uk/media/667d5af197ea0c79abfe4d1a/new-nps-for-fusion-energy-consultation-document-1.pdf

Most fusion energy infrastructure will produce thermal energy and will convert this to electricity. It is expected that this will be done using standard power conversion systems such as steam generators and turbines. These power conversion systems need to be cooled, in a very similar way to other heat-generators.

There are a range of cooling system types available:

A. direct, or once-through, wet cooling systems

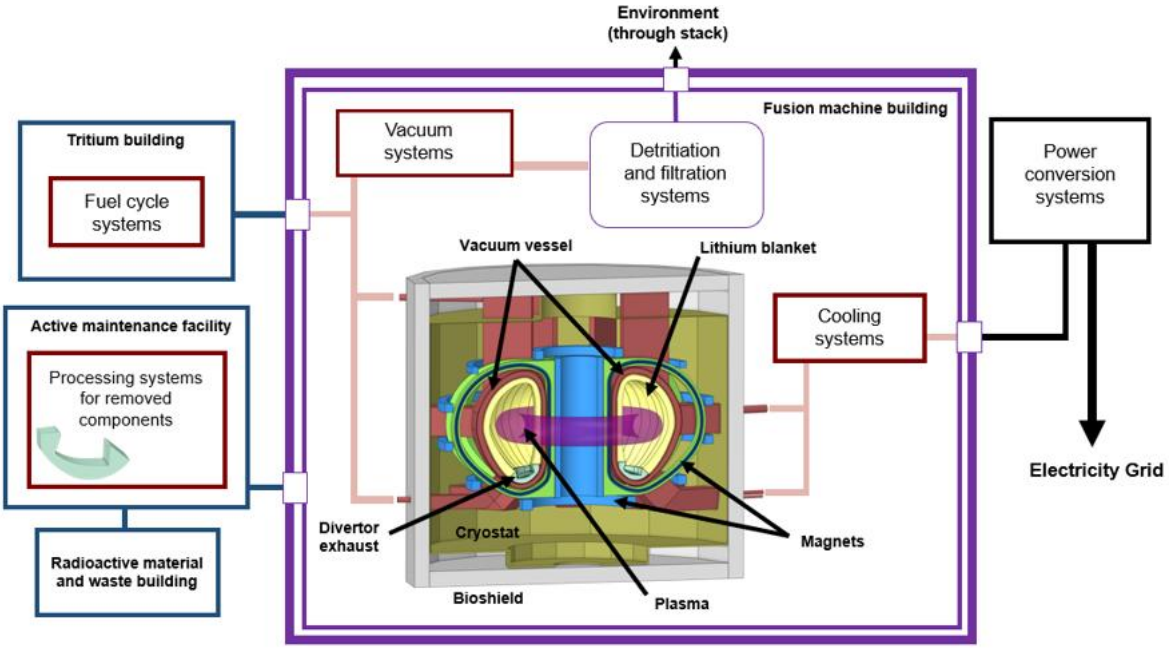
B. indirect, or recirculating, wet cooling systems such as natural draught towers (e.g. hyperboloid cooling towers) or low-profile mechanical draught towers

C. dry cooling systems, such as dry coolers or condensers

D. hybrid cooling systems that combine recirculating wet and dry cooling elements

In addition, fusion energy infrastructure is likely to require fuel handing and maintenance systems alongside radioactive material storage and/or processing.

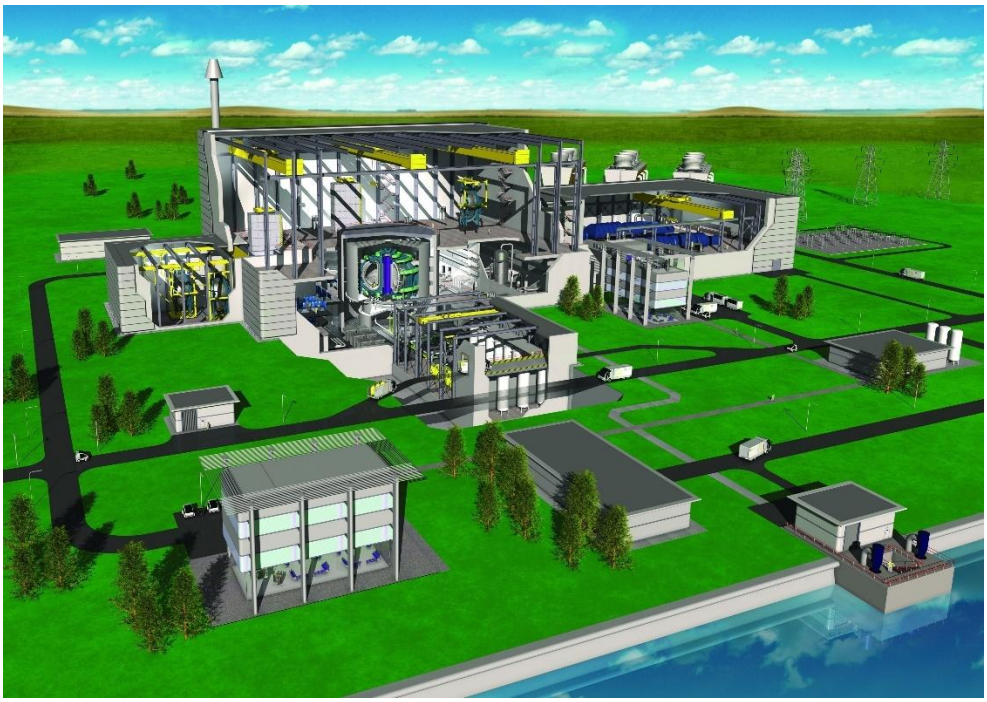
Figure 1 (courtesy of UKAEA, adapted with permission) shows the components of fusion energy infrastructure for one type of fusion technology (magnetic confinement):



The size of the different components of fusion energy infrastructure will depend on the expected thermal/electrical capacity of the infrastructure, and the type of fusion technology that is used.

The size of the site needed for fusion energy infrastructure is not expected to be larger than the site of nuclear fission generating infrastructure of a similar expected capacity.

Figure 2 (courtesy UKAEA and EUROfusion) shows the possible layout of a fusion energy infrastructure site for one type of fusion technology (magnetic confinement):



While precise figures are not possible at this stage, an indication of the likely workforce required can be seen from the Spherical Tokamak for Energy Production (STEP) project, which is the UK's flagship fusion energy programme, aiming to construct a UK prototype fusion energy plant by 2040. This is estimated at approximately 8,000 during the construction phase, with approximately 1,500 during operation. Note that this would include sizeable numbers (estimated 1,200) of people to be trained in skilled areas such as welding, electrical and mechanical work and 330 apprenticeships[3]. Estimates for the decommissioning phase of STEP are not available, but it can be anticipated that these would be lower than the construction force, but still significant in number.

Purpose of this AoS Report

This AoS Report has been prepared for draft EN-8 which defines 'fusion energy infrastructure', as infrastructure using the process of fusion to generate energy, and any ancillary infrastructure, that is: (a) defined as a Nationally Significant Infrastructure Project (NSIP) by the Planning Act 2008, or (b) treated as development for which Development Consent is required according to Section 35 and 35ZA of the Act.

At present, to be an NSIP, fusion energy infrastructure must be expected to have capacity greater than 50MW in England and 350MW in Wales. However, the Government is committed to amending the Act to ensure that fusion energy infrastructure in England with a thermal capacity, or a combination of thermal and electrical capacity, of over 50MW is also included.

[3] See STEP programme – Economic and wider impact assessment (March 2025).

This AoS Report has two primary functions:

- The Environmental Assessment of Plans and Programmes Regulations 2004 (as amended), known as the Strategic Environmental Assessment (SEA) Regulations (and which are derived from the Strategic Environmental Assessment Directive - 2001/42/EC), require that before a plan or programme which establishes the framework for development consent is adopted, it should be subject to consultation alongside an environmental report which identifies, describes and evaluates the significant effects which its implementation is likely to have on the environment. Amongst other things, the NPS EN-8 is a plan or programme for the purposes of the Regulations, and so this AoS report fulfils the function of an environmental report under the Regulations.
- The Planning Act 2008 requires that NPSs must be the subject of an AoS before they are designated. The scope of such an appraisal is similar to that of an environmental report under the SEA Regulations, but with more emphasis on social and economic impacts, and informed overall with the principles of sustainable development (often summarised as ensuring that development meets the needs of the present without compromising the ability of future generations to meet their own needs).

By requiring the AoS to be produced alongside the NPS while it is still in draft form, the SEA Regulations and Planning Act aim to ensure that consultees and the wider public are able to review and comment on the NPS with a sense of what it would mean in environmental and wider sustainability terms for fusion energy infrastructure to be built in accordance with decisions made on planning applications for development consent which will be decided on the basis of the NPS.

Report structure

The remainder of this report is structured as follows:

- Overview of AoS process
- Scope of the AoS
- Policy context, baseline, issues and framework
- Baseline information and key issues
- AoS framework
- Assessment of fusion EN-8
- Assessment of reasonable alternatives
- Cumulative and transboundary effects
- Monitoring

The Appendices to this report are published separately and are as follows:

- Appendix A – Glossary & List of Abbreviations
- Appendix B – Recommendations made
- Appendix C – Responses to Consultation
- Appendix D – Review of policies, plans and legislation
- Appendix E – Baseline data and contextual information
- Appendix F – Baseline maps (provided as a separate volume)

Overview of the AoS process

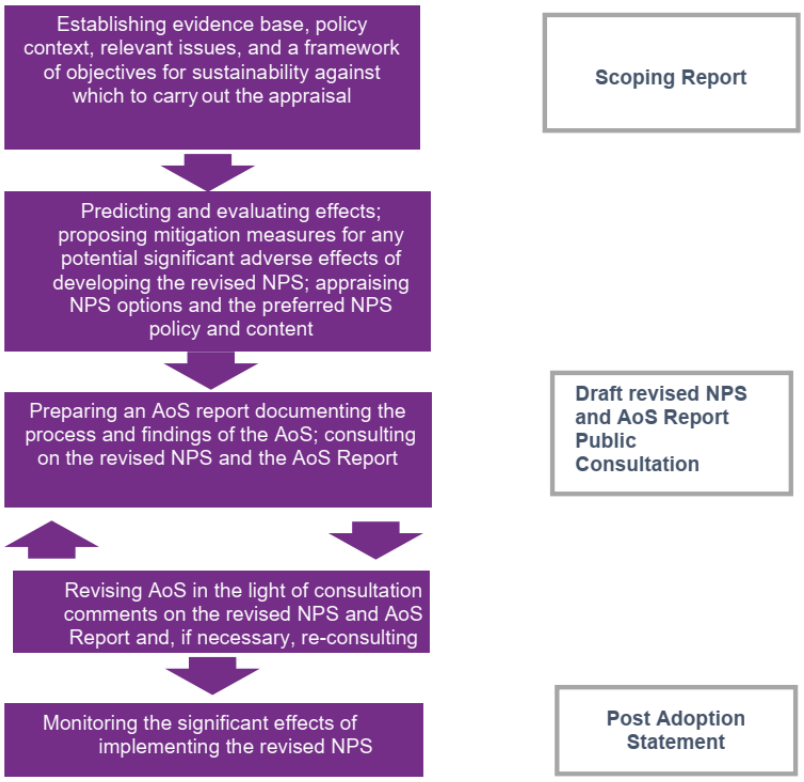
Assessment methodology

The AoS process and methods that have been applied are broadly based on a number of published guidance documents (note that there is no specific guidance on preparing an AoS):

- Sustainability Appraisal (SA) of Regional Spatial Strategies and Local Development Documents - Guidance for Regional Planning Bodies and Local Planning Authorities, by the ODPM, the Scottish Executive, the Welsh Assembly Government and the Northern Ireland Department of the Environment November 2005;
- A Practical Guide to the Strategic Environmental Assessment Directive, by the ODPM, the Scottish Executive, the Welsh Assembly Government and the Northern Ireland Department of the Environment, September 2005; and
- Revised National Planning Policy Framework, December 2024 and associated revised Planning Practice Guidance.

It is to be noted that the processes of SEA and Habitats Regulation Assessment (HRA) are based on European Union (EU) Directives. While the United Kingdom has left the EU, the relevant SEA and HRA Regulations implementing these processes still apply.

Figure 1 Government's guidance for preparing SEAs and Sustainability Appraisals



Source: Based on ODPM (2005) A practical guide to the Strategic Environmental Assessment Directive and ODPM (2005) Sustainability Appraisal of Regional Spatial Strategies and Local Development Documents

The AoS of the draft NPS EN-8 has been carried out in a staged approach, with this AoS report representing the 3rd stage in the above figure which sets out the various preparation stages of the AoS.

The methodology that has been adopted is described below.

Setting the context and establishing the baseline

The NPS will both influence and be influenced by other plans, policies and programmes (PPPs) produced by local and combined authorities, by statutory agencies and other bodies with plan making responsibilities. Legislation is a further driver that sets the framework for the NPS, both directly and indirectly. Relevant legislation, plans and programmes have been identified and considered to inform the preparation of this AoS report.

To predict accurately how NPS policies will affect the current baseline, it is first important to understand its current state and then examine the likely evolution without the implementation of the plan. Baseline information provides the basis for understanding existing local environmental, economic and social issues, and alternative ways of dealing with them; formulating objectives to address these issues and predicting and monitoring sustainability effects.

Key sustainability issues have been identified through analysis of the baseline data and review of other plans and programmes. The identification of these issues helped focus the AoS processes on the aspects that really matter. Implications to NPS development and opportunities for how the NPS could assist in addressing these issues were also identified.

A set of AoS Objectives has been developed, against which the policies in the NPS could be assessed. For each objective, guide questions were set out to form the AoS framework. The assessment aid questions provided a clarification of the intended interpretation of each objective to support direction of change sought through the implementation of the NPS.

The scoping information was refined through prior consultation on the AoS Scoping Report with the statutory consultees identified under the SEA Regulations (including those of England, Northern Ireland, Scotland and Wales)[4]. This consultation took place from 8 May 2024 to 17 July 2024. The consultation comments were taken on board in preparing this AoS Report (see Appendix C).

Government has decided that an appraisal of sustainability against a separate equality objective is unnecessarily duplicative and difficult to apply at the strategic level of the National Policy Statements. Not all Appraisals of Sustainability have included a specific equality objective. Issues relating to equality are also addressed through other objectives in the framework, e.g. the objective to improve health and well-being for all citizens and reduce inequalities in health. In reviewing the National Policy Statement, the Secretary of State will be subject to the Public Sector Equality Duty. When considering individual development consent applications, interested parties may make representations on the effect of the proposed development on individuals (including those with protected characteristics), and relevant material considerations should be integrated into the wider assessment of the merits and demerits of the application.

Appraisal of draft EN-8 policies

The appraisal of the draft NPS policies has been undertaken in a topic by topic manner, with the draft NPS for fusion energy (EN-8) tested against each of the 14 AoS objectives. Where relevant, the interactions between topics have been considered and the commentary is reported against each of the AoS Objectives.

As draft EN-8 is part of a wider suite of Energy NPS, consideration was also made of the findings of the AoS of that wider suite. In particular, as EN-1 sets the overarching framework for energy development, many of the sustainability effects that would be inherent in the development of fusion energy infrastructure are addressed in EN-1 and were considered as part of the AoS of EN-1. EN-8 sets out (see Section 1.3 of draft EN-8) that draft EN-8 should be read in conjunction with EN-1 and in order to avoid unnecessary duplication, draft EN-8 does not repeat text from EN-1. However, in order to understand the full sustainability effects

[4] The Environment Agency, Historic England, Natural England, Cadw, Countryside Council for Wales and the Environment Agency Wales, Department of Agriculture, Environment and Rural Affairs (Northern Ireland), Historic Scotland, Scottish Natural Heritage, Scottish Environmental Protection Agency.

of the application of EN-8, the AoS considered EN-1 in the context of EN-8 and where relevant, reference to EN-1 requirements is made in this AoS Report.

The appraisal seeks to predict the significant environmental effects of the NPS. This is done in accordance with the criteria set out in Annex II of the ODPM guidelines[5]. In predicting effects, changes to the baseline which would occur as a result of implementing the NPS are identified. These changes are then described (where possible) in terms of their geographic scale, the timescale over which they could occur, whether the effects would be temporary or permanent, positive or negative, likely or unlikely, frequent or rare and whether or not they are secondary, cumulative or synergistic.

Quantitative information is not available to help inform the development of predictions in most cases. In such cases, the effects have been predicted based on professional judgement and by reference to relevant legislation and regulations and baseline data. Significance of likely effects was predicted according to the five categories set out in the following table:

Table 1: Differentiator scale for significance of effect

Effect significance	Effect 'Score'	Rationale for significance of effect
Significant positive effect considered likely	**++**	Policy is expected to address an existing sustainability problem or deliver sustainability enhancements, such as substantial environmental net gain above existing/emerging policy.
Minor positive effect is considered likely	**+**	Policy is expected to lead to environmental net gain in line with existing or emerging government policy OR result in protection and conservation of a sustainability asset (for example, a designated biodiversity site or designated heritage asset).
No effect likely or not applicable	**0**	No perceptible effects expected, or the objective is not relevant to the part of the NPS being assessed.
Minor negative effect is considered likely	**-**	Policy is expected to result in adverse effects of a lower magnitude or smaller scale, which can be mitigated through standard measures and best practice.
Significant negative effect is considered likely	**--**	Policy is expected to result in adverse effects of a greater magnitude or larger scale, which cannot be

[5] ODPM (2005) A practical guide to the Strategic Environmental Assessment Directive. See Figure 5. Available online at: https://www.gov.uk/government/publications/strategic-environmental-assessment-directive-guidance

		mitigated OR will require extensive and bespoke mitigation solutions. Further studies may be required to identify appropriate solutions.

It is important to note that draft EN-8 is not site-specific and provides a framework for assessing applications for developments of the relevant type in any location. This does mean though that all findings carry a degree of uncertainty as precise effects will ultimately be determined by the nature of the infrastructure and the specific location within which it is developed.

Where beneficial and adverse effects have both been noted, this is shown in relation to the relevant AoS Objective as applicable.

Throughout the assessment process, an iterative approach has been taken, with detailed and sustained discussions held between the AoS team and the NPS team. As noted, these discussions were informed by findings from the previous AoS undertaken of EN-1 to EN-5 (including those related to the 2025 updates) and EN-7. During these discussions, a series of recommendations were made to be considered in the drafting of EN-8 for public consultation. An overview of key recommendations made is provided in Appendix B.

Appraisal of alternatives

The SEA Regulations also require the environmental assessment of reasonable alternatives to the NPS policies and these alternatives are analysed in this AoS Report.

It is important to maintain the appraisal of alternatives at the appropriate level of plan making and to ensure it is compatible with the AoS undertaken for alternatives for EN-1 to EN-5 and EN-7. For these reasons, the strategic alternatives for implementing the aims of the NPS were assessed at a higher level by using six sustainable development themes, identified through aggregating the AoS objectives into topics that better reflected the strategic characteristics of the options as follows:

Table 2 Sustainable development themes and AoS Objectives

Headline SD themes	AoS / SEA Objectives (numbers refer to AoS Objectives)
Climate change	Net Zero (1)
Security of energy supply	Health (11), Economy (13)
Health and well-being	Air Quality (8), Health (11)

The economy	Health (11), Economy (13), Resources (14)
The built environment	Transport (12), Heritage (5), Adaptation and Resilience (2), Landscapes and Townscapes (6)
The natural environment	Adaptation and Resilience (2), Biodiversity (3 & 4), Heritage (5), Landscapes and Townscapes (6), Water (7), Soils (9), Geodiversity (10)

Note that in consideration of Alternatives, the assessment is undertaken in comparison to draft EN-8 and as such, the findings of the AoS in respect of draft EN-8 broadly apply to all of the alternatives – the key differentiator being the higher level of protection provided to certain environmental assets and the cooling technologies considered.

In order to draw comparison between the Alternatives on a broad level, the following scale has been used:

Table 3 Differentiator scale for alternatives

Scale	Description
Large Positive	A materially different positive outcome is anticipated compared to EN-8
Positive	A more positive outcome is anticipated compared to EN-8
Neutral	This alternative is anticipated to have the same outcome as EN-8
Negative	A more adverse outcome is anticipated compared to EN-8
Large Negative	A materially different adverse outcome is anticipated compared to EN-8

Cumulative and transboundary effects

The SEA Regulations require consideration of cumulative effects (Schedule 2, Paragraph 6). Cumulative effects on communities and the environment can arise where the effects of several proposed pieces of new energy infrastructure interact. Such effects may be additive, neutralising or synergistic – where the effect of one or more effects acting together is more than the simple sum of the effects when acting alone. For example, a wildlife habitat can become progressively fragmented with limited effects on a particular species until the last

fragmentation makes the habitat too small to support the species anymore. Conversely, progressive small additions of habitats may have limited effects individually until a threshold is reached at which the areas and linkages of habitat contribute positively to green infrastructure aims. Clustering of new developments can have positive synergistic effects on the local economy, upskilling and community vitality but conversely may have negative cumulative effects on landscape, air quality and local amenity. It may be considered that climate change is the ultimate cumulative effect.

The AoS Report for EN-1 to EN-5 considers the likely significant effects of implementing the EN suite of NPSs as a whole with the mix of technologies it includes, as well as the likely specific significant generic effects associated with all major energy infrastructure for each type of technology. Specific effects associated with specific energy technology are detailed for Natural Gas Electricity Generating Infrastructure (EN-2), Renewable Energy Infrastructure (EN-3), Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4) and Electricity Networks Infrastructure (EN-5). The AoS Report for EN-7 does likewise for new nuclear generation – AMR, SMR and GW scale generating facilities post 2025.

The nature (positive or negative) and significance of any cumulative effects is likely to be associated with the number and types of technology specific infrastructure projects and the sensitivities of the receiving communities and environment. As for technology specific EN-2 to EN-5 and EN-7, draft EN-8 does not have any locational specificity and therefore it is difficult to predict any significant cumulative effects. Nonetheless, each energy technology is associated with certain characteristics and an understanding of the potential for cumulative effects was used to identify any key effects and mitigation possibilities.

The significance of cumulative effects may vary with the mix of energy technology projects that is proposed. It is considered that the cumulative effects on certain topics, such as climate change and the economy, may be significant overall at the national level of the NPS, whilst effects on other topics, such as water quality and resources, and biodiversity, are more likely at the regional or sub-regional and local levels. Consideration of interactions and cumulative effects was integral to the appraisal process and addressed in this AoS using professional judgement and evidence from the draft EN-8 NPS, the baseline and the plans/programmes review.

The cumulative effects assessment has been undertaken both individually for draft EN-8 and also considering the cumulative effects between all eight NPSs in combination.

Cumulative effects can also arise due to effects from the NPS combining with effects from other plans and policies. However, due to the strategic and high level nature of draft EN-8 and the energy NPSs and the lack of any locational and specific detail on any infrastructure developments that are likely to be brought forward, as well as that inevitably there is going to be a delay between the adoption of draft EN-8 and the other energy NPSs and any subsequent energy infrastructure development, it is not possible to know when (or indeed if) any subsequent project proposal will come forward and it is not therefore possible to predict what other plans and projects will be relevant to future project assessments. The type of PPPs that

could have cumulative or in-combination effects with infrastructure developed under the NPSs are:

- Applications lodged but not yet determined;
- Projects subject to periodic review;
- Projects authorised but not yet started;
- Projects started but not yet completed;
- Known projects that do not require external authorisation;
- Proposals in adopted plans; and
- Proposals in draft plans formally published or submitted for final consultation, examination or adoption.

Typical types of effects that could lead to cumulative or in-combination effects include (but are not limited to):

- Resilience to climate change;
- Noise, vibration and light disturbance;
- Air, land and water pollution;
- Changes to water quantity / flow and coastal change,
- Landscape;
- Species injury and mortality;
- Changes in habitat extent, composition and structure;
- Health and Wellbeing;
- Sustainable transport; and
- Economy.

Such in-combination effects are more likely to arise when multiple projects have similar impacts; due to effects exceeding the limit of what the relevant sustainability parameters can tolerate and becoming significant effects. Note that projects that include non-energy infrastructure development and smaller scale development that is not an NSIP can also lead to cumulative or in-combination effects and should be considered at the appropriate point. In combination effects can be by virtue of proximity, connectivity and/or timing. The most common combined effects that have been considered in the AoS include additive air quality, water quality/quantity and habitat/species disturbance impacts.

Transboundary effects extend to multiple countries rather than just the UK. Potential transboundary effects from the NPS have been approached in a similar way to other cumulative effects, only that the assessment looks at effects that originate within the UK but have the ability to extend across national borders. Transboundary effects are addressed through Regulation 14 of the SEA Regulations, which requires notification to Member States of the European Union of any Plan or Programme which is considered likely to have significant

effect on the environment of that Member State. Transboundary effects are addressed in this AoS.

Monitoring the effects of implementing the NPS

Monitoring involves measuring indicators which will enable the establishment of a causal link between the implementation of the plan and the likely significant effect (positive or negative) being monitored. It thus helps to ensure that any adverse effects which arise during implementation, whether or not they were foreseen, can be identified and that action can be taken to deal with them. A monitoring programme has been prepared and is presented in this report.

Consultation on this AoS Report

The AoS Report is published for public consultation together with the draft NPS for fusion energy generation (EN-8). Please refer to the consultation document for details.

Next steps

Government will consider comments received during the public consultation, and the NPS will be subject to approval by Parliament before final designation. Upon designation of the NPS, an AoS Post Adoption Statement will be published, and this will outline how the findings of the AoS and the responses to consultation have been taken into account. It will also provide further information on how monitoring of the significant effects of implementing the NPS will be carried out.

Habitats Regulation Assessment

A Habitats Regulations Assessment (HRA) report has been prepared for the draft NPS in a parallel process to the AoS. The HRA report is subject to public consultation alongside the draft NPS and this AoS report.

In England and Wales, under the Conservation of Habitats and Species Regulations 2017 (as amended), as well as the Conservation of Offshore Marine Habitats and Species Regulations 2017 (together known as the ‘Habitats Regulations’) an ‘Appropriate Assessment’ is required to be undertaken on proposed plans or projects are likely to have a significant effect on a Habitat Site either individually, or in combination with other plans or projects.

European Sites include Special Areas of Conservation (SACs), originally designated under European Council Directive 92/43/EEC (referred to as the Habitats Directive), and Special Protection Areas (SPAs), originally designated under the Conservation of Wild Birds Directive (Council Directive 2009/147/EC (which codifies Directive 79/409/EEC)) for rare, vulnerable and

regularly occurring migratory bird species and internationally important wetlands. As a matter of Government policy listed or proposed Ramsar sites, potential SPAs (pSPA), candidate SACs (cSAC) and sites identified, or required, as compensatory measures for adverse effects on habitats sites, pSPAs, cSACs and listed or proposed Ramsar sites, are treated in the same way as European Sites. Hereafter, all the above sites are referred to as European Sites.

Therefore, a HRA report was prepared for the draft NPS and considers the potential effects of designating the draft NPS on European sites.

It is important to note that the Habitats Regulations require assessment of the NPS as a plan and as such the HRA has been undertaken on that basis – this does not remove the requirement for detailed project level HRA to be undertaken at development consent stage. At this point, there are no specific sites, allocations or any spatial component to the draft NPS. Therefore, the HRA has purely focused on the policy content within the draft NPS and has been applied in a manner which is consistent with the non-spatial, strategic nature of the draft NPS which does not identify locations to construct new nationally significant infrastructure related to fusion energy generation (of whatever technology).

The HRA of the draft NPS noted that while the lack of spatial information within the draft NPS made it impossible to reach certainty on the effect of the plan on the integrity of any European Site, the potential for proposed fusion energy infrastructure projects of the kind contemplated by draft EN-8 to have adverse effects on the integrity of such sites cannot be ruled out, based on following the precautionary principle. The HRA explains why the Government considers that draft EN-8 is, nevertheless, justified by imperative reasons of overriding public interest, while noting that its conclusions are only applicable at the NPS level and are without prejudice to any project-level HRA, which may result in the refusal of consent for a particular application.

Scope of the AoS

Technical scope

This AoS considers the technology of fusion energy infrastructure as defined in draft EN-8.

The AoS has a very wide remit and will consider the following topics associated with the SEA Regulations which require that the likely significant effects on the environment are assessed, considering the following factors and interrelationship between them:

- Biodiversity;
- Population;
- Human health (covering noise, vibration and light issues among other effects on local communities and public health);
- Fauna and flora;
- Soil;
- Water;
- Air;
- Noise;
- Climatic factors (covering GHG emissions and adaptation to climate change);
- Material assets (covering infrastructure, waste and other assets);
- Cultural heritage[6] including architectural and archaeological heritage; and
- Landscape.

In addition, SA guidance requires the consideration of socio-economic factors alongside the environmental factors identified above.

Building on the SA/SEA themes above, and having considered the nature of the sustainability effects potentially arising from a Fusion NSIP in the UK and in neighbouring countries, this AoS covers the following topics:

- Biodiversity;
- Geodiversity;
- Greenhouse Gas Emissions;
- Adaptation to a Changing Climate;
- Air Quality and Noise;

[6] Please note that the NPS refers to the term ‘historic environment’, which reflects feedback from Natural England provided during the development of draft EN-8. However, the AoS uses the term ‘Cultural Heritage’ as this is as used in the SEA Regulations and is a wider concept (covering aspects such as language and art).

- Water Resources and Quality;
- Soil and Contaminated Land;
- Historic Environment;
- Landscapes, Waterscapes and Townscapes;
- Resources and Waste;
- Economic Activity, Opportunities and Deprivation;
- Population Growth and Demographics;
- Communities: Physical Infrastructure; and
- Communities: Physical Health and Mental Wellbeing.

The AoS of EN-1 concluded that unintended release of radiation from nuclear power stations may result in transboundary effects. This is not the same for fusion power plant due to the type of reactions being used (no risk of an uncontrollable chain reaction) and the considerably smaller radiological fusion inventory of fusion energy infrastructure in comparison with a similar capacity nuclear power station. The safety characteristics of fusion and compliance with the UK's robust legislative and regulatory regime means that the risk of radiological health detriment posed by fusion energy infrastructure (both during normal operation and as a result of an unplanned release) is extremely small.

In the UK, the regulatory bodies will need to be satisfied that the radiological and other risks are as low as reasonably practicable and within the relevant radiological risk limit.

Fusion energy facilities are principally regulated by the Health and Safety Executive (HSE) and the relevant environment agency - the Environment Agency (EA) in England and Natural Resources Wales (NRW) in Wales.[7]. A fusion energy facility will not be allowed to operate without compliance with emergency planning regulations and robust safety measures in place. For example, operators are required to prepare measures for off-site emergencies through the Radiation (Emergency Preparedness and Public Information) Regulations 2019 (REPPIR 2019).

Data and assessment limitations

It is considered that the datasets available provide a comprehensive overview of sustainability issues across the United Kingdom (particularly England and Wales) in respect of the technical scope of the NPS. However, it is to be noted that the scale of the assessment (applying to England and Wales as a whole) means that regional or local variations are not discernible. As such, assessments are high level and strategic in scale.

[7] It is also to be noted that there may be other regulatory bodies involved depending upon the specific geographical location of potential impacts, or activities involved. This could include for example, the Scottish Environmental Protection Agency (SEPA), or the Office for Nuclear Regulation (in respect of the transport of radioactive material) or the Marine Management Organisation (in respect of impacts to marine areas). Note that some activities are regulated by ONR irrespective of location.

One further limitation of the assessment relates to the non-spatial nature of draft EN-8. As draft EN-8 does not prescribe the location for new fusion energy infrastructure projects, there are limitations in terms of appraising those effects that are site specific in nature. This is not to exclude the possibility that they could be significant but rather to indicate that such effects may only be effectively judged as significant at the project level (for example, increases in noise or vibration levels from a new access road affecting a local housing settlement). This explains why effects that may be quite intensely felt at local level do not always register as strategically significant in the scoring of the assessment.

Note that due to inherent uncertainty in assessment associated with the non-spatial nature of draft EN-8, a precautionary approach has been taken to findings set out in the AoS.

The assessment of project level effects will be given full consideration at the application for development consent, as detailed in the NPS, particularly through Environmental Impact Assessment (EIA), and, where relevant, Habitats Regulations Assessment (HRA).

Geographic scope

The AoS applies to the same geographical area of the NPS – namely England and Wales, although in certain circumstances elements will apply to Scotland. Where applicable, assessments are made for a variety of expected sustainability effects within these geographical areas. Consideration will also be made in the AoS of the potential for transboundary effects (i.e. on other surrounding countries to the United Kingdom).

Draft EN-8 is non-spatial in its application. As such, potential effects have been considered across a range of geographic scales (including international, UK, regional and local) and for transboundary effects extending beyond the geographical boundary of the draft NPS to other nation states.

However, as the draft NPS does not prescribe the location for new fusion energy infrastructure projects, there are limitations in terms of appraising those effects that are site specific in nature.

The assessment of project level effects will be given full consideration at the application for development consent, as detailed in EN-1, particularly through Environmental Impact Assessment (EIA), and, where relevant, Habitats Regulations Assessment (HRA).

Temporal scope

Once adopted, the NPS will remain in force unless withdrawn or suspended in whole or in part by the Secretary of State. It is to be noted that the adopted NPS will be subject to review (at least every 5 years) in order to ensure it remains appropriate.

While experimental fusion energy technology is now well-developed, the fusion energy infrastructure currently being developed are all prototypes. The precise technologies and

timeframes of fusion energy infrastructure are therefore not known. It is to be noted that the aim is to complete the construction of STEP in 2040 and it is the ambition of private fusion companies to deliver commercial fusion facilities in the 2030s. To deliver against these timescales, construction of these facilities will need to start this decade (prior to 2030) and as such, sites will need to be identified in the next few years.

The AoS considers the full lifetime of any individual fusion energy infrastructure which might arise from the adopted EN-8 and that includes the construction, operation and decommissioning stages, as well as any need for on-site storage of radioactive material.

For the purposes of the AoS, the following is proposed to be considered for each fusion energy infrastructure within the scope of draft EN-8, irrespective of specific fusion technology:

A period of up to 150 years in relation to any site which is proposed for development of a new fusion energy infrastructure site. This period is based on the following assumptions (although it is recognised that there may be some variations within this):

- Construction: up to ten years
- Operation: Approximately 40 years
- Decommissioning (including any radioactive material storage): up to 100 years after operation, including an initial decay period, dismantling and possibly some continued radioactive material storage after the main decommissioning actions have been performed. The main decommissioning actions (e.g., dismantling) is assumed to take up to approximately 30 years. The initial decay period will depend upon materials and activation levels. Different decay periods might be used for different materials/components.

In relation to assessment of fusion energy infrastructure, short term is considered to be up to ten years, coinciding with construction period. Medium term is considered to be 40 years, coinciding with operation, and long term covers the periods of decommissioning (including any radioactive material storage), potentially lasting up to 100 years.

Policy context, baseline, issues and framework

Review of Policies, Plans and Programmes (PPP)

The SEA Regulations requires a report containing:

'*an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes*'. (Schedule 2, Paragraph 1)

'*The environmental protection objectives, established at international, (European) Community or Member State level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation*'. (Schedule 2, Paragraph 5)

Summary of PPP reviewed

The review of PPP is a valuable element of the AoS process as it assists with the identification of environmental, social and economic objectives of other relevant PPP that will guide:

- The identification of sustainability issues and opportunities pertinent to the draft fusion energy NPS EN-8;
- The development of the AoS framework to be used in the assessments of the draft fusion energy NPS EN-8 which will comprise Sustainability Objectives and associated Decision Aid Questions;
- The identification of planning and thematic guidance across sustainability topics which may shape draft NPS policy approaches as advocated by the AoS; and
- The identification of any clear early potential conflicts or challenges between the PPP and planning and thematic guidance with the emerging NPS policy which is the subject of the AoS process.

The international and national PPP that have been reviewed are listed below and details of the key PPP are presented in Appendix D. It is to be noted that the list of PPP reviewed has been expanded from that set out at AoS Scoping stage, in order to ensure the consideration of the most up to date PPPs.

INTERNATIONAL

Cross – thematic

- UNEP Nature-Based Solutions for Climate Change Mitigation 2021
- Nature-Based Solutions for Climate Adaptation 2024

Biodiversity

- Convention on Biological Diversity 2010
- Post-2020 Global Biodiversity Framework (first draft, 2021)
- Berne Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention) 1989
- Ramsar Convention 1971
- Convention on the Conservation of Migratory Species of Wild Animals 1979 (Bonn Convention)
- Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)

Climate Change

- UN Framework Convention on Climate Change 1992, Kyoto Protocol 1997, Paris Agreement 2015 etc.
- UK-EU TAC Agreement 2021

Heritage

- World Heritage Convention 1972
- Convention on the Protection of Underwater Cultural Heritage 2001
- Convention on the Protection of the Archaeological Heritage (1992) – the 'Valetta Convention'

Landscape

- European Landscape Convention 2000 – the 'Florence Convention'

Marine Environment

- The OSPAR Convention 1992 (Convention for the Protection of the Marine Environment of the North-East Atlantic)
- The UN Convention for the Law of the Sea 1982 (UNCLOS)
- The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London convention)
- 1996 Protocol to The Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (London Protocol 1996)

Noise

- WHO Guidelines for Community Noise 1999
- WHO Night Noise Guidelines for Europe 2009
- WHO Environmental Noise Guidelines for the European Region 2018

Human Health

- WHO Closing the Gap: Social Determinants of Health 2008

Transboundary effects

- Espoo Convention on Environmental Impact Assessment in a Transboundary Context 1991

Public Consultation

- Aarhus Convention 2001

NATIONAL

Cross – thematic

- Environmental Protection Act 1990
- Environment Act 2021
- Clean Growth Strategy 2017
- UK Sustainable Development Strategy 2005
- UK Shared Framework for Sustainable Development; One Future – Different Paths 2005
- The Planning Act 2008
- Environmental Permitting (England and Wales) Regulations 2016
- The Town and Country Planning and Infrastructure Planning (Environmental Impact Assessment) (Amendment) Regulations 2018
- Localism Act 2011
- Environmental Assessment of Plans and Programmes Regulations 2004
- Planning Practice Guidance – Natural Environment 2019

Biodiversity

- Wildlife and Countryside Act 1981
- Countryside and Rights of Way Act 2000 (CROW Act)
- Conservation of Habitats and Species Regulations 20170 as amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019
- National Pollinator Strategy 2014-2024
- The Great Britain Invasive Non-native Species Strategy 2023
- The Invasive Alien Species (Enforcement and Permitting) Order 2019
- National Parks and Access to Countryside Act 2006
- Natural Environment and Rural Communities Act 2006
- The Economics of Biodiversity: The Dasgupta Review, 2021
- National Forest Inventory
- Local Nature Recovery Strategies Policy Paper June 2023

Air Quality

- Air Quality Standards Regulations 2010 as amended by The Air Quality (Amendment of Domestic Regulations) (EU Exit) Regulations 2019
- Air Quality Strategy: framework for local authority delivery 2023
- Clean Air Strategy 2019
- Air Quality Plan for Nitrogen Dioxide in the UK 2017
- National Emission Ceilings Regulations 2018
- Air Pollution: Action in a Changing Climate (Defra, 2010)

Climate Change

- Unlocking the benefits of the clean energy economy 2025
- Climate Change Act 2008 and its 2050 Target Amendment Order, 2019
- UK Net Zero Strategy 2021
- The Road to Zero 2018
- UKCP18
- Industrial Decarbonisation Strategy 2021
- National Infrastructure Strategy 2020
- National Infrastructure Assessment 2023
- Planning Practice Guidance – Climate Change 2019
- Climate, people, places and value design principles for national infrastructure, National Infrastructure Commission, 2021
- Independent Assessment of UK Climate Risk, Committee on Climate Change 2021

Heritage

- Historic Buildings and Ancient Monuments Act 1953
- Heritage Protection for the 21st Century 2007
- Ancient Monuments and Archaeological Areas Act 1979
- Protection of Military Remains Act 1986
- National Heritage Act 1983 (as amended 2002)
- The Protection of Wrecks Act 1973
- Government Heritage Statement 2017
- Planning (Listed Buildings and Conservation Areas) Act 1990
- National Parks and Access to the Countryside Act 1949

Landscape

- National Parks and Access to the Countryside Act 1949

- Norfolk and Suffolk Broads Act 1988
- Environment Act 1995
- Countryside and Rights of Way Act 2000 (CROW Act)
- Levelling up and Regeneration Act 2023
- Hedgerow Regulations Act 1997
- UK Peatland Strategy 2018 – 2040
- Making Space for Nature 2010
- Geoconservation: Principles and practice 2023 (NE802)

Water Environment

- Water Resources Act 1991
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

  Flood and Water Management Act 2010
- Urban Wastewater Treatment Regulations 1994
- Water Industry Act 1991
- Storm Overflow Discharge Reduction Plan
- Reservoirs Act 1975
- Water Resources Infrastructure National Policy Statement
- River Basin Management Plans
- Flood Risk Management Plans
- Local Flood Risk Management Strategies
- Salmon and Freshwater Fisheries Act 1975
- Eels (England and Wales) Regulations 2009
- Shoreline Management Plans
- Fisheries Act 2020
- Marine and Coastal Access Act 2009
- The Marine Works (Environmental Impact Assessment) Regulations 2007
- UK Marine Policy Statement 2011
- Relevant marine plans
- UK Marine Strategy
- Marine strategy part one: UK updated assessment and Good Environmental Status, 2019
- Marine Strategy Part 2, 2021

- Marine strategy part three: UK programme of measures

Noise

- Environmental Noise (England) Regulations 2006 (as amended)
- JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys 2017
- JNCC Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise 2010
- Reducing marine noise Policy Paper
- Planning Practice Guidance for Noise
- Environmental Protection Act 1990 (Part III)
- Control of Pollution Act 1974
- The Noise Insulation Regulations 1975 (as amended)
- The Noise Insulation (Railways and Other Guided Transport Systems) Regulations 1996
- British Standards related to noise (BS 4142, BS 6472, BS 8233 and BS 5228)

Transport

Decarbonising Transport: A Better, Greener Britain 2021

Energy

- The Energy White Paper 2020
- The Ten Point Plan for a Green Industrial Revolution 2020
- British Energy Security Strategy 2022
- Nuclear Energy in the UK 2022
- Energy Innovation Programme (EIP) (2015-2021)
- Net Zero Innovation Portfolio and Advanced Nuclear Fund (2021-2025)
- Powering up Britain: The Net Zero Growth Plan 2023
- Managing radioactive substances and nuclear decommissioning policy: government response 2024

Radioactive Waste

- Implementing Geological Disposal – Working with communities 2018
- Closed Consultation: Managing Radioactive Substances and Nuclear Decommissioning

DEVOLVED ADMINISTRATIONS / LOCAL

England

Cross - thematic

- 25 Year Environment Plan 2018
- Environmental Improvement Plan 2025
- National Planning Policy Framework 2025
- Environmental Damage (Prevention and Remediation) (England) Regulations 2015 as amended by The Environmental Damage (Prevention and Remediation) (England) (Amendment) Regulations 2019
- MMO Marine Character Areas 2018
- Natural England Geoconservation: Principles and Practice (NE802) 2023.

Biodiversity and Green infrastructure

- Biodiversity 2020: A strategy for England's wildlife and ecosystem services
- The Town and Country Planning (Trees Preservation) (England) Regulations 2012
- The Environmental Targets (Biodiversity) (England) Regulations 2022
- The Environmental Targets (Woodland and Trees Outside Woodland) (England) Regulations 2022
- England Trees Action Plan 2021-2024
- Government Forestry and Woodlands Policy Statement 2013
- 30x30 Government Commitment 2020
- Nature for Climate Fund
- The Green Book, Central government guidance on appraisal and evaluation 2022
- Natural England Green Infrastructure Framework
- Natural England's Green Infrastructure Standards for England 2023
- Natural England's climate change risk assessment and adaptation plan 2021 (published 2022). Climate change adaptation reporting: third round.
- Nature Networks Evidence Handbook (NERR081) Natural England 2020
- The Environmental Benefits from Nature Tool - Beta Test Version, Natural England 2021
- The Statutory Biodiversity Metric Calculation Tool, Defra 2023
- Carbon Storage and Sequestration by Habitat, Natural England 2021
- Climate Change Adaptation Manual. Evidence to support nature conservation in a changing climate, RSPB, Natural England, 2020
- Local Nature Recovery Strategies Policy Paper June 2023

- The Biodiversity Gain Requirements Regulations 2024
- Making Space for Nature 2010
- Defra Policy paper: Notice of designation of sensitive catchment areas 2024
- England Peat Action Plan 2021
- Nature Recovery Network, Defra and Natural England 2024
- Delivering 30by30 on land in England 2023
- Enabling a Natural Capital Approach guidance 2025
- Management of Hedgerows (England) Regulations 2024

Landscape

- National Character Areas (England), Natural England 2023
- English National Parks and Broads UK Government Vision and Circular 2010

Water Environment

- National Flood and Coastal Erosion Risk Management Strategy for England 2020
- The Environmental Targets (Water) (England) Regulations 2022
- The Environmental Targets (Marine Protected Areas) Regulations 2022

Air Quality

- The Environmental Targets (Fine Particulate Matter) (England) Regulations 2022

Human Health

- Public Health England – Strategy (2020-2025)
- Contaminated Land (England) Regulations 2006 as amended by the Contaminated Land (England) (Amendment) Regulations 2012

Soils

- Safeguarding our Soils: a strategy for England 2009
- Healthy Soils

Waste

- Waste (England and Wales) Regulations 2011 as amended by The Waste (England and Wales) (Amendment) Regulations 2014
- National Review of Waste Policy in England 2011
- Waste Management Plan for England 2021
- Waste Prevention Programme for England 2023.
- Resources and Waste Strategy for England, DEFRA and Environment Agency 2018
- National Planning Policy for Waste 2014
- The Environmental Targets (Residual Waste) (England) Regulations 2022

Noise

- Noise Policy Statement for England 2010
- Environmental Noise (England) Regulations 2006 as amended by The Environmental Noise (England) (Amendment) Regulations 2018

Wales

Cross – thematic

- Environmental Damage (Prevention and Remediation) (Wales) Regulations 2009
- Future Wales – The National Plan 2040
- Environment (Wales) Act 2016
- Wellbeing of Future Generations (Wales) Act 2015
- State of Natural Resources Report (SoNaRR) for Wales 2020
- Environment (Wales) Act 2016
- Natural Resources Policy (Welsh Government) 2017
- State of Natural Resources Report (SoNaRR) for Wales 2020
- Planning Policy Wales (Edition 11, 2021)
- Welsh National Marine Plan 2019
- One Wales: One Planet – the Sustainable Development Scheme for Wales 2009
- Welsh Government Rural Communities - Rural Development Programme (2014-2020)
- TAN 5: Nature Conservation and Planning 2009
- TAN 6: Planning for Sustainable Rural Communities 2010
- TAN 11: Noise 1997
- TAN 13: Tourism 1997
- TAN 15: Development, Flooding and Coastal Erosion 2021
- TAN 16: Sport, Recreation and Open Space 2009
- TAN 18: Transport 2007
- TAN 21: Waste 2014

Climate Change

- The Climate Change Strategy for Wales 2010
- Net Zero Wales: Carbon Budget 2 (2021 – 2025)
- Policy Statement on Local ownership of energy generation in Wales – benefitting Wales today and for future generation
- Prosperity for All: A Climate Conscious Wales 2019

- Adapting to Climate Change: Guidance for Flood and Coastal Erosion Risk Management Authorities in Wales 2022

Waste

- The Waste (Miscellaneous Provisions) (Wales) Regulations 2012
- Welsh Government Policy on the Management and Disposal of Higher Activity Waste

Biodiversity

- The Town and Country Planning (Trees) (Amendment) (Wales) Regulations 2017
- The Town and Country Planning (Development Management Procedure) (Wales) Order 2012 as amended by The Town and Country Planning (Development Management Procedure) (Wales) (Amendment) Order 2017
- Woodlands for Wales 2018

Contaminated Land

- The Contaminated Land (Wales) Regulations 2006 as amended by the Contaminated Land (Wales) (Amendment) Regulations 2012

Noise

- Environmental Noise (Wales) Regulations 2006
- Welsh Government Noise and Soundscape Plan for Wales 2023 to 2028
- Noise and Soundscape Action Plan 2018 to 2023: The Welsh Government's overarching policy on noise

Heritage

- Historic Environment Act (Wales) 2016
- The Welsh Historic Environment Strategic Statement: Action Plan 2010

Water Environment

- Water Strategy for Wales 2015
- Flood and Water Management Act 2010
- National Strategy for Flood and Coastal Erosion Risk Management in Wales 2020
- Welsh National Marine Plan (Welsh Government 2019)
- Flood Consequence Assessments: climate Change Allowances 2021
- Shoreline Management Plans applicable in Wales

Landscape

- Valued and Resilient: The Welsh Government's Priorities for Areas of Outstanding Natural Beauty and National Parks (July 2018)

Energy

- Nuclear Energy in Wales (Third Report of Session 2022-2023).

- Natural Wales Resources Technical Guidance

Transport

- Llwybr Newydd: the Wales Transport Strategy 2021

Scotland

Cross – thematic

- Town and Country Planning (Environmental Impact Assessment) (Scotland)
- The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013
- National Planning Framework 4 (2023)
- Planning Advice Note (PAN) 3/2010 Community Engagement
- PAN 33 Development of Contaminated Land (Revised Oct 2000)
- PAN 51 Planning, Environmental Protection and Regulation (Revised 2006)
- PAN 2/2011 Planning and Archaeology
- PAN 71 Conservation Area Management
- PAN 60 Planning for Natural Heritage
- PAN 1/2011 Planning and Noise
- PAN 61 Waste Management Planning 2001

Biodiversity

- The Nature Conservation (Scotland) Act 2004 (Authorised Operations) Order 2011
- Scottish Biodiversity Strategy to 2045 (2022)
- Wildlife and Natural Environment (Scotland) Act 2011 (as amended)
- Scotland's Forestry Strategy (2019-2029)
- Forestry and Land Management (Scotland) Act 2018
- Forestry (Felling) (Scotland) Regulations 2019
- Control of Woodland Removal 2012
- The Town and Country Planning (Tree Preservation Order and Trees in Conservation Areas) (Scotland) Regulations 2010

Waste

- The Waste (Scotland) Regulations 2014
- Scotland's Zero Waste Plan 2010
- Management and Disposal of Higher Activity Waste

Air Quality

- The Air Quality Standards (Scotland) Regulations 2010
- The Air Quality (Scotland) Amendments Regulations 2016
- Cleaner Air for Scotland – the Road to a healthier future (the Scottish Government 2015)

Contaminated Land

- Contaminated Land (Scotland) Regulations (2000 and 2005)

Noise

- Environmental Noise (Scotland) Regulations (2006) (as amended)

Climate Change

- Climate Change (Scotland) Act 2009
- Climate Change (Emissions Reduction Targets) (Scotland) Act 2019
- Securing a Green Recovery on a Path to Net Zero: climate change plan (2018–2032 – update)
- Climate Ready Scotland Scottish Climate Change Adaptation Programme (2019-2024)

Water Environment

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011
- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017
- Scotland's National Marine Plan 2015
- The Marine Scotland Act 2010

Energy

- Scottish Energy Strategy: The Future of Energy in Scotland 2017

Northern Ireland

Cross – thematic

- Environment Strategy for Northern Ireland 2023

Marine Environment

- Marine Plan for Northern Ireland 2022

Climate Change

- The Path to Net Zero Energy: Secure, Affordable, Clean 2021
- Climate Change Act (Northern Ireland) 2022
- Management and Disposal of Higher Activity Waste

Environment themes

The review of PPPs revealed a large number of common themes in terms of their objectives relating to sustainability within the context of strategic development planning. These are listed below:

Biodiversity and the Natural Environment

- Protect and enhance sites designated for nature conservation purposes (including candidate and potential sites).
- Protect irreplaceable habitats such as Ancient Woodland, Ancient and Veteran trees and Lowland FensProtect and enhance irreplaceable habitats such as Ancient Woodland, Ancient and Veteran trees and Lowland Fens.
- Increase priority habitats and available habitat for protected species.Protect and enhance endangered or important species and habitats and irreplaceable habitats
- Support the delivery of biodiversity strategies and plans.
- s.
- Protect, maintain and where possible enhance natural habitat networks and green infrastructure, to avoid fragmentation and isolation of networks.
- Deliver multi-functional Green and Blue Infrastructure – note this will also have implications in addition to biodiversity across a range of themes such as climate change, air quality, water quality, health, wellbeing and so on.
- Support ecosystem resilience.
- Reduce the problem of Invasive Non Native Species, including eradication and prevention of spread.
- Ensure achievement of Biodiversity Net Gain, with a minimum 10% required for new development on land.
- Protect marine ecosystems and biodiversity.
- Protect blue carbon habitats and sediments.
- Support the long-term biodiversity target for species' extinction risk in England which is to reduce the risk of species' extinction by 2042, when compared to the risk of species' extinction in 2022.
- Support the long term target of at least 16.5% of all land in England covered by woodland and trees outside woodland by end of 2050.
- Ensure the achievement of Environment Net Gain.

Geodiversity & Coastal processes

- Protection of sites designated for geodiversity importance.

- Improve access to sites of geodiversity interest.
- Maintenance of natural shoreline processes / management of shorelines.

Greenhouse Gas Emissions

- Reduce GHG emissions, particularly CO2.
- Maximise the use of renewable energy.
- Minimise embedded carbon in development.
- Encourage green infrastructure to help with carbon sequestration.
- Increase energy efficiency and make use of new technology.
- Minimise use of fossil fuels.
- Contribute to the achievement of Net Zero Carbon target.

Adaptation to a Changing Climate and Flooding

- Prepare for extreme weather events and sea level rise – with worst case scenarios being appropriate for fusion energy infrastructure development.

Minimise the risk and impact of flooding

- Avoid development in floodplains when possible.
- Steer development away from areas at high risk of flooding and make development safe for its lifetime without increasing flood risk elsewhere.
- Help meet objectives of Flood Risk Management Plans allowing for climate change.
- Utilise Natural Flood Management.

Air Quality & Noise

- Reduce effects of air pollution on people and the environment
- Do not exacerbate air pollution in existing AQMA and do not cause additional AQMA to be designated.
- Reduce emissions of NO2Reduce emissions of PM10 and PM2.5.
- Reduce emissions in relation to all relevant chemicals, including derivatives of NoX, ammonia and in relation to nitrogen deposition, acid deposition and particulates (due to transport).).
- Increase use of low emission / zero emission at point of use vehicles.

- Increase convenience and use of sustainable transport modes, including for construction.
- Encourage use of green infrastructure to address pollution distribution and improve local air quality
- Reduce effects of noise (and vibration) on people and the natural environment including underwater.
- By the end of 31st December 2040 the annual mean level of PM2.5 in ambient air must be equal to or less than 10 μg/m³ (in England).

Water Resources

- Protect and improve the quality of groundwater, inland surface water, transitional waters, coastal and marine waters.
- Ensure sufficient water resources are available for locating fusion energy facilities. Note specific groundwater protection may be required for certain fusion energy facilities.
- Help to meet objectives of the Water Framework Directive (WFD) and the relevant River Basin Management Plan, as well as Shoreline / Estuarine Management Plans and Special Protection Zones.
- Consider how climate change may alter rainfall patterns and water availability.
- Make use of Sustainable Drainage Systems (SuDS).

Land Use, Soil and Agriculture

- Recognise finite nature of soil.
- Protect peat soils.

Prioritise development on brownfield sites.

- Seek to reclaim derelict and contaminated land, note that brownfield sites can support more biodiversity than the greenfield sites at times
- Protect farmland and soils – particularly those of the Best and Most Versatile agricultural land.
- Ensure the sustainable management, storage and use of soils during construction.

Cultural Heritage

- Conserve and protect historic assets (designated and undesignated) and those of cultural note.

- Increase awareness of buried archaeology / unknown heritage – recognise that some historic assets can be offshore.
- Protect and enhance the setting of cultural heritage assets – this can include at a landscape scale.
- Improve access to historic assets, including buildings and landscapes of value where appropriate.
- Sympathetic design and use of vernacular architecture when appropriate to enhance the local character and 'sense of place.'

Landscapes and Townscapes

- Protect those areas designated or recognised for landscape value, including on a local scale.
- Protect and enhance landscape and townscape character and local distinctiveness, including those areas with a sense of wildness and remoteness.
- Protect tranquillity from noise and light pollution.
- Consider how landscape planning can act in a cross-cutting fashion e.g. carbon sequestration.
- Foster good design quality for all new development.
- Promote access to good quality landscapes and wellbeing infrastructures including Soundscape opportunities.
- Promote regeneration of previously developed land when appropriate.
- Ensure compliance with the duty in the Levelling Up and Regeneration Act to further the purposes of protected landscapes, actively supporting their conservation and enhancement.

Natural Resources and Waste

- Ensure efficient resource use and minimise resource footprint.
- Use secondary and recycled materials.
- Consider opportunities to maximise on-site re-use of materials.
- Employ waste reduction methods to minimise construction and maintenance waste.
- Reduce the amount of waste disposed of at landfill.
- Provide for safe and secure short term radioactive waste storage.
- Promote circular economy.
- Long-term target to ensure that the total mass of residual waste per head of population in England does not exceed 287 kilograms by 31st December 2042.

Economic themes

- Improve physical accessibility to jobs through the location of employment sites and transport links close to areas of high unemployment.
- Widen the number and range of accessible employment opportunities and support growth in employment and labour productivity.
- Improve attractiveness for inward investment.
- Improve rail and road journey reliability for business users.
- Support local businesses and local supply chain.
- Support enhancement of local economy and overall prosperity.
- Support development of the skills base through training and apprenticeships.
- Build / encourage opportunities for clusters of related industries, services and research to develop around fusion energy facilities.

Social themes

- Distinctive development that recognises, reflects and enhances the ‘sense of place’ and ‘sense of community.’
- Self-sufficient, resilient and adaptable communities.
- Communities that will develop roots and connections between people.
- Access to social facilities – community, cultural, health and leisure / recreational.
- Access to transport with an emphasis on active, low carbon and sustainable modes.
- Access to and provision of modern and robust infrastructure.
- Access to Open Space and Green Infrastructure.
- Access to educational, training and employment opportunities.
- Access to natural green space.
- Protect public rights of way including national trails and the King Charles III England Coast path.

Baseline information and key issues

The SEA Regulations require identification and characterisation of '*the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme*'. (Schedule 2, Paragraph 2); '*the environmental characteristics of areas likely to be significantly affected*'. (Schedule 2, paragraph 3) and '*any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of particular environmental importance, such as areas designated pursuant to Directive 79/409/EEC and 92/43/EEC'*. (Schedule 2, Paragraph 4)

This section sets out an overview of the baseline information used to help inform development of the updated AoS framework and the assessment of the draft NPS. The AoS has been undertaken to assess national implications of draft EN-8 and the approach to the baseline data collation process that has been adopted involved the collation of higher-level national data. Appendix E sets out national baseline information that has been collated. An overview of national information for each topic is as follows.

Table 4 Summary of national baseline information

Topic	Baseline information (national)
Climate Change & Greenhouse Gas Emissions	Distribution of greenhouse gas emissions Contribution of sectors to greenhouse gas emissions Predicted changes to temperature and weather patterns
Biodiversity and Ecosystems	Special Protection Areas Special Areas of Conservation Ramsar sites National Nature Reserves and Local Nature Reserves Sites of Special Scientific Interest (England, Scotland, Wales) and Areas of Special Scientific Interest (Northern Ireland) Marine Conservation Zones (England, Wales, Northern Ireland) – note these also align with Highly Protected Marine Areas (HPMAs)

Topic	Baseline information (national)
	Nature Conservation Marine Protected Areas (Scotland) Ancient Woodland Priority Habitat Biosphere Reserves Chalk Rivers (England only) Biodiversity Targets Protected Species Nature Recovery Network Climate change adaptation risk and opportunities for biodiversity Local Nature Recovery Strategies
Communities – Population, Employment, and Viability	Population Location of major settlements and areas of population Working age population Unemployment Economic Activity Rates
Communities – Supporting Infrastructure	Location of strategic rail links Location of strategic road network Location of airports Location of ports Gas Network High Voltage Electricity Network Offshore Wind Farms

Topic	Baseline information (national)
	Nuclear Power Stations
Health and Wellbeing	Radioactivity levels in the environment The Index of Multiple Deprivation (England) The Scottish Index of Multiple Deprivation The Welsh Index of Multiple Deprivation Northern Ireland Multiple Deprivation Measure The Measuring National Well-Being Programme The People and Nature Surveys for England Open Green Space National Trails (England and Wales), Scotland's Great Trails Country Parks National Cycle Networks Coastal Paths (See also Air Quality and Noise below)
Historic Environment	World Heritage Sites Scheduled Monuments Historic Battlefields Parks and Gardens Protected Wrecks Listed Buildings Conservation Areas Historic Landscape Characterisation Areas of Archaeological Importance

Topic	Baseline information (national)
	Heritage at Risk Registered Historic Landscape
Landscape, Townscape, and Seascape	National Parks National Landscapes (formerly known as Areas of Outstanding Natural Beauty) in England, Wales and Northern Ireland, as well as National Scenic Areas (Scotland) Heritage Coasts (England and Wales) National Character Areas (England) Seascape Character Areas (England and Wales) Green Belt Local Landscape Character Assessments Local Landscape Sensitivity Assessments
Air Quality	Air Quality Management Areas Noise Important Areas Air Pollution Information System
Soils, Geology, and Land Use	Sites of Special Scientific Interest (England, Scotland, Wales) and Areas of Special Scientific Interest (Northern Ireland) National Soil Map Contaminated Land UNESCO Global Geoparks Agricultural Land Classification Peat soils location

Topic	Baseline information (national)
Water Quality and Resources	Water Framework Directive (WFD) ecological and chemical status River Basin Management Plans Bathing Water Quality Marine Strategy Framework Directive environmental status Groundwater Source Protection Zones Drinking Water Protected Areas
Flood Risk and Coastal Change	Flood Zones (England, Scotland, Wales) and Flood Risk Areas (Northern Ireland) Location of Fluvial and Tidal Floodplains and Shoreline Management Plans Shoreline Management Plans Predicted changes to temperature and weather patterns
Resources and Waste	Sector waste statistics Active Landfill Sites Mineral safeguarding and exploration zones Exploration Licences

Note that baseline data have been predominantly compiled through interpretation of open source, official and readily available data and statistics and includes, where relevant, the interpretation of Geographic Information Systems spatial data. While baseline review and data searches have been undertaken through 2025 in order to provide a comprehensive basis from which to develop the updated AoS Framework, it is to be recognised that some sources are subject to infrequent review, maintenance or update. Where available, source publishing dates or ‘last updated’ dates have been included in the baseline update and reference provided as footnotes.

Appendix E is supported by a range of figures set out in Appendix F which show the geographical distribution of some of the key designations and land uses across England and Wales. Table 5 provides a summary of the data presented on these figures. Note that mapping is available and has been considered for Scotland and Northern Ireland, but due to size it is not provided. An indication is provided in brackets of whether an information layer only applies to a specific part of the UK.

Table 5 Key designations and land use across the United Kingdom

Figure	Key designations / land use considered
Figure 1: **Biodiversity and Ecosystems**	Special Protection Areas Special Area of Conservation Ramsar sites Sites of Special Scientific Interest (England, Scotland, Wales) Areas of Special Scientific Interest (Northern Ireland) National Nature Reserves Ancient Woodland Inventory (England and Scotland) Marine Conservation Zones (England, Wales, Northern Ireland) Nature Conservation Marine Protected Areas (Scotland) Biosphere Reserves
Figure 2: **Infrastructure**	Location of urban areas Location of strategic rail links Location of strategic road network Location of airports Location of ports
Figure 3: **Historic Environment**	Protected Wrecks (England, Wales, Northern Ireland) Historic Marine Protected Areas (Scotland)

	World Heritage Sites Scheduled Monuments (England, Wales and Scotland) Scheduled Historic Monuments (Northern Ireland) Historic Battlefields Historic Parks and Gardens
Figure 4: **Landscape / Health and Wellbeing**	National Landscapes (formerly Areas of Outstanding Natural Beauty) National Parks Heritage Coasts (England and Wales) National Trials (England) National Scenic Areas (Scotland)
Figure 5: **Air Quality**	Air Quality Management Areas
Figure 6: **Flood Risk**	Flood Risks Zones (England, Scotland and Wales) Flood Risk Areas (Northern Ireland) Coastal change management areas

Note that while the above noted Figures depict a range of key designation and land use across England and Wales, the scale at which this mapping is presented does not allow for the full granularity of data of relevance. Underpinning many of the above noted aspects are a series of more ‘local’ designations and land uses which are also sustainability considerations. These include, for example, sites designated as Local Nature Reserves, Sites of Nature Conservation Importance, Noise Important Areas, non-designated heritage assets, listed buildings, conservation Areas, Special Landscape Areas, Areas of Great Landscape Value, areas of contaminated land and so on. It is important to recognise that such designations, assets and features would need to be considered during the design and planning process for any NSIP planning application, including through Environmental Impact Assessment.

Key Issues

The SEA Regulations require identification and characterisation of '*any existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of particular environmental importance, such as areas designated pursuant to Directive 79/409/EEC on the conservation of wild birds and the Habitats Directive'.* (Schedule 2, paragraph 4)

The baseline data provides an overview of the sustainability characteristics of the United Kingdom, with a particular focus on England and Wales. This overview, together with contextual information, is presented in Appendix E.

The analysis of the baseline and likely evolution without the NPS has highlighted several key issues. These, together with implications and opportunities arising for the NPS, have been summarised in Table 6. Note that due to the geographical scope of the NPS, this summary of key sustainability issues is focused on England and Wales, along with the United Kingdom as a whole as appropriate. Further detail on Scotland and Northern Ireland is provided in the baseline and contextual information contained within Appendix E.

It should be noted that some issues are cross-cutting and affect several topics. For example, climate change can affect biodiversity, water resources, flooding and landscapes. Table 6 shows the linkages to the AoS Objectives set out in the AoS Framework (Table 7).

In addition, Table 6 below identifies the likely evolution of each key sustainability issue, if the draft NPS was not to be designated. This addresses the SEA Regulations requirement to describe 'the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme'. (Schedule 2, Paragraph 2).

Table 6 Key issues

Key issue and summary of baseline situation / information	Summary of likely evolution of the baseline without the Fusion NPS (direction of condition trend)	Implications and opportunities for the Fusion National Policy Statement	AoS Objective
Greenhouse gas (GHG) emissions – there is an urgent need to further reduce emissions from the energy sector The release into the atmosphere of greenhouse gases (e.g. CO2, CH4, N2O, O3) resulting from fossil fuel usage, agriculture, land use change and other human activities has been linked with atmospheric warming and global climate change. The UK has achieved significant cuts to emissions in recent years. Total emissions of direct GHG have decreased by 50.0% between 1990 and 2022 and 3.5% between 2021 and 2022. This decline between 1990 and 2022 is driven predominantly by a decrease in emissions from the	**Declining** Interventions at the local and regional level have started to reduce the rate of GHG emissions; and actions outside the NPS are contributing to decarbonisation of the energy system. However, the underlying trend points towards a slowing of emissions rather than reversal of trends.	The NPS should ensure that reducing CO2 emissions and achieving Net Zero is a core component of all fusion development ambitions alongside development of negative emissions removals, both technological and nature-based. The NPS should also ensure that opportunities are taken for maximising tree cover, where practical. Amongst other benefits, careful species selection and placement in the right location can contribute to carbon sequestration by absorbing increased amounts of CO2 from the atmosphere. Depending on the site, other approaches including peat restoration could also contribute to carbon sequestration. There is an opportunity for the NPS to coordinate the proposed strategic energy development locations with sustainable infrastructure connections.	Consistent with the national target of reducing carbon emissions to Net Zero by 2050

energy supply sector – particularly from power stations. CO2 is the largest contributor to global warming in the UK. As of 2022, CO2 emissions were estimated to be 406.2. Mt CO2 equivalent, 50.0% below the 1990 level. CH4 is the second most significant greenhouse gas in the UK after CO2 and since 1990, emissions of CH4 have decreased by 62.5%. As of 2022, methane emissions were 56.4 Mt CO2 equivalent. As of 2022, emissions of N2O were 18.1 MtCO2 equivalent. Emissions of N2O have declined 58.8% since 1990. Emissions of the F-gases (HFCs, PFCs, SF6 and NF3) totalled 7.6 Mt CO2 equivalent in 2022. Since 1990 the overall decrease in their emissions has been 48.6%. [8] Efforts in relation to addressing climate change have been			

[8] UK Government (2024) Final UK greenhouse gas emissions national statistics 1990-2022 – Territorial greenhouse gas emissions by gas. Available: final-greenhouse-gas-emissions-tables-2022.xlsx

bolstered by a declaration of a Climate Emergency and this has resulted in commitments (made in January 2025 under the UK's Nationally Determined Contribution communication to the UNFCCC9) to reducing all GHG emissions by at least 81% by 2035, compared to 1990 levels and to bring all GHG emissions to net zero by 2050. Under the UK Climate Change Act 2008, the UK has so far set six 'carbon budgets', with recommendations made in February 2025 by The Committee for Climate Change for the 7th Carbon Budget, to limit the UK's GHG emissions over the five-year period 2038 to 2042, to 535 MtCO2e, including emissions from international aviation and shipping. The 6th carbon budget for 2033-2037 would require a 78% reduction and the 7th budget for 2038-2042 a reduction of 87%. The UK has already met, and overachieved, its first (2008-2012), second (2013-2017) and third			

[9] UNFCCC is the United Nations Framework Convention on Climate Change

(2018-2022) carbon budgets and is on track to meet the fourth (2023-2027). The UK is the first major economy to halve its emissions – having cut them by 54% between 1990 and 2024 The UK Net Zero Strategy sets out that the exact technology and energy mix in 2050 cannot be known now, and the path to net zero will respond to the innovation and adoption of new technologies over time. However, it is expected to rely, among other technologies, on electricity from low carbon and renewables generation and storage technologies to meet higher demand for low carbon energy in buildings, industry, transport, and agriculture. Negative emissions technologies (NET) for the absorption and storage of CO2 and other atmospheric GHG will play a role in meeting net zero. These include Bio -Energy with Carbon Capture and Storage (BECCS), Direct Air Carbon Capture and Sequestration			

(DACCS); and newly emerging NETs focusing on ocean based carbon capture. Alongside NETs, Nature Based Solutions (NBS) on land such as protecting and restoring forests and wetlands are also a means to achieve negative emissions by biological sequestration. Compared to technology - based solutions to climate challenges, NBS are often more cost -effective, longer lasting, and have multiple synergistic benefits including: reducing net emissions, expanding carbon sinks; providing habitats for biodiversity, benefiting human health and well -being, helping our society and economy adapt to climate change, and making more resilient and nicer places to live and work.			
Adaptation to a changing climate – England and Wales are already seeing the impact of climate change through increased severe weather	**Declining** Climate change is recognised as a global concern with England and Wales, as with the rest of the UK, anticipated to	The NPS needs to be realistic and recognise that changes in temperature and rainfall patterns, along with more frequent extreme weather events, creates the situation where a greater	Maximise adaptation and resilience of built assets, communities and

events, leading to flooding, heat waves and hotter summers. The extent of the effects of climate change will vary by location and projections indicate that climate change trends observed over the last century will continue and intensify over the coming decades. **There is a need for development to be climate change resilient** The UK's Climate Projections show that the UK as a whole is likely to continue to experience hotter, drier summers, warmer, wetter winters and rising sea levels. This is likely to have a significant effect on a range of environmental conditions, including the water environment / water resources and there is an urgent need to develop climate resilience. Along with an increase in extreme weather events, it is anticipated that a changing climate will lead to an increase in risk to people and place. These increased risks include risks to health and well-being from increase in extremes of	experience hotter, drier summers; warmer, wetter winters; and rising sea levels. These trends are anticipated to continue irrespective of interventions from outside the NPS.	degree of resilience will have to be incorporated into plans and proposals. Recognition also needs to be made of health implications from a changing climate and the NPS can drive a strategic response to health stressors associated with climate change. There are multiple benefits associated with tree planting, including climate change adaptations. Strategic policies present the opportunity to promote this as a means of delivering urban cooling, wildlife benefits, contributing to flood reduction and supporting carbon sequestration. There are also benefits to wider Nature Based Solutions, such as Natural Flood Management and blue infrastructure. Green infrastructure specifically can contribute to climate change adaption through carbon storage, cooling and shading, opportunities for species migration to more suitable habitats and the protection of water quality and other natural resources. It can also be an integral part of multifunctional sustainable drainage and natural flood risk management.	people as well as natural assets, habitats and species, to the multiple effects of climate change * **Adaptation is about taking steps to live with the effects and managing the impact of climate change such as building quay walls and flood barriers or managing coasts through rollback. Resilience is the ability of a system to adsorb and bounce back after an adverse event.*

temperatures; risk to people, communities and buildings from flooding; risk to viability of coastal communities from sea level rise; risk to health and social care delivery from extreme weather and risk to health from changes in air quality, as well as risks to people and the economy from climate-related failure of the power system. A changing climate is likely to result in increased frequency and intensity of severe weather events. At present, significant proportions of the UK population are at risk from flooding, although the degree of risk varies, with a range of factors affecting potential risk. Increased flooding and increased flood risk are recognised as being some of the main potential threats from a changing climate due to potential direct risk to properties and infrastructure, as well as potential direct risk to human life and indirect risk to mental wellbeing. In addition, extreme weather events could include increased risk of higher summer		The NPS should recognise the challenges that a changing climate will bring and aim to reduce the impacts. More frequent and extreme weather events should be considered in any design – this would include potential risks posed by increased heat, or more intense cold. The NPS should seek to ensure that new development minimises any negative effects arising from flooding and avoids where possible areas of highest flood risk. Flood risk should be considered in any design and the implementation of multi-functional green infrastructure including SuDS and other similar appropriate measures or new approaches should be considered and encouraged where feasible. This should include Natural Flood Management and other means of increasing flood storage capacity. The NPS should seek to explore the possibilities for creating blue infrastructure which can both help to manage localised flood risk and simultaneously create new habitats. Climate change could also reduce water resources / quantity of water available	

temperatures (with direct impacts on water resources / water availability), or severe cold spells. Across England and Wales, areas of potential flood risk from both rivers and coastal sources have been identified and are noted in a series of flood hazard maps and flood management plans. Flood Zones 2 and 3 are located across England and Wales. Very significant numbers of properties are currently at flood risk – for example, in England alone this is in excess of 5.2 million properties. A changing climate also presents risks to the natural environment and the services it provides. The viability and diversity of terrestrial, freshwater and marine habitats and species are being affected from multiple climate hazards. For example, coastal squeeze due to sea level rise, coastal flooding and erosion leading to coastal habitat loss, and changes in the distribution of species, and arrival of new species including invasive		for fusion generation projects. This may also lead to an increased requirement for water efficiency measures. Reduced flows in water courses / amounts in water bodies could also have implications for discharges to the water environment.	

species, due to changes in climate; and natural carbon stores and sequestration being affected by multiple climate hazards, for example loss or degradation of peatland due to extreme drought. Soil health is affected from increased flooding and drought which compromises soil functions (note this is further considered under the soil topic).			
Biodiversity – new fusion energy infrastructure and underlying climate change may put pressure on sites designated for nature conservation and wider green infrastructure[10], but wider green infrastructure can benefit from opportunities to deliver Biodiversity Net Gain through new development	**Declining** Although designated sites are afforded protection; this is unlikely to prevent some decline in condition due to the combined effects of climate change and increased development. Much of the green infrastructure network is not designated, however, the absence of the	The NPS should aim to protect and enhance all sites of biodiversity importance and place a particular emphasis on protecting sites designated for nature conservation. This could be achieved by ensuring that planning / design of new fusion energy infrastructure and their associated infrastructure avoid sensitive areas and through the adoption of best practice wildlife friendly designs.	Enhance biodiversity and ecological networks, deliver biodiversity net gain, protect and support ecosystem resilience and functionality

[10] Green Infrastructure is defined by Natural England as “a network of natural spaces designed to deliver benefits for people and the planet. This includes more good quality parks and greenspaces, more connected green routes and corridors like footpaths, cycle lanes, rivers and canals, more nature in towns and cities like wildflower meadows, street trees ponds and green roofs.” This can include blue infrastructure elements which refer to water-based elements, such as rivers and ponds.

Biodiversity – new development and climate change put pressure on sites designated for nature conservation and other wildlife rich sites, but the Nature Recovery Network and wider Green Infrastructure Network can benefit from opportunities to deliver Biodiversity Net Gain (or net benefit for biodiversity in Wales) through new development Across England and Wales, there are sites internationally (SACs, SPAs, Ramsar sites) and nationally (SSSIs) designated for nature conservation. SACs, SPAs, Ramsar sites and SSSIs are afforded the highest level of protection through statutory designations. Within England there are a total of 88 SPAs, while Wales has a total of 17. There are also 286 SACs in England and 85 in Wales. Note also that Scotland also has numerous sites designated for nature conservation and there is a potential, in some circumstances,	strategic guidance of the NPS could lead to further declines. However, there are Government initiatives under way to counteract the declines such as the establishment of the Nature Recovery Network.	The NPS should explore opportunities for new habitat creation and enhancement associated with fusion energy infrastructure, e.g. through the use of appropriate locally native species in landscaping plans and through addressing the two interconnected frameworks for the Nature Recovery Network and Green Infrastructure Network aimed at enhancing the quality of life and environmental health in rural and urban areas. The NPS should avoid the fragmentation of green infrastructure, by seeking the integration and enhancement of the green infrastructure network as part of the projects. The NPS should contribute to the enhancement of accessibility to appropriately designed green infrastructure so as to divert pressure away from more sensitive sites or areas. The potential for biodiversity creation in brownfield sites should be also taken into account in the NPS. In parallel with the AoS of the NPS, HRA is being undertaken which will	Protect and enhance sites designated for their international importance for nature conservation purposes *(linked to separate HRA process for the Fusion NPS)*

for these to be affected by proposals in the NPS. Across the whole of the UK, there is an extensive network of Priority Species and Priority Habitats, including those that were identified as being the most threatened and requiring conservation action under the 2024 UK Biodiversity Framework. Lists of priority species have been drawn up (and are updated) in respect of each of the UK's constituent countries. Many of these species are mobile / migratory. In addition, there are many of Invasive Non-Native species (approx. 3,000 across the UK) which can pose a threat to native species. A number of SPAs and SACs protect habitat and/or species associated with the marine environment. Currently, there are 46 SPAs with marine components designated partly or wholly within English waters and 10 within Welsh waters. A total of 3 SPAs with marine components are		identify the internationally designated nature conservation areas, where possible establish the likelihood of impacts on the integrity of these sites and identify appropriate avoidance and mitigation measures early in the development of the NPS. The NPS should recognise and include provisions for the protection of Protected Species, Priority Species and Priority Habitats. The NPS should apply the mitigation hierarchy- a sequential approach to addressing potential harm to biodiversity in determining planning applications. It states avoidance should be prioritised (avoid or reduce biodiversity impacts through site selection and layout), before minimisation (take measures to reduce the duration, intensity and/or extent of impacts to biodiversity) then mitigation (the condition of on-site habitat or an affected area is improved and/or protected. Including enhance, restore, or regenerate biodiversity on-site), and finally compensation and offset (Compensating for any residual,	

located within both English and Welsh waters. There are also currently 37 SACs with marine components designated partly or wholly within English waters and 12 designated partly or wholly within Welsh waters. A further 3 SACs with marine components are located within both English and Welsh waters. There are 73 Ramsar sites in England, totalling an area of 320,648 ha, while Wales has 7 Ramsar sites, totalling 11,366ha. In addition to these internationally designated sites, there are over 4100 SSSIs within England and over 1000 in Wales. There are also 89 MCZs designated in English waters and 3 in Welsh waters. Note that MCZs can also include those areas designated as Highly Protected Marine Areas (HPMAs), which while aligned with the same area, have different conservation objectives. In Scotland, the MPA		adverse, unavoidable impacts after full implementation: onsite or offsite). Biodiversity net gain (BNG) should be achieved in a way that is consistent with the mitigation hierarchy. Noting that BNG requirements for Nationally Significant Infrastructure Projects (NSIPs) are currently under development, it is the intention of government to incorporate biodiversity net gain (BNG) requirements for all (terrestrial) NSIP projects and develop an approach for marine net gain (MNG). The NPS needs to reflect this situation and set out how BNG / Biodiversity Net Benefit can be demonstrated on a project. The NPS should incorporate measures designed to support the adaptation of habitats and species to the effects of climate change and increase the resilience of ecosystems such as creation of cohesive habitats networks. In Wales, the NPS should note the Diversity, Extent, Condition, Connectivity and Aspects of ecosystem resilience (DECCA) framework for evaluating ecosystems resilience based	

network in territorial and offshore waters consists of 247 sites, 233 of these are for nature conservation purposes. The entire network is made up of 65 SSSI; 58 SAC; 58 SPA; 36 Nature Conservation MPAs; 16 RAMSAR sites; 1 Demonstration and Research MPA, 8 Historic MPAs and 5 other area based measures (which protect species such as sandeels and blue ling, as well as vulnerable marine ecosystems). There are substantial numbers of NNR and LNR recorded across England and Wales. There are also numerous areas of Ancient Woodland and priority habitats, together with Sites of Nature Conservation Interest (SNCIs) and locally designated wildlife corridor sites. Although these areas are not afforded the highest statutory protection, they contribute significantly towards nature conservation. All sites, from those designated with the very highest level of		on the attributes of diversity, extent, condition, connectivity and adaptability.	

protection, to those areas at the local level, are threatened by a range of issues such as habitat loss, human encroachment, poor management practices and invasive species. Changes in air and water quality along with a changing climate can also change distribution of species and habitats within these sites. Increased accessibility or proximity of development to designated sites also has the potential to adversely affect them indirectly, for example through disturbance or pollution deposition. There is extensive priority habitat coverage across England with 1.86 million hectares across terrestrial and coastal priority habitats. There are 27 main habitat types in comparison to Wales where there are 20 across terrestrial and marine habitats. The wider green infrastructure network across England and Wales incorporates not only sites designated for nature conservation			

purposes, but also many other multi-functional green spaces and the connections between such locations. This network is highly susceptible to impacts from development including: • direct land take (which may contribute to fragmentation) • construction and operational disturbance (noise, vibration, light pollution, etc.), particularly on protected species, local wildlife and marine life. • emissions / contamination (air, water and soil). • There are also potential risks associated with blue infrastructure across this region, which includes rivers, streams and other waterbodies. Potential impacts include (but are not limited to) changes in water flows and levels, particularly from water abstraction. In addition, the importance of impacts at a landscape scale must			

be recognised, including considering fragmentation and isolation when identifying potential impacts on habitats and species. This is particularly relevant to the potential for large land requirements from large scale new energy development, particularly during construction and in delivering related infrastructure. The establishment of the Nature Recovery Network (NRN) will aim to address many of the issues discussed above through enhancing sites designated for nature conservation and other wildlife-rich places, corridors and stepping stones wildlife populations to grow and move; improving the landscape's resilience to climate change, providing natural solutions to reduce carbon and manage flood risk, and sustaining vital ecosystems such as improved soil, clean water and clean air. By 2042, the aim is to restore 75% of protected sites on land (including freshwaters) to favourable			

condition and restore 500,000 hectares of additional wildlife-rich habitat outside of protected sites. Regional NNR are being established across the UK. Local Nature Recovery Strategies (LNRSs) are a new system of spatial strategies for nature recovery and will play a major role in providing detail on the best locations to create, enhance and restore nature and deliver wider environmental benefits. LNRSs will also agree priorities for nature recovery and map the most valuable existing areas for nature. They will be critical in delivering new government targets for species abundance and habitat creation commitments, as well as other pressing environmental outcomes for water and flood risk, carbon and trees In the marine environment, birds, mammals, fish, pelagic habitats and benthic habitats are affected by impacts such as:			

• extraction of, or mortality/injury to, wild species (by commercial fish and shellfish harvesting and recreational fishing and other activities) • changes to hydrological conditions • anthropogenic sound • input of other forms of energy (including electromagnetic fields, light and heat) • physical loss of benthic habitats (due to permanent change of seabed substrate or morphology and to extraction of seabed substrate). In recognition of the continued threats and alarming levels of biodiversity decline, there are a range of commitments made through Strategies, Policy and Action Plans at the International, National and Local levels to halt biodiversity loss and reverse those losses made to date – this has			

resulted in the need for new development to deliver Biodiversity Net Gain (BNG) in England, with a minimum 10% set out in the Environment Act 2021. Currently BNG targets only apply to terrestrial and intertidal components of new development granted planning permission under the Town and Country Planning Act 1990. The Environment Act 2021 also includes provisions to introduce a biodiversity net gain requirement for NSIPs. Principles for Marine Net Gain are currently in development by Defra who will provide further guidance in due course. Note that Planning Policy in Wales promotes Biodiversity Net Benefit. The statutory Environment Act 2021 set out the following targets for restoring nature: • Halt the decline in species abundance by 2030 • Increase species abundance so that by 2042 it is greater than in			

2022 and at least 10% greater than in 2030 • Improve the Red List Index for England for species extinction by 2042 compared to 2022 levels • Restore or create in excess of 500,000 hectares of a range of wildlife-rich habitats outside protected sites by 2042 • Increase tree canopy and woodland cover to at least 16.5% of total land area by 2050 • Ensure that at least 70% of protected features in Marine Protected Areas (MPAs) are in favourable condition by the end of 2042, with the remainder in recovering condition. • The latest Environmental Improvement Plan published December 2025 sets out new interim targets for restoring nature: • Restore or create a total of 250,000 hectares of a range of wildlife-rich habitats			

outside of protected sites by December 2030 • By December 2030 50% of Site of Special Scientific Interest (SSSI) features to have actions on track to achieve favourable condition • Reduce the rate of establishment of invasive non-native species (INNS) • by at least 50% by December 2030, compared to 2000 levels • Increase England's tree canopy and woodland cover by 0.33% of land • area by December 2030 from the 2022 baseline of 14.9% (Equivalent to a net increase 43,000 hectares) • At least 49% of Marine Protected Area (MPA) protected features are in favourable condition and at least 46% in recovering			

condition, by December 2030 •			
Geodiversity - new development puts pressure on designated geodiversity sites In addition to the three Geoparks designated within England and two in Wales, there are a number of areas designated as SSSI due to having geodiversity, or geodiversity combined with biodiversity importance. These areas are in a mix of conditions, with both favourable and unfavourable occurring. There are also some of the areas in decline, while others are recovering. Some SSSIs are also part of active quarry sites, which presents a potential link between new development and the need for further quarried resource for development. There are also a range of Regionally Important Geology	**Declining** While some of the geodiversity resource is in favourable condition, some is not and all aspects are experiencing threats from development, as well as the need to adapt to climate change. In the absence of the NPS, there is heightened potential for inappropriate greenfield development.	A co-ordinated strategic approach to development and infrastructure is required to limit the potential for inappropriate greenfield development to occur. This will help to manage pressures on SSSIs designated for their geological importance and on RIGS. The NPS presents an opportunity to develop strategic principles designed to control pollution, promote the re-use of previously developed land and tackle some of the causes of climate change, all of which should help to afford protection to the geodiversity resource.	Protect, enhance and promote geodiversity

Sites (RIGS) and Local Geological Sites across England and Wales. Geology across England and Wales is likely to face threats from new development, human activities such as pollution, roads, disturbance, farming practices, changes to shoreline management, loss of habitat and a changing climate.			
Air Quality – the United Kingdom experiences pockets of poor air quality, principally derived from concentrations of urban and industrial activity, major road infrastructure and congestion Air pollution affects public health, the natural environment and the economy. Air quality has improved in the UK over the last sixty years as a result of the switch from coal to gas and electricity for heating of domestic and industrial premises, stricter	**Improving** At the national level air quality is generally improving as industrial practices, energy sources and tighter environmental legislation have contributed to reductions in pollutants. However, parts of England and Wales experience localised pockets of poor air quality – interventions outside the NPS will seek to address some of these issues, but opportunities exist for the NPS to influence this issue.	The NPS should aim to protect and enhance air quality and should seek to ensure that reducing NO2, PM2.5 and PM10 emissions is a fundamental principle. The NPS should aim to ensure that no AQMA is worsened, or proposed development does not lead to changes, particularly increases, in traffic / transport that could lead to the declaration of further AQMA. The NPS should aim to exceed Government targets for air quality and be reflective of appropriate legislation, particularly seeking to deliver health	Protect and enhance air quality on a local, regional, national and international scale Improve health and well-being and safety for all citizens and reduce inequalities in health

controls on industrial emissions, higher standards for the composition of fuel and tighter regulations on emissions from motor vehicles. However, poor air quality – particularly from motor vehicles – remains a significant issue for community health and for biodiversity, especially in/downwind of urban areas and major transport networks. It is also to be noted that the use of solid fuels (including for 'lifestyle' fuel such as wood burners in homes) are recognised as being a major contributor to poor air quality in towns, particularly during winter months. Nevertheless, poor air quality is generally associated with urban/industrial areas and major road infrastructure and this is reflected in the typical location for Air Quality Management Areas (AQMA), many of which have been designated due to high NO2 and PM10 levels. Across England, there are a total of 532 AQMA, while within Wales there were 44,		benefits from improved air quality, as well as considering ecological receptors.	

all principally in those areas of greatest population, or areas of particular road congestion and these have impacts both on human health and biodiversity. Approximately 85% of Sites of Special Scientific Interest (SSSI's) in England have nitrogen deposition rates above levels at which harm is expected (environmental thresholds), these exceedances will influence the ability of protected sites to reach favourable conservation status / favourable condition. An estimated 95% of nitrogen sensitive habitat is thought to be exceeding its critical load. Nitrogen emissions have been identified as a significant pressure or threat to 62% of England's International (European) protected sites. The Environmental Improvement Plan 2025 set out updated interim targets for PM2.5 in air: • An annual mean concentration target of 10 micrograms per cubic metre			

to be achieved by December 2030. • A population exposure reduction target of 30% compared to 2018 to be achieved by December 2030.			
Water environment –pollutants from a range of sectors including energy pose considerable risks to the quality of water bodies across England and Wales. Additional water demand from energy development would likely put further pressure on water resources. There are considerable pressures on freshwater water resources with resulting major impacts on many of the waterbodies across the UK. For the purposes of taking a holistic approach to management of water resources and to address the pressures on the water environment, under the Water Framework Directive (WFD), the	**Stable / Improving** Surface water quality is predicted to remain stable; however, ongoing pressures remain and climate change may compromise improvements. In relation to water demand, it is predicted the trend will be a decline in resource, as pressures such as abstraction are set to continue and increase in many areas.	The NPS should seek to prevent pollution of water bodies (including groundwater and bathing water) both during the construction and operation of any proposed energy development. This could be achieved via the appropriate use of SuDS, green infrastructure or other appropriate measures and new approaches in infrastructure drainage design to enhance water quality and reduce pollution and flood risk. Risk to all types of water bodies (not just main rivers) is to be considered during any development design. In the marine environment, the NPS should seek to prevent release of contaminant pollution to inshore and offshore waters. Recognition of the objectives of the WFD and Marine Strategy Regulations should be made and all opportunities to	Protect and enhance the water environment Enhance biodiversity and ecological networks, deliver biodiversity net gain, protect and support ecosystem resilience and functionality

UK has been divided into a series of River Basin Districts (RBD). As with most water bodies in England, there are a range of significant water management issues manifested across RBD, with pollution from infrastructure being of note. It is worth noting that not a single river in England has received a 'clean bill of health' in terms of chemical contamination11 Groundwater is also an important element of the water environment and can be vulnerable to pressures from energy infrastructure, for example through abstraction or through discharges (controlled or uncontrolled). Many groundwater bodies are not expected to achieve good status for in excess of 20 years (if at all). There are also a series of Drinking Water Safeguard Zone (DWSZ) across England and Wales (which are areas where additional measures are needed to improve		help meet the objectives of both regulations should be taken when possible. .	

[11] House of Commons Environmental Audit Committee – Water Quality in Rivers Fourth Report of Session 2021-22

water quality), as well as Source Protection Zones (SPZ) which are used to define areas close to drinking water sources where the risk associated with ground water contamination is greatest) and designated bathing waters. The number of waterbodies assessed each year varies and has decreased from 10,761 in 2009 to 9,300 in 2018. There was a small decrease in the overall number of water bodies awarded high or good surface water status between 2009 and 2018. In 2018, 35% of surface water bodies assessed under the WFD in the UK were in high or good status. This reflects very little change from 36% of surface water bodies assessed in 2009 and 37% in 2013. It is anticipated that overall water quality will improve as the UK aims to ensure that the objectives of the WFD (all aquatic ecosystems and terrestrial ecosystems and wetlands to reach			

good chemical and ecological status by 2027). Climate change and a growing population will increase pressure on water resources. The marine environment is covered by a network of Marine Protected Areas (which complement and are aligned to wider designations such as SAC and SPA) around the UK, with 178 MPAs in English waters covering 51% of inshore and 37% of offshore waters. Protecting MPA species and habitats will contribute to healthier marine ecosystems, and the maintenance and restoration of valuable ecosystem services. In addition, the first 3 Highly Protected Marine Areas were designated in June 2023. These are designated to protect the marine ecosystem of the area (including all marine flora and fauna, all marine habitats and all geological or geomorphological interests, including all abiotic elements and supporting			

ecosystem functions and processes, in the seabed, water column and the sea surface). The Marine Strategy Regulations 2010 marked a significant step forward in the protection and management of the UK's coastal waters through requiring actions to be taken to achieve Good Environmental Status (GES). As at 2019, the UK has largely achieved its aim of GES for contaminants. Concentrations of hazardous substances in the Celtic Seas and the Greater North Sea and their biological effects are generally meeting agreed target thresholds which means they are at levels that should not cause harm to sea life (89% for contaminant concentrations and 96% for biological effects). The few failures are caused by highly persistent legacy chemicals such as PCBs in biota and marine sediments mainly in coastal waters and often close to polluted sources.			

Soil and Contaminated Land – soil is a non-renewable resource and is vulnerable to erosion, degradation and contamination. In addition, historic land use has contributed to contamination across large areas. There is a need to address this contamination to enable beneficial re-use of previously developed land and help protect soil resources from pressure for greenfield development. Soil across England and Wales is graded, with those considered Best and Most Versatile (BMV) being noted as Grade 1, 2 and 3a. BMV soils are under pressure in many areas from development in order to support market led growth aspirations. Soil sealing (the covering of the soil surface with impervious material or the changing of its nature so that it becomes impermeable) is associated with development and is a primary cause of soil loss. The development of greenfield sites can lead to loss to valuable	**Declining** It is likely that greenfield sites will experience increasing pressure for development in preference to the complexities of redeveloping previously developed and potentially contaminated sites. This could reduce available high quality soil resources and fail to realise the potential of existing capacity within existing urban and previously developed areas.	The NPS should seek to make best use of areas that are already urbanised (or subject to energy / industrial uses) and provide an opportunity for regeneration / improvements to land quality. Measures should be taken to avoid those areas of the highest quality agricultural soils and aim to protect soil and agricultural holdings through avoidance of impacts such as contamination or severance. There are also opportunities for improved soil management, as all soils store carbon, the amount largely depending on soil type and management. The NPS must protect soils as they are essential natural capital and perform a range of important ecosystem services and functions. Dealing with the past pollution / contamination legacy is a major issue and should be addressed at all opportunities due to its ongoing environmental impact. Remediation of land / soil can benefit other environmental topics such as the water environment but note that land	Protect soil resources, promote use of brownfield land and avoid land contamination

agricultural land which generally cannot be mitigated. Contaminated Land is legally defined as where substances are causing or could cause significant harm to people, property or protected species, significant pollution of surface waters or ground waters. Determination of contaminated land is made in the UK by a local council or the relevant environment agency. Many areas of land in the UK have also been contaminated by past industrial and other human activities, including former factories, storage depots and landfills. Energy related infrastructure is also a frequent source of land contamination. Land at the full range of potentially contaminated sites could be contaminated by a wide range of harmful substances such as oils and tars, heavy metals, asbestos and chemicals. While many areas of contaminated land, including special sites of		remediation also needs to be resilient to a changing climate.	

contamination determined under the Regulations, or those known by Local Authorities have been identified, by its nature, it is often very difficult to know where land has been contaminated previously or is currently suffering ongoing contamination. As such the number of known sites of contamination is likely to be only a very small fraction of the overall number of potentially contaminated sites. Given the present and historic levels of industrial, commercial and transportation activity across England and Wales, in addition to high levels of urbanisation, it is suggested that the number of areas of contaminated land could be considerable.			
Cultural Heritage – there is a substantial cultural heritage resource across England and Wales and their estuarine, coastal and offshore waters; however, there is considerable	**Stable/Declining** Designated heritage assets benefit from protection that will continue without the NPS. However, in the absence of a strategic plan there is a greater	New energy related development may result in pressure on areas of importance for their cultural heritage and aesthetic quality. There is a requirement for development proposals to be carefully considered such that assets	Protect and enhance cultural heritage assets and their settings, and the wider historic environment.

variation in the condition and integrity of assets. There is a need for a strategic perspective that promotes contextual understanding and supports regeneration where this contributes to conservation and enhancement Those cultural heritage assets of the greatest recognition in England and Wales are the 22 World Heritage Sites. These sites are recognised as having Outstanding Universal Value and the management plans note that this is to be understood, protected and sustained. In addition, there is also a very large number of Scheduled Monuments across England and Wales (in excess of 24,000), including a large number which are at particular risk of being lost through neglect, decay or deterioration. Similarly, there is a very significant number of listed buildings across England and Wales (over 400,000) and many of	risk of uncoordinated and piecemeal energy development resulting in contributing to the successive erosion of the quantum and integrity of the nation's cultural heritage resource.	are preserved and enhanced – the NPS will need to respond to context such that preservation is pursued where appropriate, but pro-active management and redevelopment can be supported where this secures viable futures for cultural heritage resources that are currently threatened. Additional energy related development may be inappropriately located or designated to pose a risk to the cultural heritage assets as well as their setting. Without a co-ordinated strategic approach to development and infrastructure there is an increased potential for this risk to result. As well as those sites of the very highest value such as World Heritage Sites, similar potential impacts can be identified in respect of the range of scheduled monuments, Listed Buildings, Conservation Areas and locally listed cultural heritage assets. It is important to note that the nature of cultural heritage features means that not all are known at present; in particular, buried archaeological remains.	

these are at particular risk of being lost through neglect, decay or deterioration. Likewise, Conservation Areas are under increasing pressure from development, neglect, decay or deterioration. In addition, Areas of Ancient Woodland, i.e. those areas that have been continuously wooded since at least 1600AD are scattered across England and Wales. These areas have a significant contribution to the cultural heritage of an area and are also of importance to biodiversity and landscape. Beyond these assets, there are also a large number of registered parks and gardens across the UK which are of historic importance. Of course, by its nature, there are also a number of undesignated assets or unknown archaeological remains which could have national, regional or local value. The importance of the protection of the historic environment is increasingly		As such, any energy related development should be as sensitively designed as possible to recognise and be sympathetic to the existing cultural character and quality and opportunities for improving settings should be examined.	

recognised at a national and regional level, with the loss of heritage resources being difficult or impossible to mitigate. Development affects the historic environment through loss, damage or changes to setting for instance from visual intrusion, increased traffic, noise or air pollution.			
Landscapes, Waterscapes & Townscapes – there are marked contrasts in the quality, character and distinctiveness of landscapes and townscapes across England and Wales. There is a need to fully protect the highest quality locations, whilst driving best practice principles through all energy development to address poor landscape and townscape environments. There are 13 National Parks within England and Wales. There are also 46 National Landscapes (formerly known as AONB's) in England and 5 within Wales. In	**Improving** Many of the most exceptional landscape and townscapes benefit from protection through designations that will persist in the absence of the NPS. In general terms, modern design principles are promoting a renewed focus on the quality of design and this trend is likely to continue; however, without the NPS it may lack strategic focus and direction, resulting in variable quality and some pressure on greenfield land.	The NPS should seek to preserve and enhance the character of the wider landscape and townscape by ensuring that its integrity and valuable natural open space is not lost. Particular attention to be paid to those areas designated for their landscape value, such as National Parks (formerly known as AONBs). Opportunities for landscape enhancement should be explored, e.g. through sympathetic design and enhancements to existing landscape improvement areas, as well as new planting opportunities associated with new energy development and be in keeping with the aims of the Nature Recovery Network. The location of	Protect and enhance the character and quality of the landscapes, townscapes and waterscapes and protect and enhance visual amenity.

addition, there are a total of 46 Heritage Coasts around both England and Wales. Landscape characteristics are assessed across the UK through several methods, including sub-division of England into Landscape Character Areas and use of the LANDMAP tool in Wales. There are also significant areas designated as Green Belt, with "*a fundamental aim to prevent urban sprawl by keeping land permanently open. This designation serves five main purposes of checking unrestricted sprawl in large built up areas; prevents neighbouring towns from merging; assists safeguarding the countryside from encroachment; preserves the setting and special character of historic towns and assists in regeneration , by encouraging the recycling of derelict and other urban land*".[12]		planting will need to be considered with regard to the proposed aims of landscape restoration in the local area. Any particular solution to a landscape problem such as additional tree planting should be the right solution for that particular area. Increased energy development poses a serious risk to tranquillity through increased disturbance (including light and noise) and visitors. As such, there is a need to protect the special quality of those areas of relative tranquillity of many parts of England and Wales. Without a co-ordinated strategic approach to development and infrastructure degradation of the special qualities of the most special areas such as National Landscapes (formerly known as AONBs) may result. The NPS should also aim to ensure that energy developments and associated infrastructure avoid sensitive areas and respect particular landscape or townscape settings. Careful consideration should be given to design quality in both an urban and rural	

[12] National Planning Policy Framework (2019), Paragraphs 133 to 134

While there are areas of great beauty and tranquillity across England and Wales, it is also important to recognise that there are significant parts that are characterised by urban development, major infrastructure and other noise and visual intrusion (including light pollution). This is largely associated with (but not confined to) the main urban areas. Loss of tranquility and loss of dark skies are increasingly being recognised as important issues. Nevertheless, there exists across England and Wales, significant elements of green infrastructure that includes for example, parks, open spaces, playing fields, woodlands and private gardens, as well as agricultural and upland areas. This, alongside 'blue infrastructure' of rivers, canals, streams and other water bodies can act in a multi-functional way across a range of issues by supporting, for example, biodiversity, carbon storage,		setting, promoting placemaking principles and seeking to inject character and distinctiveness where possible and where this enhances the sense of place. Design, where possible, should respond positively to the local characteristics, including vernacular architecture when appropriate. Without a co-ordinated strategic approach to development and infrastructure, there is increased potential for planning decisions to lead to inappropriate development, which could fragment existing networks of open space thereby reducing connectivity.	

natural drainage and flood storage and health and wellbeing. However, increased urbanisation and general development have acted to erode the connectivity of this green and blue infrastructure, resulting in a decrease in its integrity. The townscapes across England and Wales includes substantial cultural heritage assets. There are many areas benefitting from associated designations, which include World Heritage Sites, Conservation Areas and local listings (refer to the cultural heritage key issue description). In many areas, 20th and 21st century redevelopment and regeneration have introduced a juxtaposition of modern architecture with historic fabric, delivering distinctiveness within the townscape. However, there are also areas where the quality and integrity of townscape has been eroded by successive and piecemeal regeneration activities and there is			

a need to promote enhanced design through all energy development proposals.			
Economic activity, opportunity and deprivation – there are marked spatial contrasts in economic activity and GVA by job across England and Wales and the challenge is to achieve more equitable access to opportunity as a means of tackling deprivation. The economy across the UK has been subject to challenging conditions over the last number of years due to impacts from COVID-19 and 'Brexit'. Main points from the ONS note that UK gross domestic product (GDP) is estimated to have increased by 0.1% in Quarter 3 (July to Sept) 2024, following a growth of 0.5% in Quarter 2 (Apr to June) 2024. GDP in the UK is estimated to have increased by 1.0% in Quarter	**Improving** The headline statistics generally show an upward trend in employment and GVA by job; and a falling trend in unemployment. However, there are clear spatial disparities between the value of jobs, which can be a proxy for the quality of job opportunities available.	Without the strategic approach to energy development the required development and associated infrastructure is less likely to be provided to encourage investment in areas where highest numbers of residents can benefit from new employment opportunities. The NPS also offers the opportunity to help shape the spatial distribution of employment generation helping to overcome some traditional barriers to opportunities, such as accessibility. The pattern of deprivation across England and Wales is geographically complex, incorporating stark contrasts between wealthy and severely deprived communities. Without the strategic approach to energy development, opportunities to deliver development and infrastructure which can improve equitable and inclusive access to employment and the increasing of	Promote a strong economy with opportunities for local communities

3 2024, compared with Quarter 3 of 2023. Overall output in the production industries decreased in 2024 from 2023 by 1.7%, following on from a decrease of 0.9% in 2023 from 2022. It is estimated that services output increased by 0.1% in November 2024, following no growth (0.0%) in September 2024 and a decrease of 0.1% in October 2024. Monthly construction output is estimated to have grown by 0.4% in volume terms in November 2024, this follows a revised decrease of 0.3% in October 2024. There has been an increase from 2023 to 2024 in private consumption. UK government consumption levels have increased from 2023 Q4 to 2024 Q4. and business investment in Quarter 2 2024 has increased from Quarter 2 in 2023.		income of local people are less likely to be achieved.	

The UK's GDP levels has recovered to pre-Covid levels, with GDP with a 2.9% increase from the end of 2019 to the beginning of 2024. As of August 2024, the unemployment rate in England was 4.4%, while it was 5.3%in Wales. Economic activity in the same period was 78.8% in England and 74.1% in Wales. These issues will undoubtedly play a major role in deprivation and economic outcomes for all parts of England and Wales, with those areas of current deprivation most likely to have the worst economic recovery and future outcome. The Indices of Multiple Deprivation show that the majority of the most deprived areas in the UK are located within urban centres of population. The south east, south west and east of England are the least deprived areas in the UK. Deprivation increases in urban areas, with towns and cities			

generally being more deprived that rural areas. The north west and north east are the most deprived areas of England. Middlesbrough, Knowsley, Kingston upon Hull, Liverpool and Manchester are the five local authority districts with the largest proportions of highly deprived neighbourhoods in England. The south east and north east coast are the most deprived areas in Wales. Deprivation is most concentrated in the south east, around the urban areas of Cardiff, Newport, Swansea and Bridgend. The smaller towns within the valleys of the south east, such as Caerphilly and Merthyr Tydfil are similarly deprived. Comparatively the rural areas of Wales are considerably less deprived. These areas have relatively lower income, less access to services, higher unemployment and increased crime rates. There has been little variance in the locations of the most deprived areas of the			

UK over the last 20 years, with certain areas being in a state of persistent deprivation. It is important to note that there are also pockets of deprivation surrounded by less deprived places in every region of England. These areas have relatively poorer health and well-being in comparison to those classed as less deprived.			
Population growth and demographics – England and Wales have a growing population, with a general underlying trend towards an ageing population, though there are areas with younger population profiles. These demographic characteristics contribute to a complex pattern of highly-contrasting communities, with differing requirements for economic and social infrastructure.	**Increasing** Population growth is projected to continue to increase across the UK and the overall trend is towards an ageing population.	Both England and Wales (along with the UK as a whole) are expected to see population growth in the coming years, with the proportion of residents of an older age. This growth will be uneven across the country, with a focus on larger urban areas most likely in relation to population growth (though the move to home working induced by COVID-19 may have implications for smaller towns, villages and rural areas). Smaller villages and rural areas may experience an increasingly older demographic (as would less deprived areas), though again, the implications of COVID-19	Promote a strong economy with opportunities for local communities.

The population estimate of England in mid-2023 was 57,690,323 which accounts for 84.5% of the UK's population. The population estimate of Wales in mid-2023 was 3,164,404 which accounts for 5% of the UK's population. In 2023, England and Wales had the least number of live births since 1977, and the total fertility rate dropped to 1.44, which is the lowest value recorded since records began in 1938, which has lead to a slowing rate of population growth. Despite birth rate dropping, the UK population is still growing and predicted to continue growing mainly due to a rapid increase in immigration from 2020 to 2023. It is also anticipated that the population profile will age, with the population over 65 in 2023 being 18.9%, that is projected to rise to 27% by 2072. Local authorities with the highest proportions of older people in the UK are most commonly found in		(such as through increased home working) are still unclear in this regard.	

coastal areas of southern and eastern England. The population of the UK is spread unevenly, with the population density ranging from 5,700 people per square kilometre across London to fewer than 50 people per square kilometre in the most rural local authorities of the UK. The south east of England, in particular London and the surrounding areas are highly populated. Large urban areas are located along the south coast, including Brighton, Southampton, Portsmouth and Bournemouth. The midlands and north west are also locations of large urban areas, including Birmingham, Leicester, Nottingham, Greater Manchester and Liverpool. The east, north east and south west of England contain fewer major settlements, however large urban areas are located in these regions, including Newcastle, Sunderland, Leeds and Bristol.			

The most populated area of Wales is the south coast, where the large urban areas of Cardiff, Newport, Bridgend and Swansea are located. The north coast has fewer major urban settlements, however areas of population are present in Rhyl, Colwyn Bay and Bangor. Central and western Wales have smaller towns and villages distributed throughout the regions.			
Communities: Supporting Physical Infrastructure – infrastructure investment is delivered by a range of providers across the United Kingdom and can often be reactive. Significant new infrastructure, or upgrades to existing infrastructure is planned across a range of sectors. The strategic rail network in England is well developed. All major cities are connected as are the majority of significant towns.	**Improving** There are various infrastructure investment plans and programmes being developed and implemented and these should continue to enhance the supporting transport, utilities and digital infrastructure to support growth levels.	There is a role for the NPS in promoting infrastructure provision in a co-ordinated and pro-active manner, delivering the means to catalyse, rather than react to demands for growth. The NPS should seek to ensure that energy development provides opportunities for utilisation of electric vehicles, as well as access to more sustainable transport modes.	Promote sustainable transport and minimise detrimental impacts on strategic transport network and disruption to basic services and infrastructure. Promote a strong economy with

Extensive rail networks are located around large conurbations such as London and Greater Manchester, with the major cities in the midlands being well connected. Remote, rural and coastal areas are less well served by rail. Both the north and south coast of Wales are well connected by rail, linking the major coastal cities such as Cardiff and Swansea in the south, and Llandudno, Bangor and Holyhead in the north. Few major branch lines extend from these links, and the central and western regions of Wales are comparatively poorly served by rail. England is covered by a comprehensive network of motorways and A roads. All major cities are served by motorways, whilst towns and larger villages are connected by A routes. Areas not serviced by these connections are generally rural and in areas of low population.			opportunities for local communities.

The south and north coast of Wales are the only areas with motorway connections. The remaining regions are serviced by the A road network which links the major towns and villages. Comparatively the central and upland regions are less provisioned with strategic network links. There is a well-established electricity generation and distribution network across both England and Wales, which is being increasingly utilised for an expanding EV charging network. As would be expected, greatest provision of electricity network capacity is to the more urbanised areas. This network is increasingly supplied by renewable sources. As would be expected, there is significant wastewater infrastructure across the area, though, as with other areas there are legacy and capacity issues with some elements. For example, many areas still have both a			

combined and separate sewer systems for collecting all wastewater and sewage and under heavy storm conditions, the sewer capacity can be exceeded. Consequently, these areas have above average risk for sewer incapacity and also has several frequent spilling storm overflows. Provision of gas networks is variable across the country. Across the UK, the areas with ultrafast broadband connectivity are mainly located in urban residential areas, though it should be noted that there are pockets within many urban areas where only standard broadband is available.			
Communities: Physical Health and mental wellbeing – in general terms there are significant differences in measures of good physical and mental health as well as life expectancy across England and	**Stable / Uncertain** While population levels are likely to continue to rise, there is uncertainty over migration levels due to factors such as general global economic and security	Indirectly, health and wellbeing levels could be improved through secondary effects of policies that help to create healthy environments. This involves the protection of existing and creation of new open spaces, contributing to a strengthened multi-functional green	Improve health and well-being and safety for all citizens and reduce inequalities in health.

Wales, many indicators reflecting the spatial distributions of economic activity and income, age, deprivation, race and similar - there is a need to tackle spatial inequalities in health regards. There is also a growing appreciation of the importance of supporting good mental health and generating a sense of well-being as a means of promoting healthy communities. There is a role for the environment in enabling people to feel connected to place; and growing evidence that physical activity and access to nature and opportunities for community interaction is an important contributor to mental health and wellbeing. It is worth noting that different groups or different areas of the UK feel differently about their lives and have different experiences, however data that compares	uncertainty. These factors will all have major implications for health outcomes for the wider population but particularly for those in more deprived or vulnerable groups. Population profiles are also likely to continue to get older – this will likely result in changes to overall health outcomes with an increased number of long-term conditions and place an increasing burden on health provision and facilities.	infrastructure network; and policy approaches designed to reduce air pollution, decreasing noise pollution and reducing traffic congestion. Good design principles can combine with broader green infrastructure as key factors in fostering active travel, recreation and healthy lifestyles. The NPS should seek to ensure continued access to and provision of quality greenspace along with improvement of the physical environment in general. Ensuring continued or enhanced access to employment, educational, recreational / leisure and health services and facilities, along with adequate provision, should also be a priority. Improved walking and cycling facilities, along with open spaces and outdoor recreational facilities are vital to ensuring people have opportunities to undertake informal and formal physical activity outdoors in a safe manner. This will help to increase physical activity levels and improve general health and wellbeing.	

different UK geographies has not yet been released. Four measures of personal well-being are examined: how satisfied people feel with their lives; how worthwhile they feel the things they do are; how happy they were yesterday; and how anxious they felt yesterday. Overall, personal well-being levels have increased in the UK. • Approximately 1 in 20 (4.7%) UK adults reported low satisfaction with their lives in July to September 2024. This showed no significant change from the same period in 2019 when the figure was 4.8%. • Individuals with low feelings of worthwhile decreased by 22% between 2011 and 2024 in the UK, and on average the UK had a 6.8% higher feelings of worth as compared with the EU-28 average		The NPS needs to ensure that energy developments are safe, both in terms of crime as well as accidents and engender a perception of safety.	

• There was little change in ratings of happiness between 2011 and 2024, but the UK remains similar to the EU-28 average of 7.4 out of 10. According to data from the Office of National Statistics), the average (mean) rating of life satisfaction of people aged 15 years and over in the UK was 7.5 out of 10 in April to June 2024. According to data published by Office for National Statistics from October to December 2022, 32.09% of adults rated they feel the things they do in life are worthwhile, which is a slight increase from 31.47% in October to December in 2011. More data published by the Office for National Statistics shows that the percentage of a very high level of happiness for people in the UK in 2023 was 43.05%, whereas the people with a reported low level of happiness was 8.83%. 7% of people in England through October			

2023 to March 2024 reported feeling lonely often or always, which has remained similar to levels from 2013/2014 at 5-6%. Crime across England shows regional variations, with the East of England having the lowest rate of crime in 2023/24 (70.7 per 1000 people, as opposed to 104.4 per 1000 people in Yorkshire and The Humber). The level of crime has been broadly stable in recent years, however England and Wales recorded a significant 9% reduction in the year ending 2023/24. Underlying this were significant falls in stalking and harassment (11%) and public order offences (18%), and almost all other crime types saw non-significant falls.			
Resources and Waste – population and economic growth continue to be associated with increased	Declining. Continued growth will contribute towards a trend of increased	The NPS should seek to reduce consumption of resources such as construction materials, e.g. through encouraging the use of recycled or	Promote sustainable use of

resource use and waste generation. There is an urgent need to reverse trends in order to move towards a circular economy where resource efficiency is maximised and waste generation curbed. The UK generated 222.2 million tonnes of total waste in 2018, and it is estimated that 40.4 million tonnes of this was commercial and industrial (C&I) waste (2020). In 2021, 26,411,000 tonnes of Waste from Households (WfH) were generated in the UK with an overall recycling rate of 44.6%. In England, the recycling rate was 44.1%, in Wales it was 56.7% (2021). Around 14,644,000 tonnes of the UK's municipal waste went to landfill in 2018. Total UK commercial and industrial waste, comprising inert, non-hazardous arising which result from trade or businesses, was 36.1 million tonnes in 2018[13]. Around	waste and resource use. Interventions outside the planning system are helping to shift towards greater efficiencies in resource use and adherence to the waste hierarchy, with wider aspirations to work toward a circular economy but underlying waste generation volumes are anticipated to increase cumulatively.	secondary materials and allow a 'Circular Economy' to develop. The NPS can also help reduce the consumption of fuel by helping to provide electricity output to help facilitate a shift to more sustainable forms of transport such as Low and Zero Emission Vehicles. Water availability (including in drought conditions and water efficiency) and management should also be considered by the NPS.	resources and natural assets.

[13] Last available figures – these figures are under review by Defra.

80% of this total was generated in England. This was split between the commercial and industrial sectors by 27.5 and 13.6 million tonnes respectively. New energy generation development will impact on and interact with a wide range of resources such as use of construction materials (aggregate, concrete etc.), waste generation and disposal etc. Construction will contribute to increased in the level of waste generated, if building materials are not efficiently used / reused. With more waste being produced, trip kilometres to transport such waste for disposal will result in greater transport trip generation and increased emissions of air pollutants or greenhouse gases. The statutory Environment Act 2021 relevant targets for waste is: • By 31st December 2042, total mass of residual waste for the calendar year 2042 does not exceed 287kg per			

capita – roughly the same as 50% reduction on 2019 levels. • In the Environmental Improvement Plan 2025, the following updated interim targets have been set – by December 2030, total mass of residual waste excluding major mineral waste in the most recent full calendar year does not exceed 437kg per capita (24% reduction).			

AoS Framework

Introduction

The establishment of appropriate AoS objectives and guide questions is central to the appraisal process and provides a method to enable the consistent and systematic assessment of the effects of implementing the draft NPS. The appraisal objectives described in this section have been informed by the examination of the baseline evidence, incorporating the identification of key issues; the review of plans and programmes; and comments received during the consultation on the Scoping Report. Their development also reflects national guidance on SEA and SA practice. Broadly, the objectives present the preferred social, economic or environmental outcome which typically involves minimising detrimental effects and enhancing positive effects where relevant. Guide questions were also developed for each of the objectives to illustrate its relevance to fusion energy infrastructure development and give more detail and focus to the appraisal process. Table 7 sets out the AoS Framework.

Table 7 AoS Framework

No.	AoS Objective	Guide Questions
1	Consistent with the national target of reducing carbon emissions to Net Zero by 2050	Will the NPS… • Support reduction of the carbon emissions of the national portfolio of major energy infrastructure? • Support reduction of direct and indirect emissions of all greenhouse gases, including carbon dioxide, during construction, operation and decommissioning? • Support supply of energy from low carbon/renewable energy sources / use of low carbon/renewable energy? • Support the generation of heat for industrial uses? • Support use carbon removals to offset residual emissions from energy such Negative Emissions Technologies (NET) and Nature Based Solutions (NBS)? • Support creation of new carbon sinks/removals through natural sequestration including that by natural habitats, blue-green infrastructure and soils? • Support an energy system consistent with reducing carbon emissions to Net Zero by 2050 and long term emphasis on electrification of Clean Power 2030?
2	Maximise adaptation and resilience of built assets, communities and people as well as natural assets, habitats and species, to the multiple effects of climate change *	Will the NPS… • Promote future proofing against the effects and risks of climate change (e.g. flooding, sea level rise, coastal erosion and change in weather patterns)? • Encourage design for successful adaptation to the predicted changes in weather conditions and frequency of extreme weather events (freezing, heat waves, intense storms)?

	**Adaptation is about taking steps to live with the effects and managing the impact of climate change such as building quay walls and flood barriers or managing coasts through rollback. Resilience is the ability of a system to adsorb and bounce back after an adverse event.*	• Address the climate induced risks of cascading failures from interdependent infrastructure energy networks or from the cascading failure of other infrastructure such as reservoirs? • Lead to major infrastructure development that is flood resilient over its lifetime, considering the effects of climate change, without increasing the flood risk elsewhere and identifying opportunities to reduce the risk overall? • Avoid inappropriate development in areas at risk from flooding and coastal erosion? • Manage the risks of flooding and coastal erosion, particularly through working with natural processes? • Ensure provision of appropriate compensatory measures is in place when there is no other option to land take from areas of flood plain? • Encourage the use of Nature Based Solutions to aid with climate adaptation?
3	Enhance biodiversity and ecological networks, deliver biodiversity net gain, protect and support ecosystem resilience and functionality	Will the NPS… • Protect and enhance nationally designated sites such as SSSIs and National Nature Reserves, Marine Conservation Zones, Marine Protection Areas and Highly Protected Marine Areas, including those of potential or candidate designation? • Protect and enhance all important and valued habitat and populations of protected/scarce species, including those on locally designated sites, including Irreplaceable Habitats, Key Wildlife Sites, Local Wildlife Sites and Local Nature Reserves? • Protect and enhance priority habitats, and the habitat of priority species? • Promote new habitat creation or restoration and linkages with existing habitats? • Help deliver the Nature Recovery Network and support the delivery of Local Nature Recovery Strategies?

		• Protect the structure and function/ecosystem processes, including in the marine environment? • Increase the resilience of biodiversity to the potential effects of climate change? • Reduce or avoid impacts to habitats with important roles in carbon sequestration? • Encourage sensitive or nature inclusive design in terrestrial and marine environments? • Ensure energy activities protect fish stocks and marine mammals? • Ensure energy activities do not exacerbate disturbance to bird populations? • Deliver a minimum 10% net gain in biodiversity for any new major infrastructure development? • Increase the resilience of biodiversity to the potential effects of climate change? • Prevent spread of invasive species (native and non-native), including new invasive species because of climate change? • Support delivery of the Environmental Improvement Plan including Environment Act 2021 targets (specifically the Apex target to halt the decline in species abundance by 2030 and then increase abundance by at least 10% to exceed 2022 levels by 2042) and interim targets?
4	Protect and enhance sites designated for their international importance for nature conservation purposes	Will the NPS… • Avoid the direct loss of, or indirect harm to, 'Habitats Sites' (SPAs, SACs and Ramsar sites), including those of potential designation (candidate SPAs, proposed SACs, Sites of Community Importance (SCI) and proposed Ramsar sites) and compensation sites both onshore and offshore? • Support continued improvements to the condition status of the UK's national site network?

5	Protect and enhance cultural heritage assets and their settings, and the wider historic environment	Will the NPS… • Encourage early engagement by developers with statutory heritage bodies? • Where possible seek to avoid impacts on designated and non-designated heritage assets? • Conserve and enhance designated heritage assets and their settings (World Heritage Sites, Scheduled Monuments, Listed Buildings and structures, Registered Parks and Gardens, Registered Battlefields and Conservation Areas), as well as maritime assets such as protected wrecks? • Conserve and enhance non-designated and / or locally listed heritage assets (including newly discovered heritage assets and archaeology) and their settings? • Address heritage assets at risk, or protect them from further threats? • Avoid significant harm to heritage assets, for example from the generation of noise, vibration and light pollution, pollutants and visual intrusion? • Ensure appropriate archaeological assessment prior to development to establish the significance of archaeological remains and the impact of the proposed development (on the significance)? • Maintain or improve the interpretation, understanding and appreciation of the historic environment? • Increase public access to heritage assets? • Ensure adequate archaeological mitigation prior to and / or during development? (i.e. to consider if archaeological remains identified by the assessment will be impacted, damaged or disturbed by the development)'
6	Protect and enhance the character and quality of the landscapes, townscapes	Will the NPS…

	and waterscapes and protect and enhance visual amenity	• Avoid development in National Parks and National Landscapes (formerly AONBs) and seek to further their purpose? • Support the integrity of any areas designated for landscape value, including in conjunction with the provisions of any relevant Management Plan (e.g. National Parks, National Landscapes, Heritage Coasts and local landscape designations)? • Conserve and enhance the intrinsic character or setting of local landscapes or townscapes or waterscapes? • Minimise noise and light pollution from construction and operational activities on residential amenity and on sensitive locations, receptors and views? • Protect dark skies, particularly those areas designated as such? • Prevent reduced tranquillity and / or protect and preserve tranquillity? • Conserve, protect and enhance natural environmental assets (e.g. parks and green spaces, common land, woodland / forests etc) where they contribute to landscape and townscape quality? • Support the delivery of the Environmental Improvement Plan?
7	Protect and enhance the water environment	Will the NPS… • Protect ground, surface, estuarine and coastal water quality in line with Water Framework Directive and Marine Strategy Framework requirements across all phases of construction, operation and decommissioning? • Result in changes to groundwater distribution and flow? • Safeguard the availability of water resources (surface and groundwater) across all phases of construction, operation and decommissioning? • Minimise the use of water resources / water consumption? • Protect the integrity of coastal and estuarine processes?

		• Reduce operational and accidental discharges to the water environment? • Protect the quality of the seabed and its sediments, and avoid significant effects on seabed morphology and sediment transport processes? • Support the delivery of the Environmental Improvement Plan?
8	Protect and enhance air quality on a local, regional, national and international scale	Will the NPS… • Minimise emissions of dust and other air pollutants that affect human health or biodiversity? • Improve air quality within AQMAs and avoid the need for new or expanded AQMAs? • Promote enhancements to green infrastructure networks to help improve air quality? • Avoid adverse air quality effects on Habitats Sites and Sites of Special Scientific Interest?
9	Protect soil resources, promote use of brownfield land and avoid land contamination	Will the NPS… • Assist in facilitating the re-use of previously developed land? • Avoid development upon the best and most versatile agricultural land, or soils of high sensitivity such as peat? • Ensure the protection of soil resources and avoid soil health degradation through sustainable soil management and re-use? • Promote and enhance soil health? • Seek to remediate contaminated land? • Minimise development (hardstanding) footprint to reduce soil sealing? • Support delivery of the Environmental Improvement Plan?

10	Protect, enhance and promote geodiversity	Will the NPS… • Protect and enhance geodiversity resource? • Protect or enhance SSSIs designated for their geological interest? • Avoid the degradation and removal, wherever possible, of RIGS? • Protect geodiversity on the shoreline and marine waters? • Support access to, interpretation and understanding of geodiversity?
11	Improve health and well-being and safety for all citizens and reduce inequalities in health	Will the NPS… • Protect the health of communities through prevention of accidental pollutant discharges, exposure to electric and magnetic fields or radiation? • Minimise nuisance on communities, their health, quality of life and their facilities including, noise, artificial light, odour, dust, steam, smoke and infestation of insects? • Result in loss of recreational and amenity land or loss of access? • Provide for facilities that can promote more social interaction and a more active lifestyle and enjoyment of the countryside and coasts? • Promote access to nature for people and improve local Green Infrastructure provision? • Promote initiatives that enhance safety and personal security for all? • Where possible, contribute to improvements to health and quality of life?
12	Promote sustainable transport and minimise detrimental impacts on strategic transport network	Will the NPS… • Prevent adverse changes to strategic transport infrastructure road/rail/airport? • Prevent loss or disruption to basic services and infrastructure (e.g. telecommunications, electricity, gas)?

	and disruption to basic services and infrastructure	• Promote transportation of goods and people by low/zero carbon transport modes? • Reduce travel distances to work and reduce the need for out commuting?
13	Promote a strong economy with opportunities for local communities	Will the NPS… • Support enhanced security, reliability and affordability of the national energy supply? • Support creation of both temporary and permanent jobs and increase skills, particularly in areas of need? • Have wider socio-economic effects such as changes to the demographics, community services or house prices? • Delivery of infrastructure to support economic investment in the local economy?
14	Promote sustainable use of resources and natural assets	Will the NPS… • Reduce consumption of materials, energy and resources? • Promote sustainable waste management practices in line with the waste hierarchy? • Encourage the use of recycled and / or secondary materials? • Encourage the development of a circular economy? • Promote the use of low carbon materials and technologies? • Produce waste by-products that require appropriate management? • Promote the use of local suppliers that use sustainably-sourced and locally produced materials? • Provide for safe and secure storage of radioactive and other wastes where necessary? • Support delivery of the Environmental Improvement Plan including the Environment Act 2021 target to reduce residual waste (excluding major mineral wastes) kg per capita by 50% by 2042 from 2019 levels, and associated interim targets?

Assessment of draft fusion energy generation EN-8

Introduction

The findings of the AoS of the draft EN-8 are set out in this section and address each of the AoS Objectives in turn. Many issues and effects for sustainability are cross-cutting and effects are reported where they are most relevant to avoid duplication of appraisal. Inter- relationships between topics and likely significant secondary, synergistic and cumulative effects are also reported where appropriate in each topic. Where significant adverse effects are predicted, possibilities for mitigation are suggested.

Draft EN-8 covers the development of fusion energy infrastructure. Different fusion technologies can use a range of methods to initiate and confine the fusion reactions that generate energy, and some use a combination of approaches. The two primary methods are: magnetic confinement and inertial confinement. While all fusion energy infrastructure will have some common characteristics, different technologies and designs may have different requirements, such as access to water for cooling as opposed to using dry cooling. The draft EN-8 does not specify a particular fusion technology or design, nor does it identify specific sites and it is anticipated that different technologies, designs and sites will have different requirements. As such, the AoS takes a conservative approach and focuses on the effects of large-scale fusion facilities. For the purposes of this assessment it has been assumed that the buildings and site footprint for a fusion energy infrastructure site is comparable in size to nuclear fission generating infrastructure of a similar expected capacity.

The AoS is undertaken with consideration of the mitigation hierarchy to avoid harm in the first instance. Where this is not possible, then mitigation and enhancement are applied, followed by compensation where required. Note that for all assessments there is uncertainty as to the precise level of effect as this will be dependent upon the precise design of the fusion energy infrastructure and the area (or alternative areas) within which it could be located.

The assessments of the draft EN-8 are undertaken in the absence of CNP policy as set out in EN-1 and the results detailed in this report reflect how it is considered the draft EN-8 performs in sustainability terms, before application of CNP policy by the Secretary of State (see below for summary of assessment results of application of CNP as presented in the AoS of EN-1).

For each AoS Objective, the process of assessment has been undertaken in three steps, by first identifying the anticipated effects of the infrastructure set out in draft EN-8, second considering how policies in the draft EN-8 (when considered alongside the requirements of EN-1) address the AoS guide questions and finally conclusions of the assessment are made of the likely residual technology effects over the short, medium and long term as defined in the Temporal Scope.

Recommendations for clarifying and strengthening of the NPS were discussed with DESNZ in an iterative fashion and the following sets out the assessment of the draft NPS as published for public consultation.

Assessment of Critical National Priority Infrastructure (as made in respect of EN-1)

EN-1 sets out that there is a critical national priority (CNP) for the provision of nationally significant low carbon infrastructure and that includes fusion energy facilities. CNP will only be applied in exceptional circumstances by the Secretary of State, when the measures and approaches outlined in EN-1 have not been able to address all residual effects. The CNP policy will influence how non-HRA and non-MCZ residual impacts are considered in the planning balance and the Secretary of State will consider whether tests requiring clear outweighing of harm, exceptionality, or very special circumstances have been met by a CNP Infrastructure application. The CNP policy will also influence the Secretary of State's approach to HRA derogations and MCZ assessments. Where, following HRA Appropriate Assessment, CNP Infrastructure has residual adverse impacts on the integrity of sites forming part of the UK national site network, either alone or in combination with other plans or projects, the Secretary of State will consider making a derogation under the Habitats Regulations. Similarly, if during an MCZ assessment, CNP Infrastructure has residual impacts which significantly risk hindering the achievement of the stated conservation objectives for the MCZ, the Secretary of State will consider making a derogation under section 126(7) of the Marine and Coastal Access Act 2009.

CNP policy was assessed in the AoS of EN-1 which concluded that robust measures to ensure environmental protection will be provided for the vast majority of environmental issues associated with energy infrastructure as set out in EN-1. It is only in exceptional circumstances, where significant residual impacts that are not capable of being addressed by application of the mitigation hierarchy, of any sort other than those that present an unacceptable risk to, or unacceptable interference with, human health, national defence or navigation, will the need for these protection measures be derogated 'as a last resort', when it can be satisfactorily demonstrated that the low carbon infrastructure could otherwise not be developed due to certain significant residual environmental impacts.

The AoS of EN-1 concluded that the application of CNP will have positive effects in relation to the need to address climate change, ensure security of energy supply and the needs of the economy. Effects on health and wellbeing are considered to be potentially both positive and negative, but given the protection outlined in EN-1, the protection provided by other, separate and specific, legislation and the commitment that the CNP approach will not be applied if a development could result in an unacceptable risk to, or unacceptable interference with, human health, it is anticipated these positive or negative effects would not be significant. However, effects on the Built and Natural Environment, through the application of CNP, have the potential to be significantly negative.

AoS Objective 1: Consistent with the national target of reducing carbon emissions to Net Zero by 2050

Anticipated effects

Fusion energy is expected to play, in due time, an important part in achieving the long term sustainability of net zero through the provision of abundant baseload low-carbon electricity. The operation of fusion energy infrastructure will result in significant savings of GHG emissions (i.e. offset many million tonnes of CO2 emissions) through the amount of low-carbon electricity it will produce, as compared to more carbon intensive energy production technologies such as natural gas fired power stations, over an at least 40-years operational life. However, it needs to be recognised that fusion energy infrastructure is not completely net zero as residual GHG emissions will be generated throughout its life cycle.

The construction phase of fusion energy infrastructure (lasting up to 10 years) will generate substantial emissions of GHG (predominantly CO2 emissions). These construction emissions can amount to several million tonnes for >1 GW scale fusion energy infrastructure. The construction of the vacuum building is expected to represent the bulk of the emissions during this phase, mainly due to emissions associated with the high embodied carbon nature of construction materials such as concrete and steel, followed by the emissions from construction of the maintenance building and of the radioactive material storage building. Construction transportation emissions are expected to represent a much smaller, but nevertheless important, proportion of the emissions. There are a wide range of mitigation measures available to help address the production of emissions during construction. These measures include the reduction of overall requirement for construction materials, reduction to construction programme, use of more efficient, low or zero emission vehicles and construction plant and equipment, low carbon design and use of low carbon fuel sources. However, the industry's requirements for high embodied carbon construction means that non-negligible residual emissions will remain and which will need to be addressed.

While there will be significant amounts of low carbon electricity produced across the operational phase, it is important to also recognise that the operation phase will result in some residual GHG emissions (predominantly CO2 emissions). Operation of the fusion building, incorporating the vacuum vessel, cooling and vacuum systems, is expected to be the main source of emissions, mainly from fuel oil use in boilers for heating and hot water, emissions associated with maintenance and refurbishment activities (transport and embodied carbon of materials) and also the embodied carbon associated with extraction and transportation of the tritium and deuterium fuels to site and waste out of the site for disposal. Operation of the radioactive material storage building and the tritium recycling operations will also generate GHG emissions. Mitigation measures such as buildings heat and air conditioning optimisation, low carbon plant and equipment and supply of low carbon electricity from the fusion energy infrastructure can be applied during this phase. Whilst it is noted that any residual GHG emissions generated during operation could be considered to be fully offset by the continuous GHG emissions savings due to the production of low-carbon electricity over its lifetime, the

emissions associated with obtaining and transporting tritium and deuterium fuels will still occur elsewhere.

Decommissioning activities in the long term are expected to result in some GHG emissions (predominantly CO2 emissions) over a relatively long timeframe (30 years after closure of the fusion energy infrastructure). GHG emissions are anticipated to be much lower than those during the construction phase because of expected advances in zero carbon emissions vehicles and machinery by the time decommissioning takes place, together with the need for less earth movements and less transportation of materials to and off the site in comparison to construction.

Facilities and activities associated with the storage of radioactive material may remain operational up to 100 years after operations cease. Energy from other sources rather than the fusion energy infrastructure for air conditioning, materials for maintenance etc may be necessary to keep such facilities operational. However, GHG emissions are expected to be very low as they will occur in a Net Zero world where energy sources and materials embodied carbon will have been decarbonised.

Despite the significant reductions that can be achieved through mitigation during construction, operation and decommissioning as discussed above, residual GHG emissions will still occur as a result of fusion energy generation. To get to net zero, any residual GHG emissions released need to be balanced by schemes that offset the same amount of GHG emissions entering the atmosphere. Available methods of removal include Negative Emissions Technologies (NET) and Nature Based Solutions (NBS). NET include Bio-Energy with Carbon Capture and Storage (BECCS) and Direct Air Carbon Capture and Sequestration (DACCS) and NBS involve schemes which protect and restore forests and wetlands to achieve negative emissions by biological sequestration.

Assessment made in respect of EN-8

Support reduction of the carbon emissions of the national portfolio of major energy infrastructure?

The draft EN-8 sets out that fusion energy has the potential to be a transformative source of clean and abundant low-carbon energy. The establishment of fusion energy infrastructure is expected to increase the proportion of energy supplied by low carbon sources and conversely reduce the proportion provided by fossil fuels thus reducing the UK’s energy related GHG emissions.

Support reduction of direct and indirect emissions of all greenhouse gases, including carbon dioxide, during construction, operation and decommissioning?

Draft EN-8 refers to Section 5.3 Greenhouse Gas Emissions of EN-1 that notes the construction, operation and decommissioning of all energy infrastructure, including fusion energy infrastructure, will in itself lead to GHG emissions. While all steps should be taken to reduce and mitigate climate change impacts, it is accepted that there will be residual emissions

from energy infrastructure, particularly during the economy wide transition to net zero, and potentially beyond.

EN-1 therefore requires that all proposals for energy infrastructure projects should include a carbon assessment as part of their ES. This should include:

- A whole life GHG assessment showing construction, operational and decommissioning GHG impacts, including impacts from change of land use;
- An explanation of the steps that have been taken to drive down the climate change impacts at each of those stages;
- Measurement of embodied GHG impact from the construction stage;
- How reduction in energy demand and consumption during operation has been prioritised in comparison with other measures;
- How operational emissions have been reduced as much as possible through the application of best available technology for that type of technology;
- Calculation of operational energy consumption and associated carbon emissions;
- Whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework; and
- Where there are residual emissions, the level of emissions and the impact of those on national and international efforts to limit climate change, both alone and where relevant in combination with other developments at a regional or national level, or sector level, if sectoral targets are developed.

A GHG assessment should be used to drive down GHG emissions at every stage of the proposed development and ensure that emissions are minimised as far as possible for the type of technology, taking into account the overall objectives of ensuring supply of energy always remains secure, reliable and affordable, in the transition to net zero. Government has determined that operational GHG emissions are not reasons to prohibit the consenting of energy projects or to impose more restrictions on them in the planning policy framework than are set out in the energy NPSs. As such any carbon assessment will include an assessment of operational GHG emissions, but operational emissions will be addressed in a managed, economy-wide manner, to ensure consistency with carbon budgets, net zero and our international climate commitments.

Support supply of energy from low carbon/renewable energy sources / use of low carbon/renewable energy?

Section 1 of draft EN-8 sets out that fusion energy has the potential to be a transformative source of clean and abundant low-carbon energy. Support for fusion energy infrastructure is expected to increase the proportion of energy supplied by low carbon sources and consequently lead to the use of low carbon energy.

Support the generation of heat for industrial uses?

Section 3.5 Developmental of draft EN-8 supports co-location of fusion energy infrastructure with sectors that can maximise the use of its clean energy and high temperature heat outputs, such as AI data centres.

Support use of carbon removals to offset residual emissions from energy such as Negative Emissions Technologies (NET) and Nature Based Solutions (NBS)?

Draft EN-8 refers to EN-1 Section 5.3 Greenhouse Gas Emissions which specifically requires an application to set out whether and how any residual GHG emissions will be (voluntarily) offset or removed using a recognised framework and sets out that planning applications for new energy infrastructure should look for opportunities within the proposed development to embed nature-based or technological solutions to mitigate or offset the emissions.

Support creation of new carbon sinks/removals through natural sequestration including that by natural habitats, blue-green infrastructure and soils?

EN-1 Section 5.3 Greenhouse Gas Emissions sets out that planning applications for new energy infrastructure should look for opportunities within the proposed development to embed nature-based or technological solutions to mitigate or offset the emissions of construction and decommissioning. Steps taken should be set out in a Greenhouse Gas Reduction Strategy, secured under the development consent order and the strategy should consider the creation and preservation of carbon stores and sinks including through woodland creation, peatland restoration and through other natural habitats.

Support an energy system consistent with reducing carbon emissions to Net Zero by 2050 and long term emphasis on electrification of Clean Power 2030?

Section 1 of draft EN-8 sets out that fusion energy has the potential to be a transformative source of clean and abundant low-carbon energy. When operational, fusion energy would increase the proportion of electricity supplied by low carbon sources, supporting the long-term emphasis on electrification, reducing the UK's energy related GHG emissions, contributing to achieving Net Zero and the maintenance of Net Zero, through continuing to contribute low-carbon energy in later decades.

Assessment conclusions and summary

In view of the anticipated effects described, and considering the requirements in draft EN-8 and EN-1 as discussed above, Table 8 provides the assessment of draft EN-8. Significant beneficial effects are predicted in the medium to long term i.e. as fusion energy infrastructure sites become operational in the 2040s, they are expected to produce very significant quantities of low carbon energy (electricity and heat) over their lifetime. The quantities of energy supplied will be critical in helping to decarbonise the energy network through providing low-carbon electricity for homes, transport and industry alongside other benefits such as providing stability and resilience to electrical grids, facilitating the wider integration of variable renewables such as wind and solar and helping provide heat to decarbonise hard-to-abate sectors such as industry.

It is considered that minor negative effects will occur in the short (construction), medium (operation) and long (decommissioning) term reflecting the residual emissions from fusion energy infrastructure associated with transportation and embodied carbon, though it is anticipated that as new approaches to construction/deconstruction such as use of low/zero carbon plant and materials and the use of low carbon electricity during operation, these emissions will become residual. Residual emissions will also remain associated with obtaining and transporting tritium and deuterium fuels to the fusion energy infrastructure and to a lesser extent with transporting materials to final disposal. These residual emissions can be balanced by negative emissions through voluntary or sectoral arrangements as set out in EN-1 but there is no certainty at present of when these arrangements will come into place so residual emissions can still be expected to occur.

Decommissioning in the long term will likely bring temporary minor negative effects similar to those for construction but effects will eventually become neutral through the cessation of operational aspects. It is to be noted that considerations made above are for large scale fusion facilities – smaller scale fusion stations can be anticipated to result in less GHG emissions during all phases due to their much smaller size individually.

Table 8: Consistent with the national target of reducing carbon emissions to Net Zero by 2050

AoS Objective 1: Consistent with the national target of reducing carbon emissions to Net Zero by 2050	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Support reduction of the carbon emissions of the national portfolio of major energy infrastructure? • Support reduction of direct and indirect emissions of all greenhouse gases, including carbon dioxide, during construction, operation and decommissioning? • Support supply of energy from low carbon/renewable energy sources / use of low carbon/renewable energy? • Support the generation of heat for industrial uses? • Support use carbon removals to offset residual emissions from energy such Negative Emissions Technologies (NET) and Nature Based Solutions (NBS)?	**-**	**-/++**	**-/++**

• Support creation of new carbon sinks/removals through natural sequestration including that by natural habitats, blue-green infrastructure and soils? • Support an energy system consistent with reducing carbon emissions to Net Zero by 2050 and long term emphasis on electrification of Clean Power 2030?			

AoS Objective 2: Maximise adaptation and resilience of built assets, communities and people as well as natural assets, habitats and species, to the multiple effects of climate change

Anticipated effects

Fusion energy infrastructure design will need to adapt and incorporate a greater degree of resilience to the unavoidable impacts of climate change. These impacts include changes in temperature and rainfall patterns, along with more frequent extreme weather events (for example drought or flood) as well as sea level rise and coastal change and erosion.

Fusion energy design to protect against extreme events may impact flood risk and coastal change and erosion resulting in increased risks elsewhere on built assets, communities and people and well as also on natural assets, species and habitats.

Nature-based solutions such as tree planting or peat restoration for carbon sequestration also have a role in climate change adaptation.

Assessment made in respect of EN-8

Promote future proofing against the effects and risks of climate change (e.g. flooding, sea level rise, coastal erosion and change in weather patterns)?

Draft EN-8 Section 2.5 Climate change adaptation and mitigation seeks to help achieve the government's climate change adaptation policy by requiring applicants to bring forward proposals that will be resilient to the effects of climate change, without increasing risks elsewhere. As climate change is likely to increase risks to infrastructure, for example from flooding or rising sea levels, applicants must set out how their proposed infrastructure would be resilient to:

- Increased risk of flooding, and taking into account the long-term implications of flood risk;
- Coastal erosion and increased risk of storm surge and rising sea levels;
- Higher temperatures;
- Increased risk of drought, which could lead to a lack of available process water;
- Risks from cascading failures across multiple sectors or infrastructure networks; and
- Any other risks and safety considerations likely to be impacted by climate change.

Encourage design for successful adaptation to the predicted changes in weather conditions and frequency of extreme weather events (freezing, heat waves, intense storms)?

Section 4.10 Climate Change Adaptation and Resilience of EN-1, to which section 2.5 of draft EN-8 refers, sets out generic considerations to help ensure that fusion energy infrastructure is resilient to climate change, both for applicants and for the Secretary of State.

Applicants must consider the impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure. Applicants should ensure that the Environmental Statement (ES) sets out how the proposal will take account of the projected impacts of climate change, using government guidance and industry standard benchmarks such as the Climate Change Allowances for Flood Risk Assessments, Climate Impacts Tool, and British Standards for climate change adaptation, in accordance with the EIA Regulations. Applicants should assess the impacts on and from their proposed energy project across a range of climate change scenarios, in line with appropriate expert advice and guidance available at the time. Applicants should demonstrate that proposals have a high level of climate resilience built-in from the outset and should also demonstrate how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario.

The Secretary of State should be satisfied that applicants for new energy infrastructure have taken into account the potential impacts of climate change using the latest UK Climate Projections and associated research and expert guidance available at the time the ES was prepared to ensure they have identified appropriate mitigation or adaptation measures. This should cover the estimated lifetime of the new infrastructure, including any decommissioning period. Should a new set of UK Climate Projections or associated research become available after the preparation of the ES, the Secretary of State (or the Examining Authority during the examination stage) should consider whether they need to request further information from the applicant; that there are no features of the design of new energy infrastructure critical to its operation which may be seriously affected by more radical changes to the climate beyond that projected in the latest set of UK climate projections, taking account of the latest credible scientific evidence on, for example, sea level rise (for example by referring to additional maximum credible scenarios and that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime. If any adaptation measures give rise to consequential impacts (for example on flooding, water resources or coastal change) the Secretary of State should consider the impact of the latter in relation to the application as a whole and the impacts guidance set out in Part 5 of EN-1.

Address the climate induced risks of cascading failures from interdependent infrastructure energy networks or from the cascading failure of other infrastructure such as reservoirs?

Addressing risks of climate induced cascading failures are a specific requirement for planning applications under draft EN-8 Section 2.5 Climate change adaptation and mitigation (see above).

Lead to major infrastructure development that is flood resilient over its lifetime, considering the effects of climate change, without increasing the flood risk elsewhere and identifying opportunities to reduce the risk overall?

Section 4.10 Climate Change Adaptation and Resilience of EN-1, to which section 2.5 of draft EN-8 refers, sets out that necessary action can be taken to ensure the operation of the infrastructure over its estimated lifetime which will include construction, operation, decommissioning. New energy infrastructure will typically be a long-term investment and will need to remain operational over many decades, in the face of a changing climate. Consequently, applicants must consider the direct (e.g. flooding of buildings) and indirect (e.g. flooded access roads to the site) impacts of climate change when planning the location, design, build, operation and, where appropriate, decommissioning of new energy infrastructure. Moreover, in certain circumstances, measures implemented to ensure a scheme can adapt to climate change may give rise to additional impacts, for example as a result of protecting against flood risk, there may be consequential impacts on coastal change.

Adaptation measures should be required to be implemented at the time of construction where necessary and appropriate to do so. However, where they are necessary to deal with the impact of climate change, and that measure would have an adverse effect on other aspects of the project and/or surrounding environment (for example coastal processes), the Secretary of State may consider requiring the applicant to ensure that the adaptation measure could be implemented should the need arise, rather than at the outset of the development (for example increasing height of existing, or requiring new, sea walls).

As per EN-1 Section 4.1 General Policies and Considerations early engagement is strongly encouraged between the applicant and key stakeholders. This is noted in paragraph 3.1.8 of draft EN-8. A non-exhaustive list of bodies that applicants are advised to engage for flooding and coastal erosion is provided in the annex of draft EN-8: Environment Agency, Natural Resources Wales, Welsh Government, Marine Management Organisation, Lead Local Flood Authorities, District and Borough Councils, Water and Sewerage Companies, Water Only Companies, Water Retailers, Internal Drainage Boards, Coast Protection Authorities and Highway Authorities.

Avoid inappropriate development in areas at risk from flooding and coastal erosion?

Section 5.8 Flood Risk of EN-1, to which draft EN-8 refers, sets out the generic Flood Risk requirements of major energy infrastructure and the assessments that must be undertaken. In particular, it states the need to ensure that flood risk from all sources of flooding is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to steer new development to areas with the lowest risk of flooding. Where new energy infrastructure is, exceptionally, necessary in flood risk areas (for example where there are no reasonably available sites in areas at lower risk), the aim is to make it safe for its lifetime without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. The infrastructure should also be designed and constructed to remain operational in times of flood. Proposals that aim to facilitate the relocation of existing energy infrastructure

from unsustainable locations which are or will be at unacceptable risk of flooding, should be supported where it would result in climate-resilient infrastructure.

Draft EN-8 sets out in Section 3.2 Environmental - Flooding that applicants are advised to determine the 'Flood risk vulnerability classification' for all parts of the proposed fusion energy infrastructure across its whole lifecycle and understand how flooding risks should therefore be addressed. If applying the Sequential Test, applicants should follow the guidance available in the 'Flood Risk' section of EN-1 as well as national planning guidance, and should consider constructability, operability and other issues when assessing reasonable alternative sites in relation to flood risk. These could include, but are not limited to: proximity or connectivity to transmission infrastructure and/or the end user for the energy produced, site access for large items required for construction or operation, any need for the infrastructure to be located in a specific region or locality and other considerations These and other issues may determine whether another site on land at a lower risk of flooding is not a reasonable alternative.

Draft EN-8 sets out in Section 3.2 Environmental - Landform Change that fusion energy infrastructure development can impact on the natural functioning of water bodies in coastal, estuarine, riverine and lacustrine locations, with consequential impacts on erosion and other forms of landform change. This section effectively extends the provisions of Section 5.6 of EN-1 on Coastal Change to estuarine, riverine and lacustrine locations.

EN-1 Section 5.6 Coastal Change deals specifically with onshore energy infrastructure projects situated on the coast, which should:

- ensure that policies and decisions in coastal areas are based on an understanding of coastal change over time;
- prevent new development from being put at risk from coastal change by: i. avoiding inappropriate development in areas that are vulnerable to coastal change or any development that adds to the impacts of physical changes to the coast, and ii. directing development away from areas vulnerable to coastal change;
- ensure that the risk to development which is, exceptionally, necessary in coastal change areas because it requires a coastal location and provides substantial economic and social benefits to communities, is managed over its planned lifetime;
- ensure that plans are in place to secure the long-term sustainability of coastal areas. Where relevant, applicants should undertake coastal geomorphological and sediment transfer modelling to predict and understand impacts and help identify relevant mitigating or compensatory measures; and
- demonstrate that full account has been taken of the potential effects of climate change on these risks. Applicants should propose appropriate mitigation measures to address adverse physical changes to the coast, in consultation with the MMO, the EA/NRW, LPAs, other statutory consultees, Coastal Partnerships and other coastal groups, as it considers appropriate. Where this is not the case the Secretary of State should consider

what appropriate mitigation requirements might be attached to any grant of development consent.

Manage the risks of flooding and coastal erosion, particularly through working with natural processes?

Section 4.10 Climate Change Adaptation and Resilience of EN-1, to which draft EN-8 refers, sets out that in preparing measures to support climate change adaptation, applicants should consider whether to take reasonable steps to maximise use of nature-based solutions alongside other conventional techniques. Integrated approaches, such as looking across the water cycle considering coordinated management of water storage, supply, demand, wastewater and flood risk can provide further benefits to address multiple infrastructure needs, as well as carbon sequestration benefits could provide a basis for such adaptation. In addition to avoiding further GHG emissions when compared with some more traditional adaptation approaches, nature based solutions can also result in biodiversity benefits and net gain as well as increasing absorption of carbon dioxide from the atmosphere.

Ensure provision of appropriate compensatory measures is in place when there is no other option to land take from areas of flood plain?

Section 5.8 Flood Risk of EN-1 sets out that where new energy infrastructure is, exceptionally, necessary in flood risk areas (for example where there are no reasonably available sites in areas at lower risk), it needs to be made safe for its lifetime without increasing flood risk elsewhere and, where possible, by reducing flood risk overall. It should also be designed and constructed to remain operational in times of flood. If, following application of the Sequential Test, it is not possible, (taking into account wider sustainable development objectives), for the project to be located in areas of lower flood risk the Exception Test can be applied. The test provides a method of allowing necessary development to go ahead in situations where suitable sites at lower risk of flooding are not available. It would only be appropriate to move onto the Exception Test when the Sequential Test has identified reasonably available, lower risk sites appropriate for the proposed development where, accounting for wider sustainable development objectives, application of relevant policies would provide a clear reason for refusing development in any alternative locations identified. Development should be designed to ensure there is no increase in flood risk elsewhere, accounting for the predicted impacts of climate change throughout the lifetime of the development. There should be no net loss of floodplain storage and any deflection or constriction of flood flow routes should be safely managed within the site. Mitigation measures should make as much use as possible of natural flood management techniques.

Encourage the use of Nature Based Solutions to aid with climate adaptation?

Section 4.10 Climate Change Adaptation and Resilience of EN-1 to which draft EN-8 refers recognises that in certain circumstances, measures implemented to ensure a scheme can adapt to climate change may give rise to additional impacts, for example as a result of

protecting against flood risk, there may be consequential impacts on coastal change. In preparing measures to support climate change adaptation applicants should take reasonable steps to maximise the use of nature-based solutions alongside other conventional techniques.

Assessment conclusions and summary

Considering the policies in EN-1 and draft EN-8 as discussed above, and the assessment made of draft EN-8, the conclusion is that AoS Objective 2 is addressed comprehensively by the policies in draft EN-8 and EN-1. The summary assessment is set out in Table 9.

The policies set out in EN-1 ensure the latest UK Climate Projections and associated research and expert guidance will be taken into account and that impacts on and from proposed energy projects across a range of climate change scenarios are considered; and in particular demonstration of how proposals can be adapted over their predicted lifetimes to remain resilient to a credible maximum climate change scenario.

EN-1 details climate adaptation requirements and considerations in relation to onshore energy infrastructure projects situated on the coast. It covers coastal erosion and deposition specifically, acknowledging that the impact of climate change on such processes and the need to address this. EN-8 recognises that fusion development may involve estuarine, riverine and lacustrine locations, as well as coastal locations, and extends the requirements of EN-1 to consider effects from riverine, lacustrine and estuarine erosion.

EN-1 also sets requirements for the management of other climate change risks associated with periods of limited water availability, storms, heatwaves and wildfires over the lifetime of the energy infrastructure.

EN-1 sets out that applicants should consider whether to take reasonable steps to maximise use of nature-based solutions to address the impacts of flooding and coastal erosion, including the use of SUDS alongside other conventional techniques.

It is considered that the application of requirements in EN-1 and draft EN-8 will maximise adaptation and resilience to climate change of fusion energy infrastructure through promoting future proofing against the effects and risks of climate change in coastal, estuarine and lacustrine locations, and working with natural processes to minimise such effects and risks, with significant beneficial effects predicted over the short, medium and long term.

Table 9: Maximise adaptation and resilience of built assets, communities and people as well as natural assets, habitats and species, to the multiple effects of climate change

AoS Objective 2: Maximise adaptation and resilience of built assets, communities and people as well as natural assets, habitats and species, to the multiple effects of climate change	Assessment of effects (by timescale)		
	S	M	L

Guide questions: • Promote future proofing against the effects and risks of climate change (e.g. flooding, sea level rise, coastal erosion and change in weather patterns)? • Encourage design for successful adaptation to the predicted changes in weather conditions and frequency of extreme weather events (freezing, heat waves, intense storms)? • Address the climate induced risks of cascading failures from interdependent infrastructure energy networks or from the cascading failure of other infrastructure such as reservoirs? • Lead to major infrastructure development that is flood resilient over its lifetime, considering the effects of climate change, without increasing the flood risk elsewhere and identifying opportunities to reduce the risk overall? • Avoid inappropriate development in areas at risk from flooding and coastal erosion? • Manage the risks of flooding and coastal erosion, particularly through working with natural processes? • Ensure provision of appropriate compensatory measures is in place when there is no other option to land take from areas of flood plain? • Encourage the use of Nature Based Solutions to aid with climate adaptation?	**++**	**++**	**++**

AoS Objective 3: Enhance biodiversity and ecological networks, deliver biodiversity net gain, protect and support ecosystem resilience and functionality

Anticipated effects

The scope and scale of fusion energy infrastructure development likely to be enabled by draft EN-8 have the potential for a range of effects on the natural environment and biodiversity. The effects include loss of habitat and species, habitat fragmentation/severance/isolation, disturbance, pollution, obstructions, changes to terrestrial microclimates and changes to coastal and marine processes due to construction, operation and decommissioning activities associated with fusion energy infrastructure.

Many types of fusion energy technology will need large volumes of cooling water; this indicates that coastal, estuarine and riverine sites are likely to be preferred. Such locations are often associated with marginal habitats, specialist species and valuable ecological environments and their development increases the risk of permanent habitat fragmentation and loss with associated risks of species loss and isolation. In addition, water based cooling systems can result in both direct and indirect effects on aquatic biodiversity, including:

- the discharge of water at higher temperatures than receiving waters, which is likely to have an effect on aquatic flora and fauna,
- effects from the abstraction of water that will reduce flows in water courses, resulting in negative effects on aquatic flora and fauna habitat,
- fish impingement and/or entrainment" – i.e. being taken into the cooling system during abstraction; and
- release of chemical anti-fouling substances, used in the treatment of water for use in cooling systems, into the water environment.

Other potential adverse effects from fusion development arise from surface water and wastewater discharge, coastal squeeze; species disturbance events (noise and visual) and air quality. These are most likely to be significant during the construction and operational stages of the fusion energy infrastructure and could also be significant during decommissioning.

Assessment made in respect of EN-8

Protect and enhance nationally designated sites such as SSSIs and National Nature Reserves, Marine Conservation Zones, Marine Protection Areas and Highly Protected Marine Areas, including those of potential or candidate designation? & Protect and enhance all important and valued habitat and populations of protected/scarce species, including those on locally designated sites, including Irreplacable Habitats, Key Wildlife Sites, Local Wildlife Sites and Local Nature Reserves?

Draft EN-8 clarifies in section 2.3 Environment - Biodiversity and geological conservation that EN-1 Section 4.6Environmental and Biodiversity Net Gain, Section 5.4 Biodiversity and Geological Conservation and Section 4.2 The critical national priority for low carbon infrastructure set out the relevant generic requirements for major fusion energy infrastructure..

Section 5.4 Biodiversity and Geological Conservation of EN-1, to which draft EN-8 refers, sets out guidance for the protection of nationally and internationally designated sites of ecological and geological importance, including Habitats sites, Sites of Special Scientific Interest, Marine Conservation Zones and Protected Areas, as well as regional and local sites, irreplaceable habitats and wider protection and enhancement of habitats and species. Section 5.4 of EN-1 also provides specific detail on how each type of designation impacts how that site should be protected.

In terms of nature conservation designations, EN-1 notes that the Secretary of State should ensure that appropriate weight is given to designated sites of international, national and local importance, protected species, habitats and other species of importance for the conservation of biodiversity. EN-1 suggests that development on land within or outside a SSSI which is likely to have adverse effects (either individually or in combination with other developments) should not be permitted but notes that an exception to this is possible where the benefits of the development in the location proposed clearly outweigh its impacts on the features of the site that qualify it as a SSSI and impacts on the national network of SSSIs. EN-1 encourages the Secretary of State to use requirements and/or planning obligations to mitigate significant harm arising from the development on SSSIs and suggests that, where possible, development should enhance a site’s biodiversity.

EN-1 notes that the valuable biodiversity resources within Ancient Woodland cannot be recreated and therefore the Secretary of State should not grant consent for any developments that would result in its deterioration or loss, unless it can be demonstrated that the benefit and need of the development outweighs the loss. The same level of protection through EN-1 is afforded to species and habitats that have been identified as being of principal importance for the conservation of biodiversity; it would need to be demonstrated that the benefits of and need for development outweighs the harm. However, it is also noted in this context that the Secretary of State should give substantial weight to any harm to the detriment of biodiversity features of national or regional importance. EN-1 also suggests that proposals should maximise opportunities to restore, create and enhance wider biodiversity, which could include consideration of Local Nature Recovery Strategies and national goals. At the local scale, EN-1 suggests that Local Nature Reserves and Local Wildlife Sites require due consideration, but given the need for new energy generating infrastructure, these designations should not be used as the sole reason to refuse development consent.

Section 3.2 Environment – Biodiversity and Geological Conservation of draft EN-8 makes clear reference to the importance of applying the ‘mitigation hierarchy’ in particular to variations in building layout to avoid ecologically sensitive areas. The mitigation hierarchy is defined in EN-1 as ‘a term to incorporate the avoid, reduce, mitigate, compensate process that applicants need to go through to protect the environment and biodiversity.

As per EN-1 Section 4.1 ‘General Policies and Considerations, early engagement is strongly encouraged between the applicant and key stakeholders. This is noted in paragraph 3.1.8 of draft EN-8. A non-exhaustive list of bodies that applicants are advised to engage for biodiversity and nature conservation is provided in the annex of draft EN-8: Environment Agency, Natural Resources Wales, the Welsh Government, Natural England, Department for Environment, Food and Rural Affairs, Marine Management Organisation, Local Planning Authorities, National Park Authorities (including the Broads Authority), National Landscape Conservation Boards.

Protect and enhance priority habitats and the habitat of priority species?

EN-1 Section 5.4 Protection and enhancement of habitats and species sets out that many individual species receive statutory protection under a range of legislative provisions and that other species and habitats have been identified as being of principal importance for the conservation of biodiversity in England and Wales, as well as for their continued benefit for climate mitigation and adaptation and thereby requiring conservation action.

The Secretary of State should ensure that these species and habitats are protected from the adverse effects of development by using requirements, planning obligations, or licence conditions. The Secretary of State should refuse consent where harm to the habitats or species and their habitats would result, unless the benefits (including need) of the development outweigh that harm. In this context the Secretary of State should give substantial weight to any such harm to the detriment of biodiversity features of national or regional importance which it considers may result from a proposed development.

Section 3.2 Environment – Biodiversity and Geological Conservation of draft EN-8 specifically sets out that, as part of applying the mitigation hierarchy during the design of fusion energy infrastructure, applicants should consider variations to building layout to avoid ecologically sensitive areas and how the applicant and the Secretary of State must apply the ‘Environmental and Biodiversity Net Gain’, ‘Biodiversity and Geological Conservation’ and ‘The critical national priority for low carbon infrastructure’ sections of EN-1, with appropriate consideration given to variations to building layout.**Promote new habitat creation or restoration and linkages with existing habitats?**

Section 5.4 Biodiversity and Geological Conservation of EN-1, to which draft EN-8 refers, highlights how applicants should consider improvements to, and impacts on, habitats and species in, around and beyond developments, for wider ecosystem services and natural capital benefits, beyond those under protection and identified as being of principal importance. This includes considering and aligning with Local Nature Recovery Strategies (LNRS) and the national goals and targets established under the Environment Act 2021.

Help deliver the Nature Recovery Network and support the delivery of Local Nature Recovery Strategies?

EN-1 Section 4 references how the Environment Act 2021 mandated the preparation of Local Nature Recovery Strategies (LNRSs) across England and how such strategies will also drive

the creation of a Nature Recovery Network (NRN), a major commitment in the government's 25 Year Environment Plan.

Protect and enhance the wider green infrastructure network?

EN-1 recognises that well designed and managed green infrastructure provides multiple benefits at a range of scales. It can contribute to biodiversity recovery, sequester carbon, absorb surface water, cleanse pollutants, absorb noise and reduce high temperatures. The Green Infrastructure Framework – Principles and Standards for England can be used to consider green infrastructure in development and plan for good quality and targeted creation or improvement. EN-1 also notes that when delivering biodiversity net gain off-site, developments should do this in a manner that best contributes to the achievement of relevant wider strategic outcomes, for example by increasing habitat connectivity, enhancing other ecosystem service outcomes, or considering use of green infrastructure strategies. Note is also made that applicants should look for a holistic approach to delivering wider environmental gains and benefits through the use of nature-based solutions and Green Infrastructure.

EN-1 states that where green infrastructure is affected, the Secretary of State should consider imposing requirements to ensure the functionality and connectivity of the green infrastructure network is maintained in the vicinity of the development and that any necessary works are undertaken, where possible, to mitigate any adverse impact and, where appropriate, to improve that network.

Protect the structure and function/ecosystem processes, including in the marine environment?

EN-1 Section 4.5 Protection and Enhancement of Habitats and Species sets out that applicants should include appropriate avoidance, mitigation, compensation and enhancement measures as an integral part of the proposed development. In particular, the applicant should demonstrate that:

- during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works
- the timing of construction has been planned to avoid or limit disturbance
- during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements
- habitats will, where practicable, be restored after construction works have finished
- opportunities will be taken to enhance existing habitats rather than replace them, and where practicable, create new habitats of value within the site landscaping proposals. Where habitat creation is required as mitigation, compensation, or enhancement, the location and quality will be of key importance. In this regard habitat creation should be focused on areas where the most ecological and ecosystems benefits can be realised.

- mitigations required as a result of legal protection of habitats or species will be complied with.

Applicants should produce and implement a Biodiversity Management Strategy as part of their development proposals.

EN-1 Section 4.5 Marine Considerations recognises that some effects of energy infrastructure may also be felt in the marine environment and applicants for a DCO must take account of any relevant Marine Plans and are expected to complete a Marine Plan assessment as part of their project development, using this information to support an application for development consent.

Applicants are also encouraged to refer to Marine Plans at an early stage, such as in pre-application, to inform project planning, for example to avoid less favourable locations as a result of other uses or environmental constraints.

Reduce or avoid impacts to habitats with important roles in carbon sequestration?

EN-1 Section 5.4 sets out that applicants' proposals should consider any reasonable opportunities to maximise the restoration, creation, and enhancement of wider biodiversity, and the protection and restoration of the ability of habitats to store or sequester carbon.

EN-1 Section 5.4 also sets out that permission for development that would result in the loss or deterioration of any irreplaceable habitats, including ancient woodland, and ancient and veteran trees should not be granted consent unless there are wholly exceptional reasons, and a suitable compensation strategy exists.

Encourage sensitive or nature inclusive design in terrestrial and marine environments?

EN-1 Section 5 sets out that as a general principle, development should, in line with the mitigation hierarchy, at the very least aim to avoid significant harm to biodiversity and geological conservation interests, including through mitigation and consideration of reasonable alternatives where significant harm cannot be avoided, then appropriate compensation measures should be sought. If significant harm to biodiversity resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then the Secretary of State will give significant weight to any residual harm.

Note that the application of the approach to CNP has implications for the ultimate protection of environmental matters in certain situations but that is not included in this assessment (see AoS section on Assessment of Critical National Priority Infrastructure).

EN-1 Section 5 also sets out that the applicant should include appropriate avoidance, mitigation, compensation and enhancement measures as an integral part of the proposed development. In particular, the applicant should demonstrate that:

- during construction, they will seek to ensure that activities will be confined to the minimum areas required for the works
- the timing of construction has been planned to avoid or limit disturbance

- during construction and operation best practice will be followed to ensure that risk of disturbance or damage to species or habitats is minimised, including as a consequence of transport access arrangements
- habitats will, where practicable, be restored after construction works have finished
- opportunities will be taken to enhance existing habitats rather than replace them, and where practicable, create new habitats of value within the site landscaping proposals. Where habitat creation is required as mitigation, compensation, or enhancement the location and quality will be of key importance. In this regard habitat creation should be focused on areas where the most ecological and ecosystems services benefits can be realised.
- mitigations required as a result of legal protection of habitats or species will be complied with.

Applicants should consider producing and implementing a Biodiversity Management Strategy as part of their development proposals. This could include provision for biodiversity awareness training to employees and contractors so as to avoid unnecessary adverse impacts on biodiversity during the construction and operation stages. The design of any direct cooling system, including the locations of the intake and outfall should be sited to avoid or minimise adverse impacts on the receiving waters, including their ecology. There should also be specific measures to minimise impact to fish and aquatic biota by entrainment and impingement or by excessive heat or biocidal chemicals from discharges to receiving waters.

EN-1 Section 4 adds that the construction of an onshore energy project on the coast may involve, for example, dredging, dredge spoil deposition, cooling water, culvert construction, marine landing facility construction and flood and coastal protection measures which could result in direct effects on the coastline, seabed and marine ecology and biodiversity. Additionally, indirect changes to the coastline and seabed might arise as a result of a hydrodynamic response to some of these direct changes. This could lead to localised or more widespread coastal erosion or accretion and changes to offshore features such as submerged banks and ridges, marine biodiversity and heritage assets.

Ensure energy activities protect fish stocks and marine mammals? & Ensure energy activities do not exacerbate disturbance to bird populations?

EN-1 Section 5 states that the design of Energy NSIP proposals will need to consider the movement of mobile / migratory species such as birds, fish and marine and terrestrial mammals and their potential to interact with infrastructure.

As fusion energy infrastructure could occur anywhere within England and Wales, both inland and onshore, the potential to affect mobile and migratory species across the UK and more widely across Europe (transboundary effects) requires consideration, depending on the location of development.

Deliver a minimum 10% net gain in biodiversity for any new major infrastructure development?

Section 4.6 Environmental and Biodiversity Net Gain of EN-1, to which draft EN-8 refers, sets out guidance on environmental and biodiversity net gain. EN-1 requires energy NSIP proposals to seek opportunities to contribute and enhance the natural environment by providing net gains for biodiversity and the wider environment where possible. Clarification is provided that currently biodiversity net gain policy in England only applies to terrestrial and intertidal components of projects and that principles for Marine Net Gain are currently being considered by Government. There are provisions in the Environment Act 2021 to allow Marine Net Gain to be made mandatory for NSIPs in the future. Net Benefit for Biodiversity is based on the concept that development should leave biodiversity and the resilience of ecosystems in a better state than before, through securing long-term, measurable and demonstrable benefit, primarily on or immediately adjacent to the site. Section 4.6 Environmental and Biodiversity Net Gain of EN-1 also requires applicants to go beyond the 'mitigation hierarchy' and consider whether there are opportunities for the enhancement of the environment.

In England, applicants for onshore elements of any development are encouraged to use the latest version of the biodiversity metric to calculate their biodiversity baseline and present planned biodiversity net gain outcomes. This calculation data should be presented in full as part of their application. Where possible, this data should be shared, alongside a completed biodiversity metric calculation, with the Local Authority and Natural England for discussion at the pre-application stage as it can help to highlight biodiversity and wider environmental issues which may later cause delays if not addressed.

In Wales, applicants should consider the guidance set out in Section 6.4 of Planning Policy Wales and the relevant policies in the Wales National Marine Plan.

Biodiversity net gain should be applied after compliance with the mitigation hierarchy and does not change or replace existing environmental obligations.

In making consenting decisions, the Secretary of State should consider what appropriate requirements should be attached to any consent and/or in any planning obligations entered into, in order to ensure that any mitigation or biodiversity net gain measures, if offered, are delivered and maintained. Any habitat creation or enhancement delivered including linkages with existing habitats for compensation or biodiversity net gain should generally be maintained for a minimum period of 30 years, or for the lifetime of the project, if longer.

Increase the resilience of biodiversity to the potential effects of climate change?

Both EN-1 and draft EN-8 fall short of recognising that off-site delivery of BNG as part of fusion development could entail delivering larger landscape scale benefits which will in turn enhance the resilience of key habitats and species to climate change. As local environments adapt to climate change, off-site delivery must incorporate a contingency to compensate for the risk of BNG not being met through designing for resilience and taking an adaptive approach that can respond to future events.

Prevent spread of invasive species (native and non-native), including new invasive species because of climate change?

Draft EN-8 states that applicants should demonstrate how the risk of introducing and spreading invasive or non-native species (INNS) will be avoided or minimised.

Support delivery of the Environmental Improvement Plan including Environment Act 2021 targets (specifically the Apex target to halt the decline in species abundance by 2030 and then increase abundance by at least 10% to exceed 2022 levels by 2042) and interim targets?

EN-1 clearly recognises that the government's 25 Year Environment Plan and the Environment Act 2021 mark a step change in ambition for wildlife and the natural environment. In making consenting decisions, the Secretary of State should have regard to the aims and goals of the government's Environmental Improvement Plan, and in Wales the objectives of the Nature Recovery Plan, and any relevant measures and targets, including statutory targets set under the Environment Act or elsewhere. In addition, in exercising functions in relation to Wales, the Secretary of State should consider Section 6 of the Environment (Wales) Act 2016 and seek to maintain and enhance biodiversity, and in so doing promote the resilience of ecosystems.

Assessment conclusions and summary

Draft EN-8 makes it clear that applicants are advised to comply with EN-1 requirements. The policies set out in EN-1 sections on Biodiversity Net Gain and Biodiversity and Geological Conservation (as discussed above) thoroughly address AoS Objective 3 Enhance biodiversity, promote ecosystem resilience and functionality and contribute to the achievement of Biodiversity Net Gain and the delivery of the Nature Recovery Network.

EN-1 recognises that careful siting and use of appropriate technologiescan help to mitigate adverse impacts on the environment and sets out an overarching principle in relation to protecting biodiversity, which is that development should at the very least aim to avoid significant harm to biodiversity interests, including through mitigation and consideration of reasonable alternatives. It is suggested that in cases where significant harm is unavoidable, then appropriate compensation measures should be sought. Where this is not possible, it is suggested that the Secretary of State gives significant weight to any residual harm.

Development proposals should seek opportunities to contribute to and enhance the natural environment by providing net gains for biodiversity where possible. To aid this, the Secretary of State will maximise opportunities for biodiversity within developments, using planning obligations. EN-1 further states that proposals should consider and seek to provide improvements to natural capital and ecosystem services (wider environmental net gain) when considering how to achieve biodiversity net gain.

Noting the Critical National Priority nature of fusion energy development, draft EN-8 adds new policy during project development, by requiring the applicant, in addition to the options for addressing the mitigation hierarchy set out in EN-1, to implement further possible mitigation or avoidance options including variations to building layout to avoid ecologically sensitive areas.

Potential adverse effects on biodiversity can be mitigated, for example through project design to avoid sensitive and high value areas and minimise footprint; habitat retention and species

protection measures on site, buffer zones to avoid or minimise disturbance to habitats and wildlife, treatment of any discharges prior to release into the water environment, air and soil pollution control measures; and design of cooling water system so as to minimise modification of sedimentary and hydrodynamic processes, avoid the entrainment and impingement of aquatic organisms and promote sufficient mixing and dispersal. This will act to further reduce the significance of any negative effects on site and in the immediate vicinity, both during construction and operation

It is therefore possible to conclude that there would generally be minor negative effects in the short and medium term to designated sites of international, national and local importance, protected species, habitats and other species of importance for the conservation of biodiversity as a result of fusion energy development coming forward under the requirements of draft EN-8. It would be only in the most exceptional circumstances, where it can be demonstrated that the benefit and need of the development outweigh the loss, harm or deterioration, that the Secretary of State would grant consent under the CNP provisions of EN-1 for any such developments with resulting significant negative effects. In those circumstances and taking a precautionary approach, effects would be considered significant adverse and this is reflected in the AoS scoring for this Objective.

During operation, permanent structures associated with new fusion development in the coastal, estuarine and lacustrine environment have the potential to alter aquatic processes and wave regimes and affect aquatic species. Such species can also be disturbed throughout operation from noise and changes to water quality from cooling water discharge, maintenance dredging or vessel movements. On land, permanent changes to surface water and groundwater hydrology due to the presence of buildings, foundations, roads and other infrastructure would also be expected during the operational phase potentially impacting surrounding habitats. It is therefore concluded that there will likely be significant negative effects during the operational phase.

Decommissioning could bring negative effects on biodiversity through potential habitat loss and disturbance due to the type of de-construction activities involved. However, mitigation measures such as those utilised during construction can reduce adverse effects, while beneficial effects could be experienced through the cessation of operational aspects such as cooling water discharge and the potential creation of new habitats and biodiversity enhancement through returning the land to previous land uses or other compatible uses.

However, significant beneficial positive effects are also anticipated in the medium and long term, through the clear approach noted in EN-1 and in draft EN-8 of using the mitigation hierarchy and biodiversity enhancement.. This means that locally designated sites and other habitats areas onsite and/or offsite of a fusion energy site will be enhanced as a result of fusion energy development.

Table 10: Enhance biodiversity and ecological networks, deliver biodiversity net gain, protect and support ecosystem resilience and functionality

AoS Objective 3: Enhance biodiversity and ecological networks, deliver biodiversity net gain, protect and support ecosystem resilience and functionality	Assessment of effects (by timescale)				
	S		M		L
Guide questions: • Protect and enhance nationally designated sites such as SSSIs and National Nature Reserves, Marine Conservation Zones, Marine Protection Areas and Highly Protected Marine Areas, including those of potential or candidate designation? • Protect and enhance all important and valued habitat and populations of protected/scarce species, including those on locally designated sites, including Key Wildlife Sites, Local Wildlife Sites and Local Nature Reserves? • Protect the structure and function/ecosystem processes, including in the marine environment? • Help deliver the Nature Recovery Network and support the delivery of Local Nature Recovery Strategies? • Protect and enhance priority habitats and irreplaceable habitats, and the habitat of priority species? • Promote new habitat creation or restoration and linkages with existing habitats? • Reduce or avoid impacts to habitats with important roles in carbon sequestration? • Encourage sensitive or nature inclusive design in terrestrial and marine environments? • Ensure energy activities protect fish stocks and marine mammals? • Ensure energy activities do not exacerbate disturbance to bird populations? • Deliver a minimum 10% net gain in biodiversity for any new major infrastructure development? • Increase the resilience of biodiversity to the potential effects of climate change?	--	--	++	--	++

• Prevent spread of invasive species (native and non-native), including new invasive species because of climate change? • Support delivery of the Environmental Improvement Plan including Environment Act 2021 targets (specifically the Apex target to halt the decline in species abundance by 2030 and then increase abundance by at least 10% to exceed 2022 levels by 2042) and interim targets?					

AoS Objective 4: Protect and enhance sites designated for their international importance for nature conservation purposes

Anticipated effects

The scope and scale of the development enabled by draft EN-8 has the potential for a range of impacts on sites designated for their international importance for nature conservation purposes. Effects will vary depending on the type of development and its location in relation to designated assets. Significant effects could arise as a result of development coming forward under the draft NPS EN-8, which could impact the qualifying features for which 'habitat sites' are designated (including Special Areas of Conservation (SAC), Special Protection Areas (SPA), and in the UK, Ramsar sites despite being designated at the international rather than European level). These potential effects and the qualifying features they could impact include:

- Air pollution – arising from emissions to air from transport to and from the site, and emissions directly from certain energy infrastructure.
  - Qualifying features: Nutrient-sensitive habitats (including soils and water) and plants, plus species they support
- Noise pollution and vibration – arising from construction, operation and decommissioning activities.
  - Qualifying features: Bird species; Mammal species; Fish species
- Light pollution – arising from construction, operation and decommissioning activities.
  - Qualifying features: Bat species; Nocturnal bird and insect species
- Change in water quality/temperature – arising from emissions to water during construction and decommissioning, and emissions directly from certain energy infrastructure.
  - Qualifying features: Freshwater habitats (such as rivers and lakes), Marine habitats, Wetland habitats (including groundwater dependent terrestrial ecosystems); Coastal habitats (saltmarsh, sand dunes); Aquatic species (freshwater, brackish and marine)
- Changes in water quantity/flow/drainage – direct loss from the abstraction of water resources, and indirect or temporary losses, for example during construction phases.
  - Qualifying features: Freshwater habitats; Marine habitats; Wetland habitats; Aquatic species (freshwater, brackish and marine)
- Land contamination – arising during construction and during operation from emissions to water (including thermal impacts) and ground.
  - Qualifying features: Terrestrial habitats and species; Wetland habitats and species
- Habitat loss/fragmentation – direct loss from land take or the abstraction of water resources, and indirect or temporary losses, for example during construction phases.
  - Qualifying features: All habitats and species
- Impingement and entrainment of fish – arising from operation processes such as cooling water intake or turbines generating tidal power.
  - Qualifying features: Coastal change – arising from construction, operation and decommissioning activities; Coastal habitats; Fish species; Seabird species; Marine mammals

- Bird/bat strike – from introduced/tall structures presenting obstacles to migration and flight paths.
- Disturbance to marine species – arising from construction, operation and decommissioning activities.
- Climate change effects on habitats and species – arising from construction, operation and decommissioning activities.
- Changes to electromagnetic fields – arising from construction, operation and decommissioning activities.
- Introduction of invasive non-native species – arising from construction, operation and decommissioning activities.

There is also potential for development to result in positive effects on habitat condition and connectivity from management, restoration and enhancements activities. The development that is enabled through EN-8 has the potential to result in direct adverse impacts on habitat sites in the short term, from the construction of developments and associated supporting infrastructure. Furthermore, given the expected need for cooling water it is quite likely that some fusion energy infrastructure development will be located in rural and/or coastal areas where the majority of habitat sites tend to be located. There is potential for direct and indirect effects on habitat sites to occur in the short and medium term, as a result of operational activities. Long term effects will be dependent on the duration that infrastructure developments are in operation, which is likely to be many decades in the case of major energy generating infrastructure. The decommissioning stage of any of the generating infrastructure also has the potential to have direct negative effects on habitat sites, due to soil, water and air contamination, as well as disturbance. However, positive effects may be achieved in the long term, through restoration of a decommissioned site.

In parallel with the AoS of the draft EN-8, a HRA has been undertaken to understand the potential for the draft EN-8 at a strategic level to impact the designated features of habitat sites, though HRAs will still need to be undertaken at an individual project level. Where possible, this has established the likelihood of impacts on the integrity of these sites and identified appropriate avoidance and mitigation measures early in the development of the NPS.

Assessment made in respect of EN-8

Avoid the direct loss of, or indirect harm to, 'Habitats Sites' (SPAs, SACs and Ramsar sites), including those of potential designation (candidate SPAs, proposed SACs, Sites of Community Importance (SCI) and proposed Ramsar sites) and compensation sites both onshore and offshore?

Specific note is made in draft EN-8 that the highest level of biodiversity protection is afforded to sites identified through international conventions and it further notes that The Conservation of Habitats and Species Regulations 2017 as amended requires a Habitats Regulation Assessment (HRA) to test if a plan or project proposal could significantly harm such sites.

In addition, Section 5.4 Biodiversity and Geological Conservation of EN-1 to which draft EN-8 refers sets out guidance for the protection of nationally and internationally designated sites of ecological and geological importance, including Habitats sites. It affords the highest level of biodiversity protection to these sites. The Habitats Regulations set out Habitats sites for which an HRA will assess the implications of a plan or project, including Special Areas of Conservation and Special Protection Areas. EN-1 extends the same protection to (a) potential Special Protection Areas and possible Special Areas of Conservation; (b) listed or proposed Ramsar sites; and (c) sites identified, or required, as compensatory measures for adverse effects on any of the other sites. EN-1 itself has been subject to HRA and draft EN-8's HRA has been carried out alongside this AoS and has informed this assessment.

Where development is subject to EIA, EN-1 suggests that the ES should clearly set out any effects on internationally designated sites of ecological or geological conservation importance.

EN-1 Section 5.4 does not avoid direct loss or indirect harm to Habitats Sites as it focuses on obtaining derogation under the Habitats Regulations. It sets out that if an AA is required, the applicant must provide the Secretary of State with such information as may reasonably be required to enable the Secretary of State to conduct the AA. This should include information on any mitigation measures that are proposed to minimise or avoid likely significant effects. If, during the pre-application stage, Statutory Nature Conservation Bodies (SNBC) indicate that the proposed development is likely to adversely impact the integrity of habitat sites, the applicant must include with their application such information as may reasonably be required to assess a potential derogation under the Habitats Regulations. If the SNCB gives such an indication at a later stage in the development consent process, the applicant must provide this information as soon as is reasonably possible and before the close of the examination. This information must include assessment of alternative solutions, a case for Imperative Reasons of Overriding Public Interest (IROPI) and appropriate environmental compensation.

Support continued improvements to the condition status of the UK's national site network?

EN-1, to which draft EN-8 refers, clarifies that SACs and Special Protection Areas (SPAs) in the UK are recognised as Emerald Network sites under the Bern Convention on Wildlife. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 have created a national site network on land and at sea, including both the inshore and offshore marine areas in the UK. The national site network includes existing SACs and SPAs and any new SACs and SPAs designated under these Regulations. Any references to Natura 2000 in the 2017 Regulations and in guidance now refers to the new national site network. Maintaining a coherent network of protected sites with overarching conservation objectives is still required in order to fulfil the commitment made by government to maintain environmental protections and continue to meet international legal obligations, such as the Bern Convention, the Oslo and Paris Convention (OSPAR), Bonn and Ramsar Conventions. Statutory Nature Conservation Bodies (SNBC) are responsible for monitoring and managing designated sites. It is also noted that applicants can request and agree 'Evidence Plans' with SNCBs, which is a way to agree and record upfront the information the applicant needs to supply with its application, so that the HRA can be efficiently carried out.

Assessment conclusions and summary

Draft EN-8 has been subject to Habitats Regulation Assessment (HRA) to determine whether the strategic plan poses a risk to habitat sites and whether it would result in likely significant effects, either alone, or in combination with other plans. Given the strategic nature of draft EN-8 and the lack of geographically specific proposals, it allows for potential fusion energy development to take place in any part of England and Wales and territorial waters. As such, it was not possible for the HRA to conclude that there will be no effects on the integrity of Habitat Sites as a result of development coming forward under EN-8.

Therefore, there is potential for significant negative effects on Habitats Sites as a result of the implementation of EN-8 in the short, medium and long term. This could include on sites which are in the jurisdiction of other countries (transboundary). The effects identified are uncertain as they will depend on the specific locations and scale of development.

Table 11: Protect and enhance sites designated for their international importance for nature conservation importance

AoS Objective 4: Protect and enhance sites designated for their international importance for nature conservation purposes	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Avoid the direct loss of, or indirect harm to, 'Habitats Sites' (SPAs, SACs and Ramsar sites), including those of potential designation (candidate SPAs, proposed SACs, Sites of Community Importance (SCI) and proposed Ramsar sites) and compensation sites both onshore and offshore? • Support continued improvements to the condition status of the UK's national site network?	--	--	--

AoS Objective 5: Protect and enhance cultural heritage assets and their settings, and the wider historic environment

Anticipated effects

There is a substantial cultural heritage resource across England and Wales and in surrounding seas; although, there is considerable variation in the condition and integrity of assets. Sites and assets range from those recognised at the very highest levels such as the 24 World Heritage Sites (20 in England and 4 in Wales), through Scheduled Monuments to listed buildings, Conservation Areas, registered parks and gardens. Offshore, there are a multitude of marine wreck sites, aircraft crash sites or other submerged artefacts. Beyond these examples, there are a large number of undesignated assets or unknown archaeological remains which could have national, regional or local value. Such heritage assets can be considered essentially finite and often irreplaceable.

Due to the nature and scale of fusion energy infrastructure, they have the potential to affect cultural heritage assets (including those unknown) and their settings, as well as the wider historic environment. Draft EN-8 makes reference to the generic effects on the historic environment that are set out in EN-1. As with other infrastructure, the development of fusion energy infrastructure could lead to:

- Direct disturbance or loss of heritage assets during construction as a result of ground works or excavation; and
- Indirect impacts on the setting of nearby heritage assets, for example visual intrusion within a landscape or townscape context, or from noise or pollutants.

Direct effects are likely to occur in the short term during the construction of fusion energy infrastructure and associated supporting infrastructure. Indirect effects are likely to occur in the short and medium term with long term effects dependent on infrastructure operation duration and decommissioning activities.

In areas where there is a concentration or cluster of energy generation infrastructure development there is also particular potential for negative cumulative effects on the setting of heritage assets. The significance of these effects is highly dependent on the location and scale of development, as well as the importance of heritage assets and their setting relative to energy infrastructure.

Assessment made in respect of EN-8

Encourage early engagement by developers with statutory heritage bodies?

As per EN-1 Section 4.1 ‘General Policies and Considerations, early engagement is strongly encouraged between the applicant and key stakeholders. This is noted in paragraph 3.1.8 of draft EN-8. A non-exhaustive list of bodies that applicants are advised to engage for heritage is provided in the annex of draft EN-8. Note is also made that the applicant should act in accordance with the measures set out in EN-1 and this also notes the need for applicants as a

minimum, to have consulted the relevant Historic Environment Record, as well as where there are cross border effects, the applicant should engage with relevant authorities.

Where possible seek to avoid impacts on designated and non-designated heritage assets?

Conserve and enhance designated heritage assets and their settings (World Heritage Sites, Scheduled Monuments, Listed Buildings and structures, Registered Parks and Gardens, Registered Battlefields and Conservation Areas), as well as maritime assets such as protected wrecks?

Conserve and enhance non-designated and / or locally listed heritage assets (including newly discovered heritage assets and archaeology) and their settings?

Draft EN-8 makes it clear that EN-1 should be followed in terms of approach to development and mitigation in respect of cultural heritage assets, setting and the wider historic environment and it is considered that EN-1 sets out a robust approach to assessment of any development applications. EN-1 also sets out the following categories of designated heritage assets that are of concern: World Heritage Sites; Scheduled Monuments; Protected Wreck Sites; Protected Military Remains; Listed Buildings; Registered Parks and Gardens; Registered Battlefields; Conservation Areas; and Registered Historic Landscapes (Wales only).

EN-1 also notes that non-designated heritage assets that have been recognised by the Secretary of State as being of equivalent significance to Scheduled Monuments or Protected Wreck Sites, or that have yet to be formally assessed but have archaeological interest and have potential to demonstrate equivalent significance to Scheduled Monuments or Protected Wreck Sites, should be considered subject to the same policy considerations as those that apply to designated heritage assets.

The Annex of draft EN-8 also makes specific note that Historic England and/or Cadw may be able to help the applicant to mitigate and/or avoid disruption to development caused by archaeological discovery. It is often the case that unexpected and/or unplanned discoveries normally necessitate delays in construction while the historical and/or heritage assets are recovered. This disruption can be substantially mitigated if contingencies are in place and archaeological resource is kept accessible to the project to promptly deal with any discovery and the early engagement noted in the Annex to draft EN-8 should help mitigate this.

Address heritage assets at risk, or protect them from further threats?

Early consultation with statutory bodies (as set out in draft EN-8 and EN-1) would allow for an understanding of which heritage assets are at risk and how best to protect these. The specific details provided in EN-1 e.g. assessment requirements mean that these issues will be considered. As noted in EN-1 there is a requirement to ensure that the extent of the impact of the proposed development on the significance of any heritage assets affected can be adequately understood from the application and supporting documents. This can be anticipated to include for those elements of heritage considered at risk.

Avoid significant harm to heritage assets, for example from the generation of noise, vibration and light pollution, pollutants and visual intrusion?

Draft EN-8 makes clear that EN-1 should be followed in terms of protecting heritage assets and the protection of the historic environment. The measures set out in EN-1, set out that studies will be required on those heritage assets affected by noise, vibration, light and indirect impacts, the extent and detail of these studies will be proportionate to the significance of the heritage asset affected.

Other elements of both draft EN-8 and EN-1 deal specifically with issues such as noise or pollutants. It is anticipated that measures outlined there will also help protect heritage assets, though it is worth noting that draft EN-8 makes the point that noise and vibration are not anticipated to be significant during operation of a fusion energy infrastructure.

Ensure appropriate archaeological assessment prior to development to establish the significance of archaeological remains and the impact of the proposed development (on the significance)?

EN-1 sets out a robust approach to assessment of any development applications in terms of cultural heritage. This notes that, through an EIA procedure, applicants should provide a description of the significance of the heritage assets affected by the proposed development and the contribution of their setting to that significance. The level of detail should be proportionate to the importance of the heritage assets and no more than is sufficient to understand the potential impact of the proposal on the significance of the heritage asset. The Annex of draft EN-8 notes that Historic England and/or Cadw may be able to help the applicant to mitigate and/or avoid disruption to development caused by archaeological discovery.

EN-1 further notes that where a development site includes, or the available evidence suggests it has the potential to include, heritage assets with an archaeological interest, the applicant should carry out appropriate desk-based assessment and, where such desk-based research is insufficient to properly assess the interest, a field evaluation.

Maintain or improve the interpretation, understanding and appreciation of the historic environment?

EN-1 places a requirement on the applicant to establish whether there may be opportunities to enhance access to, or interpretation, understanding and appreciation of the heritage assets affected by the scheme.

Increase public access to heritage assets?

Draft EN-8 notes the need to apply Section 5.9 Historic Environment of EN-1. This includes increasing access to heritage assets – for example, EN-1 notes applicants should look for opportunities for new development within Conservation Areas and World Heritage Sites, and within the setting of heritage assets, to enhance or better reveal their significance. Proposals that preserve those elements of the setting that make a positive contribution to the asset (or which better reveal its significance) should be treated favourably.

Ensure adequate archaeological mitigation prior to and / or during development? (i.e. to consider if archaeological remains identified by the assessment will be impacted, damaged or disturbed by the development)'

Early engagement with key stakeholders (as set out in draft EN-8 and EN-1) would allow for an understanding of which heritage assets are at risk and how best to protect these. EN-1 notes the need for applicants as a minimum, to have consulted the relevant Historic Environment Record. The Annex of draft EN-8 also notes the potential for discoveries to cause disruption. This disruption can be substantially mitigated if early engagement takes place.

Assessment conclusions and summary

There is the potential for minor negative effects (including cumulative effects) on heritage assets in the short, medium and long term as a result of the potential impacts on heritage assets and their settings (with some uncertainty about the extent of direct effects such as disturbance and loss as these will be determined by location of any infrastructure in relation to the heritage assets). It is to be noted that some heritage assets such as shipwrecks are located offshore and may be in the legal ownership of or be of considerable historic interest to other countries (for example wrecks identified as war graves) and as such, there is a potential for trans-boundary effects. However, it is considered that all potential effects are addressed through the approach outlined in draft EN-8 which states that the relevant sections in EN-1 apply.

Note is also made in draft EN-8 that engagement should take place with Historic England and / or Cadw, as well as relevant local authorities in respect of the historic environment and heritage and it is considered that this will help ensure full consideration of potential affects and how best to address these.

Table 12 Protect and enhance cultural heritage assets and their settings and the wider historic environment

AoS Objective 5: Protect and enhance cultural heritage assets and their settings, and the wider historic environment	Assessment of effects (by timescale)		
	S	M	L
Guide questions: • Encourage early engagement by developers with statutory heritage bodies? • Where possible seek to avoid impacts on designated and non-designated heritage assets? • Conserve and enhance designated heritage assets and their settings (World Heritage Sites, Scheduled Monuments, Listed Buildings and	-	-	-

structures, Registered Parks and Gardens, Registered Battlefields and Conservation Areas), as well as maritime assets such as protected wrecks? • Conserve and enhance non-designated and / or locally listed heritage assets (including newly discovered heritage assets and archaeology) and their settings? • Address heritage assets at risk, or protect them from further threats? • Avoid significant harm to heritage assets, for example from the generation of noise, vibration and light pollution, pollutants and visual intrusion? • Ensure appropriate archaeological assessment prior to development to establish the significance of archaeological remains and the impact of the proposed development (on the significance)? • Maintain or improve the interpretation, understanding and appreciation of the historic environment? • Increase public access to heritage assets? • Ensure adequate archaeological mitigation prior to and / or during development? (i.e. to consider if archaeological remains identified by the assessment will be impacted, damaged or disturbed by the development)'			

AoS Objective 6: Protect and enhance the character and quality of the landscapes, townscapes and waterscapes and protect and enhance visual amenity.

Anticipated effects

As with virtually all nationally significant infrastructure projects, fusion energy infrastructure will have effects on the landscape and is likely to have visual effects for many receptors around proposed sites. It is to be noted that the scale of the facilities means that the scope for reducing visual intrusion is limited. These facilities will also likely have a considerable operating life and it is worth noting that some elements, although ultimately temporary, will be long term features in the landscape (taken to include townscape and waterscape).

Nevertheless, landscape effects depend on the existing character of the local landscape, its current quality, how highly it is valued and its capacity to accommodate change. Generic effects on landscape from fusion energy infrastructure are anticipated to include:

- the introduction of a range of new, industrial structures, (often of significant size and requiring substantial landtake) including long term, permanent structures; and developments that are temporary in the short to medium term;
- introduction of associated outputs such as visible steam plumes, and
- visual effects for receptors (residents, tourists, visitors).

It is to be noted that many areas within England and Wales that could potentially host fusion energy infrastructure of a large scale (e.g. coastal locations), currently support a high level of local and national landscape designations. The development of new fusion energy infrastructure is likely to require large scale and tall structures, potentially in existing energy generating sites, as well as industrial locations, brownfield sites, edge of town or urban settings, as well as in new greenfield settings. Some of these structures are potentially likely to be in predominantly rural areas, including areas of high landscape value where visual impacts will be significant.

Depending on the scale of development in rural areas, this could potentially result in the loss of green infrastructure, greenspace and other features of importance to landscape such as hedgerows, forested areas etc.

The scale and severity of those effects will depend on the overall setting context and the specifics of the site itself. It is recognised that coastal areas are particularly vulnerable to visual intrusion because of the potential high visibility of development on the foreshore, on the skyline and affecting views along stretches of undeveloped coast.

Particular effects can be experienced in those areas that are designated for their landscape value such as National Parks, the Broads and National Landscapes (formerly AONBs). It is to be noted that each of these areas has specific statutory purposes that could be adversely affected by development.

Locating new infrastructure adjacent to existing facilities or industrial areas can have beneficial effects in terms of delivering enhancement opportunities, though it would also increase the scale and quantum of development that cumulatively can have major adverse effects, particularly in areas that are rural. Peace and tranquillity can be adversely affected by the site itself, but also associated infrastructure and traffic, with night time tranquillity particularly affected by light pollution. Effects may be particularly pronounced during construction or decommissioning activities (it is anticipated that operation of fusion energy infrastructure is unlikely to be associated with significant noise or vibration).

Despite the potential for adverse effects, it is also worth noting that large scale infrastructure (of whatever technology), can contribute to local distinctiveness and provide a focal point in the landscape, with many people finding them to be interesting visual features in themselves.

Assessment made in respect of EN-8

In Section 1.3 of draft EN-8 cross reference is made to EN-1, with both recognising that the potential for mitigating effects on landscape, or reducing visual intrusion, can be limited due to the scale of the facilities typically required. Draft EN-8 specifically notes that there may be long term effects on visual amenity which it may not be possible to completely eliminate through mitigation.

Of particular note in EN-1 is the need for a Landscape and Visual Impact Assessment to be carried out and reported in an ES (including cumulative effects). Note is also to be made of landscape, seascape and marine plan character assessments, as appropriate. Consideration is also to be made of tranquillity, including light pollution on dark skies, local amenity and nature conservation.

Draft EN-8 makes reference to the use of Good Design contributing to the character of places and delivering enhancements to the local environment, infrastructure and community identity.

Reference is also made in draft EN-8 to the requirements set out in EN-5 which provides further information on Good Design.

In relation to landscape, t is worth noting that EN-1 states there may be exceptional circumstances where the mitigation of visual and/or landscape impacts that has a very significant benefit warrants a small reduction in function e.g. electricity generation output. In the case of fusion energy infrastructure, it is anticipated that this may apply where a small fraction of the energy output of fusion energy infrastructure is used to operate powered cooling systems with a substantially reduced visual profile, such as mechanical draft wet cooling, air cooling or mechanical draft hybrid wet and dry cooling.

Avoid development in National Parks and National Landscapes (formerly AONBs) and seek to further their purpose?

Draft EN-8 recognises the importance of landscape and notes that there may be opportunity for Good Design to contribute to the character of places and minimise local impacts. This is in

line with Levelling-up and Regeneration Act 2023, which states that the relevant authorities must 'seek to further' the statutory purposes of Protected Landscapes.[14]

As per EN-1 Section 4.1 'General Policies and Considerations, early engagement is strongly encouraged between the applicant and key stakeholders. This is noted in paragraph 3.1.8 of draft EN-8. A non-exhaustive list of bodies that applicants are advised to engage for landscape is provided in the annex of draft EN-8. Nevertheless, EN-1 (to which draft EN-8 references in Section 1.3) does note that in respect of those areas with nationally significant landscape designations, such as National Parks, the Broads, National Landscapes (formerly AONBs) and Heritage Coasts, development consent can be granted in exceptional circumstances, having been demonstrated to be in the public interest and with any development carried out to high environmental standards, including through the application of appropriate requirements where necessary.

Support the integrity of any areas designated for landscape value, including in conjunction with the provisions of any relevant Management Plan (e.g. National Parks, National Landscapes, Heritage Coasts and local landscape designations)?

As draft EN-8 is non-locational in its approach, there is a potential for development to occur in sites designated for landscape value. Nevertheless, in non-exceptional circumstances, EN-1 (to which EN-8 refers in Section 1.3) places strong protection on such areas. For example, EN-1 notes specifically that development within a Heritage Coast (that is not also a National Park, The Broads or an AONB – now known as National Landscape) is unlikely to be appropriate, unless it is compatible with the natural beauty and special character of the area.

Conserve and enhance the intrinsic character or setting of local landscapes or townscapes or waterscapes?

Draft EN-8 cross references in Section 1.3 to EN-1 which requires the applicant to consider landscape and visual matters in the early stages of siting – this would include consideration of those landscapes considered important locally etc. Landscape and Visual Impact Assessment is also a requirement to be set out in an ES.

As noted in EN-1, in relation to those areas that are not nationally designated in terms of landscape, but which may be highly valued locally and in some cases protected by local designation, the policies within local development plans that are based on landscape or seascape character assessment should be paid particular attention. However, local landscape designations should not be used in themselves to refuse consent, as this may unduly restrict acceptable development.

It is also worth noting that some areas may also consider existing infrastructure, including energy generating facilities, as reflective of local character, or a key element of the local landscape. As such, it cannot be assumed that all largescale development is automatically considered as negative. Draft EN-8 recognises that Good Design principles may enable energy

[14] https://www.gov.uk/government/publications/the-protected-landscapes-duty/guidance-for-relevant-authorities-on-seeking-to-further-the-purposes-of-protected-landscapes

infrastructure to minimise adverse local impacts and potentially make a positive contribution to the character of its host location and community. Applicants are advised to engage with a range of bodies, including local authorities.

It is also worth noting that draft EN-8 also recognises the potential for fusion energy infrastructure to impact the natural function of coastal / riverine processes and this would have implications for landscapes and or waterscapes. Draft EN-8 (via reference to EN-1) sets out how such impacts are to be managed.

Minimise noise and light pollution from construction and operational activities on residential amenity and on sensitive locations, receptors and views?

Draft EN-8 notes that the operation of fusion energy infrastructure is unlikely to be associated with significant noise or vibration effects, though it notes that like all major energy infrastructure, such impacts are expected to be part of constructing and decommissioning fusion energy infrastructure and appropriate mitigation measures should be applied.

Draft EN-8 also cross references to EN-1 which notes the need for a Landscape and Visual Impact Assessment to be carried out and reported in an ES (including cumulative effects). EN-1 also details associated issues such as noise pollution and sets out measures to address this.

Protect dark skies, particularly those areas designated as such?

Draft EN-8 requires that the applicant should assess the landscape and visual impact of the proposed fusion energy infrastructure in accordance with the landscape and visual section of EN-1. EN-1 specifically notes that assessment should include the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include light pollution effects, including on dark skies, local amenity, and nature conservation.

Prevent reduced tranquillity and / or protect and/ preserve tranquillity?

Draft EN-8 notes that the applicant should assess the landscape and visual impact of the proposed fusion energy infrastructure and cross references to the applicable section of EN-1.

EN-1 notes that as part of the assessment, there should be consideration of the visibility and conspicuousness of the project during construction and of the presence and operation of the project and potential impacts on views and visual amenity. This should include light pollution effects, including on dark skies, local amenity, and nature conservation.

Conserve, protect and enhance natural environmental assets (e.g. parks and green spaces, common land, woodland / forests etc) where they contribute to landscape and townscape quality?

EN-1 (to which draft EN-8 refers in Section 1.3) notes that consideration should be made of how landscapes can be enhanced through landscape management plans as this will help to enhance environmental assets (such as parks, green spaces, woodland etc.) where they contribute to landscape and townscape quality. However, it is to be recognised that due to the

nature and size of potential development (as well as likely potential locations such as coastal areas), opportunities for mitigation will be limited and while EN-1 sets out a robust approach to addressing impacts on landscape, townscape and waterscape across the short, medium and long timeframes, EN-8 recognises that impacts cannot be expected to be eliminated completely..

Support the delivery of the Environmental Improvement Plan?

Landscape is an important element to the Environmental Improvement Plan. Draft EN-8 notes that the applicant should assess the landscape of the proposed fusion energy infrastructure according to the applicable section of EN-1. EN-1 notes also that the Secretary of State have regard to the ambitions, goals and targets set out in the Environment Act 2021 and associated Environmental Improvement Plans.

Assessment conclusions and summary

Significant negative effects for landscape, townscape and visual receptors are likely as a result of the implementation of EN-8 in the short, medium and long term and it is to be noted that due to the size of likely development, opportunities for mitigation will be limited and as recognised by draft EN-8,it may not be possible to completely eliminate impacts through mitigation..

However, draft EN-8 (in combination with EN-1) nevertheless sets out a robust approach to addressing impacts on landscape, townscape and seascape across the relevant timeframes and there is a clear requirement that applicants should reduce the landscape impacts and visual intrusion of a project as far as reasonably practicable. Although still considered significant, there is a potential for adverse landscape effects to be reduced as decommissioning progresses.

Table 13 Protect and enhance the character and quality of the landscapes, townscapes and waterscapes and protect and enhance visual amenity

AoS Objective 6: Protect and enhance the character and quality of the landscapes, townscapes and waterscapes and protect and enhance visual amenity.	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Avoid development in National Parks and National Landscapes (formerly AONBs) and seek to further their purpose? • Support the integrity of any areas designated for landscape value, including in conjunction with the provisions of any relevant Management Plan (e.g. National Parks, National Landscapes, Heritage Coasts and local landscape designations)?	--	--	--

• Conserve and enhance the intrinsic character or setting of local landscapes or townscapes or waterscapes? • Minimise noise and light pollution from construction and operational activities on residential amenity and on sensitive locations, receptors and views? • Protect dark skies, particularly those areas designated as such? • Prevent reduced tranquillity and / or protect and/ preserve tranquillity? • Conserve, protect and enhance natural environmental assets (e.g. parks and green spaces, common land, woodland / forests etc) where they contribute to landscape and townscape quality? • Support the delivery of the Environmental Improvement Plan?			

AoS Objective 7: Protect and enhance the water environment

Anticipated effects

The scope and scale of the development promoted by draft EN-8 has the potential for a number of generic impacts on the water environment (groundwater, inland surface water, transitional waters, coastal and marine waters). They include:

- increased demand for water leading to volume abstractions and the modification of water levels resulting in reduced surface and groundwater flow;
- increased discharges to water and atmospheric pollution associated with industrial processes, which can lead to reduced water quality;
- construction, operation and decommissioning activities can increase the risk of spills, leaks and pollution events with negative effects on water quality, human health and protected biodiversity; and
- construction activities and the associated land take can result in physical modifications to the water environment.

There is potential for negative cumulative effects on the water environment in areas where there is a concentration or cluster of energy infrastructure development. The significance of these effects will be dependent on the locations and scales of development relative to water bodies.

Of particular note, all fusion energy infrastructure is expected to require a cooling system (as for all thermal power plants). While there are a range of cooling system types available, wet cooling systems can require significant quantities of water and as such would typically be located adjacent to the sea, a river, or other large body of water. This could have particular implications for the adjacent water body:

- discharging water at a higher temperature than the receiving water, affecting the biodiversity of aquatic flora and fauna
- use of water which may reduce the flow of water courses, affecting the rate at which sediment is deposited, conditions for aquatic flora and potentially affecting migratory fish species (for example salmon)
- chemical anti-fouling treatment of water for use in cooling systems may have adverse impacts on aquatic biodiversity, and
- potential impacts on groundwater availability and quality.

Note that there are also potential effects on species and habitats associated with the water environment. For example, there is a risk of fish impingement and entrainment due to cooling water abstraction.

It is also to be noted that infrastructure facilitated by draft EN-8 could impact on the natural functioning of water bodies in coastal, estuarine, riverine and lacustrine locations, with

consequential impacts on erosion and other forms of landform change. These elements can affect a range of issues including water quality.

Assessment made in respect of EN-8

Protect ground, surface, estuarine and coastal water quality in line with Water Framework Directive and Marine Strategy Framework requirements across all phases of construction, operation and decommissioning?

Draft EN-8 sets out that applicants should assess and consider the characteristics of any cooling water for the proposed fusion energy infrastructure and the specific implications at the proposed site for marine, estuarine, riverine, groundwater, lake and/or reservoir environments.

Draft EN-8 also cross references to EN-1 which recognises the risk that energy infrastructure (during construction, operation and decommissioning) could result in water bodies failing to meet objectives established under the WFD and Marine Strategy Regulations.

EN-1 also requires (through the EIA process),applicants to describe existing water quality and the impacts of the proposed project on water quality, including noting any relevant existing discharges, proposed new discharges and any proposed changes to discharges.

In cases where there is potential for a project to have effects on the water environment, EN-1 indicates that an assessment of the existing status of and potential impacts on water quality, water resources and physical characteristics of the water environment and how this might change due to the impact of climate change on rainfall patterns and consequently water availability across the water environment should be undertaken as part of an ES. There is also a requirement in EN-1 to indicate that the ES for energy infrastructure proposals should demonstrate how proposals will minimise the use of water resources and water consumption.

EN-1 also recognises the impacts that energy generating infrastructure’s emissions can have on water bodies in terms of causing excessive enrichment of nutrients (eutrophication) as a result of air pollution containing NOx and ammonia. As such, EN-1 notes that changes in algal composition cause algal blooms, which remove oxygen from the water environment that adversely impacts plants and fish. To tackle this, EN-1 advises that where a project may have adverse impacts on air quality, the ES should describe any potential eutrophication impacts.

Despite the risks to water quality identified, there is potential for the majority of adverse effects on the water environment as a result of fusion energy infrastructure development to be avoided, reduced and mitigated through careful design and planning to facilitate adherence to good pollution control practice. Furthermore, EN-1 (to which EN-8 refers) recommends that risks to the water environment can be reduced on sites by designated areas for storage and unloading, appropriate drainage facilities and efficient use of water. Encouragement is also made to consider protective measures to control the risk of pollution to groundwater. It is also to be noted that reference is made to the use of SuDS. While these would be primarily for addressing issues related to flood risk, they also do have an important function in terms of helping to protect water quality. These systems would help to achieve the noted encouragement for applicants to manage surface water during construction by treating surface

water runoff from exposed topsoil prior to discharging and to limit the discharge of suspended solids e.g. from car parks or other areas of hard standing, during operation.

However, the long term significance of these effects remains uncertain, and the effectiveness of the mitigation possibilities proposed will depend on the individual sensitivities of the receiving sites, in the context of specific details of the development design, layout and operation.

EN-1 notes that the Secretary of State should consider proposals to mitigate adverse effects on the water environment and any enhancement measures put for forward and whether appropriate requirements should be attached to any development consent and/or planning obligations. Draft EN-8 notes that consultation should take place with relevant statutory bodies such as Environment Agency, Natural England, Historic England, Natural Resources Wales and the Marine Management Organisation, as well as water companies.

Result in changes to groundwater distribution and flow?

EN-1 (to which draft EN-8 refers), notes the potential for adverse impacts on groundwater, with a potential that these waterbodies could fail to meet relevant environmental objectives. Note continues to be made that applicants should avoid locating potentially polluting activities in the most sensitive locations for groundwater, in particular Source Protection Zone 1 (SPZ) and close to nationally important drinking water supplies. Applicants should consider implementing protective measures to control the risk of pollution to groundwater, for example through the use of protective barriers.

EN-1 also requires consideration of applicable proposed schemes through the EIA process. Note is made of the need to consider impacts on water sources, including abstraction issues and the existing physical characteristics of the water environment (including quantity and dynamics of flow) affected by the proposed project. This can be anticipated to include groundwater waterbodies.

Safeguard the availability of water resources (surface and groundwater) across all phases of construction, operation and decommissioning?

To protect water resources, draft EN-8 cross references to EN-1 which advises the applicant should note any relevant abstraction rates, proposed new abstraction rates and proposed changes to abstraction rates, which should include any impact to mains supplies and reference to Abstraction Licensing Strategies and also demonstrate how proposals minimise the use of water resources and water consumption in the first instance. The same approach is set out in EN-1 for physical characteristics of water bodies including quantity and dynamics of flow. EN-1 also notes that any impacts on water bodies protected under the Water Environment Regulations or source protection zones (SPZs) around potable groundwater abstractions should also be identified and that consideration should be made of how climate change could impact these elements in the future.

In addition, EN-1 notes that applicants should make early contact with the Environment Agency, Natural Resources Wales and water companies with their proposed water

requirements to understand whether water is available (draft EN-8 also advises contact with such bodies). If insufficient water is available for abstraction the Environment Agency and Natural Resources Wales will be unable to authorise an abstraction licence.

It is also noted in EN-1 that if insufficient water is available for abstraction, the applicant will need to find alternative sources of water to be able to proceed, whether this is developing their own source or collaborating with the water industry or other water abstractors to develop a joint source.

Minimise the use of water resources / water consumption?

EN-1, to which draft EN-8 refers, notes that the impact on local water resources can be minimised through planning and design for the efficient use of water, including water recycling. If a development needs new water infrastructure, significant supplies or impacts other water supplies, the applicant should consult with the local water company and the EA or NRW. Draft EN-8 notes that where new fusion energy infrastructure is in an area where an abstraction permission is not required, from the relevant regulators, the imposition of any requirements to mitigate any impact of that abstraction infrastructure and the acceptance or not of any residual impacts are a matter for the Secretary of State to determine when considering whether to grant consent and what conditions apply to that consent.

Protect the integrity of coastal and estuarine processes? & Protect the quality of the seabed and its sediments, and avoid significant effects on seabed morphology and sediment transport processes?

In terms of the marine environment, EN-1 indicates that applicants for a Development Consent Order will need to take account of relevant marine plans and conduct a marine plan assessment. It is suggested that applicants refer to marine plans at an early stage to avoid less favourable locations.

Applicants also need to contact all relevant regulatory bodies. For example, they should make early contact with relevant regulators, including EA or NRW and the Marine Management Organisation for advice (such contact is also advised in draft EN-8). Close cooperation should take place between the Secretary of State and such bodies (in respect of ensuring that energy NSIPs are licensed in accordance with environmental legislation).

Applicants should also consult the MMO on nationally significant projects as the MMO (or NRW) will advise the Secretary of State on what conditions should apply to deemed marine licence and will determine applications in accordance with any applicable marine plans and the requirements under Part 4 of the Marine and Coastal Access Act, unless relevant considerations indicate otherwise.

EN-1 also recognises that in coastal environments, the delivery of energy generating infrastructure may involve construction activities that would result in direct impacts on coastal and marine habits, or indirect impacts through changes to the hydrodynamic regime of an area. As such, EN-1 sets out that applicants should undertake coastal geomorphological and sediment transfer modelling where necessary.

Note is also made in EN-1 that the Secretary of State will also consider the interactions of proposed projects with Shoreline Management Plans (as well as other plans such as those relating to water resources). As such, applicants are to detail through an ES, the impact of the proposed project on coastal processes and geomorphology (which would be anticipated to include sediment and seabed morphology), including by taking account of potential impacts from climate change. If the development will have an impact on coastal processes the applicant must demonstrate how the impacts will be managed to minimise adverse impacts on other parts of the coast. Consideration also needs to be made of the implications of the proposed project on strategies for managing the coast as set out in Shoreline Management Plans (SMPs), any relevant Marine Plans and capital programmes for maintaining flood and coastal defences and Coastal Change Management Areas.

Reduce operational and accidental discharges to the water environment?

EN-1 (to which draft EN-8 refers) notes that consideration of discharges are to be described within the ES. This will note any relevant existing discharges, proposed new discharges and proposed changes to discharges and can be expected to address the issue of accidental discharge. Applicants are encouraged to manage surface water during construction by treating surface water runoff from exposed topsoil prior to discharging and to limit the discharge of suspended solids e.g. from car parks or other areas of hard standing. Additionally, EN-1 sets out that applicants should avoid locating potentially polluting activities in the most sensitive locations for groundwater, in particular Source Protection Zone 1 (SPZ) and close to nationally important drinking water supplies.

In addition, EN-1 continues notes that applicants should consider protective measures to control the risk of pollution to groundwater, which could include the use of protective barriers. Note is also made that the risk of impacts on the water environment can be reduced through careful design to facilitate adherence to good pollution control practice. For example, designated areas for storage and unloading, with appropriate drainage facilities, should be clearly marked.

Draft EN-8 also notes that an application should include specific measures to minimise impacts by excessive heat or biocidal chemicals from discharges to receiving waters.

Support the delivery of the Environmental Improvement Plan?

Draft EN-8 cross references to EN-1 which notes that the Secretary of State must have regard to the ambitions, goals and targets set out in the Environment Act 2021 and associated Environmental Improvement Plans.

Assessment conclusions and summary

There is a clear requirement (via both draft EN-8 and its reliance on EN-1) that applicants should seek to prevent pollution of water bodies (including surface and groundwater) during the construction, operation and decommissioning of any proposed fusion energy development. This could be achieved via the measures set out in EN-1 such as the appropriate use of SuDS, green infrastructure or other appropriate measures and new approaches in infrastructure

drainage design to enhance water quality and reduce pollution and flood risk. Risk to all types of water bodies (not just main rivers) is to be considered during any development design.

Nevertheless, minor negative effects for water quality are likely to continue as a result of the implementation of draft EN-8 in the short term (construction) and during decommissioning (long term) as it will not be possible to avoid all negative effects on the water environment, given the nature of activities relating to these phases. More significant effects could be anticipated during operation, particularly if the cooling system requires large volumes of water. Should a dry cooling system be used adverse effects may be minor during operation, given that water won't be used as the cooling agent and the mitigation and controls outlined.

Across all timescales, there is potential for the measures outlined above, along with Environment Agency controls and compliance with international best practice to appropriately mitigate these risks, though some minor adverse effects will remain. The effects identified are uncertain as they will depend on the specific locations and scale of development.

Table 14: Protect and enhance the water environment

AoS Objective 7: Protect and enhance the water environment	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Protect ground, surface, estuarine and coastal water quality in line with Water Framework Directive and Marine Strategy Framework requirements across all phases of construction, operation and decommissioning? • Result in changes to groundwater distribution and flow? • Safeguard the availability of water resources (surface and groundwater) across all phases of construction, operation and decommissioning? • Minimise the use of water resources / water consumption? • Protect the integrity of coastal and estuarine processes? • Reduce operational and accidental discharges to the water environment? • Protect the quality of the seabed and its sediments, and avoid significant effects on	**-**	**--**	**-**

seabed morphology and sediment transport processes? • Support the delivery of the Environmental Improvement Plan?			

AoS Objective 8: Protect and enhance air quality on a local, regional, national and international scale

Anticipated effects

Enabling the development of fusion energy infrastructure has the potential for a number of adverse effects on air quality. They include:

- emissions generated as a result of construction activities (transport emissions from the transport of materials, resources and personnel; dust and fumes from machinery operation, excavation and drilling); and
- emissions from project operation (operation of plant, transport of materials, resources and personnel); and
- emissions from plant, machinery and vehicles during the decommissioning of projects (including transport to and from site).

The construction of fusion energy infrastructure is likely to have some localised adverse effects on air quality in the short term, including dust and emissions from construction vehicles, heavy goods vehicles (HGVs), and traffic movements generated by the construction workforce. This has the potential to affect residential properties along local access/haul routes in the immediate surrounding area as well as ecological receptors. AQMA may also be affected if they are in existence in the surrounding area. It is anticipated that effects on air quality can be minimised through good construction practices such as effective dust suppression, careful management of earthworks and a robust monitoring programme and the adherence to required consent/permits.

It can be expected that during operation emissions will be generated from associated plant / machinery and traffic which could potentially affect properties and ecological receptors. However, mitigation measures including promotion of sustainable transport (through robust transport planning) could successfully reduce emissions to acceptable levels. It is unlikely that such transport emissions will affect any AQMA or lead to the designation of new AQMA.

Similar effects on air quality from decommissioning to those during the construction phase are expected. However, emissions are anticipated to be lower than those during the construction phase because of expected advances in zero emissions vehicles and machinery by the time decommissioning takes place together with the need for less earth movements and less transportation of materials off the site as compared to construction. Adherence to similar mitigation measures as during the construction phase would also reduce effects. There is, however, a large degree of uncertainty associated with this assessment, given the uncertainties on the timescales and timing of decommissioning.

Assessment made in respect of EN-8

Minimise emissions of dust and other air pollutants that affect human health or biodiversity?

Draft EN-8 cross references to EN-1 in respect of air quality,. with direct reference made to the 'Dust, Odour, Artificial Light, Smoke, Steam and Insect Infestation' section of EN-1.

EN-1 notes that adverse effects may occur at all stages of the project, as a result of emissions released during construction, operation, and decommissioning. Air emissions are noted to include particulate matter (for example dust) up to a diameter of ten microns (PM10) and up to a diameter of 2.5 microns (PM2.5), as well as gases such as sulphur dioxide, carbon monoxide and nitrogen oxides (NOx). The significance of effects will depend upon local site-specific factors, such as transport routes and proximity to sensitive receptors and it is anticipated these will be dealt with during the project level EIA.

EN-1 also recognises that proximity to emission sources can have significant impacts on sensitive receptor sites for air quality, such as education or healthcare sites, residential use or sensitive or protected ecosystems. Projects near a sensitive receptor site for air quality should only be proposed in exceptional circumstances if no viable alternative site is available. In these instances, substantial mitigation of any expected emissions will be required.

EN-1 also requires the Secretary of State to consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application. A construction management plan may help codify mitigation at this stage. EN-1 further notes that mitigations on traffic and transport impacts will help mitigate the effects of air emissions from transport.

In addition, EN-1 notes that during construction, operation and decommissioning of energy infrastructure there is potential for the release of a range of emissions such as odour, dust, steam, smoke, artificial light and infestation of insects. All have the potential to have a detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990. There is a requirement that such emissions are assessed and mitigation measures applied, with all reasonable steps taken to minimise detrimental impacts. Nevertheless EN-1 does recognise that for any largescale energy NSIP, some impact on amenity for local communities is likely to be unavoidable. The aim should be to keep impacts to a minimum, and at a level that is acceptable.

Improve air quality within AQMAs and avoid the need for new or expanded AQMAs?

EN-1 (to which draft EN-8 refers) identifies that applicants will be required to undertake an assessment of impacts of the proposed project on air quality as part of the Environmental Statement, describing any significant air emissions. EN-1 also notes that substantial weight should be given to air quality where a project would lead to a deterioration in an area where national air quality limits, targets or statutory air quality objectives are breached, and air quality considerations will also be important where substantial changes in air quality are expected, even if this does not lead to any breaches of national air quality limits, or statutory air quality objectives or targets.

In addition, EN-1 notes that the levels for pollutants in ambient air are set out in the Air Quality Standards Regulations 2010 and reiterated in the Air Quality Strategy or for Wales, the Air Quality (Wales) Regulations 2000 and the Clean Air Plan for and that two fine particulate

matter (PM2.5) targets were set under the Environment Act 2021 for England – an annual mean concentration target and a population exposure target.

The Secretary of State should give air quality considerations substantial weight where a project is proposed near a sensitive receptor site such as an education or healthcare facility, residential use or a sensitive or protected habitat. Where a project is proposed in close proximity to a sensitive receptor or air quality, if justification cannot be provided for that location and a suitable mitigation plan proposed, consent should be refused.

Where a proposed development is likely to lead to a breach of the air quality thresholds or affect the ability of a non-compliant area to achieve compliance within the timescales set out in the most recent relevant air quality plan / strategy at the time of the decision, the applicant should work with the relevant authorities to secure appropriate mitigation measures to ensure that those thresholds are not breached.

The Secretary of State should consider whether mitigation measures are needed both for operational and construction emissions over and above any which may form part of the project application. The measures outlined for transport and traffic impacts in EN-1 will also help to mitigate the effects of air emissions from transport.

Promote enhancements to green infrastructure networks to help improve air quality?

Draft EN-8 explicitly references the Land Use, Including Open Space, Green Infrastructure, and Green Belt section of EN-1, which sets out the need for provision and enhancement of green infrastructure and it is recognised that this can contribute to cleansing of pollutants. Applicants are encouraged to consider how new green infrastructure can be provided, or how existing green infrastructure can be enhanced, as part of their application.

Avoid adverse air quality effects on Habitats Sites and Sites of Special Scientific Interest?

EN-1, to which draft EN-8 refers, sets out that the Secretary of State should give air quality considerations substantial weight where a project is proposed near a sensitive receptor site such as an education or healthcare facility, residential use or a sensitive or protected habitat – this is anticipated to include Habitats Sites and Sites of Special Scientific Interest. Where a project is proposed in close proximity to a sensitive receptor, if justification cannot be provided for that location and a suitable mitigation plan proposed, consent should be refused.

Assessment conclusions and summary

While EN-1 (to which draft EN-8 refers) notes a robust approach to managing effects on air quality, it is anticipated that effect on air quality is still expected to be slightly adverse, due to the potential for emissions of air pollutants at all life stages of fusion energy infrastructure. The construction of fusion energy infrastructure is likely to have some localised adverse effects on air quality in the short term, including dust and emissions from construction vehicles, heavy goods vehicles (HGVs), and traffic movements generated by the construction workforce. This has the potential to affect residential properties along local access/haul routes in the immediate

surrounding area as well as ecological receptors. It is anticipated that effects on air quality can be minimised through good construction practices such as effective dust suppression, careful management of earthworks and a robust monitoring programme and the adherence to required consent/permits.

While operation of the fusion energy infrastructure itself is not anticipated to result in significant effects on air quality (as recognised in draft EN-8), there is still expected to be emissions generated from associated plant / machinery and traffic which could potentially affect properties and ecological receptors. However, mitigation measures including promotion of sustainable transport (through robust transport planning) could successfully reduce emissions to acceptable levels.

Similar effects on air quality from decommissioning to those during the construction phase are expected. However, emissions are anticipated to be lower than those during the construction phase because of expected advances in zero emissions vehicles and machinery by the time decommissioning takes place together with the need for less earth movements and less transportation of materials off the site as compared to construction. Adherence to similar mitigation measures as during the construction phase would also reduce effects.

Table 15: Protect and enhance air quality on a local, regional, national and international scale

AoS Objective 8: Protect and enhance air quality on a local, regional, national and international scale	Assessment of effects (by timescale)		
	S	M	L
Guide questions: • Minimise emissions of dust and other air pollutants that affect human health or biodiversity? • Improve air quality within AQMAs and avoid the need for new or expanded AQMAs? • Promote enhancements to green infrastructure networks to help improve air quality? • Avoid adverse air quality effects on Habitats Sites and Sites of Special Scientific Interest?	-	-	-

AoS Objective 9: Protect soil resources, promote use of brownfield land and avoid land contamination

Anticipated effects

Development of fusion energy infrastructure has the potential to result in a loss of soil resources (including in those areas considered Best and Most Versatile) and lead to pollution or contamination of land. As well as loss, soil can also be damaged due to soil sealing and general soil degradation. Note that effects on soil can also have implications for other environmental topics such as biodiversity and the water environment.

Most effects, which can be direct, are likely to occur in the short term from the construction activities involved in developing new fusion generation sites and associated infrastructure (including facilities for storage of radioactive material), especially given that such developments will often be located on greenfield land. There is potential for contamination of soil resources to occur in the medium to long term as a result of air and water pollution arising from construction or the operations of infrastructure or potentially as a result of spills during the operation of such developments. The decommissioning stage of infrastructure may also cause direct negative effects on soil resources due to spills and contaminated waste left on-site, but also offer potential for the remediation of land. Similarly, delivery of fusion energy infrastructure on previously developed land may create opportunities to deliver local regeneration. Cumulative negative effects on soil resources may occur where there is a cluster or concentration of infrastructure development. The significance of any effects will be dependent on the locations and scales of development.

Assessment made in respect of EN-8

It is anticipated that potential sites for fusion energy development would include previously developed (brownfield) land – often located in or adjacent to urban and industrial areas. A key element of EN-1, to which draft EN-8 refers, sets out that the contamination of environmental features such as soils can be mitigated through the Environmental Impact Assessment (EIA) process and managed through the possible implementation of Environmental Management Plans. This requirement for EIA, would ensure that the direct, indirect, secondary, transboundary and short to long term effects of the development on soil quality will be considered, as these are requirements in the EIA Regulations.

Assist in facilitating the re-use of previously developed land?

Draft EN-8 notes that using brownfield land for fusion energy infrastructure aligns with the NPPF to prioritise brownfield development, better utilise existing land in built-up areas and preserve undeveloped land. Draft EN-8 also notes that the use of brownfield land presents opportunities for soil and groundwater remediation prior to development. Remediation can improve land quality inherited from previous industrial use and deliver environmental benefits. In addition, EN-1 (to which draft EN-8 refers) notes that where contamination is present,

applicants should consider opportunities for remediation where possible. This would help facilitate the use of brownfield land.

Avoid development upon the best and most versatile agricultural land, or soils of high sensitivity such as peat?

EN-1 (to which draft EN-8 refers) suggests that the applicant should seek to minimise impacts on the best and most versatile agricultural land (grades 1, 2 and 3a of the Agricultural Land Classification) and should seek to use land in areas of poorer quality (grades 3b, 4 and 5), unless this would result in negative impacts on other sustainability considerations. For developments on previously developed land, EN-1 requires that applicants should consider the risk posed by existing land contamination.

Ensure the protection of soil resources and avoid soil health degradation through sustainable soil management and re-use?

Draft EN-8 notes that using brownfield land for fusion energy infrastructure will better utilise existing land in built-up areas and preserve undeveloped land and thereby it can be considered help protect soil resources. It is also anticipated that the comprehensive measures set out in EN-1 (referred to by draft EN-8) would mean that the majority of adverse effects on soil resources as a result of developing new fusion energy infrastructure could be avoided, reduced and mitigated through careful design and planning. For example, while there would inevitably be some loss of soil resource, effects can be minimised by good site selection, design and protection of soils during construction. EN-1 encourages applicants to develop and implement a Soil Management Plan as part of infrastructure proposals and this would also likely help to minimise potential land contamination. EN-1 also notes that where contamination is present, applicants should consider opportunities for remediation where possible.

Promote and enhance soil health?

There is potential for the majority of adverse effects on soil resources as a result of fusion energy infrastructure development to be avoided, reduced and mitigated through careful design and planning. However, the long term significance of these effects remains uncertain, and the effectiveness of the mitigation possibilities proposed will depend on the individual sensitivities of the receiving sites, in the context of specific details of the development design, layout and operation. In terms of mitigating impacts on soil resources, EN-1 (to which draft EN-8 refers) requires applicants to identify any effects on soil health and protect and improve soil quality, seek to minimise them, and take account any mitigation measures proposed. EN-1 also encourages applicants to develop and implement a Soil Management Plan as part of energy infrastructure proposals and this would also likely help to minimise potential land contamination, as well as promote and enhance soil health. It is also noted that the sustainable reuse of soils needs to be carefully considered in line with good practice guidance where large quantities of soils are surplus to requirements or are affected by contamination.

Seek to remediate contaminated land?

Draft EN-8 notes that applicants should consider opportunities for soil and groundwater remediation prior to development and demonstrate how soil protection and remediation opportunities have been integrated into site assessment. Draft EN-8 also notes that there should be a prioritisation for brownfield land for fusion energy infrastructure development and that this aligns with the NPPF. The NPPF is supportive of policies which support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land and as such it is anticipated that remediation of contamination would form a key element of any proposed development should it be identified on site. It is also anticipated this would form a key issue in engagement with relevant bodies such as Local Authorities as advised by draft EN-8.

EN-1 (referred to by draft EN-8), notes that applicants should ensure that they have considered the risk posed by land contamination and how it is proposed to address this. Consideration should also be made of opportunities for remediation where possible and it is important to do this as early as possible as part of the engagement with relevant bodies before the official pre-application stage. Note is also made in EN-1 that where pre-existing land contamination is being considered within a development, the objective is to ensure that the site is suitable for its intended use. Risks would require consideration in accordance with the contaminated land statutory guidance as a minimum.

Minimise development (hardstanding) footprint to reduce soil sealing?

While draft EN-8 does not specifically note the issue of soil sealing, it does cross reference EN-1 which sets out that there is a need to consider soils through Environmental Impact Assessment and it is anticipated that this would address all potential impacts on soils directly or indirectly impacted by any development. It is anticipated this would include matters relating to soil sealing. The size of area of hardstanding would also be a factor considered in any assessment in respect of the water environment, with potential implications for water quality runoff (perhaps leading to pollution incidents, as well as greater flood risk in the locality, or downstream of a development).

In addition, EN-1 notes that opportunities should be taken to lower flood risk by reducing the built footprint of previously developed sites and using SuDS. The use of SuDS is encouraged throughout the NPS and while there are a number of different types of SuDS, a key element to these are that they generally reduce the amount of hardstanding / soil sealing (allowing water to soak into the soil and reduce runoff rates).

Support delivery of the Environmental Improvement Plan?

The EIP notes the need to responsibly manage resources to provide healthy soils and essentially recognises good quality soil as a finite resource - once vital soil functions are lost, they often cannot be restored entirely. A focus on brownfield lands noted through draft EN-8, along with the measures noted in EN-1 is aligned with the EIP in this regard.

Assessment conclusions and summary

Direct, short term effects on soil resources, through loss or contamination, are likely to occur from the construction of developments for fusion energy generation and associated infrastructure, especially given that such developments will often be located on greenfield land, although they may also be located in brownfield land where soil resources may be of a lesser value. There is potential for contamination of soil resources to occur in the short to long term as a result of air and water pollution arising from construction or the operations of energy generating infrastructure or potentially as a result of spills during the operation of such developments. Draft EN-8 sets out that fusion energy infrastructure may also include facilities for the storage of radioactive materials. Such facilities could also result in contamination to the surrounding environment should they not be contained adequately. As noted by draft EN-8, EN-1 sets out the principles for management of hazardous and non-hazardous waste generated by large infrastructure projects. Furthermore, both draft EN-8 and EN-1 note the requirements for 'Good Design' of all energy infrastructure.

The decommissioning stage of fusion energy infrastructure may also cause direct negative effects on soil resources due to spills and contaminated waste left on-site but also offer potential for the remediation of land. Similarly, delivery of fusion energy infrastructure on previously developed land may create opportunities to deliver local regeneration. Cumulative negative effects on soil resources may occur where there is a cluster or concentration of energy infrastructure development, including fusion energy infrastructure. The significance of any effects will be dependent on the locations and scales of development.

Minor negative effects on soil resources are likely as a result of implementation in the short, medium and long term due to the potential for loss of agricultural land and contamination of soil, potentially from spills of oil or chemicals used in the construction, operations and decommissioning of energy related infrastructure. The effects identified are uncertain as they will depend on the specific nature, location and scale of development.

The mitigation and approach outlined in EN-1 (referred to by draft EN-8) has the potential to ensure that energy generating development enabled through draft EN-8 will avoid the best and most versatile agricultural land, where possible. Additionally, the requirement that development should not be given consent unless they have been considered by relevant pollution authorities is likely to minimise the potential for land contamination.

Table 16: Protect soil resources, promote use of brownfield land and avoid land contamination

AoS Objective 9: Protect soil resources, promote use of brownfield land and avoid land contamination	Assessment of effects (by timescale)		
	S	M	L

Guide questions: • Assist in facilitating the re-use of previously developed land? • Avoid development upon the best and most versatile agricultural land, or soils of high sensitivity such as peat? • Ensure the protection of soil resources and avoid soil health degradation through sustainable soil management and re-use? • Promote and enhance soil health? • Seek to remediate contaminated land? • Minimise development (hardstanding) footprint to reduce soil sealing? • Support delivery of the Environmental Improvement Plan?	-	-	-

AoS Objective 10: Protect, enhance and promote geodiversity

Anticipated effects

Development of fusion energy infrastructure has the potential to have a range of effects on geodiversity, depending upon the nature and scale of the infrastructure, as well as the location in which it is placed. Effects could include:

- Disturbance to, or loss of, geologically important sites, for example from the digging of foundations, trenches, culverts, laying of pipes, cabling etc.
- Changes to coastal and marine processes – through physical changes to coastline and marine environment (including flood management features), dredging, water abstraction and water discharge. This could result in direct loss of exposed features, as well as changes in erosion and sediment transportation. Draft EN-8 notes that fusion energy infrastructure may be sited in non-coastal locations and could then impact the natural functioning of estuarine, riverine and lacustrine locations, with consequential impacts on erosion and other landform change.
- Obstructions – from introduced structures presenting obstacles to access and study geodiversity assets

While effects are likely to be typically localised, they could be direct or indirect, as well as both temporary or permanent. Effects could also be experienced at superficial, as well as bedrock levels.

Assessment made in respect of EN-8

Protect and enhance geodiversity resource? Protect or enhance SSSIs designated for their geological interest?

Draft EN-8 notes both issues relating to landform change, as well as the need for wider geological conservation and cross references to EN-1 which sets out the approach to geological conservation. Application of EN-1 would ensure that geological conservation would include those sites designated for their geology and / or geological importance. Early engagement is also encouraged through draft EN-8 with relevant bodies.

Avoid the degradation and removal, wherever possible, of RIGS?

At the regional and local scale, which includes Regionally Important Geological Sites and Local Geological Sites, EN-1 (to which draft EN-8 refers) indicates that due consideration should be given to such sites, but given the need for new nationally significant infrastructure, these designations should not be used in themselves to refuse development consent. EN-1 also asks applicants to produce and implement a Geodiversity Management Strategy with an aim that these strategies will also preserve and enhance access to geological interest features as part of relevant development proposals. EN-1 also recognises that careful siting and use of appropriate technologies can help to mitigate adverse impacts on the environment. Applicants

are required to demonstrate how the design process was conducted and how it evolved. Where several different designs were considered, the applicant should explain why the favoured choice was selected. This may offer scope for avoidance and mitigation of impacts on geodiversity assets at the design stage.

Protect geodiversity on the shoreline and marine waters?

Draft EN-8 recognises the issue of coastal / landform change from the development of fusion generation infrastructure. Cross reference is made to EN-1 which notes that coastal change means physical change to the shoreline and where onshore infrastructure projects are proposed, coastal change is to be a key consideration, noting that energy infrastructure can act as a driver of change. It notes there is a need to ensure that developments are resilient to ongoing and potential future coastal change. EN-1 also sets out that where relevant, applicants should undertake coastal geomorphological and sediment transfer modelling and help identify relevant mitigating or compensatory measures – in particular the impact of a proposed project on coastal processes and geomorphology should be considered.

EN-1 also notes the role of Shoreline Management Plans in helping to manage coastal processes and notes that the Secretary of State should not normally consent new development in areas of dynamic shorelines where the proposal could inhibit sediment flow or have an adverse impact on coastal processes at other locations. Impacts on coastal processes must be managed to minimise adverse impacts on other parts of the coast and this would act to help protect geodiversity, though the Secretary of State may grant consent when satisfied that the benefits (including need) of the development outweigh adverse impacts. Note is also made that the Secretary of State should ensure that applicants have restoration plans for areas of foreshore disturbed by direct works and will undertake pre- and post-construction coastal monitoring arrangements with defined triggers for intervention and restoration. The Secretary of State should also examine the broader context of coastal protection around the proposed site, and the influence in both directions, i.e. coast on site, and site on coast.

Support access to, interpretation and understanding of geodiversity?

Further to any mitigation outlined, EN-1 asks the Secretary of State to maximise opportunities (using planning obligations) for building in beneficial geological features as part of good design. EN-1 also sets outs the applicant to ensure construction of developments should be confined to the minimum areas required for the works and that to further minimise any adverse impacts on geodiversity, where appropriate applicants are encouraged to produce and implement a Geodiversity Management Strategy to preserve and enhance access to geological interest features, as part of relevant development proposals.

Assessment conclusions and summary

There is potential for negative effects on geodiversity due to NPS implementation in the short, medium and long term, through loss of land / seabed, changes to coastal processes etc., particularly during construction. However, due to the potential for enhancement of geological features (or increasing access etc.) outlined in EN-1 (to which draft EN-8 cross references), there is also potential for minor positive effects in the medium to long term.

Nevertheless, it is important to note that the significance of any effects on geodiversity remains uncertain, and the effectiveness of the mitigation possibilities proposed will depend on the individual sensitivities of the receiving sites, in the context of specific details of the development design, layout and operation.

Table 17 Protect, enhance and promote geodiversity

AoS Objective 10: Protect, enhance and promote geodiversity	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Protect and enhance geodiversity resource? • Protect or enhance SSSIs designated for their geological interest? • Avoid the degradation and removal, wherever possible, of RIGS? • Protect geodiversity on the shoreline and marine waters? • Support access to, interpretation and understanding of geodiversity?	**-**	**-/+**	**-/+**

AoS Objective 11: Improve health and well-being and safety for all citizens and reduce inequalities in health

Anticipated effects

Fusion generation infrastructure has the potential to impact on the health and well-being of the population at all stages – construction, operation and decommissioning. Effects could include:

- positive effects resulting from security and affordability of supply, and potential enhancements to employment and economic opportunities;
- potential significant negative impacts, in particular during construction phases (dust, noise, odour, vibration, artificial light, exposure to pollutants, smoke and steam, waste products and an increase in pest incidence);
- loss of land that has value for recreation or which can enhance well-being – for example potential loss / diversion of walking routes such as the King Charles III England Coastal Path;
- indirect negative impacts through loss of amenity, access, including access to open spaces/transport networks, changes (increases) to local populations placing pressure on essential services (including health or social care provision).

Assessment made in respect of EN-8

Protect the health of communities through prevention of accidental pollutant discharges, exposure to electric and magnetic fields, or radiation?

Draft EN-8 refers to EN-1 and notes that the primary fuel for fusion energy is a combination of deuterium and tritium, which is a source of ionizing radiation and draft EN-8 notes that this will require careful management both during operation and decommissioning. EN-1 also notes that where a proposed energy infrastructure project has an effect on human beings, an Environmental Statement should be undertaken that should assess these effects for each element of the project, identifying any potential adverse health impacts, and identifying measures to avoid, reduce or compensate for these impacts as appropriate. This would include all elements such as increased traffic, air or water pollution, dust, odour, hazardous waste and substances, noise, exposure to radiation, and increases in and would be anticipated to include EMF and shadow flicker etc. Consideration should also be made of how the impacts of more than one development may affect people simultaneously, so the applicant should consider the cumulative impact on health in the ES where appropriate.

Note that it is also recognised in draft EN-8, that fusion energy infrastructure presents very low radiological risk. The safety characteristics of fusion and compliance with the UK's robust legislative and regulatory regime means that the risk of radiological health detriment posed by fusion energy infrastructure (both during normal operation and as a result of an unplanned release) is extremely small. As such, given the likelihood of such an event, no health surveillance is expected for the general workforce or anyone outside radiation controlled areas.

Note is also made in draft EN-8 that the Secretary of State must also have regard to any relevant Regulatory Justification decision when considering impacts on human health and wellbeing and must act on the basis that the UK's regulatory regime will be properly applied and enforced to protect human health.

Minimise nuisance on communities, their health, quality of life and their facilities including, noise, artificial light, odour, dust, steam, smoke and infestation of insects?

Draft EN-8 recognises that during operation, the fusion energy infrastructure is unlikely to be associated with significant noise, vibration or air quality impacts, although it also recognises that there may be local impacts due to increased transport activities. EN-1 (to which draft EN-8 refers) notes that those areas of energy infrastructure which are most likely to have a significantly detrimental impact on health are subject to separate regulation (for example for air pollution) which will constitute effective mitigation of them, so that it is unlikely that health concerns will either by themselves constitute a reason to refuse consent or require specific mitigation under the Planning Act 2008. However, not all potential sources of health impacts will be mitigated in this way and the Secretary of State will want to take account of health concerns when setting requirements relating to a range of impacts such as noise. EN-1 also notes that opportunities should be taken to mitigate indirect impacts, by promoting local improvements to encourage health and wellbeing.

EN-1 also sets out the need to identify any potential adverse health impacts and reflect and address the potential for health effects across the whole of society and the different groups within it and recognises the need to protect the most vulnerable. In addition EN-1sets out that not all health impacts will be addressed through separate regulation and notes the need for opportunities to be taken to mitigate indirect impacts, by promoting local improvements to encourage health and wellbeing, this includes potential impacts on vulnerable groups (including those noted with protected characteristics under the Equality Act 2010) within society i.e. those groups within society which may be differentially impacted by a development compared to wider society as a whole.

The recognition is also made in EN-1 that the potential for dust, odour, artificial light, smoke, steam and insect infestation to cause detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990. Applicants are required to carry out assessment of such nuisance and that all reasonable steps have been taken, and will be taken, to minimise any such detrimental impacts. Sensitive receptors are to be identified. It is also advised that consultation takes place with local planning authorities and where appropriate, the EA (or Welsh regulators) about the scope and methodology of the assessment.

In addition, EN-1 recognises that excessive noise can have wide-ranging impacts on the quality of human life, health such as annoyance, sleep disturbance, cardiovascular disease and mental health. It can also have an effect on the environment and use and enjoyment of areas of value such as quiet places and areas with high landscape quality. EN-1 notes the Noise Policy Statement for England and that the Welsh Government's overarching policy is set out in its Noise and Soundscape Action Plan. Its focus is on creating appropriate soundscapes

for communities. This includes not only managing noise but also considering what sounds are appropriate in a given time and place. A range of mitigation measures relating to noise are also provided within the wider NPS suite.

Result in loss of recreational and amenity land or loss of access? & Provide for facilities that can promote more social interaction and a more active lifestyle and enjoyment of the countryside and coasts? & Promote access to nature for people and improve local Green Infrastructure provision?

EN-1, to which draft EN-8 refers, recognises that there is a risk to open space, countryside and coasts due to the need to locate infrastructure in these locations and that new energy infrastructure may also affect the composition, size and proximity of the local population, and in doing so have indirect health impacts, for example if it in some way affects access to key public services, transport or the use of open space for recreation and physical activity. EN-1 also continues to recognise that there is a potential for impact on community facilities through an influx of workers to an area, along with a potential risk to social cohesion.

However, these issues are addressed throughout EN-1 which notes, for example, that it is government's policy is to ensure there is 'good design' (also referenced in draft EN-8) and adequate provision of high quality open space (including green infrastructure) and sports and recreation facilities to meet the needs of local communities. Open spaces, sports and recreational facilities all help to underpin people's quality of life and have a vital role to play in promoting healthy living. Well designed and managed green infrastructure in particular, provides multiple benefits at a range of scales. It can contribute to health, wellbeing, biodiversity recovery, absorb surface water, cleanse pollutants and absorb noise and reduce high temperatures. It will also play an increasingly important role in mitigating or adapting to the impacts of climate change. The provision and enhancement of green infrastructure can improve air quality, particularly in urban areas. Applicants are therefore encouraged to consider how new green infrastructure can be provided, or how existing green infrastructure can be enhanced, as part of their application. Note is also made that applicants will need to consult the local community on proposals to build on existing open space, sports or recreational buildings and land. Taking account of the consultations, applicants should consider providing new or additional open space including green and blue infrastructure, sport or recreation facilities, to substitute for any losses as a result of their proposal. Note that when considering proposals for green infrastructure, applicants should refer to the Green Infrastructure Framework. Applicants should use any up-to-date local authority assessment or, if there is none, provide an independent assessment to show whether the existing open space, sports and recreational buildings and land is surplus to requirements.

Promote initiatives that enhance safety and personal security for all?

Draft EN-8 notes a range of safety and security issues of relevance to fusion energy infrastructure including seismic activity. Applicants are required to include an assessment of any risks posed by seismic hazards during its whole lifecycle and provide details of appropriate mitigations to any significant risks.

In addition, draft EN-8 notes the need for emergency planning – the exact amount of planning will depend on the radiological inventory, design and the specific fusion technology of the infrastructure.

EN-1, to which draft EN-8 refers, also provides further clarity on pollution control as well as the role of safety legislation and notes how this can help to protect health. Further consideration is made within relevant discrete sections with particular direct relevance to health, such as air quality or noise and vibration, as well as indirect relevance such as green space that can help promote healthy living.

EN-1 also recognises that national security considerations apply across all national infrastructure sectors. DESNZ works closely with Government security agencies including the National Protective Security Authority (NPSA) and the National Cyber Security Centre (NCSC) to provide advice to the most critical infrastructure assets on terrorism and other national security threats, as well as on risk mitigation. It is also Government policy is to ensure that, where possible, proportionate protective security measures are designed into new infrastructure projects at an early stage in the project development.

In addition, EN-1 notes that DESNZ will be notified at pre-application stage about every likely future application for energy NSIPs, so that any national security implications can be identified. Where national security implications have been identified, it is noted that the applicant should consult with relevant security experts including NPSA, NCSC and/or DESNZ to ensure security measures have been adequately considered in the design process and that adequate consideration has been given to the management of security risks.

Where possible, contribute to improvements to health and quality of life?

A fundamental element of draft EN-8, as well as EN-1, is that there is a need for a secure, reliable and affordable national energy system and it is explicitly recognised that given the vital role of energy to economic prosperity, health and social well-being, it is important that supplies of energy remain secure, reliable and affordable. Fusion energy is anticipated to become a key element of this energy mix and will help to ensure that all groups have a secure and affordable supply, with improvements to quality of life possible.

Assessment conclusions and summary

Reliable energy supplies nationally will contribute to positive effects generally on the economy and skills with indirect positive effects for health and well-being in the medium to longer term through helping to secure affordable supplies of energy and minimising fuel poverty. Opportunities for employment (across the short, medium and long term) are also likely, with consequent beneficial effects on wellbeing.

EN-1, to which draft EN-8 refers, also provides clear recognition of the need to identify potential adverse health impacts, including on vulnerable groups (or those with protected characteristics) within society and notes that opportunities should be taken to mitigate direct impacts by promoting local improvements to encourage health and wellbeing. Beneficial effects will likely be from the short through to the long term.

Table 18: Improve health and well-being and safety for all citizens and reduce inequalities in health

AoS Objective 11: Improve health and well-being and safety for all citizens and reduce inequalities in health	Assessment of effects (by timescale)		
	S	M	L
Guide questions: • Protect the health of communities through prevention of accidental pollutant discharges, exposure to electric and magnetic fields or radiation? • Minimise nuisance on communities, their health, quality of life and their facilities including, noise, artificial light, odour, dust, steam, smoke and infestation of insects? • Result in loss of recreational and amenity land or loss of access? • Provide for facilities that can promote more social interaction and a more active lifestyle and enjoyment of the countryside and coasts? • Promote access to nature for people and improve local Green Infrastructure provision? • Promote initiatives that enhance safety and personal security for all? • Where possible, contribute to improvements to health and quality of life?	+	+	+

AoS Objective 12: Promote sustainable transport and minimise detrimental impacts on strategic transport network and disruption to basic services and infrastructure

Anticipated effects

Any large scale infrastructure project has the potential to impact transport networks and disrupt basic services. This would be particularly during the initial construction phases. Typical effects, which would also apply to fusion energy infrastructure, would include:

- disruption to road and public transport services, cycleways and footpaths, especially during construction;
- increased traffic leading to congestion and increased journey times;
- increased noise and atmospheric emissions from road transport; and
- potential positive effects through new road facilities and transport links, upgrading of existing roads, enhanced public transport. This could include new sustainable transport modes.

In specific relation to fusion energy infrastructure, it is anticipated that there will be a need to transport radioactive material in a safe and secure fashion.

Assessment made in respect of EN-8

Prevent adverse changes to strategic transport infrastructure road/rail/airport?

As per EN-1 Section 4.1 ‘General Policies and Considerations, early engagement is strongly encouraged between the applicant and key stakeholders. This is noted in paragraph 3.1.8 of draft EN-8. A non-exhaustive list of bodies that applicants are advised to engage for local impacts is provided in the annex of draft EN-8: including National Highways, South Wales Trunk Road Agent (SWTRA), North and Mid Wales Trunk Road Agent (NMWTRA), the Planning Inspectorate, local authorities, parish councils and community groups.

Draft EN-8 also references EN-1, which notes that if a project is likely to have significant transport implications, the applicant’s ES should include a transport appraisal, using the methodology stipulated in DfT’s Transport Analysis Guidance (TAG) and Welsh Governments WelTAG. National Highways and Highways Authorities are statutory consultees on NSIP applications including energy infrastructure where it is expected to affect the strategic road network and / or have an impact on the local road network. EN-1 also notes that where mitigation is required, possible demand management measures must be considered and if feasible and operationally reasonable, required, before considering requirements for the provision of new inland transport infrastructure to deal with remaining transport impacts.

In addition, draft EN-8 also sets out that Good design can minimise adverse local impacts and deliver enhancements to local infrastructure – this is anticipated to include transport infrastructure.

Prevent loss or disruption to basic services and infrastructure (e.g. telecommunications, electricity, gas)?

Draft EN-8 references EN-1, which notes that a transport assessment should also consider any possible disruption to services and infrastructure (such as road, rail and airports). Further clarity is also provided in relation to water borne transport and notes that Developers should consider the DfT policy guidance "Water Preferred Policy Guidelines for the movement of abnormal indivisible loads" when preparing their application.

Where appropriate, the applicant should prepare a travel plan including demand management measures to mitigate transport impacts. The applicant should also provide details of proposed measures to improve access by active, public and shared transport, to reduce the need for parking associated with the proposal and to mitigate transport impacts.

EN-1 further notes that there may be requirements for consent where there is likely to be substantial HGV traffic that:

- control numbers of HGV movements to and from the site in a specified period during its construction and possibly on the routing of such movements;
- make sufficient provision for HGV parking, either on the site or at dedicated facilities elsewhere, to avoid 'overspill' parking on public roads, prolonged queuing on approach roads and uncontrolled on-street HGV parking in normal operating conditions; and
- ensure satisfactory arrangements for reasonably foreseeable abnormal disruption, in consultation with network providers and the responsible police force.

Promote transportation of goods and people by low/zero carbon transport modes?

EN-1 (to which draft EN-8 refers) notes that all stages of the project should support and encourage a modal shift of freight from road to more environmentally sustainable alternatives, such as rail, cargo bike, maritime and inland waterways, as well as making appropriate provision for and infrastructure needed to support the use of alternative fuels including charging for electric vehicles.

EN-1 further notes, that where appropriate, the applicant should prepare a travel plan including demand management measures to mitigate transport impacts. The applicant should also provide details of proposed measures to improve access by active, public and shared transport, to reduce the need for parking associated with the proposal and to mitigate transport impacts.

Reduce travel distances to work and reduce the need for out commuting?

Travel plans, as required by EN-1 (to which draft EN-8 refers), would provide details of proposed measures to improve access by public transport, walking and cycling, to reduce the

need for parking associated with the proposal and to mitigate transport impacts. Potential increased opportunities for employment / economic development in local areas (as a result of fusion energy infrastructure development) would reduce the need for out commuting to other areas for work.

Assessment conclusions and summary

Draft EN-8, supported by EN-1, provides for a robust approach to promoting sustainable transport, as well as minimising detrimental impacts on the strategic transport network and disruption to services and infrastructure. It also describes the need to undertake transport assessment and include Travel Plans and this would help to ensure that all aspects of effect on the transport network (strategic and local) can be achieved. As such, while it is anticipated that uncertain effects may be experienced in the short (construction) term, benefits should be experienced across the later timescale of the development, particularly through the application of Good design (as mentioned by draft EN-8), to deliver enhancements to local infrastructure – this is anticipated to include transport infrastructure.

Table 19: Promote sustainable transport and minimise detrimental impacts on strategic transport network and disruption to basic services and infrastructure

AoS Objective 12: Promote sustainable transport and minimise detrimental impacts on strategic transport network and disruption to basic services and infrastructure	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Prevent adverse changes to strategic transport infrastructure road/rail/airport? • Prevent loss or disruption to basic services and infrastructure (e.g. telecommunications, electricity, gas)? • Promote transportation of goods and people by low/zero carbon transport modes? • Reduce travel distances to work and reduce the need for out commuting?	**-**	**+**	**+**

AoS Objective 13: Promote a strong economy with opportunities for local communities

Anticipated effects

Businesses and jobs rely on the use of energy, with economic output and associated jobs dependent on a robust and reliable system. A robust and reliable system also has important implications for consumers, as well as protecting the fuel poor, providing opportunities to save money on bills, giving warmer, more comfortable homes and balancing investment against bill impacts.

In addition, it is anticipated that the construction, operation and decommissioning of energy infrastructure can be expected to have socio-economic effects at local and regional levels. It is anticipated that fusion energy infrastructure will require a range of skills to build, operate and decommission – many of these will be highly skilled and well paid. Nevertheless, in addition to beneficial effects, there is potential for adverse effects, particularly if large scale infrastructure is to be developed in rural areas where existing infrastructure, housing supply, health and social services and so on can be limited. Large scale engineering projects can also cause adverse effects on certain sectors such as the rural economy from loss of land, with potential further effects on food security or farm viability.

Without a strategic approach to energy development the required development and associated infrastructure is less likely to be provided to encourage investment in areas where highest numbers of residents can benefit from new employment opportunities.

The pattern of deprivation across England and Wales is geographically complex, incorporating stark contrasts between wealthy and severely deprived communities. Without the strategic approach to energy development, opportunities to deliver development and infrastructure which can improve equitable and inclusive access to employment and increases in income of local people are less likely to be achieved.

Both England and Wales (along with the UK as a whole) are expected to see population growth in the coming years, with the proportion of residents of an older age. This growth will be uneven across the country, with a focus on larger urban areas most likely in relation to population growth (though the move to home working may have implications for smaller towns, villages and rural areas). Smaller villages and rural areas may experience an increasingly older demographic (as would less deprived areas), though, there would likely be regional variations.

Assessment made in respect of draft EN-8

Support enhanced security, reliability and affordability of the national energy supply?

Clear recognition is made within draft EN-8 that there is a commitment to ensuring the UK's energy supply is secure, reliable, affordable and consistent and the Government sees development of fusion energy and the significant economic growth that could bring as a high priority. This NPS (draft EN-8) is considered a key enabler of that growth by providing certainty

to investors, developers and others in the fusion industry as to how Government will handle planning for fusion energy infrastructure.

Cross reference is made in draft EN-8 to EN-1 and this notes that applicants and local authorities are strongly encouraged to engage during early stages of project development so that the applicant can gain a better understanding of local or regional issues and opportunities. Draft EN-8 itself also encourages early engagement with key stakeholders. On socioeconomic impacts, draft EN-8 encourages applicants to engage with relevant local authorities and notes that the application of Good Design may enable the fusion energy infrastructure to contribute wider benefits for host communities. It is anticipated this would deal with specific issues of relevance to the local area, for example, in rural areas, impact on farming activities and the wider rural economy would be considered.

Support creation of both temporary and permanent jobs and increase skills, particularly in areas of need?

Fusion energy generation is a new technology, with the UK at the forefront of technical advancement in this field. The NPS provides an opportunity to build upon existing expertise and support creation of a range of jobs of all skill levels. The development of a fusion energy generation industry would also unlock significant investment at the local, regional and national levels. The development of fusion energy infrastructure would also require large numbers of skilled trades during construction, operation and decommissioning.

EN-1 (to which draft EN-8 refers) notes that applicants are encouraged, where possible, to demonstrate that local suppliers have been considered in the supply chain. There is also potential need for consideration to include requirement for the approval by the local authority of an employment and skills plan detailing arrangements to promote local employment and skills development opportunities – it is anticipated that this would include for the provision of apprenticeships to local communities, though this is not explicitly stated. Further consideration would be made of any relevant positive provisions the developer has made or is proposing to make to mitigate impacts (for example through planning obligations) and any legacy benefits that may arise as well as any options for phasing development in relation to the socio-economic impacts.

The hazard profile of fusion energy infrastructure set out in draft EN-8 allows for location of facilities near to high population centres, with potential co-location opportunities. This could provide synergy across industries, as well as allow for more efficient and lower cost economic opportunities – for example benefitting industries that require a steady supply of heat and electrical output.

In addition, EN-1 states that the Secretary of State may wish to include a requirement that specifies the approval by the local authority of an employment and skills plan detailing arrangements to promote local employment and skills development opportunities, including apprenticeships, education, engagement with local schools and colleges and training programmes to be enacted. It is also noted that applicants should also consider developing accommodation strategies where appropriate, especially during construction and

decommissioning phases, that would include for the need to provide temporary accommodation for construction workers if required. This could help increase the skills base in local areas.

Have wider socio-economic effects such as changes to the demographics, community services or house prices? Delivery of infrastructure to support economic investment in the local economy?

EN-8 refers to EN-1 which requires Environmental Impact Assessment and consultation with the local authorities. Through this process, the applicant should identify at a local and regional level any socioeconomic impacts associated with the whole life cycle of the infrastructure. This assessment should demonstrate that the applicant has taken account of potential pressures on local and regional resources, population change and economic benefits.

EN-1, to which EN-8 refers, also notes that consideration should be made through an Environmental Statement of:

- the creation of jobs and training opportunities. Applicants may wish to provide information on the sustainability of the jobs created, including where they will help to develop the skills needed for the UK's transition to Net Zero;
- the contribution to the development of low-carbon industries at the local and regional level as well as nationally;
- the provision of additional local services and improvements to local infrastructure, including the provision of educational and visitor facilities;
- any indirect beneficial impacts for the region hosting the infrastructure, in particular in relation to use of local support services and supply chains;
- effects on tourism;
- the impact of a changing influx of workers during the different construction, operation and decommissioning phases of the energy infrastructure. This could change the local population dynamics and could alter the demand for services and facilities in the settlements nearest to the construction work (including community facilities and physical infrastructure such as energy, water, transport and waste). There could also be effects on social cohesion depending on how populations and service provision change as a result of the development; and
- cumulative effects – if development consent were to be granted to for a number of projects within a region and these were developed in a similar timeframe, there could be some short-term negative effects, for example a potential shortage of construction workers to meet the needs of other industries and major projects within the region. It is also anticipated that such assessment of cumulative effects would entail consideration of potential effects on discrete sectors such as the rural economy. Impacts to be addressed would be loss of land, farm viability, potential food security issues and so on.

It is to be noted that the significant workforces required during construction of fusion energy infrastructure (particularly large scale facilities) could change the local population dynamics

and could alter the demand for services and facilities in the settlements nearest to the construction work (including community facilities and physical infrastructure such as energy, water, transport and waste). It is anticipated that the measures set out in EN-1 (particularly through the Environmental Impact Assessment) would address those issues.

Assessment conclusions and summary

Development of fusion energy infrastructure will support the security, reliability and affordability of the national energy supply and lead to the provision of jobs in local areas to the development and further afield. Some of these jobs are likely to be specialist in nature, but others will be lower skilled, or suitable for apprenticeships or will provide opportunities to further develop skills. It is anticipated that most jobs would be during the construction phase, with significantly less jobs during operation and then an increase during any decommissioning phase. A significant increase in workers can lead to stress on local housing and labour markets (particularly in more rural areas / smaller towns), however, draft EN-8, via the requirements set out in EN-1, will ensure a clear approach to addressing such issues. As such, some slight adverse effects are anticipated in the short term, but overall, there should be significant benefits in local areas during construction, with ongoing benefits through the medium to long term.

It is also important to note that the NPS will help to provide a robust and secure national supply of energy. This will have significant benefits across the wider economy, through for example allowing people and businesses to make long term investment decisions and could be expected to provide significant benefits through to the long term.

Table 20: Promote a strong economy with opportunities for local communities

AoS Objective 13: Promote a strong economy with opportunities for local communities	**Assessment of effects (by timescale)**		
	S	M	L
Guide questions: • Support enhanced security, reliability and affordability of the national energy supply? • Support creation of both temporary and permanent jobs and increase skills, particularly in areas of need? • Have wider socio-economic effects such as changes to the demographics, community services or house prices? • Delivery of infrastructure to support economic investment in the local economy?	**-/++**	**++**	**++**

AoS Objective 14: Promote sustainable use of resources and natural assets

Anticipated effects

All fusion energy infrastructure projects will require the use of natural resources (potentially of very significant quantities and including from virgin sources) and are likely to generate hazardous and non-hazardous waste. There is also likely to be a loss of environmental aspects / resources such as soil, which can be considered finite.

Reducing the need for virgin construction materials, e.g. through encouraging the use of recycled or secondary materials will not only reduce consumption but will also reduce the need to transport construction materials to site and to transport construction waste off site.

Generation of low carbon energy offers potential for reducing the use of fossil fuels, either directly through the use of other fossil fuel powered generation, or through allowing transport to become electrified.

Assessment made in respect of draft EN-8

Reduce consumption of materials, energy and resources?

Draft EN-8 notes that the applicant must consider the principles of ‘Good Design’ and cross reference the relevant section of EN-1, where more detail is provided. EN-1 notes that that applying ‘Good Design’ to energy projects should produce sustainable infrastructure efficient in the use of natural resources and energy used in their construction and operation. It is also noted that given the benefits of “good design” in mitigating the adverse impacts of a project, applicants should consider how “good design” principles can be applied to a project during the early stages of the project lifecycle.

Applicants are also encouraged to use construction best practices in relation to storing materials in an adequate and protected place on site to prevent waste or degeneration of valuable materials, for example, from accidental damage or excessive weathering. Encouragement is also made to prepare a materials management plan. The use of Building Information Management tools (or similar) to record the materials used in construction can help to reduce waste and realise further value in future decommissioning of facilities, by identifying materials that can be recycled or reused.

Promote sustainable waste management practices in line with the waste hierarchy? Encourage the use of recycled and / or secondary materials? Encourage the development of a circular economy?

EN-1, to which draft EN-8 refers, notes that sustainable waste management is implemented through the “waste hierarchy”, which sets out the priorities that must be applied when managing waste. Disposal of waste should only be considered where other waste management options are not available or where it is the best overall environmental outcome.

EN-1 also notes that applicants must ensure that all proposals align with circular economy objectives. In Wales, applicants are encouraged to refer to 'Towards Zero Waste: Our Strategy for Wales'.

In addition, EN-1 clearly notes that development proposals must not compete with greater waste prevention, re-use or recycling. Applicants should set out how they intend to ensure that recyclable materials, including those that may be recyclable in the future, will be separated and sent for appropriate treatment. In accordance with the waste hierarchy, EN-1 notes that recyclable material must not be combusted or disposed of in landfill and that where possible, projects should include the reuse of materials and use of sustainable materials such as timber, or recycled materials.

EN-1 also requires that all applicants should set out the arrangements that are proposed for managing any waste produced and prepare a report that sets out the sustainable management of waste and use of resources throughout any relevant demolition, excavation and construction activities. The arrangements described and a report setting out the sustainable management of waste and use of resources should include information on how re-use and recycling will be maximised in addition to the proposed waste recovery and disposal system for all waste generated by the development. They should also include an assessment of the impact of the waste arising from development on the capacity of waste management facilities to deal with other waste arising in the area for at least five years of operation.

If the applicant's assessment includes dredged material, the assessment should also include other uses of such material before disposal to sea, for example through re-use in the construction process.

As such, consideration will also be made in the application process by the Secretary of State as to the effectiveness of proposed waste management systems, including ensuring that the waste arisings will not have an adverse effect on waste management facilities to deal with other waste arisings in the area. Consideration will also be given to the 'Circular Economy' and the Secretary of State should also be satisfied that all waste will be properly managed and that adequate steps have been taken to minimise volume of waste arisings and disposal. It is also noted that the Secretary of State may wish to include a condition on revision of waste management plans at reasonable intervals when giving consent.

Importantly, EN-1 sets out that the Secretary of State should not grant consent to a residual waste treatment facility where they are not convinced that the proposals will support the diversion of non-recyclable waste for landfill or replace an older, less efficient facility. The Secretary of State should also be satisfied that any proposed residual waste treatment facility is feasible for the duration of its proposed lifecycle in light of declining residual waste volumes and will not be reliant on material that is recyclable.

Promote the use of low carbon materials and technologies?

EN-1 (to which draft EN-8 refers) set out that where possible, applicants are encouraged to source materials from recycled or reused sources and use low carbon materials, sustainable

sources and local suppliers. In a wider context, note is also made in EN-1 of using innovative low carbon technologies, energy efficiency measures and so on.

Produce waste by-products that require appropriate management? Provide for safe and secure storage of radioactive and other wastes where necessary?

In fusion energy infrastructure, radioactive materials will primarily arise from neutron activation of structural components and contamination from tritium that fuels the fusion reactions. The majority of waste generated will be during decommissioning, rather than operation. As such, fusion energy infrastructure will not lead to the disposal of the very long lived, high level radioactive waste associated with nuclear spent fuel from a fission power plant.

EN-1 (to which draft EN-8 refers) notes that Government policy on hazardous and non-hazardous waste is intended to protect human health and the environment by producing less waste and by using it as a resource wherever possible. Where this is not possible, waste management regulation ensures that waste is disposed of in a way that is least damaging to the environment and to human health. In England, the EA's Environmental Permitting regime incorporates operational waste management requirements for certain activities. When an applicant applies to the EA for an Environmental Permit, the EA will require the application to demonstrate that processes are in place to meet all relevant Environmental Permit requirements. In Wales, NRW carries out this duty.

As per EN-1 Section 4.1 'General Policies and Considerations, early engagement is strongly encouraged between the applicant and key stakeholders. This is noted in paragraph 3.1.8 of draft EN-8. A non-exhaustive list of bodies that applicants are advised to engage is provided in the annex of draft EN-8 and includes bodies such as the Office for Nuclear Regulation and Department for Transport. Such bodies would have relevance in relation to the transport of some waste if this is radioactive or constitutes hazardous material.

Promote the use of local suppliers that use sustainably-sourced and locally produced materials?

EN-1 (to which draft EN-8 refers) notes that applicants must ensure that all proposals align with circular economy objectives and the government's circular economy ambitions. It is anticipated by the AoS that a mature circular economy would have sustainably sourced and locally produced materials at its core. Note is also made that applicants are encouraged, where possible, to demonstrate that local suppliers have been considered in the supply chain. In addition, applicants are also encouraged to source materials from recycled or reused sources and use low carbon materials, sustainable sources and local suppliers. Note is also made that that where possible, projects should include the reuse of materials and use of sustainable materials such as timber.

Support delivery of the Environmental Improvement Plan including the Environment Act 2021 target to reduce residual waste (excluding major mineral wastes) kg per capita by 50% by 2042 from 2019 levels, and associated interim targets?

EN-1 (to which draft EN-8 refers) notes that The Secretary of State must have regard to the ambitions, goals and targets set out in the Government's Environmental Improvement Plan 2023 for improving the natural environment. Waste is a key element of the Environmental Improvement Plan and EN-1 sets out that applying 'Good Design' to energy projects should produce sustainable infrastructure efficient in the use of natural resources and energy used in their construction and operation.

Applicants are also encouraged through EN-1 to use construction best practices in relation to storing materials in an adequate and protected place on site to prevent waste, for example, from damage or vandalism. The use of Building Information Management tools (or similar) to record the materials used in construction can help to reduce waste in future decommissioning of facilities, by identifying materials that can be recycled or reused.

Other elements also set out in EN-1 such as the use of Site Waste Management Plans, acting in accordance with the waste hierarchy, as well as reference to the Waste Prevention Programme for England, and 'Towards Zero Waste: Our Strategy for Wales' and should seek to minimise the volume of waste produced and the volume of waste sent for disposal and as such would help to meet applicable waste targets.

Assessment conclusions and summary

Draft EN-8, supported by EN-1, provides a robust approach to promoting sustainable use of resources and natural assets and notes how good design can reduce the requirement for consumption of materials and applying this to a project at as early a stage as possible will act to reduce consumption. Clear note is made (in EN-1) of a number of key aspects such as the waste hierarchy, and the requirement to set out the arrangements that are proposed for managing any waste produced, as well as ensuring proposals align with circular economy objectives. While there will be a high level of consumption of sources in the short term (construction phases), including virgin material, this will reduce during the operational phase and techniques such as the use of Building Information Management tools (or similar) will provide opportunities in the long term for realising the recovery and reuse of materials used at the construction stage.

It is also considered that draft EN-8 (supported by EN-1) will help reduce the consumption of fossil fuels by the economy by helping to promote a shift to more sustainable forms of energy generation and transport such as active modes like cycling and walking, as well as Low and Zero Emission Vehicles by helping to provide / enable the appropriate infrastructure in new development areas.

Draft EN-8 sets out how radioactive material produced during operation of the fusion energy infrastructure will need to be managed. It also notes that it is likely that some radioactive material will need to be stored at the site of the fusion energy infrastructure prior to disposal. This storage could occur during operation and decommissioning.

Table 21: Promote sustainable use of resources and natural assets

AoS Objective 14: Promote sustainable use of resources and natural assets	Assessment of effects (by timescale)		
	S	M	L
Guide questions: • Reduce consumption of materials, energy and resources? • Promote sustainable waste management practices in line with the waste hierarchy? • Encourage the use of recycled and / or secondary materials? • Encourage the development of a circular economy? • Promote the use of low carbon materials and technologies? • Produce waste by-products that require appropriate management? • Promote the use of local suppliers that use sustainably-sourced and locally produced materials? • Provide for safe and secure storage of radioactive and other wastes where necessary? • Support delivery of the Environmental Improvement Plan including the Environment Act 2021 target to reduce residual waste (excluding major mineral wastes) kg per capita by 50% by 2042 from 2019 levels, and associated interim targets?	**-**	**-**	**-/+**

Assessment of reasonable alternatives to EN-8

Introduction

The Environmental Assessment of Plans and Programmes Regulations 2004 ("the SEA Regulations") require that when an environmental report on a proposed plan or programme is prepared, it must identify, describe and evaluate the likely significant effects of implementing reasonable alternatives to the plan or programme which it assesses, as well as the likely significant effects of the plan or programme itself. The analysis of reasonable alternatives is to take into account "*the objectives and the geographical scope of the plan*".

As such, in line with the principles of good policy making and with the requirements of the SEA legislation, reasonable alternatives for implementing the aims of draft EN-8 need to be considered as part of the wider statutory AoS undertaken of draft EN-8 proposals.

The analysis of reasonable alternatives sets out a strategic context for the detailed assessment of the likely significant sustainability effects of draft EN-8, as well as a means of evaluating such effects by comparing them with the effects of alternative ways of achieving the same wider energy policy objectives.

Note that the assessment of alternatives has focused on fusion energy infrastructure which is comparable in scale to GW-scale nuclear (fission) infrastructure as such facilities are anticipated to have the greatest effect on sustainability. This is a precautionary approach to the assessment of reasonable alternatives.

Reasonable alternatives for draft EN-8

It is to be noted that when considering potential reasonable alternatives to draft EN-8, the need for fusion power generation, as part of a need for a mix of energy generation technologies, has been addressed and stated in Energy NPS EN-1. EN-1 clearly sets out the 'need to transform the energy system, tackling emissions while continuing to ensure secure and reliable supply, and affordable bills for households and businesses. This includes increasing the supply of clean energy from renewables, nuclear and hydrogen manufactured using low carbon processes (low carbon hydrogen), and, where we still emit carbon, developing the industry and infrastructure to capture, transport and store it'. EN-1 sets out that fusion power plants are a known generation technology that is included in the scope of the wider NPS. As such, the need for fusion energy generating technology is considered to be 'settled' and no further alternatives are considered in this AoS in this regard.

In terms of risks to health and wellbeing from fusion energy generation, the UK Government concluded in 2022 that, although fusion technology continues to evolve, the overall hazard

profile of a large fusion energy plant will be comparable to a large chemical plant[15]. Fusion energy plants are therefore primarily regulated by the Health and Safety Executive and the Environment Agency or Natural Resources Wales in a way that is outside of and independent to, the planning system. This regulation will ensure that risks to the local population are minimised by applying the regulatory processes of justification, optimisation, and limitation[16]. It is also worth noting that the UK Atomic Energy Authority have developed a technology report on the safety and waste aspects of fusion power plants[17] and this shows the following key elements:

- The understanding of the hazards relating to a fusion power plant is well developed.
- Published safety analyses for conceptual designs of fusion power plants show that even in the case of major in-plant failures from significant internal or external events, the potential for harm to members of the public is low.
- Published assessments of environmental radioactive discharges for conceptual designs of fusion power plants show that the potential for harm to members of the public is very low.
- Published assessments for conceptual designs of fusion power plant show that they will not generate a high level radioactive waste legacy burden.
- Published analyses of radioactive waste for conceptual designs of fusion power plant illustrate a good capability to estimate the low level waste and intermediate level waste requiring disposal.

As such, no reasonable alternatives on health and wellbeing grounds have been considered in this AoS.

Therefore, Government focussed on two key issues for the development of reasonable alternatives for draft EN-8 NPS:

- the level of protection provided to certain environmental assets in site selection; and
- the use of alternative cooling technologies to mitigate environmental impact.

The following reasonable alternatives were set by the NPS making team for consideration through the AoS and testing against the AoS Objectives:

- NPS provides full protection to highest priority designated habitats (SAC, SPA, MCZ, RAMSAR) – fusion energy infrastructure development will not be granted DCO where it will inevitably (i.e. after reasonably practicable mitigations) cause residual harm to those sites.
- NPS provides full protection to highest priority designated landscapes and cultural sites (national landscapes and heritage sites) – fusion energy infrastructure development will not be granted DCO where it will inevitably (i.e. after reasonably practicable mitigations)

[15] Towards fusion energy: proposals for a regulatory framework - GOV.UK
[16] Fundamental Principles of Radiological Protection - ICRPaedia
[17] UKAEA Technology Report – Safety and Waste Aspects for Fusion Power Plants (September 2021)

cause harm to the visual character and cultural and/or historical significance of those sites.

- NPS specifies the use of alternative cooling technologies to mitigate the environmental impact of cooling water abstraction and discharge on receiving waters from fusion energy infrastructure, and the visual impact of natural draft cooling towers and steam plumes on surrounding landscapes.

As draft EN-8 is the latest component in a wider energy NPS, it is considered appropriate to align assessment of the alternatives to draft EN-8 with the approach undertaken for technology EN-2 to EN-5 and EN-7. As such, the 14 AoS objectives have been grouped into 6 more appropriate headline sustainable development themes for the purpose of the alternatives appraisal as set out in Table 22. Use of these headline sustainable development themes allows the appraisal to better keep at a higher and strategic level and comparable to the assessments made of EN-2 to EN-5 and EN-7.

Table 22 Sustainable development theme and AoS Objective

Headline SD Themes	AoS / SEA Objectives (numbers refer to AoS Objective)
Climate Change	Net Zero (1)
Security of Energy Supply	Health (11), Economy (13)
Health & Well- Being	Air Quality (8), Health (11)
The Economy	Health (11), Economy (13), Resources (14)
The Built Environment	Transport (12), Heritage (5), Adaptation and Resilience (2); Landscapes and Townscapes (6)
The Natural Environment	Adaptation and Resilience (2), Biodiversity (3 & 4), Heritage (5), Landscapes and Townscapes (6), Water (7), Soils (9), Geodiversity (10)

As with EN-2 to EN-5 and EN-7, in order to draw comparison between the alternatives and EN-8 on a broad level, the following scale has been used.

Table 23 Differentiator scale for assessment of reasonable alternatives

Scale	Description

Large Positive	A materially different positive outcome is anticipated compared to draft EN-8
Positive	A more positive outcome is anticipated compared to draft EN-8
Neutral	This alternative is anticipated to have the same outcome as draft EN-8
Negative	A more adverse outcome is anticipated compared to draft EN-8
Large Negative	A materially different adverse outcome is anticipated compared to draft EN-8

Results of the appraisal of Reasonable Alternatives to draft EN-8

The findings of the appraisal of strategic alternatives for draft EN-8 are set out below.

Alternative 1

In relation to the highest priority designated habitats (SAC, SPA, MCZ, Ramsar), the approach taken by draft EN-8 means that DCO may be granted under CNP even though there is significant residual harm to those Habitat sites. Alternative 1 would provide full protection in relation to the same sites from residual harm through not allowing derogations.

In respect of climate change, it is considered this alternative would allow for better protection of Habitats sites than draft EN-8, including those which would have particular importance for sequestration of carbon (e.g. peat bogs, forests, grasslands, parts of the marine environment etc.). As such, it is considered selection of this alternative would have a Positive effect in respect of Climate change (Net Zero) targets.

However, in terms of security of energy supply, it is considered that an alternative provides full protection in respect of Habitats sites could potentially reduce the availability of otherwise suitable fusion generation sites and reduce the likelihood of the UK meeting targets related to domestic low carbon energy generating capacity, as compared to draft EN-8. Restricting the potential for development could also reduce the overall economic output of the UK. As such, it is considered selection of this alternative would have a Negative effect in respect of security of energy supply.

Positive benefits could be anticipated from this alternative in respect of health and wellbeing as compared to draft EN-8. Such Habitats sites protect and maintain areas of the most valuable

habitat, which, in addition to being of critical importance to biodiversity, are recognised as having health and wellbeing benefits to people through allowing access to nature and performing air and water pollution cleansing.

In economic terms, it is considered that this alternative could result in areas being excluded from potential fusion energy infrastructure development as compared to draft EN-8. This could potentially reduce the availability of otherwise suitable sites. Such areas could lose out on economic benefits that would be anticipated from the development of fusion energy infrastructure (well paid job opportunities, opportunities for suppliers etc.). As such, it is considered selection of this alternative would have a Negative effect in respect of the economy.

It is considered that this alternative would have no strategic implications for the built environment – the Habitat sites noted in this alternative relate to those sites designated at the highest level (European / International) for nature conservation. As such, it is considered selection of this alternative would have a Neutral effect in respect of the built environment in comparison to draft EN-8.

This alternative would provide for better protection for the Habitats sites (natural environment) as fusion energy infrastructure development will not be granted DCO where it will inevitably (i.e. after reasonably practicable mitigations) cause residual harm to those sites. As such, by protecting such areas (and by not allowing derogations), it is considered selection of this alternative would have a Positive effect in respect of the natural environment in comparison to draft EN-8.

Table 24: Consideration of Alternative 1 to draft EN-8

Sustainable development theme	Alternative 1
Climate Change (Net Zero)	Positive
Security of Energy Supply	Negative
Health and Wellbeing	Positive
The economy	Negative
The built environment	Neutral
The natural environment	Positive

Alternative 2

In relation to the highest priority designated landscapes and cultural sites (national landscapes and heritage sites), the approach taken by draft EN-8 means that DCO may be granted where it will inevitably (i.e. after reasonably practicable mitigations) cause harm to the visual character and cultural and/or historical significance of those sites. Alternative 2 would provide full protection in relation to the same landscapes and cultural sites.

In relation to climate change, it is considered that this alternative allows for better protection for sites that, in addition to being National Landscapes, could include areas of importance for sequestration of carbon (e.g. peat bogs, forests, grasslands). As such, it is considered selection of this alternative would have a Positive effect in respect of Climate change (Net Zero) targets in comparison to draft EN-8.

However, this alternative could result in areas being excluded from potential fusion energy infrastructure development. This could potentially reduce the availability of otherwise suitable sites and reduce the likelihood of the UK meeting targets related to domestic low carbon energy generating capacity. Restricting the potential for development could also reduce the overall economic output of the UK. As such, it is considered selection of this alternative would have a Negative effect in respect of security of energy supply as compared to draft EN-8.

In respect of health and wellbeing, it is considered that this alternative could result in protection of sites which would have benefits in terms of health and wellbeing. In short, such designated sites protect and maintain areas / features that can provide a ‘sense of place’ for people, as well as a connection to their heritage – this is widely recognised as having positive wellbeing effects. As such, it is considered that this alternative would have a Positive effect in respect of health and wellbeing.

In economic terms, it is considered that this alternative could result in areas being excluded from potential fusion energy infrastructure development. This could potentially reduce the availability of otherwise suitable sites. Such areas could lose out on economic benefits that would be anticipated from the development of fusion energy infrastructure (well paid job opportunities, opportunities for suppliers etc.). As such, it is considered selection of this alternative would have a Negative effect in respect of the economy in comparison to draft EN-8.

The built environment plays a key role in landscape and cultural sites. As such, an alternative which results in removing the potential for fusion energy infrastructure development in those areas considered highest priority designated landscapes, or cultural sites would likely be beneficial in ensuring that the quality and setting of such features is maintained. As such, it is considered selection of this alternative would have a Positive effect on the built environment as compared to draft EN-8.

This alternative is focused on highest priority designated landscapes (national landscapes) and cultural sites and it is to be recognised that such areas play an important role in maintaining the natural environment, by restricting development that is not appropriate to the scale or context of the area. As such, by protecting such areas, it is considered selection of this

alternative would have a positive effect in respect of the natural environment as compared to draft EN-8.

Table 25: Consideration of Alternative 2 to draft EN-8

Sustainable development theme	Alternative 2
Climate Change (Net Zero)	Positive
Security of Energy Supply	Negative
Health and Wellbeing	Positive
The economy	Negative
The built environment	Positive
The natural environment	Positive

Alternative 3

Draft EN-8 promotes a range of cooling technologies which include direct (or once through) wet cooling, indirect (or recirculating) wet cooling, dry cooling and hybrid cooling. Alternative 3 excludes direct and indirect wet cooling from the mix of cooling technologies.

In terms of climate change, it is considered that this alternative would have no implications in comparison to draft EN-8. It is anticipated that all fusion energy infrastructure will produce energy in line with net zero targets and use such energy in their cooling facilities, no matter the specific technical detail of how they are cooled. As such, it is considered selection of this alternative would have a Neutral effect in respect of climate change.

It is also considered that this alternative would not allow the full range of potential sites as set out in draft EN-8 to be utilised, with areas near water bodies being effectively excluded from potential fusion energy infrastructure development, if wet cooling is the technology of choice, and as such would reduce the availability of otherwise suitable sites and reduce the likelihood of the UK meeting targets related to domestic low carbon energy generating capacity. As such, it is considered this alternative would have no implications in comparison to draft EN-8 and this alternative would have a Negative effect in respect of security of energy supply.

In terms of health and wellbeing, it is considered that this alternative would have no implications – it is anticipated that all cooling technologies will be operated in a manner which protects health of the local and wider population. As such, it is considered selection of this alternative would have a Neutral effect in respect of health and wellbeing.

In economic terms, it is considered that this alternative could result in less sites being potentially viable for the development of fusion energy infrastructure with a result that some areas could lose out on economic benefits that would be anticipated from such development. As such, it is considered selection of this alternative would have a Negative effect on the economy in comparison to draft EN-8.

A range of alternative dry and hybrid cooling technologies would potentially allow for consideration of greater / more effective mitigation of effects on those areas of landscape value – i.e. some cooling technologies would allow for the removal (or reduction in size) of cooling towers, with beneficial effects on landscape. Similarly, this could better protect the setting of some cultural heritage assets. As such, it is considered selection of this alternative would have a Positive effect on the built environment.

Use of alternative dry and hybrid cooling technologies would allow for a greater range of locations to be considered for the development of fusion energy infrastructure, including areas which may have less environmental features of interest and thus lead to lower impacts. It could also mean that some pressures on the natural environment can be reduced or avoided. Such cooling technologies would have less requirement, or no requirement, to abstract or discharge large volumes of water therefore resulting in less or no impacts on receiving waters quantity and quality and on aquatic biodiversity. As such, it is considered that the use of alternative cooling technologies would allow for potential Positive effects on the natural environment to be realised.

Table 26: Consideration of Alternative 3 to draft EN-8

Sustainable development theme	Alternative 3
Climate Change (Net Zero)	Neutral
Security of Energy Supply	Negative
Health and Wellbeing	Neutral
The economy	Negative
The built environment	Positive
The natural environment	Positive

Given that the limited restrictions in locating fusion energy infrastructure near population areas as determined by Government will likely result in a larger number of potentially suitable sites for this type of infrastructure, including brownfield sites and industrial sites, the assessment concluded that there will likely be limited reliance on developing on priority designated habitats

sites or highest priority designated landscapes and cultural sites. On balance, the three alternatives are as good (i.e. not materially different) as the proposals set out in draft EN-8. The Government's preferred option is thus to take forward the new NPS EN-8 as drafted which will ensure positive outcomes for 'Security of Energy Supply'. The British Energy Security Strategy[18] emphasises the importance of addressing underlying vulnerability to international energy prices by reducing dependence on imported oil and gas and accelerating deployment of a range of energy technologies and related network infrastructure. Draft EN-8 is part of a suite of approaches that reflect these wider requirements by introducing greater flexibility in energy infrastructure provision at the national level and recognise that there is a 'Critical National Priority' for low carbon energy infrastructure.

[18] See https://www.gov.uk/government/publications/british-energy-security-strategy

Cumulative and transboundary effects

Introduction

It is a requirement to consider cumulative, synergistic and indirect effects of implementation of draft EN-8. Secondary and indirect effects are effects that are not a direct result of the implementation of draft EN-8, but which occur away from the original effect or as the result of a complex pathway. Cumulative effects arise where several proposals or elements of draft EN-8, individually may or may not have significant effect but in-combination have a significant effect due to spatial crowding, temporal overlap or multiple individual effects on a single receptor. Synergistic effects occur when two or more effects act together to create an effect greater than the simple sum of the effects when acting alone.

As required by the SEA Regulations, cumulative, synergistic and indirect effects have also been considered during the AoS. The identification of these effects already takes into account the fact that earlier recommendations have taken on board to improve the sustainability performance of draft EN-8.

Cumulative effects between EN-8 NSIP and with other energy NSIP

Cumulative effects between draft EN-8 NSIP are considered similar to those identified for the suite of energy NSIP set out in EN-1, which include fusion energy generation.

A fundamental element in terms of cumulative effects is the need for low carbon energy generation and transmission, reducing GHG emissions in order to meet Government commitments to Net Zero and ultimately address the causes of climate change. The development of fusion energy generation would be aligned with this approach to low carbon energy generation (notwithstanding issues relating to embodied carbon in infrastructure construction) and result in positive cumulative effects on GHG emissions, both individually and in combination with other low carbon energy generation.

The issue of clustering of installations was also addressed as part of the consideration of EN-1 and it was noted that there could be both beneficial and negative effects with this aspect. An example was given of how if there were a number of projects being developed within a region and in a similar timeframe, it can affect local economies and labour supply markets, as well as drive up demand for housing and accommodation and local services. This could also lead to a shortage of skilled workers in a local area. On the other hand, it was considered that beneficial cumulative effects could be accrued through increased spend in the local area, as well as increased opportunities for secure and well paid employment and development of skills / training, with potentially beneficial indirect effects on health. Such cumulative effects are more likely to be more pronounced in rural areas. It is considered the case that, due to the anticipated scale of fusion energy infrastructure (either large scale ‘standalone’, or through co-

location of smaller scale facilities), these issues would also be relevant to the development of new fusion energy infrastructure.

It is also to be noted that the development of fusion energy infrastructure will represent further diversification of the energy supply network (along with wider energy NSIP development) and as such would provide cumulative benefit to the population as a whole by helping to ensure certainty of investment and security of energy supplies.

There are also likely to be cumulative effects on the environment and these can be anticipated to be cumulatively greatest and more significant when infrastructure (fusion energy infrastructure or otherwise) is co-located. As with all effects set out across draft EN-8, the particular significance would depend on precise location, scale, technology to be deployed / infrastructure required and the environmental context of the area. In specific relation to fusion energy infrastructure, it is anticipated that areas of coastline, that may have wide and expansive views, may be favoured due to the readily accessible source of cooling water, with a consequent effect on landscape, though smaller scale fusion facilities (or fusion facilities using different technologies) could allow such effects to be reduced, or for a greater range of locations to be considered. However, ‘smaller’ facilities may also allow for multiple fusion devices to be placed in one area, with potential for other cumulative effects. Aspects such as these are set out in detail in EN-1 which notes a range of potential impacts of multiple devices and the need for consideration of cumulative effects.

As proposed fusion energy infrastructure will be subject to EIA (as draft EN-8 makes it clear that EN-1 applies unless stated otherwise), it is the case with any application for Development Consent, cumulative impacts will be taken into account where relevant. However, it can be anticipated that cumulative effects are likely from the development of energy generation and transmission infrastructure. Across all energy technologies it was considered that cumulative effects of construction (e.g. air quality, dust, noise, visual, traffic, socio- economic etc.) may arise and may be difficult to mitigate (again depending on precise scheme parameters). As such, the NPS suite as a whole (including draft EN-8) places a careful emphasis for decision makers to balance such competing issues. As noted, it also places a strong emphasis on the need for further consideration of all issues and effects (including cumulative effects) through applicable assessment types such as EIA, or through socio-economic assessment.

In short therefore, while the lack of clarity relating to location of infrastructure means it is not possible to be precise as to cumulative, synergistic and indirect effects, it is possible to conclude that the significance and nature of cumulative effects may vary with the precise infrastructure project proposed and the sensitivity of the receiving communities and environment. Draft EN-8 (via the requirements set out by EN-1) though sets out a series of approaches such as the need for more detailed assessment and liaison with appropriate bodies, that will address and manage these issues.

Nevertheless, it is important to recognise that the declaration of a project as being of Critical National Priority, could lead to a potential for cumulative, synergistic or indirect effects, in relation to those residual effects which it has not been possible to address through application of the NPS. This is particularly likely if a group of developments, all considered to be of CNP

and with potentially the same residual effects, are located in proximity to each other, or where there are clear pathways of effect.

Cumulative effects in-combination with other projects, plans and policies

Cumulative effects can also arise due to effects from the fusion energy development combining with effects from other projects, plans and policies (PPPs) in various sectors. However, due to the strategic and high level nature of draft EN-8 and the lack of any locational and specific detail on any fusion energy generation developments that are likely to be brought forward, as well as that inevitably there is going to be a delay between the adoption of EN-8 and any subsequent fusion generation development, it is not possible to know when (or indeed if) any subsequent project proposal will come forward and it is not therefore possible to predict what other plans and projects will be relevant to future project assessments.

The type of PPPs that could have cumulative or in-combination effects with infrastructure developed under draft EN-8 are:

- Applications lodged but not yet determined
- Projects subject to periodic review
- Projects authorised but not yet started
- Projects started but not yet completed
- Known projects that do not require external authorisation
- Proposals in adopted plans; and
- Proposals in draft plans formally published or submitted for final consultation, examination or adoption

Typical types of effects that could lead to cumulative or in-combination effects include (but are not limited to):

- Resilience to climate change
- Noise, vibration and light disturbance
- Air, land and water pollution
- Changes to water quantity / flow and coastal change
- Landscape
- Species injury and mortality
- Changes in habitat extent, composition and structure
- Health and Wellbeing
- Sustainable transport; and
- Economy

Such in-combination effects are more likely to arise when multiple projects have similar impacts; due to effects exceeding the limit of what the relevant sustainability parameters can tolerate and becoming significant effects. Note that projects that are not fusion energy generation or general energy infrastructure development, as well as smaller scale development, that is not an NSIP can also lead to cumulative or in-combination effects and should be considered at the appropriate point. In-combination effects can be by virtue of proximity, connectivity and/or timing. The most common combined effects include additive air quality, water quality/quantity and habitat/species disturbance impacts. Effects could also take place at all phases – construction, operation and decommissioning.

Application of the approach to CNP could also result in cumulative effects with other projects, plans and policies, though again the scale and nature of such effects cannot be known at this stage.

In summary, in order to fully understand the potential for and likely extent of cumulative effects, details of when fusion energy infrastructure NSIPs will be developed, as well as details of the precise scale, location and technology to be used / infrastructure requirements, would need to be known for both the proposed fusion energy infrastructure, as well as other developments. Note that EN-1 (to which EN-8 refers), requires the undertaking of Environmental Impact Assessment for relevant energy infrastructure schemes. Consideration of cumulative effects is a requirement of EIA and as such, the potential for cumulative effects (in light of the particular circumstances of the development) would be considered through that mechanism. Similarly, other development types (potentially outside the energy sector) would also be subject to the EIA Regulations and would, as a matter of course, consider the potential for cumulative effects between that development and any energy infrastructure.

Transboundary effects

Potential transboundary effects from the implementation of draft EN-8 have been approached in a similar way to other cumulative effects, only that the assessment looks at effects that originate within the UK but have the ability to extend across national borders. Transboundary effects are addressed through Regulation 14 of the SEA Regulations, which requires notification to Member States of the European Union of any Plan or Programme which is considered likely to have significant effect on the environment of that Member State.

Unintended releases of radiation from fusion energy infrastructure are very unlikely to result in any transboundary effects. The safety characteristics of fusion and compliance with the UK's robust legislative and regulatory regime means that the risk of radiological health detriment posed by fusion energy infrastructure (both during normal operation and as a result of an unplanned release) is extremely small.

Radioactive releases from all radiological sites are strictly controlled. This regulatory system ensures that permitted radioactive discharges are within authorised limits. These releases are likely to remain sufficiently localised so as not to impact significantly on neighbouring countries.

It is worth noting that draft EN-8 considers the potential for transboundary and cross-border effects. In the case of cross border effects, applicants should make early contact with relevant statutory bodies in Scotland and Northern Ireland where there is the potential for cross-border effects on a range of topics. The cross-border effects that this refers to are non-radiological.

It is also worth noting that EN-1 (to which draft EN-8 refers) places a strong emphasis on the need for applicants to undertake an Environmental Impact Assessment. The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ('the EIA Regulations'), require transboundary effects to be considered from any development subject to these regulations.

As such, it is possible that Ireland, France, Belgium, Germany, Denmark, Sweden and the Netherlands would need to be consulted in the unlikely circumstances that there is potential for significant environmental effect from fusion energy infrastructure that falls under draft EN-8 and is subject to the EIA Regulations (in England and Wales). The particular nation state(s) (or other territories) to be consulted would be dependent on the proposed development, location and nature and significance of predicted transboundary effects.

Monitoring

Monitoring helps to examine the effects predicted through the AoS process against the actual effects of EN-8 when implemented. It is also a requirement of the SEA Regulations to describe the measures envisaged concerning how significant effects of implementing EN-8 will be monitored – Section 17 (1) notes "*the responsible authority shall monitor the significant environmental effects of the implementation of each plan or programme with the purpose of identifying unforeseen adverse effects at an early stage and being able to undertake appropriate remedial action*". As ODPM Guidance[19] advises, it is not necessary to monitor everything, or monitor an effect indefinitely, but rather monitoring needs to be focused on significant sustainability effects. Monitoring should therefore ideally focus upon significant effects that may give rise to irreversible damage, with a view to identifying trends before such damage is caused, and significant effects where there was uncertainty in the AoS and where monitoring would enable preventative or mitigation measures to be undertaken.

While significant effects have not been identified in relation to all Objectives and it is considered that in many instances the text within draft EN-8 (bolstered by that within EN-1 and the wider NPS suite) provides robust policy to address issues, the non-specific spatial nature of draft EN-8 does mean that there is in some instances a degree of uncertainty in findings and as such a potential for unforeseen individual or cumulative effects to arise. Therefore, it was considered important to take a precautionary approach to monitoring.

The sustainability effects of draft EN-8 may be monitored through the monitoring frameworks already carried out by the environmental regulators and the local authorities, including those set out in respect of the monitoring of EN-1. Pollution control and environmental management monitoring, including status of water quality and resources, protected habitats and species, is carried out by the environmental agencies; human health protection is the responsibility of the health authorities and bodies such as UK Health Security Agency and Office for Health Improvement and Disparities.

Local Planning Authorities monitor the effectiveness of their spatial plans, including indicators such as employment and access to community facilities and services. Nationally, Government[20] assesses and reports annually on progress against sustainable development indicators (including greenhouse gas and carbon dioxide emissions), energy use (including renewables), and resources (including water).

It is also the case that fusion energy facilities will be monitored through the appropriate consenting, licensing or authorisation process. Draft EN-8 explains that fusion energy facilities are regulated by the Health and Safety Executive (HSE) and the Environment Agency (EA) or Natural Resources Wales (NRW).

[19] Practical Guide to the Strategic Environmental Assessment Directive (ODPM, September 2005)
[20] U.K. Indicators For The Sustainable Development Goals

As such, there is a large body of evidence that can be drawn upon to inform implementation of EN-8 and help inform any future review. As discussed, note should also be made of the monitoring set out in the AoS Report of EN-1 as this sets out a comprehensive approach to monitoring across all energy infrastructure and therefore would include monitoring relevant to new fusion energy infrastructure.