DEPARTMENT OF ENERGY & CLIMATE CHANGE

Appraisal of Sustainability for the revised draft Overarching National Policy Statement for Energy (EN-1): Main Report

Planning For New Energy Infrastructure

October 2010

Preface

This document is the Appraisal of Sustainability report (AoS) for the draft Overarching National Policy Statement for Energy (EN-1). EN-1 is one of a suite of National Policy Statements (NPSs) which the Government intends should form the basis for decision-making on development consents for a new generation of large-scale energy infrastructure. The other five energy NPSs cover specific technologies, such as nuclear power or electricity networks.

The main function of this report is to set out the likely significant effects on the environment of developing new energy infrastructure of the types, and on the scale, envisaged by the energy NPSs as a whole, as well as indicating how the NPSs are consistent with the principles of sustainable development more generally.

The AoSs are designed to inform consultation on the revised drafts of the NPSs with which they are being published. If you have any comments on them, please respond as part of the re-consultation on the revised draft NPSs. The documents are available at: www.energynpsconsultation.decc.gov.uk.

The re-consultation will be open for 14 weeks from the 18th October 2010 to January 24th 2011.

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1. Introduction

1.1. UK energy policy

The Government aims to support the transition to a safe, secure, low-carbon, affordable energy system in the UK. In this context, a "low-carbon" system means one which meets or exceeds the target set by the Climate Change Act 2008, of an 80% reduction in UK emissions of greenhouse gases by 2050. The 2050s Pathways Analysis published by DECC on 27 July 2010 presents a framework through which to consider possible routes to that goal and this analysis makes clear that moving to a secure, low-carbon energy system is extremely challenging, but it is achievable. This is because:

- about a quarter of existing electricity generating capacity is due to close by 2018;
- current DECC analysis on the different pathways to 2050 shows that reductions in energy consumption resulting from improvements in energy efficiency are likely to be outweighed by increases in electricity demand, as some sources of energy demand, such as industry, transport and heating, are increasingly electrified. In order to achieve the required overall reduction in greenhouse gas emissions, the electricity being consumed will need to be almost exclusively from low carbon sources by 2050;
- the Government is committed to meeting the 15% renewable energy target, which means that a very large amount of new renewable generation capacity will be needed. Much of this capacity is likely to be onshore and offshore wind, which will affect electricity security as it is both intermittent and unpredictable. To back up wind generation we will need more electricity capacity than we have now even if demand remains the same.

As noted in the 2010 Annual Energy Statement[1], the Government's determination to support the transition to a secure, safe, low-carbon, affordable energy system in the UK will require action in four main areas:

- Saving energy through the Green Deal and supporting vulnerable consumers
- Delivering secure energy on the way to a low carbon energy future
- Managing our energy legacy responsibly and cost-effectively
- Driving ambitious action on climate change at home and abroad.

This AoS is about the planning regime for large-scale energy infrastructure, which plays a key part in the second of these areas in particular. While the planning system does not set targets for particular types of energy production, consumption or infrastructure, it plays a critically important part in the transition to a secure, safe, low-carbon, affordable energy system, as it determines which projects for new energy

[1] http://www.decc.gov.uk/assets/decc/what%20we%20do/uk%20energy%20supply/237-annual-energy-statement-2010.pdf

infrastructure put forward by industry in response to market factors (including any Government interventions) are permitted to be built. UK energy policy is based on the principle that, once Government has put in place whatever structural measures it considers appropriate, and in particular has established any incentives necessary to ensure that industry takes steps which might not otherwise be in its interest in the short term (such as developing low carbon generation capacity), independently regulated, competitive energy markets are the most cost effective and efficient way of providing energy supply and that investment is best made by the private sector.

Accordingly, planning policy needs to set a framework in which applications for consent to develop large-scale energy infrastructure are evaluated in a way that supports the overall objectives of Government policy in this area, while providing a clear framework for weighing up the benefits and adverse effects (particularly environmental) of such developments, and for ensuring that the adverse effects are mitigated as effectively as possible.

1.2. The new planning regime for large-scale energy infrastructure and the role of National Policy Statements

The Planning Act 2008[2] reforms the procedures for examining and deciding on applications for consent to develop certain important categories of infrastructure in the energy and other sectors. The types of energy infrastructure which will require development consent under the Act are as follows:

- electricity generating stations generating more than 50 megawatts onshore and 100 megawatts offshore ;
- overhead electric lines with a voltage of 132kV or more;
- large gas reception and liquefied natural gas facilities and underground gas storage facilities (as defined in the Act); and
- oil and gas pipelines at or above the threshold of 16.093 kilometres/10 miles in length and certain licensed gas transporter pipelines (as defined in the Act).

At the heart of the new system introduced by the Act are the National Policy Statements, or NPSs. It is intended that the NPSs relating to energy infrastructure should be designated in 2011. Once designated, they will form the primary basis for all examination of, and decision-making on, applications for development consent under the Act. For the new regime to succeed as far as energy infrastructure is concerned, the policies set out in the NPSs relating to energy projects must support the Government's wider energy policies in the way described above.

Government Departments are responsible for preparing the NPSs. The Department of Energy and Climate Change (DECC) has prepared NPSs for energy infrastructure projects, as follows:

- Overarching NPS for Energy (EN-1);

[2] Planning Act 2008, available online at http://www.opsi.gov.uk/acts/acts2008/ukpga_20080029_en_1

- NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2);
- NPS for Renewable Energy Infrastructure (EN-3);
- NPS for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4);
- NPS for Electricity Networks Infrastructure (EN-5); and
- NPS for Nuclear Power Generation (EN-6).

EN-1 sets out national policy for energy infrastructure and describes:

- the policy context for development of nationally significant energy infrastructure (in Part 2 of the NPS);
- the need for new energy infrastructure (in Part 3 of the NPS);
- issues which as a matter of law or policy are relevant (or potentially relevant) to the way in which applications for all types of infrastructure are to be presented and assessed (e.g. adaptation to the effects of climate change), or whose relevance is not confined to only one type of infrastructure (e.g. combined heat and power) (in Part 4 of the NPS);
- how consideration should be given to various kinds of environmental and other impacts which all types (or at least more than one type) of energy infrastructure have (such as noise, or landscape and visual impacts) (in Part 5 of the NPS); and
- the circumstances in which it is appropriate for a specified type of action to be taken to mitigate the impact of a specified description of development (in Part 5 of the NPS).

The “technology-specific NPSs” (EN-2 to EN-6) focus on additional impacts related to the specific technologies with which they are concerned. Consideration of any given application for development consent for energy infrastructure which is covered by a technology-specific NPS will need to be based on a combination of EN-1 and the relevant technology-specific NPS. So, for example, consideration of an application to develop a nuclear power station under the Act will need to be based on EN-1 and EN-6. Further information on the function of EN-1 and the other NPSs in the Planning Act regime is set out in Part 1 of EN-1.

1.3. Purpose of this AoS Report

This AoS has two primary functions.

- EU law requires, in the Strategic Environmental Assessment Directive (2001/42/EC), 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 NPSs are a plan or programme for the purposes of

the Directive, and so the AoSs fulfil the function of an environmental report under the Directive.

- The Planning Act requires that NPSs must be the subject of an appraisal of sustainability before they are designated. The scope of such an appraisal is similar to that of an environmental report under the SEA Directive, 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 NPSs while they are still in draft form, the Directive and Act aim to ensure that consultees are able to review and comment on the NPSs with a sense of what it would mean in environmental and other terms for a new generation of large-scale energy infrastructure to be built in accordance with decisions made on Planning Act applications for development consent which were decided on the basis of the energy NPSs.

A separate AoS has been produced for each of the energy NPSs. Just as the technology-specific NPSs, EN-2 to EN-6, must be read in conjunction with the Overarching NPS, EN-1, so this AoS (AoS-1) must be read in conjunction with the AoSs for the relevant technology-specific NPSs. The AoS for EN-6 is more free-standing than those for EN-2 to EN-5 because the location-specific policies in EN-6 mean that the AoS for it can be carried out at a more detailed level than is possible for those NPSs which are not locationally specific.

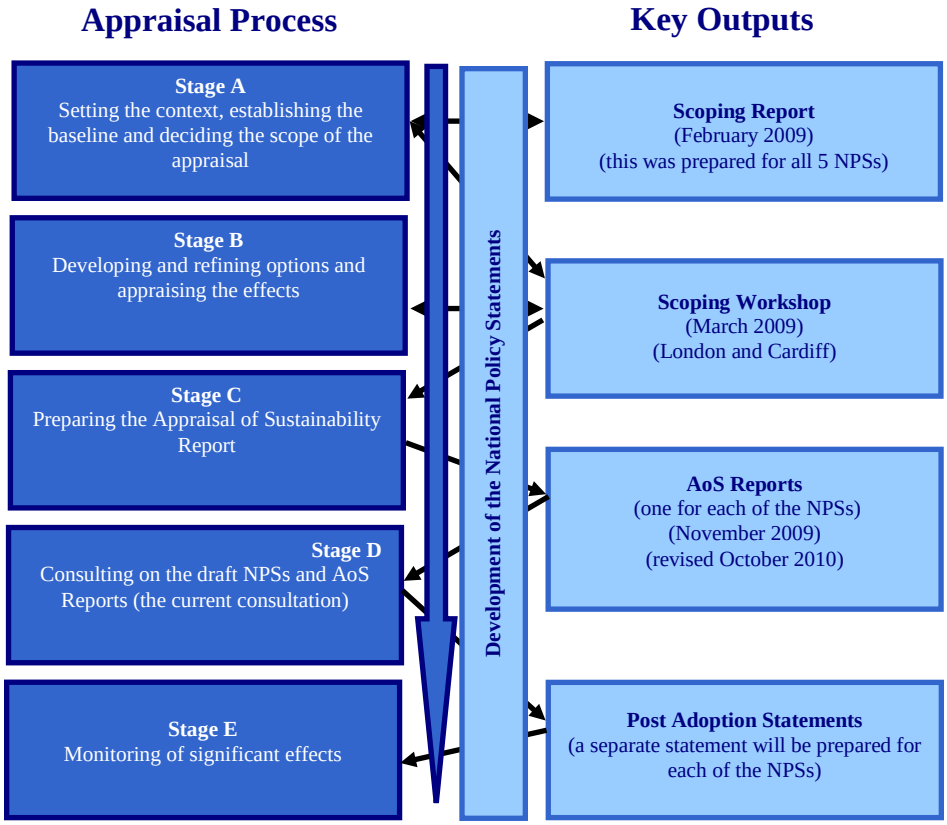
1.4. Overview of the AoS process

1.4.1. An iterative process

Figure 1.1. provides an overview of the appraisal process, based on Government guidance on SEA practice[3], showing how the development of the AoSs for the energy NPSs corresponds to the steps recommended in that guidance.

[3] ODPM et al, 2005: A Practical Guide to the Strategic Environmental Assessment Directive.

Figure 1.1 Overview of the Appraisal of Sustainability Process



1.4.2. Scoping Consultation

The Scoping Report for appraising the Overarching NPS for energy and the four non-nuclear energy NPSs (EN-1 to EN-5) was subject to a five week consultation period between the 13 February and 23 March 2009 for the statutory bodies and other key consultees including the Department of Health. The consultation responses are summarised in Annex C and they informed the development of the AoS process. The Scoping Report for appraising the Nuclear NPS was subject to early public consultation in March 2008 and continuing consultation with the further studies reported in July 2008 and January 2009.

1.4.3. Consultation on the initial AoS and draft NPSs

The draft NPSs and the Initial AoS Report were subject to public consultation between 9 November 2009 and 22 February 2010. A number of consultees were concerned that the AoSs had focused on the difference between having an NPS or not having an NPS and on the different ways in which an AoS might be drafted rather than appraising the likely effects of the policies in the NPSs. They also had concerns about the assessment of reasonable alternatives to NPS policies (required by the SEA Directive) and about the appraisal of cumulative effects. The details of the

consultation comments are set out in the Government Response[4] published with this revised AoS and the revised draft NPS.

Government has revised the draft NPSs to take account of some of the methodological comments made by respondents to the November 2009-February 2010 consultation. Government believes that the revised AoSs:

- fulfil more effectively their functions as environmental reports on the likely significant effects of the NPSs for the purposes of the SEA Directive and as appraisals of sustainability of the NPSs under the Act;
- represent more accurately than the initial drafts the background to the policies set out in the NPS (particularly in the sections on appraisal of alternatives); and
- will enable consultees to consider the policies set out in the revised NPSs against the background of a clearer understanding of the likely significant effects of their implementation and the reasonable alternatives to the plans that have been considered.

1.4.4. Consultation on this AoS

The revised AoSs are published for comment together with the revised draft NPSs. The re-consultation will be open for 14 weeks from the 18th October 2010. The revised AoSs and NPSs have been subject to prior consultation with the statutory consultees identified under the SEA Regulations (including those of England, Northern Ireland, Scotland and Wales)[5] and non-statutory consultees such as the Department of Health. The revised draft NPSs will be subject to Parliamentary scrutiny in parallel with the public consultation. Government will consider comments received during the public consultation, and the NPS will be subject to ratification 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 will be carried out

1.4.5. Report Structure

This remainder of this report is structured as follows:

Section 2 **Methodology:** The approach taken to the appraisal process is presented, including how this document fulfils the requirements of the SEA Directive.

Section 3 **Assessment of NPS Alternatives:** identifying and assessing strategic alternatives to the NPS; comparison of the significant sustainability effects of the strategic alternatives and why the draft NPS is the preferred option.

[4] Government Response October 2010 at www.energynpsconsultation.decc.gov.uk
[5] The Environment Agency, English Heritage, Natural England, Department of the Environment's Environment and Heritage Service (Northern Ireland), Historic Scotland, Scottish Natural Heritage, Scottish Environment Protection Agency, Cadw (Welsh Historic Monuments), Countryside Council for Wales, and the Environment Agency Wales.

Section 4 **Findings of Appraisal of Sustainability:** This section presents the findings of the appraisal of the NPS policies, including possibilities for mitigation.

Section 5 **Monitoring and Next Steps:** Monitoring proposals, how to respond to consultation, and the AoS Statement.

The annexes to AoS-1 are published separately and are as follows:

Annex A	List of Abbreviations
Annex B	Review of Policies, Plans and Programmes
Annex C	Response to Scoping Consultation
Annex D	Comparison of Consenting Requirements
Annex E	Quality Assurance Checklist
Annex F	Baseline Information
Annex G	Supplementary discussion of possible elements of alternatives to the planning policies in EN-1

2. Methodology

2.1. Introduction

This AoS Report provides a qualitative and comparative assessment of the Overarching NPS for Energy and its contribution towards achieving a range of environmental, social and economic objectives. The approach adopted in this AoS is consistent with the requirements of SEA and has been expanded to include a wider range of issues normally found within an appraisal of sustainability.

This section sets out the methodology, including when the AoS was undertaken and by whom, the scope of the appraisal (Section 2.2), the method for collecting and presenting baseline information (Section 2.3), the objectives and issues addressed in this AoS (Section 2.4), the approach to completing the appraisal (Section 2.5), assumptions and technical difficulties encountered during the assessment (Section 2.7) and screening for appropriate assessment (Section 2.8).

The Overarching AoS report must be read in conjunction with the AoS reports for the relevant technology-specific NPS(s), which focus on additional issues. The Overarching AoS includes a description of the methodology, baseline, issues and recommendation which are common across all of the non-nuclear NPSs and are therefore not set out again in AoS-2 to AoS-5. The technology-specific NPSs (EN-2 to EN-6) focus on alternatives, issues and recommendations which are additional to those already in the Overarching AoS report.

However, it should be noted that the approach taken for appraising the Nuclear NPS (EN-6) differs in some respects from that taken in the AoSs of EN-2 to EN-5. This reflects a significant difference between EN-6 and the other technology-specific NPSs, which is that the Nuclear NPS designates particular sites as potentially suitable sites for new nuclear power stations, and applies only to those sites; by contrast, EN-2 to EN-5 are not site-specific, and provide a framework for assessing applications for developments of the relevant type in any location. The relationships between the AoS frameworks for appraisal of EN-1 to EN-5 and EN-6 are detailed in the AoS-6 Main Report[6] Section 2.5 and table 2.8.

The initial appraisal of EN-1 was undertaken in 2009 by consultants Entec with input from DECC; the revised appraisal of the revised NPS (following the November 2009-February 2010 consultation) was carried out by a team from MWH (UK) Ltd and Enfusion Ltd, again with input from DECC. The findings presented in this revised AoS Report will be issued to statutory consultees and the public.

[6] See Nuclear AoS Report

2.2. Scope of the Appraisal

2.2.1. Thematic Scope of the Appraisal

The SEA Directive (Article 5(1) and paragraph (f) of Annex I) requires the analysis of likely significant effects on the environment in an environmental report to include the effects on factors such as "biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage including architectural and archaeological heritage, landscape and the interrelationship between the above factors". This is what Section 4 of this AoS does. Section 4 also covers paragraph (g) of Annex I to the Directive, which requires the environmental report to include "measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment" of implementing the plan or programme. The scoping consultation confirmed that all these issues were relevant to the development of energy infrastructure. Table 2.1 identifies the headings under which analysis of these issues is set out in this AoS Report (particularly in Part 4).

Table 2.1: Presentation of SEA Directive Annex I, paragraph (f) factors in this AoS

SEA Annex I Factors	Headings used in this AoS (including for objectives in Table 2.2)
Biodiversity	2. Ecology (Flora and Fauna)
Population	4. Economy and Skill; 7. Traffic and Transport; 8. Noise; 9. Landscape, Townscape and Visual; 13. Health and Wellbeing; 14. Equality
Human Health	13. Health and Wellbeing; 8. Noise; 11. Air Quality; 14. Equality
Fauna	2. Ecology (Flora and Fauna); 8. Noise; 11. Air Quality
Flora	2. Ecology (Flora and Fauna); 11. Air Quality
Soil	12. Soil and Geology
Water	1. Climate Change; 5. Flood Risk and Coastal Change; 6. Water Quality & Resources
Air	11. Air Quality
Climatic Factors	1. Climate Change; 5. Flood Risk and Coastal Change; Water Quality & Resources; 7. Traffic and Transport;
Material Assets	3. Material Assets and Resource Use; 12. Soil and Geology
Cultural Heritage	9. Landscape, Townscape and Visual; 10. Archaeology and Cultural Heritage
Landscape	9. Landscape, Townscape and Visual

2.2.2. Geographic Scope of the Appraisal

This AoS includes any geographic area which could be affected by the implementation of the NPS. As the NPS covers the implementation of national energy infrastructure, it is important that the focus of the appraisal captures both baseline information and the policies, plans and programmes at the appropriate level.

Potential effects have been considered across a range of geographic scales (including international, UK, regional and local). However, as the NPS does not prescribe the location for new 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 which may be quite intensely felt at local level do not always register as strategically significant in the scoring sections of the assessment.

The assessment of project level effects will be given full consideration at the application for development consent, as detailed in the NPSs, particularly through Environmental Impact Assessment (EIA), and, where relevant, Habitats Regulations Assessment (HRA). This AoS considers the likely significant effects at the strategic level and over the UK as a whole.

2.2.3. Temporal Scope of the Appraisal

The effects of a policy, plan or programme sometimes change over time for a number of reasons. This has been reflected in the appraisal. In this context, for the purposes of the appraisal, the “short term” has been defined as the effects arising generally during the infrastructure construction period 2-7 years (different technologies have different construction times); the “medium term” as between 5 and 25 years (operational lifetimes vary with the characteristics of different technologies); and the “long term” as beyond 25 years (and including decommissioning where relevant).

2.3. Baseline

2.3.1. Review of Policies, Plans and Programmes

The SEA Directive requires a report containing:

‘*an outline of the contents, main objectives of the plan or programme and relationship with other relevant plans and programmes’.* (Annex 1(a))

‘*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*’. (Annex 1(e))

The NPSs are designed to help achieve certain key objectives of energy and climate change policy as set out in Section 1. The energy policy objective underlying the energy NPSs (the “overall objective”) is “to maintain safe, secure and affordable

supplies of energy to GB consumers (individuals or businesses) in the shorter and longer term and support the goal of an 80% reduction in UK greenhouse gas emissions by 2050, set in the Climate Change Act 2008."

The plan or programme contained in the energy NPSs is:

- to put in place a framework of policies for assessing applications for development consent which will facilitate the construction of large-scale infrastructure (for electricity generation and transmission and oil and gas supply) of the types, and on the scale that will make it possible to achieve the overall objective in a way which balances the need for new infrastructure against the need to follow the principles of sustainable development;

- the appraisal of the energy NPSs therefore consists in an assessment of the likely significant effects of applying the planning policies set out in the NPSs to applications for development consent.

However, there are a number of policy levers other than the planning regime which Government can and does use to try to achieve this overall objective. In the energy NPSs and their AoSs, we are concerned only with those policies which relate to land use and help set the framework for development consent.

One of the first steps in undertaking the AoS was to review other relevant policies, plans, and programmes that could influence the Overarching NPS for Energy, to identify how the NPS could be affected by the other policies, or how it could contribute to, or hinder, the achievement of any environmental or sustainability targets set out in these policies. The review also helped to support the completion of the social, economic and environmental baseline and identification of the key issues for sustainable development.

The review is detailed in Annex B. It is organised by reference to the 14 "AoS objectives" (see below) which stand for the various different ways in which development such as major energy infrastructure can impact on the environment (for example, biodiversity, noise, or landscape and visual effects). In each of these areas, the NPS policies stand alongside and are often largely based on European and other international requirements or conventions, which in turn have often already been expressed in a range of national legislation or planning policy documents, all of which aim in one way or another to reconcile the inevitability, in England and Wales, that major developments will generally do some damage to the environment, with the need to ensure that the adverse effects of consented development are mitigated as far as reasonably practicable. In some respects, it could be said that the majority of issues raised by the consenting of large-scale energy infrastructure have probably been addressed in one way or another in one or other of the policies, plans or programmes noted in Annex B. However, the energy NPSs draw on these existing documents to create a single unified framework for consenting large-scale energy infrastructure which reflects the concerns of UK energy policy – and in particular the scale and urgency of need for new infrastructure as set out in Part 3 of EN-1. Annex D shows some of the ways in which the NPSs and the Planning Act 2008 regime help to consolidate existing consenting requirements for energy infrastructure to some extent.

2.3.2. Baseline Information and Key Issues

The SEA Directive requires 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'*. (Annex 1 (b))

'*the environmental characteristics of areas likely to be significantly affected*'. (Annex 1 (c))

'*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*'. (Annex 1 (d))

An essential part of the AoS process is to characterise the current baseline sustainability conditions and their likely evolution following a 'business as usual' scenario. In this way, key sustainability problems or issues and that are relevant to the Energy NPSs may be identified and then considered during the appraisal process. Fourteen key issues (corresponding to the AoS objectives: see below) were identified and were consulted upon in the Scoping Report. An overview of baseline conditions for each of the topic sections is presented with Annex F. This information has helped form the basis for appraisal by setting out the current condition against which the likely significance of effects may be judged.

Some parts of England and Wales have been industrialised to a significant extent for over 200 years and are relatively densely populated. At the same time, considerable legislative, administrative and voluntary effort has gone into attempting to remedy the consequences of high levels of development, often (historically at least) not carried out in a particular sustainable way, with the Government participating in EU programmes such as the designation of protected "Natura 2000" sites, as well as adopting various national measures designed to protect the environment. A particular challenge facing the development of the large quantities of new large-scale energy infrastructure which the Government has determined need to be constructed is that much of it will, for one reason or another, need to be located in areas which have hitherto seen relatively little large scale development of any kind and/or enjoy some kind of protective designation. In some cases, the need to take account of the increased risk of floods which comes with climate change (and which arises particularly in areas where some types of energy infrastructure may be located) provides an additional challenge.

2.4. Appraisal Objectives and Guide Questions

The establishment of appropriate 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 the 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 (see Annex

C). Their development also reflects national guidance on SEA and SA practice[7]. 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 energy infrastructure development and give more detail and focus to the appraisal process.

Table 2.2 AoS Objectives and Guide Questions

AoS Objective	Guide Questions	
1. Climate Change: To minimise detrimental effects on the climate from greenhouse gases and ozone depleting substances and maximise resilience to climate change.	• Will the NPS ensure that the carbon throughput of the national portfolio of major energy infrastructure is reduced (at least in proportion to the carbon targets and budgets set under the Climate Change Act)? • Will the NPS significantly change the direct or indirect emissions of carbon dioxide and other greenhouse gases? • Will the NPS significantly change in the indirect emissions of carbon dioxide or other greenhouse gases due to changes in energy use? • Will the NPS promote future proofing (e.g. through good design) against the effects and risks of climate change (e.g. sea level rise and changes in weather patterns)? • Will the NPS promote long term adaptation to the effects of climate change? • Will the NPS have wider implications for the mitigation of climate risks?	Climate change
2. Ecology (Flora and Fauna): To protect and enhance protected habitats, species, valuable ecological networks and ecosystem functionality.	• Will the NPS help to prevent damage to and enhance species and habitats (e.g. by promoting good design)? • Will the NPS seek to minimise habitat fragmentation and severance of migration and commuter routes? • Will the NPS promote new habitat creation or restoration and linkages with existing habitats? • Will the NPS promote the sustainable management of natural habitats?	Fauna, flora and biodiversity

[7] ODPM (2005) A Practical Guide to the Strategic Environmental Assessment Directive.

AoS Objective	Guide Questions	
	• Will the NPS affect the structure and function of ecosystem processes? • Will the NPS limit air pollution to levels which do not damage natural systems by acidification or eutrophication?	
3. Resources and Raw Materials: To promote the sustainable use of resources and natural assets and to deliver secure, clean and affordable energy.	• Will the NPS adhere to the waste management hierarchy? • Will the NPS help to meet the joint challenge of tackling climate change and ensuring secure, clean and affordable energy? • Will the NPS generate waste by products? • Will the NPS promote the UK's competitiveness, vitality and adaptability within the energy market? • Will the NPS promote security of supply in the energy market? • Will the NPS have wider effects on energy economics?	Material assets
4. Economy and Skills: To promote a strong and stable economy with opportunities for all.	• Will the NPS promote sustainable growth in the national economy? • Will the NPS improve the reliability of the national energy supply? • Will the NPS have wider socio-economic effects such as impact fuel poverty or have effects on specific groups? • Will the NPS promote investment for the long term? • Will the NPS promote diversification of the economy? • Will the NPS increase the national skills base? • Will the NPS avoid adverse effects on the national economy?	Material assets
5. Flood Risk and Coastal Change: To avoid, reduce and manage flood risk (including coastal flood risk) from all sources	• Will the NPS help to minimise the risk of flooding to existing properties and new energy infrastructure? • Will the NPS help to discourage inappropriate development in areas at	Climatic factors

AoS Objective	Guide Questions	
and coastal erosion risks by locating infrastructure in lower risk areas and ensuring it is resilient over its lifetime without increasing risks elsewhere.	risk from flooding and coastal erosion? • Will the NPS help to manage the risks associated with coastal erosion?	
6. Water Quality & Resources: To protect and enhance surface (including costal) and groundwater quality (including distribution and flow).	• Will the NPS protect and improve ground and surface water quality in line with Water Framework Directive requirements? • Will the NPS avoid adverse effects on costal water and fisheries? • Will the NPS safeguard and enhance the UK's water resources and maintain water abstraction within carry capacity? • Will the NPS help to implement the Water Framework Directive?	Water
7. Traffic and Transport: To minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	• Will the NPS significantly change national transport networks (e.g. a modal shift from road to rail)?	Population
8. Noise: To protect both human and ecological receptors from disturbing levels of noise.	• Will the NPS seek to minimise any adverse effects of noise?	Population
9. Landscape, Townscape and Visual: To protect and enhance landscape quality, townscape quality and to enhance visual amenity.	• Will the NPS seek to protect and enhance the character of landscapes and townscapes (e.g. by promoting good design)? • Will the NPS seek to protect wilderness and areas of high landscape value? • Will the NPS give consideration to	Landscape

AoS Objective	Guide Questions	
	strategic views designated in LDFs and views from designated areas (e.g. AONBs)?	
10. Archaeology and Cultural Heritage: Protect and where appropriate enhance the historic environment including heritage resources, historic buildings and archaeological features.	• Will the NPS have any direct, indirect or cumulative effects on sites of universal cultural heritage importance (e.g. World Heritage Sites)? • Will the NPS have any direct, indirect or cumulative effects on other national or local designated sites (e.g. Scheduled Ancient Monuments (SAMs), listed buildings, registered battlefield sites etc)? • Will the NPS protect and enhance the historic environment? • Will the NPS have any potential impact on historic landscape character with landscapes designated as nationally important such as National Parks and AONBs as well as conservation areas?	Cultural heritage, including architectural and archaeological heritage
11. Air Quality: To protect and enhance air quality on local, regional, national and international scale.	• Will the NPS maintain and enhance air quality? • Will existing areas of poor air quality be made worse?	Air
12. Soil and Geology: To promote the use of brownfield land and where this is not possible to prioritise the protection of geologically important sites and agriculturally important land.	• Will the NPS promote the wise use of land? • Will the NPS safeguard soils and geology from potential contamination?	Soil
13. Health and Well-Being: To protect and enhance the physical and mental health of the population	• Will the NPS affect the physical health or well-being of the population? • Will the NPS affect perceptions of risk? • Will the NPS help to reduce health inequalities?	Human heath

AoS Objective	Guide Questions	
	• Will the NPS affect recreational enjoyment of the countryside and coasts? There are a number of elements scoped out as they are location specific, e.g. will it encourage walking or cycling, will it affect an individual's access to health facilities and green spaces? will be assessed at project level through the EIA.	
14. Equality: To encourage equality and sustainable communities.	• Will the NPS result in changes to community services or facilities? • Will the NPS affect the level of people in fuel poverty? • Will the NPS reduce inequalities?	Human health

2.5. Structuring the Appraisal

This appraisal of the NPS policies has been undertaken in a topic by topic manner, with the draft NPS tested against each of the 14 AoS objectives (Table 2.2). The findings of the AoS are presented in Section 4. Where relevant, the interactions between topics have been considered and the commentary is reported against each of the AoS Objectives.

2.6. Sustainable Development Themes

The SEA Directive also requires the environmental assessment of reasonable alternatives to the NPS policies (Article 5(1) and paragraph (h) of Annex I: these alternatives are analysed in Section 3 of this AoS). It is important to maintain the appraisal at the appropriate level of plan making and AoS. For this reason, 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 2.3: Sustainable Development Themes and AoS Objectives

Headline SD Themes	**AoS/SEA Objectives** (numbers refer to AoS objectives)
Climate Change	Climate change (1)
Security of Energy Supply	Resources & Raw Materials (3)
Health & Well-Being	Noise (8), Air Quality (11), Health & Well-Being (13), Equality (14)

The Economy	Economy & Skills (4)
The Built Environment	Flood Risk and Coastal Change (5) Traffic & Transport (7) Archaeology & Cultural Heritage (10)
The Natural Environment	Ecology (flora & fauna) (2) Water Quality & Resources (6) Landscape, Townscape & Visual (9) Soils & Geology (12)

2.6.1. Prediction and Evaluation of Effects

The appraisal seeks to predict the significant environmental effects of the plan[8]. This is done in accordance with the criteria set out in Annex II of the ODPM guidelines. In predicting effects, changes are identified to the baseline which would occur as a result of implementing the NPS. 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 (see Annex B and Annex F, published separately). Significance of likely effects was predicted according to the six categories set out in the following table:

Table 2.4: Key to Appraising Significance of Predicted Effects

Likely Significant Effects:		
Major Positive	++	Policy would resolve an existing sustainability problem; effect considered to be of national/international significance
Minor Positive	+	No sustainability constraints; effect considered to be of regional/national/international significance
Neutral	0	Neutral effect i.e. no overall effects or not-applicable
Minor Negative	-	Potential sustainability issues, mitigation possible; effect considered to be of regional/national/international significance
Major Negative	--	Problematical because of known sustainability issues; mitigation difficult and/or expensive; effect considered to be of national/international significance
Uncertainty	**?**	Where the significance of an effect is particularly uncertain, eg insufficient information is available at the plan stage to fully appraise the effects of the policy or the potential for successful mitigation, the significance category is qualified by the addition of the symbol "?"

2.6.2. Assumptions Made During Appraisal

The following assumptions were made to aid the understanding of the influence of the NPSs on the outcome of planning decisions. It is intended that the Planning Act regime should:

[8] ODPM (2005) A Practical Guide to the Strategic Environmental Assessment Directive. See Figure 5. Available online at: http://www.communities.gov.uk/publications/planningandbuilding/practicalguidesea

- help to ensure that decisions are taken consistently, and should increase certainty (and efficiency) for investors;

- add greater certainty to the delivery of nationally significant energy infrastructure by making the criteria for decision-making clearer and more transparent;

- lead, as compared with the system it has replaced, to a more focused inquiry process, which will produce faster decisions and may result in more projects being built in the short-term. Faster decisions will improve the UK's security of supply and accelerate the attainment of its low carbon goals. What EN-1 says about the overall level of need for energy infrastructure is relevant in terms of the IPC's understanding of the scale of need when considering individual applications.

2.7. Addressing Challenges in Undertaking the AoS

The key technical difficulty encountered was maintaining the appraisal at the strategic level for a national plan and not duplicating the project level assessments that the IPC will consider in their decision making at the development consent application stage. Any uncertainties in the findings of the AoS were recorded and recommendations made from the AoS to the draft NPS to highlight to the IPC where they should consider more detailed studies at the project level stage.

2.8. Relationships Between the Overarching AoS and the Technology Specific AoSs for Cumulative Effects Assessment

The Overarching AoS considers the appraisal of sustainability and the likely significant effects of implementing the draft NPSs as a whole with a mix of technologies and including likely significant generic effects associated with all major energy infrastructure. Specific effects associated with each energy technology are detailed in AoS-2 for Fossil Fuel Electricity Generating Infrastructure, AoS-3 for Renewable Energy Infrastructure, AoS-4 for Gas Supply Infrastructure and Gas and Oil Pipelines, AoS-5 for Electricity Networks Infrastructure, and AoS-6 for Nuclear.

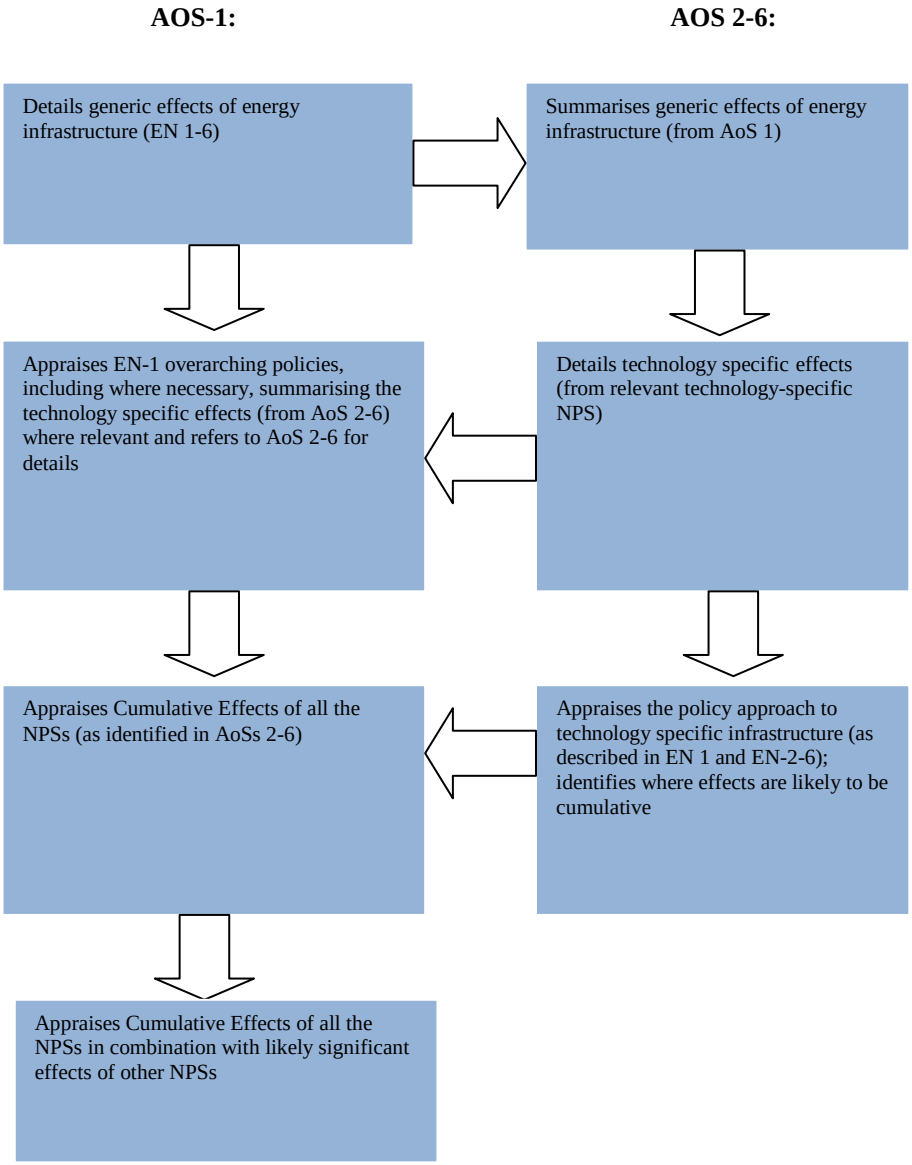
Cumulative effects on communities and the environment can arise where the effects of several proposed pieces of new energy infrastructure interact. Such effects may be additive, neutralising or synergistic – where the effect of one or more effects acting together is more than the simple sum of the effects 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 any more. 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 energy developments can have positive synergistic effects on the local economy, upskilling and community vitality. It may be considered that climate change is the ultimate cumulative effect. The SEA Directive requires consideration of cumulative effects (paragraph (f) of Annex I, with footnote).

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. The draft Nuclear NPS (EN-6) considers sites potentially suitable for building new nuclear power stations and for this AoS it was possible to address likely significant cumulative effects for clusters of new infrastructure. The other technology specific NPSs do not have any locational specificity and therefore it is more 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 that the NPSs should draw to the attention of the IPC when considering applications for development consent.

The significance of cumulative effects may vary with the mix of energy technology projects that are 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 NPSs, the baseline and the plans/programmes review. Cumulative effects assessment was considered individually both within each energy NPS and in combination with other NPSs. The relationships between the appraisals with regard to cumulative effects assessment is summarised in the following diagram:

Figure 2.1: Relationships between AoSs and Cumulative Effects Assessment



2.9. Habitats Regulations Assessment

Habitats Regulations Assessment (HRA) reports have been prepared for the suite of draft NPSs. The HRA reports are subject to public consultation alongside the draft NPSs. A HRA report was prepared for the five non-nuclear draft NPSs (EN-1 to EN-5) and a separate HRA report was prepared for EN-6. The HRA considers the potential effects of designating the draft NPSs on European sites.

The HRA has been applied to drafts of EN-1 to EN-5 in a manner which is consistent with their non-spatial, strategic nature. The HRA has been applied to the draft of EN-6 in a manner which is consistent with its locationally specific nature (as EN-6 lists sites that the Government has judged to be potentially suitable for the deployment of new nuclear power stations).

EN-1 to EN-5 do not identify locations to construct new nationally significant infrastructure. The HRA of the draft National Policy Statements (EN-1 to EN-5) concludes that although it cannot exclude the possibility that the integrity of one or more European sites, including sites which host priority habitats or species, could be adversely affected by new nationally significant infrastructure, either alone or in-combination with other plans and projects, there is a case for Imperative Reasons of Overriding Public Interest (IROPI) in permitting new nationally significant energy infrastructure. This is because security of supply is essential for the maintenance of human health and safety, and also because combating climate change through decarbonisation of the electricity supply will have beneficial consequences of primary importance for the environment. The full assessment including the examination of alternative plans and the IROPI case are set out in the main HRA[9].

[9] See Main Habitats Regulations Assessment Report.

3. Assessment of NPS alternatives

3.1. Introduction

The SEA Directive requires 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".

This section of AoS-1 is concerned with the analysis of alternatives. The analysis of reasonable alternatives provides a strategic context for the detailed assessment of the likely significant effects of EN-1 (in Section 4), as well as a means of evaluating it by comparing it with other ways of achieving the same wider energy policy objectives through the planning regime – both in terms of their comparative merits as ways of achieving those objectives and in terms of their environmental, social and economic impacts.

Certain strategic alternatives to the draft NPS as a plan were appraised and reported in the draft of AoS-1 published as part of the November 2009 consultation. As a result of this consultation, Government decided to look again at the AoSs and the draft NPSs, including the analysis of alternatives. The revised appraisal of strategic alternatives to EN-1 is set out in this AoS. In line with the principles of good policy making and with the requirements of the SEA legislation, reasonable alternatives for implementing the aims of the NPS were considered. The work presented in this section cannot be compared directly with that reported in the November 2009 AoS-1 and is intended to take the place of the earlier assessment.

The assessment of alternatives to EN-1 for the reworked AoS has been a two stage process:

1) Development and initial screening to establish a series of reasonable strategic alternatives to the plan.

2) Assessment of the selected reasonable alternatives against the AoS objectives.

A wide range of strategic alternatives has been considered in the initial screening. Those alternatives that appear capable of fulfilling the objectives of the plan have then been tested against the AoS objectives. The strategic alternatives proposed and considered by the appraisal team in the initial screening, together with the reasons for not taking forward certain options to the second stage of the alternatives assessment, are discussed in Section 3.2. Sections 3.4 to 3.8 present the assessment of the selected reasonable alternatives against the AoS objectives, with a summary of the findings in Section 3.10. As noted in Section 2.5, the 14 AoS objectives have been grouped into 6 more appropriately strategic sustainable development themes for the purposes of the alternatives assessment.

3.2. Developing Strategic Alternatives

3.2.1. Objectives of the Plan

As noted in Section 2, the overall objective of the energy and climate change policy which the Energy NPSs are designed to help achieve is to enable the development of new energy infrastructure that will maintain safe, secure and affordable supplies of energy to GB consumers (individuals or businesses) in the shorter and longer term and support the goal of an 80% reduction in UK greenhouse gas emissions by 2050, set in the Climate Change Act 2008.

Thus, to fulfil the objectives of the plan and be considered reasonable alternatives to it, alternatives need to represent different possible ways of constructing energy NPSs which would nevertheless still enable the development of new energy infrastructure that will:

- maintain safe and secure supplies of energy
- maintain affordable supplies of energy
- support the achievement of the goal of an 80% reduction in UK greenhouse gas emissions by 2050.

It is important to note that the assessment of alternatives is not an examination of a range of possible different energy and climate change policies. Clearly there are a number of different policies which could be adopted, quite separately from NPSs, to give greater emphasis to one or other of the aspects of the overall objective referred to above: some of these may be considered as part of the Electricity Market Reform project. The question for the assessment of alternatives is a narrower one of whether the balance which has been struck between these aspects of the overall objective in the revised draft NPSs is the right one. The 2050 Pathways Analysis shows us scenarios that could lead to achievement of the overall objective. So, to put it another way, do the planning policies set out in the NPSs provide the right filter or gateway for consenting the possible mixes and quantities of infrastructure, without unacceptable adverse impacts, that could be associated with any of the scenarios?

3.2.2. Formulation of Alternatives Considered for AoS of EN-1

The NPSs set out planning policies. There are over a dozen key policy elements in EN-1 alone. Each such policy element could have been designed differently and still produce a result that could be consistent with the overall objectives of energy and climate change policy (see the first column of the tables in Annex G for examples). It would not be practicable or helpful in assessing strategic effects to attempt to assess alternatives to each constituent policy in EN-1 (mathematically, tens of individual policies imply thousands of different possible combinations of them, even if there is only one reasonable alternative to each policy). But in fact there is no need to do this.

In order to fulfil the overall objective, any reasonable alternative to the energy NPSs must, like them, strike a balance between four principal criteria. These are:

i. Cost

ii. Security of supply.

iii. Reduction of greenhouse gas (in particular, CO_2) emissions.

iv. Minimising environmental impacts other than greenhouse gas emissions.

The purpose or effect of adopting a reasonable alternative to any one of the constituent policies which make up the NPSs would be to give greater emphasis to one or the other of these criteria (for example, so as to reduce greenhouse gas emissions further and/or faster, or to ensure that energy is available more cheaply): Annex G shows how a range of possible alternatives to individual EN-1 policy elements can all be analysed in these terms. It follows that a good way of analysing alternatives to EN-1, without going in to a level of detail about how it might be done which would be both unmanageable and inappropriate to a strategic assessment of a high-level plan which is expressed in broad, generic terms and has no locational specificity, is to consider in generic terms (illustrated by reference to specific possible reasonable alternatives to EN-1 policy elements) the ways in which the balance between these four principal criteria might be varied while still fulfilling the objectives of the plan.

One of the features of the NPSs as a plan or programme for SEA Directive purposes is that although the NPSs are part of a new, reformed planning regime, and although their policy content has been re-evaluated as a result of the process of consultation on the draft NPSs and the assessment of alternatives, the starting point in drafting them has been to express, as far as possible and appropriate, the policies which have guided examination and decision-making on applications for consent to develop large-scale energy infrastructure under the pre-Planning Act regimes, which provide the foundation for the NPS policies. But Government's adherence to those policies, which have evolved over time, has always ultimately been determined by one or more of the four principal criteria, which have been the drivers of consenting policy for large-scale energy infrastructure for some time. Accordingly, the approach to alternatives assessment proposed here has the additional merit of accurately reflecting the way that the constituent policies of EN-1 have developed over time.

Table 3.1 summarises the main alternatives that have been considered.

Table 3.1 Plan and alternatives considered for EN-1

Criterion	Alternative that places more emphasis on criterion than Plan does	Plan	Alternative that places less emphasis on criterion than Plan does
Low Cost	A1	EN-1	B1
Security of Supply	A2	EN-1	B2
Reduction in greenhouse gas emissions	A3	EN-1	B3
Reduction in Environmental impacts	A4	EN-1	B4

Key:

Reasonable alternative		Unreasonable alternative		Alternative not considered	

See text below for explanation of screening assessment

The alternatives A1-A4 and B1-B4 shown on the table stand for possible sets of development control policies which would tilt the overall balance of the plan set out in EN-1 either towards or away from one or other of the different directions represented by each of the four principal criteria. Alternatives A1- A4 give more emphasis to one of the criteria than is given in the existing plan. Alternatives B1-B4 each give less emphasis to one of the criteria. For example, alternative A1 changes the balance in EN-1 to give greater priority to supplying low cost energy.

The first test is to check whether all 8 of the options shown on Table 3.1 are, in principle, capable of being reasonable alternatives to the Plan. In screening the alternatives, a reasonable alternative is considered to be an alternative set of development control policies that could be included in the NPSs and would still achieve the overall objective. An alternative is not reasonable if it would be unlawful or physically impossible to implement; an alternative will also be unreasonable if it gives rise to a significant risk of failure to achieve any of the overall energy and climate change policy objectives which the plan or programme of the NPSs exists to achieve by contributing to a failure:

- to maintain affordable supplies of energy;
- to maintain safe and secure supplies of energy; or
- to support the achievement of the goal of an 80% reduction in UK greenhouse gas emissions by 2050.

On this basis, B1, B2 and B3, the three alternatives that place less emphasis on the above three objectives, were considered not to be reasonable alternatives. The appraisal team has not given further consideration to them since by definition these must represent policies which, by giving less emphasis to one of the key elements of

the energy and climate change policy underlying the energy NPSs, are likely to risk failing to achieve the objectives of that policy.

Alternative B4 – placing less emphasis on the reduction of environmental impacts – does not necessarily fail to fulfil the objectives of the Plan. However, it was concluded that there was no merit in developing alternative B4 further since the Planning Act obliges the Secretary of State to discharge his plan-making functions with the objective of contributing to the achievement of sustainable development. It would therefore be inappropriate to develop an alternative whose underlying rationale was essentially to be less good than the energy NPSs at achieving sustainable development.

By contrast, alternatives A1 – A4 all appear able to fulfil the objectives of the Plan and together they provide an appropriate framework for assessing the effects of variations to the Plan. However, alternative A2 (more emphasis on security of supply) has not been developed further for two reasons. Firstly, the policies in EN-1 are intended to provide a secure energy supply, so to achieve greater security implies providing additional capacity to give an extra margin of safety. Provision of this capacity will increase adverse effects on the Built and Natural environment and increase greenhouse gas emissions and resource use for construction. Only if the additional capacity needs to be used will beneficial effects arise to the Economy and, indirectly, to Human Health and Well-being. Assessment of the right balance to be struck is more appropriately considered through risk assessment and economic modelling than through an appraisal of sustainability and therefore not considered here. Secondly, as the second columns of the tables in Annex G show, there are few, if any specific variations of EN-1 policies which can be said to give more emphasis to security of supply without also potentially contributing to the achievement of lower cost energy or one of the objectives represented by A3 or A4.

Therefore, the alternatives assessment has focussed on alternatives A1, A3 and A4, representing, respectively, the various possible changes in the constituent elements of NPS policy that would lead to greater emphasis in the overall plan being placed on, respectively, achieving low cost energy, reducing greenhouse gas emissions and reducing non-greenhouse gas related environmental impacts.

Amongst other things, this approach provides a structure for high-level evaluation of the development consent consequences of possible alternatives to the plan which, while still aiming to achieve the ultimate objective of secure, affordable and low-carbon supplies of energy, might seek to give a significantly different direction to energy infrastructure policy by giving significantly greater or less priority than EN-1 does to the development of particular types of technology in the overall energy mix (such as some of the possibilities reflected in the 2050 Pathways Analysis). For example, a policy might be adopted of not giving consent to new nuclear power stations; of keeping to the absolute minimum the consents given to projects for fossil fuel generation any part of whose capacity will not be fitted from the outset with carbon capture and storage equipment; or of minimising the consents given to certain types of renewable generation project (e.g. plants which burn biomass or waste). At a strategic level, adoption of any of these policies would ultimately be driven by one or more of the four principal criteria listed above (e.g., in the case of “no nuclear”, by placing more emphasis on reducing non-greenhouse gas environmental impacts); in more detailed terms, these possible changes to the priority given to different

infrastructure types are considered in the alternatives analysis for the individual technology-specific NPSs concerned.

Annex G supplements the assessment of alternatives below by showing the kinds of alternatives that could be devised for the key planning policies within EN-1; indicating how each of these possible alternatives relates to the high-level alternatives identified in Table 3.1; and explaining why they have not been preferred to the NPS policies. The intention is to confirm (by way of illustration, rather than exhaustively) from a "bottom-up" perspective that the range of alternatives reviewed in this section provides an appropriately strategic-level view of alternatives to the policies in the energy NPSs and provide some further background on the relationship between planning policies and energy and climate change policies.

3.2.3. Alternatives Considered

The headline sustainable development topics (see section 2.5) have been used to assess the Plan and the alternatives developed as described above. In summary, the effects of the following options have been assessed under each of the headline SD themes in turn:

- "**Overarching NPS for Energy"**: the NPS EN-1 in line with Government Policy;
- "**No NPS**": (the "business as usual" scenario in accordance with normal SEA practice). This represents the likely evolution of the baseline conditions without the implementation of the NPS. This means construction of new energy infrastructure under a business as usual scenario where there is no Overarching NPS for Energy or other energy NPSs to set the framework for development consents but decision-makers are still guided by the objectives of maintaining secure, safe and affordable supplies of energy from predominantly low-carbon sources. Under the "business as usual" option, energy companies could still apply for development consents for major energy infrastructure projects, but the Government would not produce any Energy NPSs. Decisions on applications would still be taken in accordance with Government policies but, without an NPS to bring these policies together in one place;
- Alternatives that place greater emphasis on particular aspects of the overall objectives of energy and climate change policy: Three alternative themes, their implications for policy options and their effects on the headline SD themes have been assessed namely:
    - Alternative A1, that places more emphasis on a low cost of energy
    - Alternative A3, that places more emphasis on reduction in greenhouse gas emissions
    - Alternative A4, that places more emphasis on reducing environmental impacts other than greenhouse gas emissions

Examples of the kinds of policy elements that could make up these alternatives are set out in sections 3.3. to 3.8 below (ordered by sustainable development theme) and in Annex G (ordered by NPS policy elements).

3.2.4. Relationship between the EN-1 reasonable alternatives and the 2050 Pathways Analysis

The Government recently published the 2050 Pathways Analysis which presents a framework through which to consider some of the choices and trade-offs which we will face over the next forty years. The Pathways Analysis is system-wide, including but also going beyond major energy infrastructure of the kinds covered by the energy NPSs to consider all parts of the economy and all greenhouse gas emissions released in the UK. It shows that it is possible for us to meet the 80% emissions reduction target in a range of ways, and allows people to explore the alternative combinations of effort which meet the emissions target while matching energy supply and demand.[10]

While the Pathways Analysis yields a number of important generic insights which are highly relevant to the AoS alternatives appraisal,[11] it is important to appreciate that the pathways referred to in the 2050 work are very different things from any of the alternatives considered in the AoSs. Their focus is on physical limits, rather than on land use impacts, wider environmental impacts, practical deliverability, technological risk, economic factors or public acceptability. The appraisal (and to some extent selection) of reasonable alternatives in the AoSs take all these things into account to some degree. The AoSs, moreover, are necessarily focused on the question of the impacts on a range of environmental, social and economic factors which particular development control policies (designed to achieve energy policy goals) may have; the Pathways look well beyond infrastructure planning to wider energy policy and policies in other areas, such as transport, but their focus is entirely on what the greenhouse gas emissions reduction impact would be of hypothetical levels of effort in certain areas and the Analysis makes clear that they are not blueprints for policy decision-making: they do not translate in any straightforward sense into reasonable alternatives for AoS purposes.

3.2.5. Formulation of Alternatives Considered for AoSs of EN-2 to EN-6

In addition to the overarching policies presented in EN-1, more detailed requirements for specific energy technologies are set out in EN-2 to EN-6. The framework for considering consents for new energy infrastructure projects comprises EN-1 and one or more of the relevant technology-specific NPSs. As well as the alternatives to EN-1, the AoS has considered the alternatives to each of the technology-specific NPSs.

In the appraisal of alternatives for each technology-specific NPS, we have compared the effects of changing the plan or programme specifically as it relates to each technology type or group of types in more detail. In assessing alternatives for the technology specific AoSs, it has been assumed that each technology is to be developed on the same sort of scale/play the same sort of part in the mix of new infrastructure as follows from the statement of need in Part 3 of EN-1.

[10] http://www.decc.gov.uk/en/content/cms/what_we_do/lc_uk/2050/2050.aspx

[11] See for example p.34f of the Analysis: ambitious per capita energy demand is needed (whatever else happens); a substantial level of electrification of heating, transport and industry is needed; electricity needs to be decarbonised, while supply may need to double; a growing level of variable renewable generation increases the challenge of balancing the electricity grid; sustainable bioenergy is a vital part of the low carbon energy system; fossil fuels continue to play a role.

Each technology-specific AoS, consistent with the approach taken in the choice of reasonable alternatives (i.e. focusing on options which hold out the prospect of increasing positive impacts and/or reducing negative impacts, and not considering in detail those options which appear likely to do the opposite) has been focused on different approaches to reducing or eliminating the impacts of the technology concerned which experience shows are most objectionable. Accordingly, in the AoS for EN-2, the focus has been on CO_2 emissions; for EN-3, the focus has been on visual, noise and shadow flicker impacts (for wind) and sustainability concerns (biomass/energy from waste); for EN-4 and EN-5 the focus has been on whether a range of adverse impacts could be reduced by taking a less market-led approach to the development of oil and gas supply infrastructure and electricity network infrastructure (in the case of EN-5 this has included consideration of different policies/presumptions about undergrounding of transmission lines). In the AoS for EN-6, the focus has been on the effects of nuclear power station development in general and on the process of site selection.

The assessments of technology-specific alternatives have concentrated on evaluating the likely development consequences. The key questions are: (i) whether the alternative will in fact reduce the adverse impacts or increase the positive impacts at which it is directed; (ii) what other impacts it will affect, either positively or negatively; and (iii) whether it will still allow the technology type concerned to play its part in achieving the overall energy policy objective.

In accordance with this approach, the following technology-specific alternatives have been assessed in the AoSs for EN-2 to EN-6.

In the AoS for EN-2, the alternatives are:

(a) a stricter approach to CCS (e.g. no new coal without full CCS, or no new fossil fuel plants without a substantial amount of CCS from the outset);

(b) a stricter approach to CCR (i.e. more demanding criteria set for demonstrating that retrofit of CCS will be economically feasible).

In the AoS for EN-3, the alternatives are:

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

(b) adopting a policy that would mean consents set more stringent criteria for biomass/energy from waste (based on what such plants were allowed to burn).

In the AoS for EN-4, the alternative is:

(a) the Government would take a strategic view on locations where it is best to develop new oil and gas infrastructure (based on geology, cost etc) and limit consenting to those areas;

In the AoS for EN-5, the alternatives are:

(a) the Government would take a strategic view on locations where it is best to develop electricity network infrastructure and limit consenting to those areas;

(b) adopt a presumption that transmission lines should be put underground (generally, or in particular locations, such as AONBs).

In the AoS for EN-6, the high-level alternative is:

(a) a Nuclear NPS that prohibits the construction of any new nuclear power stations. This would mean that development consent would not be granted for any new nuclear power stations. This is similar to one of the policy options assessed in relation to the AoS of EN-1 but is considered as a single policy change in the AoS for EN-6. In the AoS for EN-1, “no nuclear” is considered as one of several policy options designed to place greater emphasis on particular criteria.

(b) because EN-6, unlike EN-2 to EN-5, contains details of nominated sites that are appraised in the AoS, the AoS for EN-6 has also considered a range of process alternatives about how the NPS should deal with siting. This has involved assessing the effects of including in the NPS various combinations of siting criteria and lists of potentially suitable sites and the effect of restricting sites to those in the vicinity of existing nuclear power stations.

The formulation of technology-specific alternatives is discussed further in the relevant technology-specific AoSs.

3.3. Climate Change

3.3.1. Overarching NPS for Energy

One of the principal purposes of EN-1 is to facilitate the development of low carbon infrastructure to meet the UK’s current and future energy demands. The potential is for positive, cumulative effects in the medium and longer term as a result of reduced emissions of carbon dioxide and other greenhouse gases. The requirements set out in EN-1-6 for resilience and mitigation measures in all new developments to ensure that technologies are appropriately adapted to forecast changes, is also positive for this theme. However, the plan does not set targets or quotas, therefore the proportion of low carbon technologies meeting energy needs in the short, medium and longer term is not known. The contributions to climate change objectives whilst potentially positive are consequently also uncertain, given the range of economic and technological factors that may influence the successful implementation of low carbon energy sources.

3.3.2. No NPS

Without NPSs, Government policy would be less transparent for applicants, making the process of applying for development consent less easy. Hence, the overall effect of the No NPS option is likely to be greater uncertainty in planning, which might result in delays to the consenting of energy projects. The difference that No NPS would make to carbon emissions and climate change reduction is difficult to assess as planning uncertainties could affect both conventional and low carbon forms of electricity generation. The AoS for EN-6 has considered in particular how the development of new nuclear power stations might proceed in the absence of a nuclear NPS. The assessment concludes that nuclear power would be a less

attractive option for energy companies given the uncertainty in planning without a nuclear NPS. However, it is not possible to predict whether fossil fuel power stations such as combined cycle gas turbines (CCGT), or renewable energy developments would come forward under this option instead of nuclear and so the effect on climate change of no Nuclear NPS cannot be assessed with any certainty.

It is possible that lack of an NPS will have more impact on new, emerging or contentious technologies where clear formulations of policy are most needed to reassure energy companies that developments will proceed. If this is the case, the No NPS option could lead to less development of technologies such as renewables, fossil fuel with CCS or nuclear power. If this is the effect, it is not clear whether the result in aggregate would be to increase or reduce carbon emissions and climate change risks, compared with the developments that would occur with Energy NPSs in place. However, given that low carbon forms of generation are likely to comprise the majority of emerging or contentious technologies, the effect of this alternative on greenhouse gases is more likely than not to be negative, although there is a degree of uncertainty in this assessment.

3.3.3. Alternative A1 – More emphasis on a low cost of energy

There are a range of policy variations that might be chosen in order to give greater emphasis to low cost energy than the Plan. Policy variations that might be implemented to reduce the cost of electricity generation and transmission include:

- Less stringent requirements for CCS/CCR in relation to new fossil-fuel plant (a low cost option in the short term if carbon prices and fossil fuel prices are relatively low);

- Giving more priority to lower cost forms of renewable energy compared to higher cost alternatives. For example, this might result in giving more emphasis to onshore wind power than offshore wind power (but note that if carbon prices and fossil fuel prices rise significantly, policies which promote all forms of renewable generating capacity may become a relatively low cost option);

Relaxation of development control policies, leading to a greater number of possible development sites and reduced requirements for mitigation measures.

With the exception of the adoption of less stringent requirements for CCS/CCR, these examples of policy variations are likely to have little negative impact on the achievement of planned CO_2 reductions. Given that policies to give more emphasis to low energy costs could be adopted selectively, this alternative could be pursued without taking the option of reducing requirements for CCS/CCR. Hence the effect of changes in the mix of generating types and development control policies on carbon reduction objectives is uncertain but is not necessarily negative.

An indirect but potentially significant increase in carbon emissions might result from the pursuit of a lower energy cost alternative if this has a positive effect on economic activity in general. The lower cost of energy is likely to provide more competitive conditions for industry in the face of international competition and may encourage

greater production from existing industries and inward investment, both of which could increase carbon emissions.

3.3.4. Alternative A3 – More emphasis on reduction in greenhouse gas emissions

The policy variations that might be implemented to give more emphasis on the reduction of greenhouse gas emissions include:

- setting planning policies on the basis that much less new large-scale infrastructure will be needed than has been assumed in EN-1, (assuming that energy policy generally places more emphasis on energy saving);
- Placing greater emphasis on renewable energy generation;
- Placing greater emphasis on new nuclear power stations (for example, by adopting tighter consenting criteria for other forms of generating infrastructure);
- Imposing more stringent requirements for CCS and/or CCR. These particular options are considered in more detail in relation to fossil fuel plant in the alternatives assessment in the AoS of EN-2.

Energy saving measures are a very important factor in achieving greenhouse gas reductions and in determining the amount of new energy infrastructure required, and Government is making considerable efforts to encourage the adoption of such measures. In relation to the Climate Change objective being assessed here, a reduction in the amount of energy that needs to be generated as a result of energy savings would be beneficial, although it is clear from the analysis in Part 3 of EN-1 that energy saving measures cannot in themselves eliminate the need for new large-scale energy infrastructure, and the 2050 Pathways Analysis indicates that both significant increases in energy efficiency and increased amounts of (low carbon) generating capacity are likely to be required in order to achieve the greenhouse gas emissions reductions targets set for 2050 in the Climate Change Act 2008 (in particular, increased demand for electricity as a result of the shift away from fossil fuels in the domestic heating, industrial and transport sectors will outpace savings resulting from energy efficiency measures). In any event, the policy levers to promote energy saving are generally outside the scope of the Energy NPSs, which is principally concerned with setting out the criteria and controls to be applied in developing energy infrastructure to meet a given level of demand.

Possible ways that investment in low carbon technologies might be encouraged by variations in the development control policies included in EN-1 have been considered. Changes to siting criteria, for example relaxing policies in relation to flood risk, could encourage more generating plant proposals to come forward. This would affect all technologies similarly, unless the relaxation of criteria was applied only to certain classes of development, in this case low carbon developments. This type of selective relaxation of development controls might be used in conjunction with targets or quotas for particular types of generating plant, to encourage development of low carbon generating capacity. As an alternative to or in conjunction with relaxing controls on low carbon developments, conditions on other forms of energy development could be made more stringent, for example by tightening emission standards or requiring that

all fossil fuel power stations include provision for CHP. Similar preferential conditions for low carbon plant would be produced by increases in the price of carbon, but this is not something that can be achieved through development controls.

Policy variations of the type discussed above, that provide incentives for low carbon developments, would reduce greenhouse gas emissions and be beneficial to the climate change objective. However, these policies may have negative effects on some of the other SD Themes assessed in the following sections, for example certain adverse environmental effects may be increased by relaxation in siting criteria. Moreover, there is little evidence that the policies which Government has followed in consenting new infrastructure under the pre-Planning Act regimes, and on which the NPS policies are based, have inhibited renewable energy infrastructure development.

3.3.5. Alternative A4 – More emphasis on reducing other environmental impacts

There are several policy variations that could be made to reduce environmental impacts apart from greenhouse gas reduction. These policy changes include placing more stringent conditions on new energy infrastructure developments for example by:

- Adopting more stringent policies on consenting, either generally, or in designated areas such as AONBs (this might include being more demanding about developers taking opportunities to improve the existing conditions of sites to be developed and their surrounding areas, as well as setting policies aimed at making it more difficult to consent particular forms of development where it would have particular adverse impacts),

- Being more prescriptive about locations for particular types of infrastructure so as to minimise technology-specific effects,

- Refusing consent if there are alternative locations for development where adverse impacts are expected to be less significant.

An illustration of the type of restrictions that could be introduced is the conditions that might be set to limit thermal impacts due to cooling water discharges. A policy could be introduced setting a limit to the quantity of cooling water (or quantity of heat) that would be permitted to be discharged to certain areas of coastal waters so as to minimise adverse environmental effects. This would effectively impose a limit on the development of fossil fuel and nuclear power stations in these areas. Such a condition would not in itself have a differential effect on these two technologies, although it might present a more significant challenge for nuclear power stations given the large scale of these plants. Hence the effect of such a policy on carbon emissions and climate change is uncertain.

Scenarios can be developed that would restrict other types of environmental impacts to lower levels than is achieved by EN-1, leading to similar conclusions that the effects on the technology mix and hence on the potential for carbon reductions are uncertain. In general, the adoption of more stringent conditions on other environmental impacts would not necessarily lead to a change in carbon emissions, although it could delay the introduction of low carbon technologies if it slows the

identification and approval of suitable sites. Overall the effect is uncertain and will depend on the specific restrictions and their incidence on different technology types.

One reason for the uncertainty of the effects of Alternative A4 is that it is not known which environmental impacts may be sought to be reduced. For example, if more emphasis is given to reducing adverse impacts on air quality, this may discourage the deployment of fossil fuel and biomass or waste to energy plants but would have little effect on wind power or nuclear generating technologies. Therefore, this environmental measure would be relatively more favourable to the deployment of low carbon technologies. To take another example, if the emphasis is on reducing impacts on Landscape, Townscape and Visual impacts, this may affect all types of energy infrastructure with the possible exception of offshore wind power. Moreover, because of the limitations that more stringent control on visual impacts may place on development of transmission infrastructure, this environmental measure could have a relatively greater effect on deployment of new energy technology in scenic areas. Hence this measure may arguably be relatively more significant for certain technologies such as wind power that may be sited in these locations. In this instance the effect of the environmental measure on technology deployment would be neutral or possibly more restrictive to some low-carbon technologies. Thus the effect of Alternative A4 on the climate change goal is difficult to assess when different environmental measures may have different relative impacts on the deployment of different energy technologies and the mix of these measures is undefined.

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
Climate Change		**-?**	**-**	**+**	**0**

3.4. Security of Energy Supply

3.4.1. Overarching NPS for Energy

A key goal of the Government's energy and climate change policy is to deliver "secure energy on the way to a low carbon future". Several of the policies built into to EN-1 are intended to address the goal of energy security. These policies include:

- not to rule out, in principle, and as a matter of planning policy, the construction of any kind of energy infrastructure anywhere;
- so far as electricity generating capacity and the supply of gas are concerned, not to try to rely on any one single source of generation/supply;
- to ensure that supply meets demand and that as much demand as possible is satisfied through the development of low carbon electricity generating capacity.

The effect of these policies is to encourage the development of new energy infrastructure and deployment of a mix of different technologies.

To secure the development of new generating capacity for each technology type will require a range of natural resource and raw material inputs. In areas where specific

development types are concentrated or clustered, this may lead to minor negative impacts, given the demands for natural resources, in particular water requirements. In mitigation, the requirement for the reuse and recycling of materials (particularly where development occurs adjacent to existing or decommissioned facilities) is promoted by EN-1 through Environmental Statements.

3.4.2. No NPS

If there is no NPS, there is likely to be greater uncertainty about the outcome of proposals to develop new energy infrastructure. This may discourage energy companies from putting forward proposals and lead to less or at least slower deployment of new energy infrastructure. This would have an adverse effect on energy security.

3.4.3. Alternative A1 – More emphasis on a low cost of energy

The effect of this alternative on the security of energy supply will depend to a large extent on the policy changes that are made to increase the emphasis on low cost energy. Policy changes that increase reliance on fossil fuel generation could have an adverse effect on energy security. Similarly, policy changes that reduce the diversity of energy generation by for example excluding certain energy developments like new nuclear power stations, would be likely to have an adverse effect on security of supply.

Policy variations that seek to reduce energy costs by relaxing development control policies or reducing the requirements for mitigation are not expected to have any direct effect on the security of energy supply, because although relaxation of planning policies could in theory lead to more consents being granted, even if this happened, one would not expect industry responding to market signals and relevant Government interventions actually to build significantly more capacity than it considers is commercially justified having regard to all relevant factors in and affecting the market.

3.4.4. Alternative A3 – More emphasis on reduction in greenhouse gas emissions

The point of setting development policies which lay more emphasis on greenhouse gas emissions reduction would be to encourage the more rapid development of those technologies covered by the NPSs which produce zero or low carbon electricity. At present, that means renewables, particularly wind power, and nuclear power stations. In the future, it is hoped that CCS will also play a part. Some of these technologies, such as CCS, are innovative and untried on a large scale. Although other low carbon technologies, for example wind power and nuclear power, are proven, Government (supported by the views of the Committee on Climate Change) considers it is very doubtful whether, in practical terms, it is likely that, over the next ten years or so (i.e. over the likely lifetime of the current batch of energy NPSs, and quite possibly, of their immediate successors), they will be developed significantly more quickly, or on a significantly larger scale, than is already envisaged by the NPSs. Thus it is doubtful whether the purpose behind the adoption of such a reasonable alternative (faster uptake of low or zero carbon large-scale generating infrastructure than would occur under the existing NPS policies) could be achieved in any event.

3.4.5. Alternative A4 – More emphasis on reducing other environmental impacts

The implication of this alternative for the mix of energy generating technologies is uncertain as noted previously and so the effect on security of energy supply is difficult to assess. It is possible that this alternative could slow the process of identifying and approving developments that satisfy the more stringent environmental requirements. As a result, the deployment of new capacity might be delayed with an adverse effect on security of supply, at least in the short term.

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
Security of Energy Supply		**-?**	**-**	**-**	**-**

3.5. Health and Well-being

3.5.1. Overarching NPS for Energy

Under this SD theme we have considered the effects on noise, air quality, health and well-being and equality. Energy production in its various forms has the potential to impact on health and well being in the short, medium and long term. The appraisals have identified the potential for negative effects on noise and air quality. In areas where development is concentrated or clustered, there is the potential for cumulative negative effects. However, these effects are typically localised and some are limited to the construction phases of development. Noise generated as a result of energy infrastructure development can generally be mitigated through the design and planning process and is not considered significant in the short, medium or long term. Air quality is unlikely to be a significant issue for the majority of energy infrastructure types principally due to the relatively low level of air pollutant emissions during operation, although the significance of site-specific factors, such as transport routes and proximity to residential housing, will be dealt with during the project assessments.

The technology-specific NPSs include or refer to a range of mitigation measures and regulatory requirements to ensure that the health and well-being of resident and working populations are protected. Potential longer term negative effects, related, for example, to radioactivity or electromagnetic field exposure, are not considered by the AoSs to be significant when mitigation measures have been taken into account.

Significant indirect positive effects for health and well being are identified as a result of EN-1 implementation because of improved employment opportunities and the predicted, enhanced economic conditions arising from investment in energy infrastructure. These positive effects have the potential to be cumulative in the long term from improved vibrancy in the energy industry sector.

Enabling the faster development of energy infrastructure to meet the energy demands of the UK has the potential for positive effects on equality through ensuring energy security and affordability. Indirect positive effects may also arise as a result of enhanced economic benefits and increased employment that could occur as a result of the suite of Energy NPSs. These effects are likely to be of most significance in the medium to long term once new energy infrastructure is operational.

3.5.2. No NPS

The effects of this option on health and well-being are likely to be similar to the scenario with EN-1. However, the increased uncertainty resulting from No NPS could delay development of energy infrastructure meaning that the generally beneficial effects of EN-1 on health and well-being would be delayed.

3.5.3. Alternative A1 – More emphasis on a low cost of energy

The main effect of this alternative on health and well-being is likely to be the beneficial effect of increasing the availability of more affordable, lower cost energy. This should be of benefit to domestic consumers, potentially reducing the numbers of people suffering "fuel poverty" with beneficial health effects by, for example, making winter heating of homes more affordable. These benefits will be most marked for groups such as low-income families and the elderly and will encourage equality and more sustainable communities. Greater availability of low cost energy should also be of benefit to industry and if this is reflected in increased employment and higher incomes this would also contribute to improvements in health and well-being.

A concern with this alternative is that pressure to reduce energy costs could result in a lowering of health and safety standards during construction and operation of new energy infrastructure, with risks to the health and well-being of the workforce associated with these developments. However, this would be mitigated by the regulatory requirements to maintain health and safety standards in the workplace.

3.5.4. Alternative A3 – More emphasis on reduction in greenhouse gas emissions

Changes in the technology mix that might result from policies to reduce greenhouse gas emissions may have a minor effect on health and well-being, although there is generally little difference in the effects on these objectives between technologies and the overall effect is uncertain. Examples of changes in the technology mix that could have minor effects on health and well-being include:

- Increased local disturbance from noise if onshore wind is increased;
- Reduced disturbance from traffic and reduced accident risk if transport of fossil fuel is reduced, (but conversely, transport might be increased by greater use of waste to energy or biomass plants)

However, these effects would be local and are not considered to be strategically significant.

A possibly significant factor may be the effect that greater emphasis on reducing greenhouse gas emissions has on energy costs. Whether or not low carbon forms of generation are more expensive than, for example, CCGT plant at any given time and over time will depend on a range of factors including carbon and fuel prices. But if energy costs to consumers are significantly increased as a result of adopting this reasonable alternative, as is possible on some economic scenarios, this could have an adverse effect on health and well-being through the linkages described for alternative A1 above acting in the opposite direction. In the longer term, policies that

contribute to reductions in greenhouse gas emissions and mitigation of climate change are expected to be beneficial to health and well-being.

Recent research has suggested that climate change may be regarded as the biggest global health threat of the 21st century[12] so that the mitigation of climate change by increased deployment of low-carbon technologies is likely to have a beneficial effect on health and well-being. Studies have also shown[13] that the adoption of appropriate mitigation strategies for climate change may have additional, beneficial effects on human health, for example by reducing emissions of airborne particles.

3.5.5. Alternative A4 – More emphasis on reducing other environmental impacts

A greater emphasis on policies to reduce environmental impacts would be beneficial to human health and well-being where the policies reduce particular impacts that affect human health and well-being. For example, where environmental controls reduce adverse effects on noise, air quality and water quality, these will indirectly be of benefit to health and well-being. Policies that are more prescriptive as to the siting of new energy infrastructure may reduce anxiety in some areas by ruling out development in certain locations, although concern may be raised in other areas that are identified as suitable for development. On balance, giving greater certainty to the location of new development and providing enhanced environmental protection should reduce public anxiety which would benefit mental health to some extent.

If the effect of increased emphasis on reducing environmental impacts were to be an increase in the cost of energy, this could negate any other benefits of this alternative to health and well-being for the reasons given for Alternative A3.

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
Health & Well-Being		**0**	**+**	**+/-**	**+/-**

3.6. The Economy

3.6.1. Overarching NPS for Energy

EN-1 provides a framework to facilitate and support the development of a mix of low carbon energy sources to meet the UK's future energy needs. Short to medium term positive effects are likely to be significant for the economy and employment across the range of technology types during construction and operation phases given the scale of development required/proposed. These benefits should accrue at local and regional levels and there may be positive cumulative effects nationally for the energy and associated sectors overall, from increased investment in infrastructure. These effects may also be particularly significant in the context of current (2010) economic

[12] Costello A, Abbas M, Allen A, et al. Lancet and University College London Institute for Global Health Commission: managing the health effects of climate change. Lancet 2009; **373**: 1693-1733

[13] Haines A, McMichael AJ, Smith KR, Roberts I, Woodcock J, Markyanda A et al. Public health benefits of strategies to reduce greenhouse-gas emissions: overview and implications for policy makers. The Lancet 2009;347(9707):2104-14.

conditions, and there are opportunities for the development and establishment of new industries, particularly in the renewables sector.

The AoSs of EN-2-6 identify the potential for minor negative effects in the short to medium term where the impacts arising from new energy infrastructure are detrimental to existing industries (e.g. tourism, through a loss of amenity/negative landscape impacts/lower property values, and agriculture/fisheries/shipping through direct impacts on natural resources from direct land loss or windfarm exclusion zones). The overall long term impacts for EN-1 are assessed as positive for the economy as plan implementation will support the creation of jobs and skills development across the energy sector.

3.6.2. No NPS

Without EN-1, it is expected that new energy infrastructure would still be built although there is greater uncertainty about the form this infrastructure might take. The effect of No NPS on the economy is, therefore, expected to be similar to EN-1, unless uncertainty becomes so great as to delay the deployment of new capacity. In this case, there could be adverse effects on the economy due to shortages or higher costs of energy.

3.6.3. Alternative A1 – More emphasis on a low cost of energy

Lower cost energy is likely to produce benefits to the wider economy by increasing the competitiveness of British industry and encouraging inward investment, although these will not necessarily be greater than the potential long-term benefits which could accrue to the UK if following the policies in EN-1 contributes towards UK firms becoming significant players in the green technology market.

Within the energy industry, the technology sectors that will benefit from creation of employment opportunities and development of skills will be affected by any changes in the mix of energy technologies deployed as a result of this alternative. Effects will be positive in sectors that may receive greater emphasis such as nuclear power and onshore wind. If there is relatively less investment in technologies such as CCS and offshore wind, there will be less demand to develop skills in these areas. This may be a disbenefit if it means that UK industry gains less experience in technology areas that may have a major international market in the longer term.

3.6.4. Alternative A3 – More emphasis on reduction in greenhouse gas emissions

The economic modelling for the 2050 Pathways Analysis indicates the importance of fossil fuel price assumptions in determining the relative costs of low carbon and high carbon electricity generation. If fossil fuel prices and carbon prices were to remain low, deployment of low carbon technologies would be expected to be more costly than, say, fossil fuel generating capacity. Under higher fossil fuel price assumptions, the low carbon pathways are less costly than the high carbon ones. The 2050 costs analysis examines physical resource costs and cannot be taken as an indication of what electricity bills will be. If electricity prices were to rise, this would be expected to have an adverse effect on the economy by reducing the competitiveness of British

industry and discouraging inward investment. On the other hand, given the inherent uncertainty in predicting the likely price of fossil fuels over the next 40 years, it is significant that the low carbon pathways reduce our exposure to the risk of high fossil fuel prices.

On the positive side, this alternative should provide the greatest opportunity to increase jobs and skills in low carbon technologies that may subsequently be employed in export markets. However, this alternative will also place the greatest demand on this type of expertise and will highlight any skills shortages in areas of emerging technologies.

3.6.5. Alternative A4 – More emphasis on reducing other environmental impacts

Two opposing effects could be produced by this alternative. If more stringent environmental requirements have the effect of increasing energy costs, this would have an adverse effect on economic activity. On the other hand, if increased restrictions on siting and more extensive mitigation measures drive innovation in environmental protection technologies, skills developed in these aspects could be applied to other markets in the UK or overseas, with beneficial economic effects.

The geographical spread of energy infrastructure projects may be more limited if fewer areas are considered suitable for these types of development. This possible concentration of energy infrastructure in certain areas might lead to increased economic benefits in the areas approved for development. At the same time, the restriction of development to more limited areas may exacerbate local skill shortages and increase pressure in these areas on infrastructure such as housing, schools and hospitals, which is needed to support the increased workforce.

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
The Economy		**0?**	**+**	**+/-**	**+/-**

3.7. The Built Environment

3.7.1. Overarching NPS for Energy

Under this SD theme we have considered the effects on Archaeology and Cultural Heritage, Traffic and Transport and Flood Risk and Coastal Change. Enabling the development of energy infrastructure has the potential for direct (disturbance and loss) and indirect (impacts to setting/landscape) negative effects on heritage assets. In areas where development is concentrated or clustered there is the potential for these effects to be cumulative. The significance of these effects is highly dependent on the location and scale of development relative to the location and sensitivity of heritage assets. The appraisal indicates that the majority of direct negative effects on heritage assets from energy infrastructure developments can be avoided, reduced and mitigated through careful design and planning. There is the potential for minor negative effects on heritage assets as a result of the potential impacts on their

settings. As direct effects are highly dependent on the location of development, there is some uncertainty as to their significance.

Negative effects on traffic and transport will predominantly be during construction and decommissioning of energy infrastructure and will tend to be temporary and localised. In areas where there is a concentration or cluster of energy infrastructure there is the potential for cumulative negative effects on traffic and transport. Construction and decommissioning effects on traffic and transport can usually be mitigated through employing appropriate traffic management measures. Any proposals for the development of energy infrastructure should include consideration of the effects on traffic and transport during the production of an Environmental Statement and the mitigation measures outlined EN-1 should help to reduce negative effects of energy infrastructure on civilian and military aviation interests. It is therefore appraised that enabling the development of energy infrastructure has no overall strategic effect in the short, medium or long term.

As noted under the Climate Change theme, EN-1 is likely to reduce climate change effects, which will be indirectly beneficial to flood risk. On the other hand, EN-1 also contemplates the development of energy technologies that require to be located near to coasts, estuaries or rivers due to their water resource needs. These locations are flood prone and any new developments have the potential to contribute to flood risk (for example by increased run-off from new impermeable areas) as well as being subject to flood risk. Minor negative effects are possible in the short term and depending on the scale and extent of new developments may lead to negative cumulative effects where significant developments are in proximity to one another. However, the effects both to and from flood risk should be managed through the design, planning and regulatory processes in accordance with requirements set by the EA. There is increasing uncertainty over the long term effects of developments given wider contextual issues (climate change, land use, housing/transport network development etc).

3.7.2. No NPS

Individual developments under the No NPS option would have similar effects on the built environment to those produced with an Overarching NPS for Energy, EN-1. A benefit of EN-1 is that it provides an opportunity to assess the strategic effects of energy policy and provide programme level measures to protect the built environment. There is a risk that individual developments brought forward without an NPS could, in combination, have unintended effects because of the lack of a strategic framework for consenting large-scale energy infrastructure.

3.7.3. Alternative A1 – More emphasis on a low cost of energy

If lower energy costs are achieved through a relaxation of environmental protection requirements or less stringent criteria for site selection, this would be likely to have an adverse effect on the built environment. Provided that all statutory protections of the built environment are complied with, the risk of adverse effects will fall predominantly on features of the built environment that do not have statutory protection, so that their only specific protection is the policies which expressly mention them in the NPSs.

Thus, for example, the settings of heritage assets that, unlike the features themselves, may not be legally protected, could be more at risk of adverse effects.

3.7.4. Alternative A3 – More emphasis on reduction in greenhouse gas emissions

There is little evidence to suggest that increased emphasis on the development of low carbon infrastructure will have a systematic effect, either adverse or beneficial, on the built environment. However, specific policies may generate effects on certain aspects. For example, more development of onshore wind could have a cumulative effect on cultural heritage interests in upland and moorland sites if new infrastructure is concentrated in these areas. On the other hand, more emphasis on nuclear power, if mainly developed at sites of existing power stations, would be more likely to limit effects to areas that have already been affected by previous power station development.

3.7.5. Alternative A4 – More emphasis on reducing other environmental impacts

If the policy changes included in this alternative cover the built environment, this alternative will have a beneficial effect on the built environment. For example, adoption of more stringent policies on developing in flood risk areas would be of benefit to the built environment.

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
The Built Environment		**0?**	**-**	**0**	**+**

3.8. The Natural Environment

3.8.1. Overarching NPS for Energy

Under this SD theme we have considered the effects on Ecology (Flora & Fauna), Water Quality and Resources, Landscape, Townscape & Visual and Soils & Geology. The appraisals for EN-1 have identified the potential for significant, cumulative effects on biodiversity, including potentially adverse effects on European designated sites. Proposed mitigations, set out in EN-1-6, will be necessary to avoid or reduce any short-term adverse effects and ensure that ecological networks and ecosystem functionality are maintained. The effects on flora and fauna of implementing the policy set out in EN-1 are more uncertain in the medium and long term and will depend on location specific factors and the effectiveness of mitigation measures.

There is the potential for adverse effects on water quality and resources particularly in the short term. These effects may be cumulative where infrastructure enabled through EN-1 is concentrated or clustered, and are potentially significant for the marine/estuarine environment. The strict application of pollution control measures and the consenting regime will be necessary to ensure that adverse effects are adequately mitigated. The effects of implementing the policy set out in EN-1 are appraised as neutral in the medium to long term where water usage and discharges are managed in accordance with good practice. Long term uncertainties of the effects

on the water environment reflect the mix of technologies enabled through EN-1 including decommissioning uncertainties. These uncertainties will be greater where the proportion of energy demand is met with technologies that require large amounts of cooling water (for example EN-2 and EN-6).

The areas that are likely to host new energy infrastructure of a large scale (for example coastal locations), currently support a high level of landscape designations. The appraisal for EN-1 has identified the likelihood of significant negative effects for landscape, townscape and visual receptors as a result of the plan implementation.

The development of a mix of generating technologies will deliver large scale and, in some cases, tall structures, in both existing industrial locations and in new greenfield/offshore/coastal settings. Many of these structures are likely to be in predominantly rural, remote areas, including areas of high landscape value. The mitigation of small scale structures through screening, planting and careful siting may be possible and is required by EN-1. However, the negative visual impacts of new developments are likely to be considerable for foreseeable timescales due to the permanence and scale of structures enabled by the implementation of EN-1.

The appraisal for EN-1 has identified that in the short term the construction of energy infrastructure has the potential for direct negative effects on soils and geology as a result of disturbance and loss. The direct effects are likely to be limited to the footprint of the development and the significance will be dependent on location. In the medium term, indirect negative effects on soil could arise during operation of energy infrastructure as a result of increased pollution risk, which can lead to the contamination of soils. The effects in the long term are uncertain as there is the potential for the remediation of contaminated land. Mitigation measures should help to minimise any negative effects.

3.8.2. No NPS

Individual developments under the No NPS option would have similar effects on the natural environment to those produced with an Overarching NPS for Energy, EN-1. A benefit of EN-1 is that it provides an opportunity to assess the strategic effects of energy policy and provide programme level measures to protect the natural environment. There is a risk that individual developments brought forward without an NPS could, in combination, have unintended effects because of the lack of a strategic energy framework.

3.8.3. Alternative A1 – More emphasis on a low cost of energy

If lower energy costs are achieved through a relaxation of environmental protection requirements or less stringent criteria for site selection, this would be likely to have an adverse effect on the natural environment. Provided that all statutory protections of the natural environment are complied with, the risk of adverse effects will fall predominantly on those features that do not have this level of protection, so that their only specific protection is the policies which expressly mention them in the NPSs. For example, sites of local nature conservation interest that do not receive the same level of protection as internationally or nationally designated sites, could be more at risk of adverse effects than more strongly protected sites. Although this would not be

considered a strategically significant effect for individual sites, the cumulative effect of this alternative on areas of lesser environmental interest could become significant, particularly if particular locations (for example coastal or estuarine sites) are preferred for energy infrastructure projects.

3.8.4. Alternative A3 – More emphasis on reduction in greenhouse gas emissions

With the exception of nuclear power, low-carbon technologies tend to involve more extensive land use than conventional power generation. Thus the area of land affected by energy infrastructure is greater for wind power and biomass to energy plants (if the land area used to grow the biomass is also considered) than for thermal power plants of equivalent capacity. In the case of offshore wind power, the effects will be greatest in marine areas and some impacts, such as visual impact, will be mitigated by the siting. Nevertheless, the overall effect of more emphasis on technolgies that reduce greenhouse gas emissions is likely to be that proportionately more land is affected by energy infrastructure.

This means that while more emphasis on reduction in greenhouse gases may have a positive effect on certain environmental attributes, by contributing to the mitigation of climate change, there will also be potentially negative impacts on other environmental attributes such as visual impact and direct habitat loss due to the additional land area affected. It is not clear on the information currently available where the balance of impacts would lie, but the possibility that this alternative could have greater impacts on the natural environment than EN-1 cannot be ruled out.

3.8.5. Alternative A4 – More emphasis on reducing other environmental impacts

If the policy changes included in this alternative provide additional protection to the natural environment, this alternative will have a beneficial effect on the natural environment. For example, the adoption of more stringent policies on development in or adjacent to AONBs would be of benefit to the natural environment.

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
The Natural Environment		**0?**	**-**	**+/-**	**+**

3.8.6. Summary Findings and Preferred Approach for the NPS

The findings of the assessment of alternatives are summarised on Table 3.2. This shows how the No NPS option and Alternatives A1, A3 and A4 were assessed as affecting the headline NPS topics compared to EN-1. The detailed assessment of EN-1, appraising the absolute effects of the Plan on the AoS objectives is presented in Section 4 of this report.

Table 3.2 Summary of alternatives assessment

Headline SD themes	EN-1	No NPS	Alternative A1	Alternative A3	Alternative A4
Climate Change		**-?**	**-**	**+**	**0**
Security of Energy Supply		**-?**	**-**	**-**	**-**
Health & Well-Being		**0**	**+**	**+/-**	**+/-**
The Economy		**0?**	**+**	**+/-**	**+/-**
The Built Environment		**0?**	**-**	**0**	**+**
The Natural Environment		**0?**	**-**	**+/-**	**+**

In comparison with EN-1, the No NPS option and the alternatives are assessed as having more adverse effects under some headings and less adverse or similar effects under other SD themes. The key differences between the different options and the plan are highlighted below.

The **No NPS option** may have much the same effect as EN-1, but would increase planning uncertainty and may delay development of new energy infrastructure projects. The Planning Act regime is designed to work with NPSs in place, and is always likely to work more quickly where NPSs provide a basis for applications and decision-making. Although there are other forms of planning guidance, they are less precisely targeted on large-scale energy infrastructure, and their application to Planning Act cases is more likely to give rise to disputes. The uncertainty may also discourage energy companies from putting forward proposals for energy developments, leading to smaller scale or slower deployment of new energy infrastructure, with adverse effects on security of supply. Overall, compared with EN-1, this makes No NPS a less good way of achieving the underlying energy policy objectives, with no countervailing benefits to recommend it. It has therefore been rejected.

Alternative A1, placing more emphasis on a low cost of energy, would:

- be likely to have an adverse effect on security of supply if it resulted in greater reliance on imports of fossil fuel or reduced the diversity of energy types;
- indirectly increase carbon emissions if lower energy costs stimulated activity in the wider economy;
- have beneficial effects on the economy and indirectly on human health and well-being because of the stimulus of lower energy costs;

- be likely to have adverse effects on features of the built and natural environment that are not protected by statutory designations. Although these effects will be local, their cumulative effect over a programme of energy development might be significant.

Although Alternative A1 compares favourably with EN-1 on the SD themes of Health and Well-being and the Economy, these are themes in respect of which the evaluation of EN-1 indicates few adverse effects. More importantly, Alternative A1 compares unfavourably with it in relation to those SD themes which are relevant to achievement of underlying energy policy objectives. It has therefore been rejected.

Alternative A3, placing more emphasis on a reduction in greenhouse gas emissions, would, by definition, be beneficial to the climate change objective. There is also the possibility that it may compare favourably with EN-1 in relation to the Health and Well-Being and Economy SD themes, but as already noted in connection with Alternative A1, these are themes in respect of which the evaluation of EN-1 indicates few adverse effects.

Whilst in principle Alternative A3 would be an attractive option, as noted in paragraph 3.4.4 above, it seems unlikely that it would be possible to give practical effect to such an alternative in the next ten years or so without running at least some risk either of greater negative impacts than EN-1 on security of supply or the natural environment. The former would arise if the alternative NPS policies were built on assumptions either that unproven technologies (e.g. CCS) will be proven (which subsequently fail to be proven) or that proven technologies (e.g. onshore wind) can be developed at a pace or on a scale which turns out not to be feasible (e.g. significantly beyond the rate needed to achieve our 2020 targets). Accordingly, Alternative A3 has not been preferred to EN-1 at this stage, although it represents options which should be kept under review for the future (e.g. once the rate of progress towards widespread availability of CCS becomes clear).

Alternative A4, placing more emphasis on reducing other environmental impacts, would:

- be beneficial for the natural and built environment;

- present risks to energy security because more stringent environmental requirements could delay the approval and development of new energy projects.

Security of supply is an SD theme which is essential to the achievement of the underlying energy policy objectives. The fact that Alternative A4 performs less well in this respect than EN-1 is therefore an important consideration. The natural and built environment SD themes cover six AoS objectives between them (see section 2.5). The evaluation of EN-1 is only significantly or unambiguously negative against one such objective – Landscape, Townscape and Visual Effects (see Section 4).

Given that EN-1 already contains policies which severely limit the prospects for development of large-scale energy infrastructure in the most attractive Landscapes and Townscapes, any tightening of development consent policies in EN-1 to make it harder for energy infrastructure to be consented which would have adverse landscape or townscape effects would be likely to make it significantly more difficult to gain

consent for a range of large-scale energy infrastructure projects in any location – otherwise it would have no purpose – and would, accordingly, carry risks for security of supply, given the levels of need indicated by Part 3 of EN-1. Whilst recognising that, in circumstances where the need for new large-scale energy infrastructure was less pressing than it is at present, Alternative A4 might be an attractive option, Government is not prepared to risk adverse effects on security of supply (and consequently potentially on human health and the economy) in order to avoid potential plan-level adverse environmental impacts which are primarily about human appreciation of the environment rather than impacts on non-human species or the ecosystem generally, in particular because any significant adverse impacts on security of supply are likely to be more widely experienced (in the form of power outages or higher prices) than adverse Landscape, Townscape and Visual Effects (which, although they will undoubtedly be keenly felt by some, will generally be confined to the immediate surroundings of consented infrastructure). Accordingly Alternative A4 is not to be preferred to EN-1, at least until such time as it becomes clear that levels of need for new large-scale energy infrastructure are very much lower than Government currently anticipates that they will be for the foreseeable future.

For all these reasons and in particular because all the alternatives are assessed as performing less well than EN-1 against one or more of the criteria for Climate change or Security of Energy Supply that are fundamental objectives of the plan, the Government's preferred option is to take forward the Energy NPS EN-1 and the technology-specific NPSs EN-2 to EN-6. It is also relevant that – as the 2050 Pathways Analysis shows – the outstanding feature of the next 40 years in energy markets is multiple uncertainties. Ultimately, all development control policies for large-scale energy infrastructure are predicated on assumptions about future directions in the market and possible interventions in the market. Not the least of the advantages of the policies in the NPSs is that at a point where it is clear that there is no one "right" or "best" pathway to 2050, they are designed to facilitate a range of possible outcomes and are not too heavily dependent on any particular view of the future.

The assessments of technology-specific alternatives to EN-2 to EN-6 are given in the AoS reports for these NPSs

4. Findings of Appraisal of Sustainability of the draft NPS

4.1. Introduction

The findings of the appraisal of sustainability of the draft energy NPS are set out in this section of the report according to the 14 topics agreed as being important to the energy NPSs. 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. Recommendations from the previous AoS and this AoS have informed the development of the draft NPS, particularly in Sections 4 and 5 of the Overarching NPS for Energy where principles for assessing energy infrastructure proposals together with generic impacts and mitigation suggestions are set out for the IPC to consider in their decision making on applications for development consent. Technology specific effects are reported in detail in AoSs 2-6; appraisal findings reported here relate to likely generic effects and the overall effects for the NPS as a national policy statement.

4.2. Climate Change

AoS Objective	Assessment (by timescale)		
	S	M	L
1. Climate Change: To minimise detrimental effects on the climate from greenhouse gases and ozone depleting substances and maximise resilience to climate change.	0 ?	+ ?	+ ?

EN-1 seeks to enable the development of energy infrastructure in the UK in order to meet growing energy demands primarily through the generation of electricity from low carbon energy sources. Potential generic effects of EN-1 implementation include:

- minor positive effects for climate change through the accelerated consent for low carbon projects with the potential for cumulative positive effects in the medium to long term;
- minor positive effects in the medium and long term for climate change adaptation objectives through the requirements in EN-1 (EN-2-6) for adaptation and resilience measures in all new energy sector developments.

EN-1 does not set targets or quotas for energy generating types but aims to enable a mix of technologies to progress lower carbon energy sources. Therefore the progress towards an energy sector that produces less greenhouse gas emissions will depend on the speed of technology development (particularly for new technologies) and deployment. The AoS of EN-2 notes the potential for substantial reductions (up to

90%) in CO_2 emissions from individual fossil fuel power stations using Carbon Capture and Storage as compared with unabated fossil fuel plants. However, the technology remains unproven and therefore in the short to medium term contributions to Climate Change objective will be neutral. In the longer term positive effects are possible when the technology is operational but there is a significant degree of uncertainty.

EN-3 seeks to enable renewable technologies (wind, biomass) and if implemented would make significant contributions to objectives to reduce the carbon throughput of energy infrastructure. The effects would be positive and should accrue in the short, medium and longer term supported by the enabling policies set out in EN-1. The AoS of EN-3 identifies that predicted changes to climate (e.g. high winds, drought conditions) may influence the viability of both wind and biomass technologies and the requirement to plan for resilience is set out in EN-1.

The AoS of EN-4 appraises that the expansion of the oil and gas network will not in itself progress climate change objectives as it will continue to support a reliance on fossil fuel based energy production. The ongoing reliance on the oil and gas network will require resilience measures for new developments as set out in EN-4 and EN-1. EN-5 is appraised as providing indirect positive contributions to climate change AoS objectives by providing the transmission infrastructure that will be necessary for new lower carbon technology energy sources. Networks infrastructure can exacerbate flooding and coastal changes, for example by affecting soils and water and increasing hard-standing areas. EN-5 and EN-1 require consideration of these issues alongside resilience measures for new development.

The AoS of EN-6 appraised that as nuclear power is a low carbon energy source, the implementation of EN-6 would reduce contribution to greenhouse gas emissions and result in positive effects against the climate change AoS objective. Nuclear power stations are however expected to be located in areas subject to pressures from climate change (because the sites designated in EN-6 are in coastal areas) and therefore resilience and adaptation measures set out in EN-6 and EN-1 will be an essential part of development.

4.2.1. Summary

One of the main purposes of EN-1 is to facilitate the development of lower and low carbon technologies. It therefore has the potential for positive, cumulative effects in the medium and longer term for the AoS objective seeking to reduce the emission of carbon dioxide and other greenhouse gases. The requirements set out in EN-1-6 for resilience and mitigation measures in all new developments, is also positive for those objectives seeking to ensure that new technologies are appropriately adapted to forecast changes. However, the proportion of low carbon technologies meeting energy needs in the short, medium and longer term is not known, so that the contributions to climate change objectives whilst potentially positive are uncertain.

4.3. Ecology (Flora and Fauna)

AoS Objective	Assessment (by timescale)		
	S	M	L
2. Ecology (Flora and Fauna): To protect and enhance protected habitats, species, valuable ecological networks and ecosystem functionality.	-	- ?	- ?

The scope and scale of the development enabled by the plan has the potential for a number of generic impacts on ecology which are applicable across the different types of energy infrastructure development. They include:

- Loss of habitat (and species) – direct loss from land take or the abstraction of water resources, and indirect or temporary losses, for example during construction phases.
- Disturbance effects on habitats and species - through noise, light, visual and dust pollution arising from construction, operation and decommissioning activities.
- Pollution impacts - arising from emissions to water (including thermal impacts), ground and air, leading to reduced water soil and air quality.
- Habitat fragmentation/severance/isolation - through development (in particular from linear features) preventing migration/foraging leading to population isolation and genetic weakness.
- Obstructions – from introduced/tall structures presenting obstacles to migration and flight paths (e.g. bats and birds), leading to injury/death.
- Changes to microclimates from development – resulting in alterations to wind patterns/speeds, shading and shadow effects.
- Habitat integrity and connectivity improvements - resulting from management, restoration and enhancements activities.

The potential effects of EN-1 on ecology, including the significance of those effects, are dependent on a number of factors that include the location of development and the sensitivity of the receiving environment.

The development of a mix of major generating infrastructure enabled by EN-1, has the potential for negative effects on ecology of local, regional and European importance in the short term. These effects may be cumulative where developments are concentrated or clustered, (for example in the North West of England) as identified in the AoSs of EN-6 and EN-2 (where the specific requirements for cooling water favour coastal locations). The AoS of EN-3 also describes possible negative effects for ecology, both onshore and offshore, that may arise from the development of wind farms and associated transmission requirements (EN-5) in remote locations,

where existing development is limited. Identified short term negative effects (e.g. AoS EN-4) are possible in marine locations and cumulative effects could occur where sensitive sites are subject to wider developments.

The AoSs of EN-2-6 indicate that the majority of adverse effects on ecology as a result of energy infrastructure development can 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.

EN-1 requires that all detailed aspects of ecological management are addressed alongside wider effects (e.g. on landscape) during the project level EIA, and HRA where necessary, of proposed energy infrastructure developments. It goes beyond the protection provided for biodiversity interests by statutory requirements by requiring developers to fulfil additional requirements where a proposed development has an impact on biodiversity interests which are not subject to statutory protection. EN-2-6 also outline technology specific mitigation measures that will act to reduce the risk of the identified adverse effects on ecology. These required measures include the need for developments to demonstrate how opportunities to conserve, enhance and, where necessary, restore biodiversity will be met.

4.3.1. Summary

There is potential for significant, cumulative effects on biodiversity, including adverse effects on European designated sites, which are appraised as being most significant in the short term. Proposed mitigations, set out in EN-1-6, will be necessary to address any adverse effects and ensure that ecological networks and ecosystem functionality is maintained. The effects on flora and fauna of implementing the policy set out in EN-1 are more uncertain in the medium and long term and will depend on location specific factors and the effectiveness of mitigation measures in implementation.

4.4. Resources and Raw Materials

AoS Objective	Assessment (by timescale)			
	S	M	L	
3. Resources and Raw Materials: To promote the sustainable use of resources and natural assets and to deliver secure, clean and affordable energy.	-	0	0	+

The scope and scale of the development enabled by the plan has the potential for a number of generic impacts and effects on the AoS objective for resources and raw materials, which are applicable across the different types of energy infrastructure development. They include:

- short term, minor negative effects from the use of natural resources (water, soil, minerals, metals) for construction and operational activities;

- the generation of a range of waste products (ash, general industrial waste, radioactive waste) during construction, operation and decommissioning with some short, medium long term negative effects;

- long term positive effects through the provision of secure, clean, affordable energy.

EN-1 does not set targets or quotas for energy generating types but aims to enable a mix of technologies to progress lower carbon energy sources. All new technological developments require the use of material and natural resources in their development life cycle. Requirements vary, however some technologies are particularly water intensive. The AoSs of EN-2 and EN-6 identify high level of water requirements across the construction, operation and decommissioning phases with negative effects that will require mitigation measures set out (EN-2 Fossil Fuels, EN-6 Nuclear) in the short, medium and long term. These negative effects may be cumulative where clusters of single or mixed technology development occur, particularly in sensitive coastal locations or areas where water supply is limited. Other technologies have significantly lower resource requirements, beyond the construction phase e.g. renewable technologies (EN-3), effects from these technologies against this AoS objective are likely to neutral in the medium to long term.

Waste generation is dependent on technology type. The AoS of EN-3 notes the potential for minor positive effects through the use of waste as a resource and the potential reduction of waste products to landfill. Waste production and management is a significant issue noted in the AoS of EN-6 which outlines measures to ensure the safe storage of waste prior to disposal in secure facilities. The promotion of mixed technologies will potentially improve security of supply and adaptability within the energy market of the future.

4.4.1. Summary

The construction and operation of new generating capacity will require a range of natural resource and raw material inputs in the short and longer term (e.g. for metals and water respectively). This may lead to minor negative impacts in areas where specific development types are concentrated or clustered (EN-2, EN-6). In mitigation, the requirement for the reuse and recycling of materials (particularly where development occurs adjacent to existing or decommissioned facilities) is promoted by EN-1 through Environmental Statements.

Waste generation depends on technology type with minor negative effects possible for construction and decommissioning for large scale developments (EN-2, EN-6). Overall the long term effects of EN-1 against this objective are likely to be neutral with some minor positive effects.

4.5. Economy and Skills

AoS Objective	Assessment (by timescale)			
	S		M	L
4. Economy and Skills: To promote a strong and stable economy with opportunities for all.	-	+ +	+	+

The scope and scale of the development enabled by the plan has the potential for a number of generic impacts and effects on the AoS objective for economy and skills, which are applicable across the different types of energy infrastructure development. They include:

- New opportunities for employment in the short term during construction and in the medium and longer term during the operation and decommissioning stages of energy infrastructure developments.
- Long terms positive effects associated with skills and training opportunities in association with new and enhanced energy infrastructure developments.
- Improved vitality and competitiveness of the UK energy industry overall through providing greater clarity, with benefits for investment certainty and inward investment.
- Potential positive (e.g. tourism) and negative (e.g. tourism, agriculture) impacts for local industries and economies where new and/or enhanced energy infrastructure developments occur.

The potential effects of EN-1 on the AoS objective for economy and skills are positive in the short, medium and long term. Enabling a mix of generating technologies provides strong support for the diversification of the economy and has the potential to improve the national skills base in both existing (EN-6, Nuclear) and emergent (EN-3 renewables, EN-2, carbon capture and storage) technologies. The AoS for EN-3 notes in particular the potential cumulative positive effects of new market developments for emergent technologies such as biomass, which may stimulate new investment opportunities.

Mixed technology development enabled through EN-1 progresses the EN-1 AoS objective to promote more sustainable growth in UK industry by potentially providing for a broader base of energy provision. Minor positive effects are possible in the short, medium and longer term, but depend on the balance of energy types that emerge in response to market forces and other relevant Government interventions.

The AoSs for EN-3, 4, 5 and 6 note that minor negative effects on existing industries may occur through infrastructure development and associated transmission requirements. For example, negative impacts may occur in the agricultural and tourism sectors through the expansion of oil and gas infrastructure and the electricity transmission network (EN-4,5). These effects are likely to be most significant during the construction period and therefore often short term/temporary in nature. EN-1 sets out mitigation measures designed to address the effects of development, and the

overall long term impacts are assessed as positive for the AoS objective as plan implementation will support the creation of jobs and skills development across the energy sector.

4.5.1. Summary

Short to medium term positive effects are likely to be significant for the economy and employment across the range of technology types (EN-2-6) in both new and established industries. These benefits should accrue at local and regional levels and there may be positive cumulative effects nationally. These effects may also be particularly significant in the context of current (2010) economic conditions.

The AoSs of EN-2-6 identify the potential for minor negative effects in the short to medium term where the impacts arising from new energy infrastructure have a detrimental on existing industries (e.g. tourism, through a loss of amenity/negative landscape impacts/lower property values, and agriculture/fisheries/shipping through direct impacts on natural resources from direct land loss or windfarm exclusion zones). However, the overall long term impacts are assessed as positive.

4.6. Flood Risk and Coastal Change

AoS Objective	Assessment (by timescale)		
	S	M	L
5. Flood Risk and Coastal Change: To avoid, reduce and manage flood risk (including coastal flood risk) from all sources and coastal erosion risks by locating infrastructure in lower risk areas and ensuring it is resilient over its lifetime without increasing risks elsewhere.	**- ?**	**0?**	**0?**

With the exception of offshore wind technologies, the scope and scale of technologies development enabled by the plan has the potential for a number of generic impacts on flood risk and coastal change objectives. These include:

- Changes to hydrological flows (surface and ground water) from alterations to land use, including increases in impermeable surfaces (built structures, hard standing etc) may result in negative and more uncertain effects in the short, medium and long term.

- Construction activities, the introduction of water management measures including sustainable drainage systems (positive effects for water management) and the development coastal/river defences may have negative effects in the short term with uncertain effects in the longer term.

EN-1 sets out the measures that developers must undertake to ensure that flood risk and coastal change issues are managed as part of planning, design and development. These mitigation measures apply to all new developments where the potential for flood risk is identified. The AoS of EN-2 notes that mitigation measures will be an essential part of development given the likelihood that new fossil fuel power

stations with CCS technology are located in river, estuary or coastal locations where fluvial or storm surge flooding is a potential risk. The appraisal also notes that developments may also contribute to flood risk where there are existing vulnerabilities. These issues are also identified by the AoS of EN-6. Short term negative impacts arising during construction phases may also lead to medium and longer term uncertainties where alternations to land forms, and hydrological cycles are permanent.

Effects from the development of technologies progressed by EN-3 (renewables) are predominantly neutral, as neither onshore or offshore windfarms contribute to or are at risk from flood events. Biomass developments are appraised as having similar impacts as those identified by the AoSs of EN-2 and 6, although effects will be dependent on specific locations. The AoS of EN-5 does not identify any significant positive or negative effects arising from the development of the transmission infrastructure for flood risk and coastal change AoS objectives.

EN-1 sets out flood risk mitigation measures in line with Environment Agency guidance which all new developments will be required to adhere to in ensuring resilience for the life of the technology. There is uncertainty regarding the long term effects of developments (particularly in sensitive coastal and estuarine locations) given wider contextual issues (climate change, land use, housing/transport network development etc).

4.6.1. Summary

Minor negative effects are possible in the short term as a result of the consenting of a range of technologies with requirements to be located near or adjacent to coasts, estuaries or rivers. Depending on the scale and extent of new developments this may lead to negative cumulative effects where significant developments are locationally clustered.

The medium and long term effects both to and on flood risk should therefore be managed through the design, planning and regulatory measures set by the EA, but the long term effects are uncertain.

4.7. Water Quality and Resources

AoS Objective	Assessment (by timescale)		
	S	M	L
6. Water Quality and Resources: To protect and enhance surface (including coastal) and groundwater quality (including distribution and flow).	- ?	0 ?	0 ?

The scope and scale of the development enabled by the plan has the potential for a number of generic impacts on the water environment (groundwater, inland surface water, transitional waters and coastal waters) which are applicable across the different types of energy infrastructure development. 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.

EN-1 supports the delivery of a mix of technologies, with a range of impacts on the water environment. EN-2 and EN-6 enable technologies with a significant water footprint that extends across the respective infrastructure life cycles. The AoSs of EN-2 and EN-6 identify the potential for adverse effect on the water environment, particularly restricted/estuarine waters, during both the construction (as a result of increased demand and the requirement for discharge and disposal to the water environment during the development and construction phases of new generating infrastructure) and the operation phase that will require specific mitigation to address impacts arising from the abstraction and discharge of cooling water. These effects may be cumulative where infrastructure enabled through EN-1 is concentrated or clustered and are potentially significant for the marine/estuarine environment, e.g. in the Severn Estuary. The appraisals identify that overall, negative effects on the water environment can be reduced through careful planning and design and that significant impacts are capable of mitigation, and will be subject to Environment Agency consenting regimes.

EN-1 supports the ongoing development of oil and gas supply infrastructure (EN-4) alongside the delivery of renewable forms of energy (EN-3). The plan is therefore likely to accelerate developments in the marine environment (e.g. offshore wind, pipeline construction) which may have minor negative effects on water quality, sediment flow/disturbance, as well as increasing the potential for pollution events in the short term. The AoSs of EN-3, 4 and 5 appraise that careful planning, design and pollution control practices, alongside Environment Agency regulatory controls, are capable of addressing the impacts identified in the medium to long term. Some uncertainty exists where the long term water needs and decommissioning requirements of technologies are not established. These uncertainties will have greater significance for locations with identified sensitivities, protected by the Habitats Directive and Water Framework Directive, e.g. Offshore Marine Sites.

EN-1 states that the IPC will generally need to give impacts on the water environment more weight where a project would have an impact on the achievement of the environmental objectives established under the WFD. The level of mitigation required will be dependent on the sensitivity of the receiving water environment.

4.7.1. Summary

There is a potential for adverse effects on water quality and resources (including cumulative effects in some areas) in England and Wales. Measures will have to be taken to ensure that adverse effects are adequately mitigated. The effects of implementing the policy set out in EN-1 are appraised as neutral in the medium to long term, but less certain in the longer term where a larger proportion of energy demand is met through water intensive technologies (EN-2, EN-6).

4.8. Traffic and Transport

AoS Objective	Assessment (by timescale)		
	S	M	L
7. Traffic and Transport: To minimise the detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects.	0	0	0

Enabling the development of energy infrastructure to meet the energy demands of the UK has the potential for a number of generic effects on traffic and transport which are applicable across the different types of energy infrastructure development. They 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;
- impacts on aviation through interfering with the operation of radars and radio signals; and
- potential positive effects through new road facilities and transport links, upgrading of existing roads, enhanced public transport.

Negative effects on traffic and transport will predominantly be during construction and decommissioning of energy infrastructure and these will most likely be temporary and affect local communities. Construction and decommissioning effects on traffic and transport can usually be mitigated through employing appropriate traffic management measures, including avoiding the transport of materials and machinery during peak times.

There is the potential for negative effects on traffic and transport at the local level during the operation of coal fired (and biomass co-fired) power stations as a result of the delivery and movement of fuel as well as the removal of residues. The AoS of EN-3 appraised that enabling the development of offshore wind has the potential for negative effects on shipping and navigation routes during construction and operation. However, this is not likely to have a significant effect at an international level as EN-3

states that consent cannot be given for wind farms that cause interference with recognised sea routes essential for international navigation.

The transport of large infrastructure (for example pylons and rotors) may also have negative short term effects on the existing transport infrastructure. These effects may be exacerbated in rural areas, where road closures and diversions can involve significant increases to journey times and HGVs can cause congestion and road safety issues. In areas where there is a concentration or cluster of energy infrastructure development there is the potential for cumulative negative effects on traffic and transport. This is unlikely to have a significant effect at a strategic/regional level as the significance of these effects can be reduced through the careful design and planning of energy infrastructure as well as the phasing of development, including employing appropriate traffic management measures and avoiding the transport of materials and machinery during peak times. Any proposals for the development of energy infrastructure should include consideration of the effects on traffic and transport during construction and operational phases.

Potential indirect negative effects arising from increased traffic, such as increased emissions and noise, are addressed under the air quality and noise topics.

Energy infrastructure development has the potential to interfere with the operation of radar by limiting the capacity to handle air traffic and aircraft landing systems. It may also act as a reflector or diffractor of radio signals on which navigational aids rely (an effect which is particularly likely to arise when large structures, such as wind turbines, are located close to radar installations). Enabling the development of energy infrastructure therefore has the potential for negative effects on civilian and military aviation interests. Certain civil and military aerodromes and aviation technical sites are officially safeguarded - on the basis of their importance to the national air transport system - in order to ensure that their operation is not inhibited by new development. The careful design and planning of development will help to avoid aviation sites that are of strategic significance and the mitigation measures outlined in EN-1 will reduce any negative effects of energy infrastructure on civil and military aviation interests.

4.8.1. Summary

Negative effects (including cumulative effects) on traffic and transport will most likely be temporary and affect local communities. The transport of large infrastructure (for example pylons and rotors) can have short term negative effects on existing transport infrastructure, particularly in rural areas. Construction and decommissioning effects can usually be mitigated by imposing appropriate traffic and transport management conditions. There is also a potential for negative effects on civilian and military aviation interests, but it should generally be possible to address these through appropriate mitigation measures. Accordingly there should be no overall strategic effect in the short, medium or long term.

4.9. Noise

AoS Objective	Assessment (by timescale)		
	S	M	L
8. Noise: To protect both human and ecological receptors from disturbing levels of noise.	0	0	0

The development of energy infrastructure to meet the energy demands of the UK has the potential for a number of generic impacts on noise which are applicable across the different types of energy infrastructure development. They include:

- noise generated as a result of construction activities (for example, from large construction equipment/machinery);
- operational noise (for example, from the operation of turbines);
- noise generated as a result of decommissioning (for example, from demolition of structures); and
- noise generated as a result of supporting or ancillary services (for example, from increased traffic movements).

EN-1 recognises that the noise effects (including vibration) of energy infrastructure developments vary in accordance with the type of development, its location with respect to noise receptors and the ambient noise setting of the proposed development. The development of a mix of major generating infrastructure enabled by EN-1 as well as the associated supporting activities, has the potential for negative impacts on current noise levels. This has the potential for negative effects on quality of life; health; the use of areas of value such as quiet places and areas with high landscape quality and biodiversity. These effects may be cumulative in areas where developments are concentrated or clustered.

The AoSs of EN-2-6 indicate that the majority of negative impacts on noise from energy infrastructure developments can 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 receptors, in the context of specific details of the development design, layout and operation.

EN-1 sets out generic effects, guidance and requirements in relation to noise impacts. The IPC must ensure that they are satisfied that a proposal will avoid significant adverse effects on health and quality of life from noise and will mitigate and minimise other adverse impacts on health and quality of life from noise. The applicant is also required to, where possible; contribute to improvements to health and quality of life by effective management and control of noise.

4.9.1. Summary

There is the potential for energy infrastructure and associated supporting activities to have negative impacts on current noise level (including cumulative effects). The significance of these effects is dependent on the type of development and its proximity to sensitive receptors, and they can generally be mitigated through the design and planning process, so are not considered significant in the short, medium or long term.

4.10. Landscape, Townscape and Visual

AoS Objective	Assessment (by timescale)		
	S	M	L
9. Landscape, Townscape and Visual: To protect and enhance landscape quality, townscape quality and to enhance visual amenity.	-?	-?	-?

The scope and scale of the development enabled by the plan has the potential for a range of landscape and visual effects which EN-1 recognises will vary according to the type of development, its location and the landscape setting of the proposed development. Generic effects on landscape from energy infrastructure include:

- the introduction of a range of new, industrial structures, including long term, permanent structures; and developments that are temporary in the short to medium term; and
- visual effects for receptors (residents, tourists, visitors).

The areas of England and Wales that are likely to host new energy infrastructure of a large scale (e.g. coastal locations, for EN-6), currently support a high level of local and national landscape designations.[14] The development of a mix of generating technologies will deliver large scale and tall structures, in both existing industrial locations and in new greenfield/offshore/coastal settings. Many of these structures are likely to be in predominantly rural, remote areas, including areas of high landscape value where visual impacts will be significant. The scale and severity of those effects will depend on the energy type, its overall setting context and the specifics of the site itself.

In some instances (e.g. CHP development, EN-2) developments will be most effectively sited near to existing industrial sites, and in proximity to consumers in urban centres. This incorporation into established built/industrial settings, where possible, will assist in mitigating landscape effects in the long term, although short to medium term effects are likely. The mitigation of small scale structures through screening, planting and careful siting may be possible and is required by EN-1. In the circumstances where infrastructure is 'lifed' and subject to decommissioning (e.g. onshore wind farms, EN-3, supporting transmission infrastructure, EN-5) then some of the long term negative impacts identified may be reversed. However, the negative

[14] EN-1 AoS Baseline, Landscape, Townscape and Visual.

visual impacts of new developments are generally likely to be considerable for foreseeable timescales due to the permanence and scale of structures enabled by the implementation of EN-1 policy objectives.

The AoS of EN-5 notes that the development of linear features (e.g. transmission lines) has the potential for negative effect in the short term during construction and in the medium to long term, particularly if construction occurs in sensitive areas. These effects may be cumulative where they coincide with substantive new developments (power stations). The possibility of mitigation through undergrounding is detailed by EN-5, and effects may be reversed in the long term if decommissioning occurs. The impacts of linear development are also highlighted by the AoS of EN-3 in relation to offshore and onshore windfarms, where the requirement for exposure contributes directly to negative visual impacts for both seascape and landscape.

For all development types the potential for cumulative negative landscape and townscape effects is likely, in particular where there is a cluster of new energy infrastructure development and its associated transmission requirements . The effects will be more significant if they are in or adjacent to areas of high landscape value (national parks, coastal locations, historic townscapes, heritage assets). The mitigations proposed in EN-1-6 recognise that effects may be reduced but not avoided or eliminated.

4.10.1. Summary

Significant negative effects for landscape, townscape and visual receptors are likely as a result of the plan implementation in the short, medium and long term. Opportunities for mitigation will be limited.

4.11. Archaeology and Cultural Heritage

AoS Objective	Assessment (by timescale)		
	S	M	L
10. Archaeology and Cultural Heritage: Protect and where appropriate enhance the historic environment including heritage resources, historic buildings and archaeological features.	**- ?**	**- ?**	**- ?**

Enabling the development of energy infrastructure to meet the energy demands of the UK has the potential for a number of generic effects on archaeology and cultural heritage which are applicable across the different types of energy infrastructure development. They include:

- disturbance or loss of heritage assets[15] as a result of ground works or excavation; and
- impacts on the setting of nearby heritage assets.

[15] Those elements of the historic environment – buildings, monuments, sites or landscapes – that have significance due to their historic, archaeological, architectural or artistic interests are called ‘heritage assets’.

EN-1 recognises that impacts during the construction, operation and decommissioning of energy infrastructure have the potential for effects on heritage assets. Enabling the development of energy infrastructure has the potential to have direct negative effects on heritage assets through ground works and excavation associated with construction. Direct effects are likely to occur in the short term during the construction of development and associated supporting infrastructure. There is also the potential for indirect negative effects through impacts to the setting of heritage assets within a landscape context. Indirect effects are likely to occur in the short and medium term with long term effects dependent on decommissioning. In areas where there is a concentration or cluster of energy infrastructure development there is also the 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.

The majority of negative effects on heritage assets from energy infrastructure developments can 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 heritage assets, in the context of specific details of the development design, layout and operation.

EN-1 ensures that sufficient weighting is given to designated sites and to elements of setting that enhance the significance of designated heritage assets and non-designated archaeological assets. It also gives due regard to the highest level of protection (World Heritage Sites) and advises that the IPC should not accept material harm to or removal of significance in relation to heritage asset, unless it can be demonstrated that the material harm to or removal of significance is outweighed by the wider social, economic and environmental benefits that will be delivered by the proposed development. Furthermore, the IPC may request applicants to undertake desk and field based assessment prior to application as part of an Environmental Impact Assessment and, where consent is given, to maximise opportunities to advance the understanding of the historic assets. During the planning stage an assessment of impacts would identify sites of significant importance and provide the opportunity to avoid potential sites.

4.11.1. 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).

4.12. Air Quality

AoS Objective	Assessment (by timescale)		
	S	M	L
11. Air Quality: To protect and enhance air quality on local, regional, national and international scale.	0	-?	0

Enabling the development of energy infrastructure to meet the energy demands of the UK has the potential for a number of generic negative effects on air quality which are applicable across the different types of energy infrastructure development. 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);
- 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).

Air quality is unlikely to be a significant issue for the majority of energy infrastructure types, principally due to the relatively low level of air pollutant emissions during operation. The AoS for EN-2 identifies that the requirement for CCS on coal-fired generating plants has the potential for significant negative effects on air quality during operation (which may be local and regional depending on the location and concentration of power station development) due to the increased release of NOx and SOx but that suitable mitigation is available and will need to account for and reduce the magnitude of this effect. Similarly, biomass plants have the potential for negative effects on air quality during their operation period, although these should be capable of mitigation. The majority of adverse effects on air quality in relation to electricity networks infrastructure are likely to occur in the short and long term during construction and decommissioning.

The significance of effects will depend upon local site specific factors, such as transport routes and proximity to residential housing and these will be dealt with during the project level EIA. EN-1 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. The IPC will 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.

4.12.1. Summary

Air quality is unlikely to be a significant issue for the majority of energy infrastructure types, principally due to the relatively low level of air pollutant emissions during operation. For EN-2 and some EN-3 technologies potentially significant local or regional effects are identified in the medium to long term. It is appraised that overall EN-1 may have minor negative strategic effects on air quality in the medium and long term, with some uncertainty.

4.13. Soil and Geology

AoS Objective	Assessment (by timescale)		
	S	M	L
12. Soil and Geology: To promote the use of brownfield land and where this is not possible to prioritise the protection of geologically important sites and agriculturally important land.	0 ?	0 ?	0 ?

Enabling the development of energy infrastructure to meet the energy demands of the UK has the potential for a number of generic effects on soil and geology which are applicable across the different types of energy infrastructure development. They include:

- direct negative effects through disturbance or loss of soils and geologically important sites; and
- indirect negative effects through increased risk of pollution and potential contamination of soils;

EN-1 identifies that energy infrastructure development has the potential for negative effects on soils and geology, including the best and most versatile agricultural land and sites that are designated for their geology and/or their geomorphological importance. Development may result in soil loss or burial, physical damage including compaction and structural damage, changes to soil water regime, effects on soil biota and soil stripping and storage. The direct effects are likely to be localised within the footprint of the development and the significance will be dependent on location. In the medium term, indirect negative effects on soil could arise during operation of energy infrastructure as a result of increased pollution risk, which can lead to the contamination of soils. The effects in the long term are uncertain as there is the potential for the remediation of contaminated land during decommissioning. Mitigation measures outlined in EN-1 to 6 should help to minimise the negative effects of energy infrastructure on soil and geology. EN-1 seeks to avoid the development of energy infrastructure on agricultural land of grades 1-3a and directs applicants to set out the effects of a project on international, national and locally designated sites of geological conservation within the Environmental Statement. This includes how the project has taken advantage of opportunities to conserve and enhance geological conservation interests.

The AoS of EN-2 and 6 identify that high water demands associated with nuclear and some fossil fuel generating technologies means that these types of developments are often located in coastal or estuarine areas. EN-1 enables the development of offshore wind to help meet the target for 15% of energy to be generated from renewable sources. The construction of energy infrastructure offshore and on the coast has the potential for negative effects on the coastline and seabed. The construction of energy infrastructure on the coast may involve dredging, dredge spoil deposition, culvert construction, marine landing facility construction and flood and coastal protection measures could all lead to direct negative effects on soil and geology. There is also

the potential for indirect negative effects on the coastline and seabed as a result of hydrodynamic response to some of these direct effects.

EN-1 directs the IPC to expect the applicant to have included appropriate mitigation measures as an integral part of the proposed development. The IPC is also directed to take account of the effects that proposed energy infrastructure may have on existing, adjacent and proposed land uses, including effects on the agricultural quality of soils and on the planning significance of any affected development. EN-1 also states that the Environmental Statement for the infrastructure project should set out the effects on international, national and locally designated sites of geological conservation and show how the project has taken advantage of opportunities to conserve and enhance geological conservation interests.

4.13.1. Summary

In the short term the construction of energy infrastructure has the potential for direct negative effects on soils and geology as a result of disturbance and loss and possible pollution risks in the longer term (although these are less certain). The policies and mitigation measures set out in the NPSs should help to minimise these.

4.14. Health and Well-Being

AoS Objective	Assessment (by timescale)		
	S	M	L
13. Health and Well-Being: To protect and enhance the physical and mental health of the population.	- ?	+	+

Energy production and distribution has the potential to impact on the health and well being of the population; potential generic effect of EN-1 implementation include:

- positive effects resulting from security and affordability of supply, and potential enhancements to employment and economic opportunities;
- potential significant negative impacts from energy production and supply, 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); and
- 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.

There is a range of positive (indirect) effects arising from the establishment of secure, affordable energy supplies. In particular, the AoSs have identified that security and affordability of supply will assist removing the negative effects on health of fuel poverty.[16] The AoSs have also noted that the long term establishment of a more

[16] AoS of EN-1 Baseline: Health and Well Being

vibrant energy sector will have significant positive effects for the economy and that this provides direct support for improved health and well being across populations as a result of employment opportunities. Employment is recognised as a key positive indicator for overall health[17] that will bring medium and long term health benefit overall. These positive effects have the potential to be cumulative in the long term from improved vibrancy in the energy industry sector.

Individual AoSs have noted a number of potential negative health impacts that are typically local in scope and effect. Particulates and NOx emissions to air are a potential negative impact for local populations noted in the AoS of EN-2. These issues are considered to be most significant in the short to medium term, primarily at a local level, with possible effects at a regional level (EN-2) depending on the location and concentration of power station development. The AoS of EN-5 identifies that there are some negative effects associated with exposure to electromagnetic fields (EMFs) and that strict regulatory controls are in place as mitigation. The AoS of EN-6, the nuclear NPS, also addresses the potential effects arising from radioactive discharges and cluster effects including the strict regulatory controls and mitigation measures proposed to address these issues. The individual AoSs do not consider these effects to be significant at regional or national scale in the longer term. Appraisal of renewable development (biomass, wind energy) as progressed by EN-3 does not identify significant negative issues for health, with minor issues being effectively mitigated through appropriate design and planning measures. Overall there are likely to be some minor negative effects on health in the short term where energy developments are clustered.

4.14.1. Summary

Negative effects may be expected but these will typically be localised and associated with the construction phases of development. ENs1-6 include a range of mitigation measures and regulatory requirements to ensure that resident and working populations are protected. Potential longer term negative effects, related, for example, to radioactivity or electromagnetic field exposure, are not considered by the AoSs to be significant when mitigation measures have been taken into account.

Significant indirect positive effects for health and well being (including cumulative effects) may be expected are from improved employment opportunities and the predicted, enhanced economic conditions arising from investment in energy infrastructure.

4.15. Equality

AoS Objective	Assessment (by timescale)		
	S	M	L
14. Equality: To encourage equality and sustainable communities.	0	+	+

[17] EN1 AoS Baseline. Health and Well Being.

Enabling the development of energy infrastructure to meet the energy demands of the UK has the potential for generic effects on equality which are applicable across the different types of energy infrastructure development. They include:

- positive effects through ensuring energy security and affordability; and
- indirect positive effects due to the enhanced economic benefits and increased employment and skills opportunities.

EN-1 along with the technology specific NPSs (EN-2 to 6) enable the development of energy infrastructure to meet growing energy demands in the UK. This has the potential for positive effects on all socio-economic groups through ensuring energy security and affordability, although the increased costs of infrastructure provision may result in energy prices rises in the short to medium term. Overall, improved security and long term affordability will have particular benefits for low income households who are susceptible to fuel poverty. Indirect positive effects for equality are also likely due to the enhanced economic benefits and increased employment likely to occur as a result of the suite of Energy NPSs.

The AoSs of EN-2 and 3 recognise that there are potential negative effects on equality and community sustainability through reductions in air and local water quality, increased noise and adverse effects on local ecology. These impacts can affect lower income groups disproportionately as they have more limited economic resources to access mitigation or move from geographically affected areas. These effects are appraised as being of local, location specific significance and are considered to be neutral at a strategic level for EN-1.

4.15.1. Summary

Enabling the development of energy infrastructure within a faster timescale to meet the energy demands of the UK has the potential for positive effects on all equality through ensuring energy security and affordability. Indirect positive effects might also arise as a result of enhanced economic benefits and increased employment that could occur as a result of the suite of Energy NPSs. These effects are likely to be of most significance in the medium to long term once new energy infrastructure is operational.

4.16. Cumulative Effects

It is good practice to integrate interactions between topics and cumulative effects assessment (CEA) within the overall appraisal and this has been undertaken in this revised AoS. However, since there was particular concern from consultees regarding the CEA carried out in the previous appraisal and reported in the documents published in November 2009, the key considerations for cumulative effects are set out here again in this separate section. As explained previously and shown in Figure 2.1, the significance of cumulative effects may vary with the mix of technology projects proposed and the sensitivity of the receiving communities and environment. Overall and strategically, the AoS found that the energy NPSs may have positive significant cumulative effects in the medium to longer term on climate change objectives; indirect positive cumulative effects on the economy, skills and equalities, are indicated from

the certainty of investment and security of energy supplies due to the implementation of the NPSs. Negative cumulative effects were identified for landscape/townscape and visual amenity, and for biodiversity.

For the draft Nuclear NPS with its list of potentially suitable sites, it was possible to predict likely significant cumulative effects with more certainty than the other non-locationally specific energy NPSs. AoS 6 (including the site AoSs) found that cumulative effects were likely where there are clusters of potentially suitable sites for new nuclear power stations and that this was likely to be significant in the north west and south west of England. The AoS identified positive effects on employment and community viability, with additional positive effects on health and well-being from secure employment. Potential negative cumulative effects on landscape and visual amenity were identified in relation to the character of the surrounding area, including the Lake District National Park, and other development objectives for biodiversity, tourism, and recreation/amenity. Similarly in the south west of England, potential negative cumulative effects were identified for biodiversity potentially if more than one new nuclear power station was built in the area of the Severn Estuary. Possible cumulative effects were also identified on a European site of nature conservation interest, the Outer Thames Estuary, if both sites in the east of England were developed. However, positive cumulative effects were indicated for local employment, upskilling, community viability, and health/well-being. In mitigation, the draft Nuclear NPS draws attention to the IPC for the potential for these significant cumulative regional/sub-regional effects and requires the IPC to consider the cumulative effects in its decision making.

Likely significant cumulative effects were identified with less certainty for the other, non-locationally specific energy NPSs 2-5, although those characteristics of the different energy technologies that might give rise to likely significant cumulative effects were identified. Cumulative effects from implementation of NPS EN-2 are likely to be associated with the development of Carbon Capture and Storage (CCS) infrastructure and coal-fired and biomass co-fired power stations. Given the likely location of CCS storage reservoirs within the oil/gas basins in the North Sea, and other factors such as proximity to a port, clustering of infrastructure may be expected in the North East, East of England, and South East England regions with the potential for significant cumulative effects. These may be negative with regard to water quality, water resources, and biodiversity but are likely to be positive with regard to employment, economy and skills, and health/well-being, including equality.

Significant cumulative effects from implementation of NPS EN-3 may be likely for onshore wind turbines with regard to visual amenity and for offshore wind facilities on intertidal habitats if there is clustering along the same stretch of coastline. EN-3 proposes that such cumulative effects could be mitigated by cooperation between developers of these facilities. Significant cumulative effects from the implementation of NPS EN-4 may arise due to the need for coastal locations for gas reception facilities and in combination with other major infrastructure could have negative effects on coastal landscapes and coastal change.

All major infrastructure projects have the potential for temporary cumulative effects in the short term during the construction phase and the significance will vary according to the number, type and location of such development. These cumulative effects may be negative, such as on traffic and air quality, or positive, such as on employment and

economy. Negative cumulative effects on the environment may be mitigated through implementation of Environmental Management Plans (EMPs) agreed with local communities and EN-1 sets out that the project level EIA requirements include a description of the measures to prevent, reduce and where possible offset any significant adverse effects and this may inform an EMP. Negative cumulative effects on communities may be identified and mitigated through a sustainability assessment and EN-1 advises the IPC to expect a development consent application to contain an assessment of the considerations given to socio-economic issues as well as environmental factors.

The potential for a number of individual developments to give rise to cumulative effects is recognised by the Overarching NPS which states that '*the IPC should consider how the accumulation of effects might affect the environment, economy or community as a whole, even though they may be acceptable when considered on an individual basis with mitigation measures in place'* To support this, the NPS states that *'the Environmental Statement should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been sought or granted, as well as those already in existence)'.*

4.17. Overall Summary of AoS Findings

Current government policy promotes the delivery of low carbon energy. The Energy NPSs are predicted to speed up the transition to a low carbon economy thus promoting positive cumulative effects on the AoS climate change objectives because UK climate change commitments may be realised sooner than continuation under the current planning system. However there is also some uncertainty as it is difficult to predict the mix of technology that will be delivered by the market.

The Energy NPSs are likely to contribute positively towards improving the vitality and competitiveness of the UK energy market by providing greater clarity for developers which should improve the UK's security of supply. Reliable energy supplies nationally will contribute to positive effects generally on our 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; positive medium and long term effects are also likely for equalities.

The development of new energy infrastructure, at the scale and speed required to meet the current need, is likely to have negative effects on biodiversity, landscape/visual amenity and cultural heritage; however the significance of these effects and the effectiveness of mitigation possibilities is uncertain at the strategic and non-locationally specific level. Short-term construction impacts are also likely through an increased use of raw materials and resources, and negative effects on the economy due to impacts on existing land and sea uses. There may also be cumulative negative effects on water quality, water resources, flood risk, coastal change and health at the regional or sub-regional levels depending upon location and the extent of clustering of new energy and other infrastructure. Proposed energy developments will still be subject to project level assessments, including Environmental Impact Assessments, and these will address locationally specific effects. The energy NPSs set out mitigation for cumulative negative effects by

requiring the IPC to consider accumulation of effects as a whole in their decision-making on individual applications for development consent.

The findings for each technology specific AoS are summarised by timescales (short, medium and long term) in the following tables 4.1 –4.3 and the overall findings for the Overarching AoS 1 are summarised in table 4.4, below:

Key for AoS 3:
1 = Onshore Wind; 2 = Offshore Wind; 3 = Biomass and energy from waste

Table 4.1: Summary of Key Findings for AoS 2-5 in the Short Term

AoS Objective	AoS-2	AoS-3			AoS-4	AoS-5
		1	2	3		
	Assessment of Effects: Short Term					
1. Climate Change	0	0	0	0	0	0
2. Ecology (Flora and Fauna)	-?	?	?	?	?	-?
3. Resources and Raw Materials	-?	0	0	+ / -?	0	0
4. Economy and Skills	+?	+?	+ / -	+	0	+
5. Flood Risk and Coastal Change	-?	0	0	-?	0	0
6. Water Quality and Resources	-?	0	-	-	0	0
7. Traffic and Transport:	0	-	-	-	0	0
8. Noise	0	-?	-?	-?	0	0
9. Landscape, Townscape and Visual	-?	-?	-?	0	-	--?
10. Archaeology and Cultural Heritage	0?	0?	0?	0?	0?	0?
11. Air Quality	0	0?	0	0?	0	0
12. Soil and Geology	0?	0?	0?	0?	0?	0?
13. Health and Well-Being	-? / +?	0	0?	0	0	0
14. Equality	0	0?	0?	0?	0	0

Table 4.2: Summary of Key Findings for AoS 2-5 in the Medium Term

AoS Objective	AoS-2	AoS-3			AoS-4	AoS-5
		1	2	3		
	Assessment of Effects: Medium Term					
1. Climate Change	+?	++	++	+	-?	+?
2. Ecology (Flora and Fauna)	-?	?	?	?	?	0
3. Resources and Raw Materials	-?	0	0	+ -?	-?	0
4. Economy and Skills	+?	+?	+ -	+	+	0
5. Flood Risk and Coastal Change	-?	0	0	-	0	0
6. Water Quality and Resources	-?	0	-	-	0	0
7. Traffic and Transport:	0	0	-	-	0	0
8. Noise	0	-?	-?	-?	0	0
9. Landscape, Townscape and Visual	-?	-?	-?	-?	-	--?
10. Archaeology and Cultural Heritage	0?	0?	0?	0?	0?	0?
11. Air Quality	-?	0?	0	-?	0	0
12. Soil and Geology	0?	0?	0?	0?	0?	0?
13. Health and Well-Being	-? +?	0	0?	0	0	0
14. Equality	0	0	0?	0?	0	0

Table 4.3: Summary of Key Findings for AoS 2-5 in the Long Term

AoS Objective	AoS-2	AoS-3			AoS-4	AoS-5
		1	2	3		
	Assessment of Effects: Long Term					
1. Climate Change	+?	++	++	+	-?	+?
2. Ecology (Flora and Fauna)	-?	?	?	?	?	0
3. Resources and Raw Materials	-?	0	0	+ -?	-?	?
4. Economy and Skills	+?	+?	+ -	+	+	0
5. Flood Risk and Coastal Change	0?	0	0	-	0	0
6. Water Quality and Resources	-?	0	-?	-	0	0
7. Traffic and Transport:	0	0	0	-	0	0
8. Noise	0	0	0	-?	0	0
9. Landscape, Townscape and Visual	0?	0	0	-?	?	--?
10. Archaeology and Cultural Heritage	0?	0?	0?	0?	0?	0?
11. Air Quality	0	0?	0	0?	0	0
12. Soil and Geology	0?	0?	0?	0?	0?	0?
13. Health and Well-Being	- +? ?	0	0?	0	0	0
14. Equality	0	0?	0	0?	0	0

Table 4.4: Overall Summary of Key Findings for AoS of Overarching NPS EN-1

AoS Objective	Assessment of effects (by timescale)		
	S	M	L
1. Climate Change	0?	+?	+?
2. Ecology (Flora and Fauna)	-	-?	-?
3. Resources and Raw Materials	-	0	0 +
4. Economy and Skills	- +	+	+
5. Flood Risk and Coastal Change	-?	0?	0?
6. Water Quality and Resources	-?	0?	0?
7. Traffic and Transport:	0	0	0
8. Noise	0	0	0
9. Landscape, Townscape and Visual	-?	-?	-?
10. Archaeology and Cultural Heritage	-?	-?	-?
11. Air Quality	0	-?	0
12. Soil and Geology	0?	0?	0?
13. Health and Well-Being	-?	+	+
14. Equality	0	+	+

5. Monitoring and Next Steps

5.1. Monitoring

Monitoring helps to examine the effects predicted through the AoS process against the actual effects of the NPS when it is implemented. It is also a requirement of the SEA Directive to describe the measures envisaged concerning how significant effects of implementing the NPS will be monitored. As ODPM Guidance[18] 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 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.

The sustainability effects of the energy NPSs may be monitored through the monitoring frameworks already carried out by the environmental regulators and the local authorities. 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 the extent of nuclear generating activities will be monitored through the nuclear licensing procedures. Local Planning Authorities monitor the effectiveness of their spatial plans, including indicators such as employment and access to community facilities and services. Nationally, Government[19] 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 proposed that the effects that should be monitored overall for the energy NPSs are focused on the positive effects predicted for climate change, resources, and economy/skills; and the negative or uncertain effects predicted for landscape/visual amenity and biodiversity.

A draft Monitoring Strategy for the Energy NPSs and AoSs will be published alongside the main consultation documents. The Government will further develop the monitoring strategy during the re-consultation period to take into account responses received on the revised draft NPSs and AoSs. The Strategy sets out the proposed indicators for monitoring together with agreed responsibilities and frequencies of monitoring during the implementation of the NPSs. This will be summarised in the Post- Adoption Statement that will be published with the designated NPSs.

5.2. Quality Assurance

The Government's guidance on SEA contains a checklist to help ensure that the requirements of the SEA Directive are met. This has been completed and is presented in Annex E.

[18] Practical Guide to the Strategic Environmental Assessment Directive (ODPM, September 2005).
[19] Defra national SD indicators http://www.defra.gov.uk/sustainable/government/progress/national/index.htm

5.3. Next Steps

The re-consultation on the revised draft energy NPSs and AoS Reports will be open for a period of 14 weeks from the 18th October 2010. The documents are available at www.energynpsconsultation.decc.gov.uk and details of how to comment are set out in the Consultation Document also available on the website. If you have any comments on the issues raised in the AoS, please respond as part of the re-consultation on the revised draft NPSs.

The Government will consider any further comments received during the public re-consultation in the decision making on the finalising of the energy NPSs. On designation of the NPS, an AoS Statement will be published and this will summarise how the AoS and the consultation responses have been taken into account, including how sustainability and environmental considerations have been integrated into the Overarching NPS for Energy.

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