

# Appraisal of Sustainability: Site Report for Sizewell

EN-6: Revised Draft National Policy Statement for Nuclear Power Generation

## **Preface:**

### **Appraisal of Sustainability of the revised draft Nuclear National Policy Statement**

The Appraisal of Sustainability (AoS), incorporating Strategic Environmental Assessment (SEA), of the revised draft Nuclear National Policy Statement (Nuclear NPS) has been undertaken at a strategic level. It considers the effects of the proposed policy at a national level and the sites to be assessed for their suitability for the deployment of new nuclear power stations by 2025. These strategic appraisals are part of an ongoing assessment process that started in March 2008 and, following completion of this AoS, will continue with project level assessments when developers make applications for development consent in relation to specific projects.

Applications for development consents to the Infrastructure Planning Commission (IPC) will need to be accompanied by an Environmental Statement having been the subject of a detailed Environmental Impact Assessment (EIA).

**The AoS/SEA Reports are presented in the following documents:**

#### **AoS Non-Technical Summary**

##### **Main AoS Report of revised draft Nuclear NPS**

- Introduction
- Approach and Methods
- Alternatives
- Radioactive Waste
- Findings
- Summary of Sites
- Technical Appendices

##### **Annexes to Main AoS Report: Reports on Sites**

- Site AoS Reports
- Technical Appendices

All documents are available on the website of the Department of Energy and Climate Change at <http://www.energynpsconsultation.decc.gov.uk>

This document is the Appraisal of Sustainability: Site Report for Sizewell.

This report has been prepared by the Department of Energy and Climate Change with expert input from a team of specialist planning and environmental consultancies led by MWH UK Ltd with Enfusion Ltd, Nicholas Pearson Associates Ltd, Studsvik UK Ltd and Metoc plc.

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**Appendices to Sizewell AoS Report**

1	AoS/SEA Objectives for Appraisal
2	Appraisal Matrices
3	Plans and Programmes Review (available on website)
4	Baseline Information (available on website)

## Summary of Key Findings

This report considers the nomination of the site at Sizewell in Suffolk as a possible location for new nuclear power station(s). The purpose of this Appraisal of Sustainability Report (AoS) is to assess environmental and sustainability impacts on the Sizewell site and surrounding area. This report also identifies the significance of those effects, and suggests possible ways of mitigation. For more information on the methodology and background to the assessment please refer to Section 2. The national policy context, which also provides a background to the assessment, is included in Section 3.

The key findings of this assessment are included below (reproduced from Section 6 for ease of reference). These key findings are supported by site characterisation and the Appraisal of Sustainability, details of which are included in Section 4 and Section 5 of this report. Further details on the key findings and suggested mitigation of the potential effects identified of developing a nuclear power station at Sizewell are included in Section 6.

### Summary of Key Findings

The AoS has explored both adverse and beneficial potential effects of building a new nuclear power station at Sizewell. Both beneficial and adverse effects were identified as potentially significant at the local level and it is recommended that these need to be further considered by the developer, regulators and the decision-maker (the IPC), during project level assessments.

The AoS process has included recommendations to inform the development of the revised draft Nuclear NPS. This site report for Sizewell has helped to inform the decision-making for the SSA. It has included advice as to the strategic significant effects arising from the construction of a new nuclear power station at Sizewell, and suggestions for how adverse effects may be mitigated, including proposed mitigation measures which could be considered as part of project level EIA.

A number of the potential effects identified for Sizewell will be similar across all the sites, including positive effects for employment and well being. However a number of potential effects have been identified that are of particular note for the nominated site at Sizewell. These are discussed below:

Of particular note for the revised draft nuclear NPS is that the site lies on the Suffolk Heritage Coast and is wholly within the Suffolk Coast and Heaths AONB. Although set in the context of the existing power station, the development may have an adverse impact on landscape character and an adverse visual impact on a nationally designated landscape; this could not be fully mitigated.

There are also potential adverse effects on at least five nature conservation sites of UK and European importance, including Minsmere to Walberswick Heaths and Marshes, Sizewell Marshes, Leiston-Aldenburgh SSSI, the Outer Thames Estuary, and the Alde-Ore Estuary; and effects on water quality and fish/shellfish populations in nearby coastal waters due to the abstraction and release of sea water for cooling.

There are existing sand and shingle flood defences in place, which may require upgrading to protect the site for the full life time of a new power station, which may have potential effects on erosion and visual appearance of the coastline. These effects could be significant, but mitigation opportunities could be available following further study at the project level.

The Appraisal of Sustainability has found that Sizewell is not close to any other nominated site and therefore does not form part of a cluster. This means that regional cumulative effects are not considered relevant for this site. However, the potential for adverse effects from Bradwell and Sizewell on the European designated site of the Outer Thames Estuary indicates that there may be interactions and cumulative effects on biodiversity should both sites be developed due to potential adverse effects on water quality, resources and habitats.

There remains some uncertainty relating to the significance of some effects and the most appropriate mitigation. It is expected that the mitigation measures will be refined iteratively as part of the development of the proposals for the nominated site, and will be assessed further in the project level EIA.

# 1 Introduction

## This Appraisal of Sustainability Report

- 1.1 This report considers the nominated site at Sizewell in Suffolk as a possible location for new nuclear power station(s). The report sets out the Appraisal of Sustainability (AoS) of the nomination of land alongside the existing nuclear power station at Sizewell. The nomination of land, as well as supporting information, was put forward by EDF. The AoS, which incorporates the Strategic Environmental Assessment (SEA), is a part of the Strategic Siting Assessment (SSA). The SSA is a process for identifying and assessing sites that could be potentially suitable for new nuclear power stations by the end of 2025.
- 1.2 This report is one of the Appraisals of Sustainability that deal with individual sites. Together, these reports form an Annex to the Main AoS Report,<sup>1</sup> which accompanies the revised draft Nuclear National Policy Statement<sup>2</sup> (NPS). The Main AoS Report for the revised draft Nuclear NPS sets out the details of the AoS process, its methods, findings, conclusions and a summary of the appraisal of the nominated sites. The main report also includes a non-technical summary.
- 1.3 This AoS has been undertaken at a strategic level and is intended only as a high level assessment of the suitability of the site from an environmental and sustainability perspective. The AoS is part of an assessment process that started in March 2008. The revised draft Nuclear NPS lists sites that have been assessed to be potentially suitable by the Government for new nuclear power stations. Developers will be able to apply for development consent for these sites from the Infrastructure Planning Commission (IPC)<sup>3</sup>. Each application from the developer for consent to build a new power station will need an Environmental Statement with a detailed Environmental Impact Assessment (EIA). The sites included in the revised draft Nuclear NPS will also be subject to other regulatory and licensing requirements.

## The Revised Draft Nuclear National Policy Statement

- 1.4 The revised draft Nuclear NPS sets out the need for sites that are potentially suitable for the development of new nuclear power stations by 2025. The Government used an SSA to assess the potential suitability of nominated

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<sup>1</sup> DECC Main AoS Report <http://www.energynpsconsultation.decc.gov.uk>

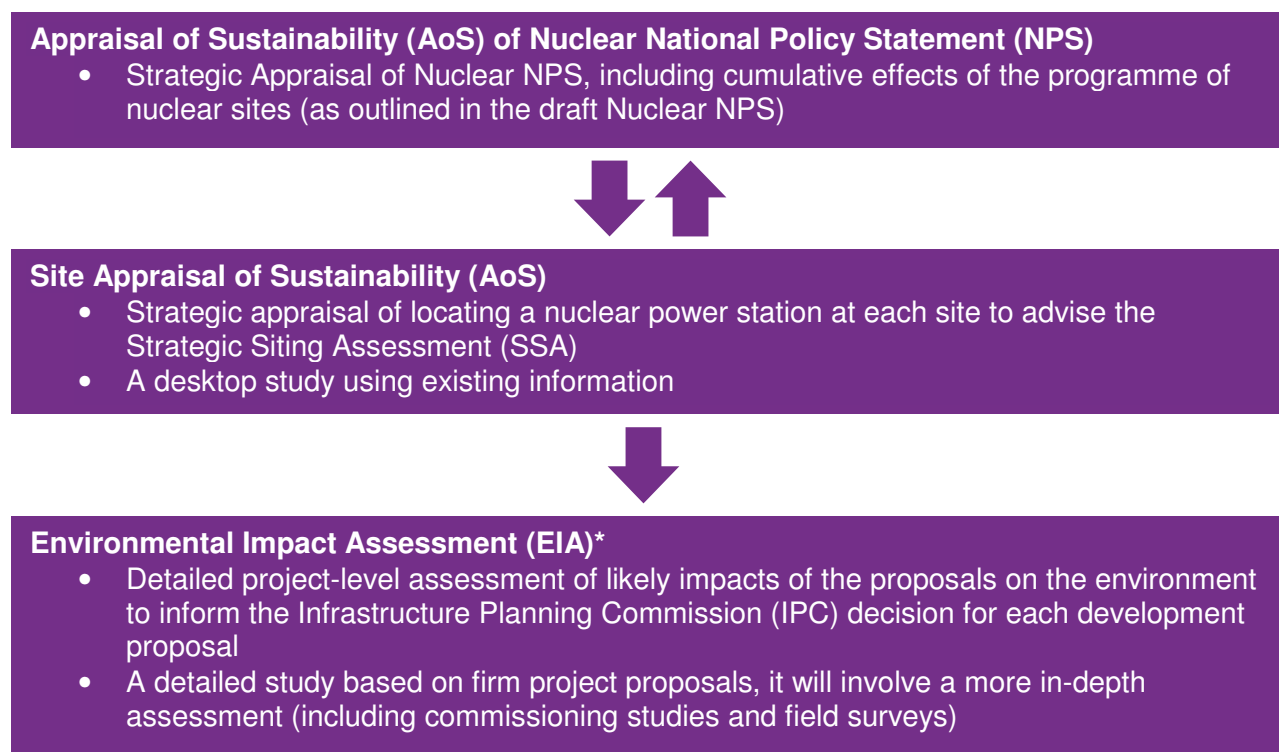
<sup>2</sup> DECC Revised Draft Nuclear NPS <http://www.energynpsconsultation.decc.gov.uk>

<sup>3</sup> The Government announced in June 2010 its intention to amend the Planning Act 2008 and abolish the IPC. In its place, the Government envisages that a Major Infrastructure Planning Unit (MIPU) will be established within the Planning Inspectorate. Once established, the MIPU would hear examinations for development consent and would then make a recommendation to the Secretary of State. It would not itself determine applications and decisions would be taken by the relevant Secretary of State. These proposed reforms require primary legislation. Until such time as the Planning Act 2008 is amended, the IPC will continue as set out in that Act. As a result, the NPSs will provide the framework for decisions by the IPC on applications for development consent for major infrastructure projects, and under the new arrangements will provide the framework for recommendations by the MIPU to the Secretary of State.

sites. This SSA process<sup>4</sup> drew on the emerging findings of the site AoSs and the Habitats Regulations Assessment (HRA)<sup>5</sup>.

## Appraisal of Sustainability incorporating Strategic Environmental Assessment

- 1.5 The Planning Act (2008)<sup>6</sup> requires an AoS for all National Policy Statements. The purpose of an AoS is to consider the social, economic and environmental implications of the policy and to suggest possibilities for improving the sustainability of the NPS. The AoS incorporates the requirements of the European Strategic Environmental Assessment Directive<sup>7</sup> which aims to protect the environment and to promote sustainable development during preparation of certain plans and programmes. This is set out in more detail in the Main AoS Report of the revised draft Nuclear NPS.
- 1.6 The purpose of this AoS is to assess environmental and sustainability impacts on the Sizewell site. This AoS also identifies the significance of those effects, and to suggest possible ways of mitigation. The AoS for the Sizewell site fed into the Strategic Siting Assessment (SSA) and the preparation of the revised draft Nuclear NPS. There would be further detailed studies at the EIA stage of any construction project. The following diagram explains the relationship between the Main AoS Report, the Site AoS Report and an EIA.



<sup>4</sup> Towards a nuclear national policy statement : Government response to the consultation on the Strategic Siting Assessment process and criteria, January 2009, URN 09/581 <http://www.berr.gov.uk/files/file47136.pdf>

<sup>5</sup> DECC Sizewell HRA Report <http://www.energy-nps-consultation.decc.gov.uk>

<sup>6</sup> Planning Act 2008

<sup>7</sup> Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, implemented through *The Environmental Assessment of Plans and Programmes Regulations 2004*



\*as required by European Directive 85/337/EEC and *Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999*

## Appraisal of Sustainability Methods

- 1.7 In undertaking the AoS of each nominated site, a wide range of information was considered including, the Scoping Report<sup>8</sup>, the Environmental Study<sup>9</sup>, the Update Report<sup>10</sup>, information from other Government departments, the statutory consultees and regulators, information from the nominators and other published reports. If additional local information was available, for example, an EIA scoping report or a locally relevant Strategic Flood Risk Assessment, it has been used to inform the appraisal where appropriate and referenced as footnotes.
- 1.8 The methods used for AoS/SEA are detailed in the Main AoS Report. The AoS uses objectives as a means of identifying and appraising the potential significant effects of building new nuclear power stations on the environment and communities. The sustainability objectives that have been agreed for the appraisal of the revised draft Nuclear NPS are detailed in Annex E of the Environmental Study and the Main AoS Report. Appendix 1 of this AoS Site Report sets out the guide questions that are used with each sustainability objective to help focus the appraisal in a more systematic way. The sustainability objectives used in the Environmental Study were grouped into themes for sustainable development in order to help focus on the key issues for appraisal. This is set out in the following table:

**Table 1.1: Sustainable Development Themes and AoS/SEA Objectives**

<b>Sustainable Development Theme</b>	<b>AoS/SEA Objective (Numbers refer to Scoping Report<sup>11</sup> and Environmental Study<sup>12</sup>)</b>
<b>Air Quality</b>	To avoid adverse impacts on air quality (12)
<b>Biodiversity and Ecosystems</b>	to avoid adverse impacts on the integrity of wildlife sites of international and national importance (1) to avoid adverse impacts on valuable ecological networks and ecosystem functionality (2) to avoid adverse impacts on Priority Habitats and Species including European Protected Species (3)
<b>Climate Change</b>	to minimise greenhouse gas emissions (13)
<b>Communities: Population, Employment and Viability</b>	to create employment opportunities (4) to encourage the development of sustainable communities (5) to avoid adverse impacts on property and land values and avoid planning blight (10)

<sup>8</sup> BERR (March 2008) Consultation of Strategic Environmental Assessment for proposed National Policy Statement for new nuclear power, URN08/680

<sup>9</sup> BERR July 2008 Environmental Study

<sup>10</sup> BERR January 2009 Update Report

<sup>11</sup> BERR (March 2008) Consultation of Strategic Environmental Assessment for proposed National Policy Statement for new nuclear power, URN08/680

<sup>12</sup> BERR July 2008 Environmental Study

<b>Sustainable Development Theme</b>	<b>AoS/SEA Objective (Numbers refer to Scoping Report<sup>11</sup> and Environmental Study<sup>12</sup>)</b>
<b>Communities: Supporting Infrastructure</b>	to avoid adverse impacts on the function and efficiency of the strategic transport infrastructure (8) to avoid disruption to basic services and infrastructure (9)
<b>Human Health and Well-Being</b>	to avoid adverse impacts on physical health (6) to avoid adverse impacts on mental health (7) to avoid the loss of access and recreational opportunities, their quality and user convenience (11)
<b>Cultural Heritage</b>	to avoid adverse impacts on the internationally and nationally important features of the historic environment (22) to avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes (23)
<b>Landscape</b>	to avoid adverse impacts on nationally important landscapes (24) to avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness (25)
<b>Soils, Geology, Land Use</b>	to avoid damage to geological resources (19) to avoid the use of greenfield land and encourage the re-use of brownfield sites (20) to avoid the contamination of soils and adverse impacts on soil functions (21)
<b>Water Quality and Resources</b>	to avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology) (15) to avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives (16) to avoid adverse impacts on the supply of water resources (17) to avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives (18)
<b>Flood Risk</b>	to avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible (14)

1.9 The AoS for each of the nominated sites considered the relevant policy context at a regional level, which helped to identify key sustainability objectives that need to be taken into account in the appraisal and potential cumulative effects that could arise with other plans and projects. Policy context at the local government level is changing as a result of the new planning system. However, local planning policy will be required to conform to regional plans and programmes. Existing and emerging local policy documents were considered, where relevant, for the characterisation of

baseline conditions and the appraisal of effects. The regional policy context and regional baseline information is set out in Appendices 3 and 4 respectively.

## Background to Nuclear Power Stations

- 1.10 This section provides some wider context on nuclear power. Nuclear power works in a similar way to conventional electricity generation, insofar as it depends on the creation of heat to generate steam, which in turn powers a turbine.
- 1.11 This process needs to be carefully managed because of the energy released in the process. The process is controlled by the use of a “moderator”. All reactors have sufficient moderators to shut them down completely and fail-safes to ensure that this occurs in the event of any potential incidents. The early designs of nuclear power stations in the UK used graphite as a moderator. Later designs of nuclear power stations use water as a moderator. It is likely that any new nuclear power stations built in the UK would be water moderated.
- 1.12 The nuclear reactions that take place in nuclear power stations create a high level of radioactivity in the reactor. Radioactivity occurs naturally and is a normal part of our environment, but nuclear power stations create much higher intensities that require careful management while operating and after they have finished generating electricity.
- 1.13 The UK has strict, independent, safety and environment protection regimes for nuclear power. The Nuclear Installations Inspectorate (NII), a division of the Health and Safety Executive, and the Environment Agency (EA) regulate nuclear power stations in England and Wales. Any new nuclear power station will be subject to safety licensing conditions and will have to comply with the safety and environmental conditions set by the regulators. NII and the Environment Agency are currently assessing two new nuclear reactor designs through the Generic Design Assessment (GDA) process.
- 1.14 Generating electricity by nuclear power creates radioactive waste, some of which remains potentially hazardous for thousands of years. The storage and disposal of this waste is an important part of the nuclear fuel cycle and needs careful long-term management. In June 2008 the Government published the White Paper on Managing Radioactive Waste Safely<sup>13</sup>. This set the framework for managing higher activity radioactive waste in the long term through geological disposal, coupled with safe and secure interim storage and ongoing research and development. Geological disposal involves isolating radioactive waste deep inside a suitable rock formation, to ensure that no harmful quantities of radioactivity ever reach the surface environment. The White Paper also invites communities to express an interest in opening up without commitment discussions with the Government on the possibility of hosting a geological disposal facility at some point in the future.

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<sup>13</sup> <http://www.defra.gov.uk/environment/radioactivity/mrws/pdf/white-paper-final.pdf>

- 1.15 When a nuclear power station reaches the end of its life, it has to be dismantled (normally referred to as “decommissioned”). This process also needs careful management. While many parts of the power station are easily decommissioned, some parts will be radioactive because they were exposed to high levels of radiation. In the UK, the Nuclear Decommissioning Authority (NDA) is responsible for the existing nuclear legacy and is decommissioning 20 civil public sector nuclear sites.
- 1.16 Operators of new nuclear power stations are required to have secure funding arrangements in place to cover the full costs of decommissioning and their full share of waste management and disposal costs.

## New Nuclear Power Station Designs

- 1.17 The HSE and EA are undertaking a process of Generic Design Assessment (GDA) of new nuclear reactor designs. GDA allows the assessment of the generic safety, security and environmental implications of new nuclear reactor designs, before an application is made for permission to build a particular design on a particular site.
- 1.18 Given the strategic level of information required for the Strategic Siting Assessment (SSA), and the information available at this early stage, it is not intended to consider the implications of different nuclear power station designs at each nominated site. It is considered that these are better addressed at the planning application stage. Therefore, in order to appraise the sites, the AoS has made a number of assumptions about the generic design characteristics of new nuclear power stations, which is discussed in more detail in the Main AoS Report.
- 1.19 To provide a standardised approach to the appraisal of the nominated sites, the assumptions about generic design characteristics have been summarised into a base-case. The base-case was used to guide the assessment for each site, except in cases where a nominator has provided further detail at variance to the base case. For example, if a nominator is proposing cooling towers instead of abstracting water for cooling, this has been considered in the assessment. The key assumptions used for the site level assessments are outlined in Table 1.2, with the variations considered in the Sizewell Site AoS Report provided in the right hand column.

**Table 1.2: Base Case Assumptions and Variations Considered for Sizewell**

<b>Base Case</b>	<b>Variations considered in AoS of Sizewell (as proposed in nomination)</b>
1 nuclear reactor	At least 1 reactor
Technology neutral (i.e. unknown reactor type)	
A requirement for cooling water abstraction	
Discharges of cooling water	

Base Case	Variations considered in AoS of Sizewell (as proposed in nomination)
Site boundary as indicated on nomination form	
<u>Timescales:</u> Construction: approximately 5-6 yrs Operation: approximately 60 years (life extension, which is subject to regulatory approval, could mean that the operating lifetime is longer) Decommissioning: approximately 30 years Lifetime of site: approximately 166 years <sup>14</sup>	
<u>No. of employees:</u> Construction: approx 4,000 (around 50% from within region) Operation: approx 500 Decommissioning: range of 400 – 800 at key phases <sup>15</sup> Associated employment creation: 2000	
Coastal flood and protection measures (where relevant)	Land raising and/or flood defence improvements and coastal protection measures
Infrastructure for transporting reactor (for example, jetty, landing facility)	
Interim radioactive waste storage facilities will be capable for at least 160 years	
Highway improvements, access routes	
Associated transmission infrastructure	
Radioactive discharges will be within legal limits	

<sup>14</sup> The site lifetime of 166 years assumes 6 years for construction, 60 years for operation and 100 years for interim storage of spent fuel after the last defueling. It is possible to envisage a scenario in which onsite interim storage might be required for around 160 years from the start of the power station's operation, to enable an adequate cooling period for fuel discharged following the end of the power station's operation. In making its assessment that onsite interim storage might be needed for 160 years, the Government took a conservative approach, to ensure that local communities are aware that it is possible that onsite interim storage might be required for this length of time. Following the public consultation, the Government has revised its position. The Government recognises that onsite interim storage might be required beyond 2130, particularly in the event that a GDF is not available to take the waste, but the Government does not expect onsite interim storage to be required for as long as 160 years. Further detail is set out in The Government Response to the consultation on the draft National Policy Statements for Energy, DECC, 2010, [www.energynpsconsultation.decc.gov.uk](http://www.energynpsconsultation.decc.gov.uk)

<sup>15</sup> Estimates for existing nuclear power stations entering the decommissioning phase indicate up to 800 full time equivalent staff for defueling, then a minimal workforce (less than 50) during the care and maintenance phases, and a second peak of up to 600 for the final demolition and site clearance (source: <http://www.nda.gov.uk/sites>)

## 2 The Site: Sizewell

- 2.1 The site area is located adjacent to the Sizewell B nuclear power station near Leiston in Suffolk, with the most substantial area identified to the northwest. The site is in the parish of Leiston within the Suffolk Coastal District in the County of Suffolk. The location of the nominated site is illustrated in Figure 1. Figure 2 shows the location of the nominated site in a sub-regional context to help address any implications for cumulative effects on biodiversity and on socio-economic factors.
- 2.2 The Sizewell area has supported nuclear power facilities since 1966. Sizewell A power station, with two 1000 MWt Magnox reactors, operated from 1966 to 2006 and is now being decommissioned by the Nuclear Decommissioning Authority. Sizewell B was built and commissioned between 1987 and 1995, after a lengthy public inquiry (1982-85) and is expected to operate for 40 years (i.e. until 2035). Sizewell B, a single 1188 MWe Pressurised Water Reactor (PWR), is operated by British Energy and is the UK's newest nuclear power station and the only PWR in the UK. A planning application by Nuclear Electric for a Sizewell 'C' nuclear power station was submitted in 1993, but withdrawn in 1995 due to the unfavourable market conditions for nuclear power.
- 2.3 The site lies within 3km to the east of the town of Leiston, with other nearby towns at Aldeburgh and Saxmundham within 10km and Southwold further north along the coast. The small coastal village of Sizewell lies to the south of Sizewell A power station. The major towns of Ipswich and Lowestoft are some 40km to the south west and north respectively.
- 2.4 The site is on the Suffolk Heritage Coast within the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB) and includes part of the Sizewell Marshes Site of Special Scientific Interest (SSSI). The site includes land in the Goose and Kenton Hills to provide for an access road and other facilities which may be located outside the nuclear power station boundary. The Goose and Kenton Hills are former areas of heathland although land use is now principally commercial forestry.
- 2.5 The nomination is for a nuclear power station development incorporating:
- at least one nuclear reactor
  - land raising, flood defence improvements and coastal protection measures
  - construction stage areas and facilities
  - infrastructure and facilities related to the operation of a nuclear power station
  - associated access roads and transmission and cooling water infrastructure
  - interim waste storage facilities
- 2.6 The site includes a secondary area to the south of Sizewell A and B power stations, between Sizewell Wents and the hamlet of Sizewell. This area has

been identified because it may be needed to accommodate ancillary facilities to meet operational requirements.

- 2.7 It is noted that the site boundary excludes in its entirety the Minsmere to Walberswick Heaths and Marshes Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar site which is located to the north of the site.
- 2.8 The site at Sizewell was nominated into the SSA process, in respect of which nominations closed on 31 March 2009. The Government is also assessing the environmental and sustainability impacts of including the nominated site in the list of potentially suitable sites in the revised draft Nuclear NPS (through this Site AoS Report).
- 2.9 The SSA required the site nominator to supply an annotated Ordnance Survey map at 1:10,000 scale showing the boundary of the nominated site, which is provided in Figure 3.

## 3 Policy Context

### Introduction

- 3.1 The Main AoS Report sets out the national policy context in relation to nuclear power stations, energy, climate change mitigation, use of natural resources, environmental protection and sustainability of communities. During the scoping<sup>16</sup> stage, a review of national plans was undertaken to help identify key sustainability objectives that need to be met and contribute to the development of the AoS Framework of objectives for appraisal.
- 3.2 This section considers the policy context at the regional and local levels relevant to the potential new nuclear power station at Sizewell and its surroundings. It aims to identify any key significant policy objectives that need to be considered for this strategic appraisal of the nominated site. This also contributes to addressing the potential interactions and cumulative effects that may arise from the operation of a power station on the nominated site. This is covered in Section 5 of the Site AoS Reports and Section 8 of the Main AoS Report.

### What are the other Key Sustainability Objectives that need to be considered?

- 3.3 The relevant policy documents are reviewed in Appendix 3 of this report and are as follows:
- Suffolk Climate Action Plan, Suffolk Climate Change Partnership (2009), Revoked July 2010<sup>17</sup>
  - Revised Regional Spatial Strategy for the East of England 2008-2021, Government Office for the East of England (May 2008), Revoked July 2010<sup>17</sup>
  - A Shared Vision: The Regional Economic Strategy for the East of England, East of England Development Agency (2004), Revoked July 2010<sup>17</sup>
  - Sustainable Communities in the East of England, Office of the Deputy Prime Minister (2003), Revoked July 2010<sup>17</sup>
  - Suffolk Coast and Heaths AONB Management Plan 2008 – 2013, Local Authorities and Suffolk Coast and Heaths Partnership (2008)
  - East of England Regional Waste Management Strategy, East of England Region Waste Technical Advisory Body (2002), Revoked July 2010<sup>17</sup>
  - Suffolk Local Biodiversity Action Plan 2000-2007, Suffolk Biodiversity Partnership

<sup>16</sup> BERR (March 2008) Scoping Report

<sup>17</sup> Data from the Regional Spatial Strategies (RSS) and other regional plans and strategies were used to inform the AoS reports published in November 2009. On 6 July 2010, the Secretary of State for Communities and Local Government, announced the revocation of Regional Strategies and the other documents noted with immediate effect. However, the RSS and other revoked regional documents remain a useful source of background data on regional sustainability issues, so references to these documents have been retained in later revisions of the AoS. The strategies and policies set out in the revoked regional documents may in future be taken forward by other means in local or strategic planning and applicants will need to consider this in preparing an application for development consent. .



- River Basin Management Plan - Anglian River Basin District, Environment Agency (2009)
- Lowestoft to Harwich Shoreline Management Plan, Halcrow (1997)
- Draft Local Development Framework – Core Strategy Preferred Options until 2025, Suffolk Coastal District Council (2008)
- Suffolk Coastal and Waveney District Strategic Flood Risk Assessment, Scott Wilson for Suffolk Coastal and Waveney District Councils (February 2008)

3.4 The key objectives for sustainability from these regional policy documents can be summarised as follows:

- Protecting and enhancing biodiversity
- Mitigating and adapting to effects of climate change
- Reducing flood risk and managing coastal processes
- Enhancing the physical environment
- Maintaining, protecting and enhancing the regional economy
- Promoting the use of renewable energy
- Improving sustainable transport and accessibility
- Protecting water quality and resources
- Accommodating increased population growth
- Increasing provision of affordable homes

3.5 The plans that are still in place may have indirect and/or cumulative interactions and this is discussed further in Section 5: Interaction and Cumulative Effects with Other Plans and Projects.

## 4 Site Characterisation

### Introduction

- 4.1 A general description of the nominated site at Sizewell and its location is provided in Section 2.
- 4.2 This section describes the general characteristics of the nominated site at Sizewell and its surrounding area relative to the key sustainability themes identified in Section 3. Information regarding the local and regional environment and communities has been obtained and reviewed from publicly available sources and comparisons have been made with equivalent regional and national data sources where relevant and available. This information is summarised in Appendix 4. Key strategic networks for transport are shown in Figure 2 and key environmental constraints in Figure 4.
- 4.3 The Scoping Report identified the indicators used for baseline data collation at the national scale (used in the Environmental Study). It also set out the indicators to be used for each site AoS following the nomination of sites, but recognised that the baseline data collation process would be refined at the site nomination stage. Therefore, following site nominations, the relevant national, regional and local data has been sourced. This has enabled a more detailed, but still strategic, assessment to be undertaken than at national SEA scoping. As this AoS is a strategic study, data that would typically be collated to inform an EIA (i.e. very site-specific data or data requiring the execution of surveys) has not been gathered. However, where relevant, information from available published reports of any previous detailed studies has been referenced to inform this strategic assessment. The scope of baseline data gathered for the AoS for Sizewell is presented in Table 4.1 below.

**Table 4.1: Summary of Scope of Baseline Data Collated for Sizewell**

<b>Sustainable Development Theme</b>	<b>Scope of baseline data collated in this AoS</b>
<b>Air Quality</b>	<ul style="list-style-type: none"> <li>• Regional air quality index</li> <li>• Location of Air Quality Management Areas</li> </ul>
<b>Biodiversity and Ecosystems</b>	<ul style="list-style-type: none"> <li>• Location and description of Special Protection Areas, Special Areas of Conservation, Ramsar Sites, Sites of Special Scientific Interest, National Nature Reserves, Local Nature Reserves, Local Wildlife Sites, Local Biodiversity Action Plans, Legally Protected Species</li> </ul>
<b>Climate Change</b>	<ul style="list-style-type: none"> <li>• Regional precipitation and temperatures;</li> <li>• Greenhouse gas emissions – regional, county and local.</li> </ul>

Sustainable Development Theme	Scope of baseline data collated in this AoS
<b>Communities and Supporting Infrastructure:</b> Population Employment Community Viability Transport Waste and Minerals Energy	<ul style="list-style-type: none"> <li>• Location of major settlements and areas of population</li> <li>• Age structure of population</li> <li>• Employment/unemployment and economic activity rates</li> <li>• Employment profile by industry</li> <li>• Socio-economic classification of population</li> <li>• Energy from low-carbon/ renewable resources: regional</li> <li>• Transport networks and links</li> <li>• Landfill sites and waste management facilities</li> </ul>
<b>Human Health and Well-Being</b>	<ul style="list-style-type: none"> <li>• Index of Multiple Deprivation</li> <li>• Age profile</li> <li>• General health</li> <li>• Life expectancy</li> <li>• Infant mortality</li> <li>• Proximity to medical services</li> </ul>
<b>Landscape and Cultural Heritage</b>	<ul style="list-style-type: none"> <li>• Location and description of National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts</li> <li>• National landscape Character Areas</li> <li>• Location and description of World Heritage Sites, Scheduled Monuments, Historic Battlefields, Historic Parks and Gardens, Designated Protected Wrecks, Conservation Areas, Listed Buildings.</li> </ul>
<b>Soils, Geology, Land Use</b>	<ul style="list-style-type: none"> <li>• Agricultural land classification</li> <li>• Soil types</li> <li>• Geological SSSIs</li> <li>• Geological risks</li> <li>• Environmental hazards</li> <li>• Historic land use</li> </ul>
<b>Water:</b> Hydrology Quality Resources Flood Risk	<ul style="list-style-type: none"> <li>• Location of areas at risk of flooding</li> <li>• State of surface and ground waters: in river basin district and catchment</li> <li>• Predicted water demand and availability by Water Resource Zone</li> <li>• Designated waters under EU Directives</li> </ul>

## Air Quality

4.4 Air quality in Eastern England is relatively good with an average air quality index score of less than 3 (where 1-3 good, 4-6 moderate, 6-9 poor and 10 bad)<sup>18</sup>. However, pockets of relatively poor air quality exist in the region,

<sup>18</sup> *State of the Region Report for East England* [2008]. North East Regional Information Partnership. [http://www.nerip.com/reports\\_briefing.aspx?id=564](http://www.nerip.com/reports_briefing.aspx?id=564) [accessed 03 March 2009]

particularly in urbanised areas and major route corridors that experience high levels of traffic flow.

- 4.5 There are 60 Air Quality Management Areas (AQMAs) in the Eastern Region of England<sup>19</sup>. One AQMA has been declared in the Suffolk Coastal District Council Region (Woodbridge, approx 25km southwest of the existing Sizewell site).
- 4.6 The average air pollution index for the East of England has been gradually increasing since 2002. Significant pressures on meeting air quality objectives are being experienced in a number of urban areas and major route corridors. This is reflected in the relatively large number of AQMAs in the region and is largely as a result of increasing population, traffic and congestion in the region (there has been an increase of 19% of vehicles on the roads from 1995 – 2006)<sup>20</sup>.
- 4.7 The EA assesses that non-radioactive aerial emissions (sulphur dioxide, nitrogen oxides and volatile organic compounds) from nuclear power stations are extremely low compared to other regulated industries. The Environment Agency's (EA) most recent available assessment of radioactive aerial emissions for regulated nuclear power stations indicates that all fall within authorised limits.<sup>21</sup>
- 4.8 The UK nuclear industry is highly regulated. All nuclear power stations require a licence to operate provided by the Health and Safety Executive (HSE)/Nuclear Installations Inspectorate (NII). The licence deals with all consents and changes from initial application to decommissioning and beyond.

## Biodiversity and Ecosystems

- 4.9 There is a high concentration of designated sites and a wide range of biodiversity interest surrounding the nominated site, including nationally important SSSIs and European designated sites. Further information on the European designated sites and their current condition is given in the separate HRA Report for Sizewell.
- 4.10 Sizewell lies to the south of the Minsmere to Walberswick Heaths and Marshes SAC, which is also recognised as a SPA for birds and a Ramsar<sup>22</sup> wetland site. The Minsmere to Walberswick European designated areas are protected for their coastal and estuarine habitats and important breeding and wintering bird populations.

<sup>19</sup> UK Air Quality Archive (online) available:

<http://www.airquality.co.uk/archive/laqm/laqm.php> [accessed 03 March 2009]

<sup>20</sup> Environment Agency: State of the Environment – Eastern England [online] available:

<http://www.environment-agency.gov.uk/research/library/publications/34061.aspx> [accessed 03 March 2009]

<sup>21</sup> Measuring Environmental Performance: Sector Report for the Nuclear Industry (Environment Agency, Nov 2005)

<sup>22</sup> Ramsar sites are wetlands of international importance designated under the Ramsar Convention, first designated in the UK in 1976. The initial emphasis was on selecting sites of importance to waterbirds within the UK, and consequently many Ramsar sites are also SPAs; however non-bird features have been increasingly taken into account.

- 4.11 Other European protected areas within close proximity which could be potentially impacted upon from the development of the nominated site include the Sandlings SPA and Alde-Ore Estuaries SAC, SPA and Ramsar wetland sites. The Outer Thames Estuary SPA borders the site as part of an offshore habitat area that extends at least 20km north and south of the nominated site.
- 4.12 Sizewell Marshes SSSI is an area of grazing marsh (including Sizewell Belts nature reserve) with important assemblages of invertebrates and breeding and winter bird populations, situated adjacent to and within the nominated site boundary. There are three other SSSIs that could be affected by the nominated site; Leiston-Aldeburgh SSSI, which supports important breeding bird populations; Minsmere-Walberswich Heaths and Marshes SSSI; and the Alde-Ore Estuary SSSI.
- 4.13 The above designated sites include RSPB reserves adjacent to the nominated site (Minsmere) and within 1.5km to the north (North Warren).
- 4.14 There are four National Nature Reserves (NNRs) within 20km of the nominated site. These are Orfordness-Havergate; Suffolk Coast; Westleton Heath and Benacre.
- 4.15 At the local level, a number of protected and priority habitats and species are associated with the area and are likely to be on or within close proximity of the nominated site.

## Climate Change

- 4.16 The potential effects of climate change on the nominated site, such as storm surges, coastal erosion, sea level rise and flooding, are explored in the Flood Risk section.
- 4.17 The East of England region is ranked 5<sup>th</sup> out of the 9 regions in the UK for its CO<sub>2</sub> emissions per head. Emissions from domestic sources are 780kg per head; compared to the average for England of 750kg per head.
- 4.18 The UK's 2008 Climate Change Act<sup>23</sup> sets a legally binding target of at least an 80 percent cut in greenhouse gas emissions by 2050, to be achieved through action in the UK and abroad. The Act also sets a target to reduce emissions by at least 34 percent by 2020. Both targets are against a 1990 baseline.
- 4.19 The region also has a number of integrated transport policies, which aim to contribute to the reduction of carbon emissions whilst addressing the expected population and transport infrastructure growth. Despite these policies, carbon emissions are still relatively high due to sparse populations and dependence on car transport.

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<sup>23</sup> [http://www.decc.gov.uk/en/content/cms/legislation/cc\\_act\\_08/cc\\_act\\_08.aspx](http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx)

- 4.20 There are 10 power stations within a 112km radius of the nominated site, in addition to the Sizewell nuclear power station which ceased operation in 2002. The 10 power stations have a combined capacity of 7.4 GW (fossil fuel mix), 0.4 GW (wind) and 2.2 GW (nuclear).

## Communities: Population, Employment and Viability

- 4.21 The population in the East of England region has steadily increased over the past 25 years and now has reached approximately 5.6 million residents. According to the Office for National Statistics, the region's population grew between 1981 and 2006 by 16%, more than double the rate for the UK as a whole and second only to the South West.
- 4.22 There are three significant growth areas wholly or partly in the region: the whole of the London-Stansted-Cambridge-Peterborough growth area and parts of the Thames Gateway and Milton Keynes and South Midlands areas (GO-East 2007). The region's population is also ageing, with the Suffolk Coastal district experiencing an increase of 7.4% of the population aged between 45 and 64 years between 1991 and 2001, and a decrease of 5.7% in the 18 to 29 years age group over the same period.
- 4.23 The population density of the Suffolk coastal district is low, with an average of 1.3 people per ha, below the England and Wales average of 3.4 per ha. The district itself is sparsely populated when compared to the region as a whole and is ranked 41 of a total of 48 local and unitary authorities.
- 4.24 Sizewell is situated on the Suffolk coast, within Leiston Ward and Suffolk Coastal district. The nearest settlement is the small fishing village of Sizewell, close to the south of Sizewell A, and the nearest town is Leiston (3km to the west). Other nearby local towns and villages include the coastal resorts of Thorpeness (4km to the south) and Aldeburgh (8km to the south), with Saxmundham and Southwold also within 10-15km to the west and north. From the 2001 Census, Leiston Ward has a population of 6240, with neighbouring wards of Aldeburgh and Saxmundham having populations of 3538 and 3992 respectively.
- 4.25 Employment rates for people of working age in the East of England region are 74.3 % (2009), which is above the national average of 70.7%, and is amongst the highest levels of employment when compared to other English Regions. Within the East of England region, employment rates for Suffolk Coastal District Council is slightly above the average for the region (at 78.1%).<sup>24</sup>

## Communities: Supporting Infrastructure

- 4.26 Transport: The Sizewell area is not well served by major road transport links. The area is connected to the main A12 via local 'A' roads and the A12 (Lowestoft to Ipswich and London) is the subject of strategic local development of improvements (i.e. bypasses). The A14 (Ipswich to Newmarket) has been identified as a national road route. Congestion issues in

<sup>24</sup> Official Labour Market Statistics, 2009, <https://www.nomisweb.co.uk/reports/lmp/la/2038432073/report.aspx>

the local area are noted in the region's population centres (Ipswich, Bury St Edmunds, and Lowestoft). There are congestion issues on strategic routes, particularly the A14 where a number of junctions are reaching capacity.

- 4.27 Future growth associated with regeneration is being taken forward in partnership with the Highways Agency. Strategic development plans are in place for a scheme to provide a new route for the A12, bypassing the four villages of Farnham, Stratford, Glenham and Marlesford.
- 4.28 Rail connections are adequate for the area's current transport loading and there are proposals for further improvement to the East Suffolk Rail Line.
- 4.29 There is currently no marine off-loading facility at Sizewell, but it is noted that a temporary facility was built for use during the construction of the existing nuclear power station. The nearest major shipping links are located in Great Yarmouth, approximately 80km north of the nominated site.
- 4.30 Conventional waste<sup>25</sup>: In 2006/2007 Suffolk County Council was one of the top performing waste disposal and unitary authorities in the country with a 43.5% recycling and composting rate. Landfill remains the principal method of waste disposal in Suffolk. A total of 36.5% of municipal waste was sent to landfill in the region in 2006/2007, this was lower than the English average of 58%.
- 4.31 There are seven municipal waste disposal sites operational in Suffolk, with a combined current capacity anticipated to last up until at least 2020. No information suggests expansion of capacity is currently being considered. However Suffolk Coastal District Council is currently in the process of considering alternative waste treatment options (Mechanical Biological Treatment and Energy from Waste plant).
- 4.32 There are currently no operational hazardous waste landfill sites in Suffolk, although established waste management contractors are known to operate and provide services within the region.

## Human Health and Well-Being

- 4.33 The Sizewell site is within the Super Output Area (SOA) known as Suffolk Coastal 004C<sup>26</sup>. Indices of deprivation show that the Suffolk Coastal SOA is not a deprived area although income and education deprivation in the area are both greater than the average. The age profile for this SOA shows that there are slightly fewer children under sixteen but significantly more senior citizens (males over 65 and females over 60) than the English average. The profile also shows that there are fewer working age people in the area than average.

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<sup>25</sup> Conventional waste means waste controlled under Part II of the Environment Act 1990

<sup>26</sup> An SOA is a geographical unit, of roughly equivalent population size and smaller than a district council area, created in the UK by the Office of National Statistics to aid statistical analysis of data

- 4.34 The most recent census (2001) found that people within the Suffolk Coastal SOA generally reported good or fairly good health. This is reflected in a life expectancy greater than the English average and also slightly higher than that of the population of the East of England region. Infant mortality is also below the English average but slightly higher than the regional average.
- 4.35 With regard to mental health, the Health Profile 2008<sup>27</sup> for the Suffolk Coastal area shows that estimates of the number of people claiming incapacity benefit for mental illness in the area (14.8 per 1000 population) are significantly below the English average (27.5 per 1000 population).
- 4.36 Despite the educational deprivation figures referred to above, pupils in the Suffolk Coastal 004C area perform significantly better in their GCSE equivalent examinations than their peers in the rest of England.
- 4.37 Housing within Suffolk Coastal District Council's area is generally good with a much smaller percentage of unfit housing<sup>28</sup> than the region or country average.
- 4.38 Figures from the Audit Commission for 2005<sup>29</sup> suggest that the crime rate in Suffolk Coastal District Council's area is much lower than the national average.
- 4.39 The economic well-being of the area is positive as can be seen from the local employment figures<sup>30</sup> (see 'Communities: Population, Employment and Viability' above - noted here as a measure of well-being). From July 2007 to June 2008, 78.5% of the population of the Suffolk Coastal District Council area were employed. This number compares favourably with figures for the East of England region (77.7%) and England as a whole (74.5%).
- 4.40 Local access to medical services is reasonable with one general practitioner (GP) practice within 5km of the site. There are also four additional GP practices within 10km of the site. A local hospital is located at Aldeburgh (6.9km), although it is noted that there is no accident and emergency department. The nearest accident and emergency department is at Ipswich (33.5km), whilst the nearest mental health hospital is the Suffolk Mental Health Partnership NHS Trust (34.3km).
- 4.41 One of the wider determinants of health and well-being is access to local recreational facilities. In this regard, the nominated site is reasonably well served, with at least three leisure centres within 20km of the site. In addition, as Suffolk Coastal is a rural and coastal location, the area offers good potential for outdoor recreational activities, such as walking, cycling and water sports since the district includes 64km of Heritage Coast, almost all of which is set in an Area of Outstanding Natural Beauty.

<sup>27</sup> <http://www.apho.org.uk/resource/view.aspx?RID=50213>

<sup>28</sup> Dwellings not suitable for occupation as defined by various criteria in Section 604 of the Housing Act 1985 (as amended)

<sup>29</sup> [http://www.areaprofiles.audit-commission.gov.uk/\(rkgonp45u4sp1o55bc5scf55\)/SingleAreaSearch.aspx](http://www.areaprofiles.audit-commission.gov.uk/(rkgonp45u4sp1o55bc5scf55)/SingleAreaSearch.aspx)

<sup>30</sup> <https://www.nomisweb.co.uk/reports/lmp/la/2038431858/report.aspx?pc=IP164UR>



- 4.42 There are two existing nuclear power stations at Sizewell. Sizewell A operated from 1966 until 2006, and Sizewell B has been in operation since 1995 and remains operational. Therefore the necessary exist to enable a comparative study between the incidence of disease in the area and the average prevalence of the same disease in the British population as a whole.
- 4.43 The Committee on Medical Aspects of Radiation in the Environment (COMARE), a scientific advisory committee providing independent authoritative expert advice on all aspects of health risk to humans exposed to natural and man-made radiation, has, for over twenty years, investigated the incidence of childhood cancer and other cancers around nuclear sites starting with the Sellafield site in 1986.
- 4.44 COMARE has published a series of reports on topics related to exposure to radiation. Its view is that there is no evidence for unusual aggregations of childhood cancers in populations living near nuclear power stations in the UK.
- 4.45 COMARE's tenth report considered the incidence of childhood cancer around nuclear installations. These were divided into nuclear power generating stations and other nuclear sites. The results for the power generating stations supported the conclusion that *'there is no evidence from this very large study that living within 25 km of a nuclear generating site in Britain is associated with an increased risk of childhood cancer'*.
- 4.46 In its eleventh report COMARE examined the general pattern of childhood leukaemia in Great Britain and concluded that many types of childhood cancers *'have been shown not to occur in a random fashion'*. *It is also stated that 'The results of analyses ... suggest that there is no general clustering around nuclear installations.'*
- 4.47 Following the KiKK study on childhood leukaemia around German nuclear power plants, COMARE requested that a reanalysis of the UK childhood cancer data used in COMARE's tenth report be carried out using the same methodology as the KiKK study as far as possible. This reanalysis - the Bithell paper - was published in December 2008. It showed that the conclusions of the COMARE tenth report remained valid when applying the KiKK methodology and did not support the findings of the KiKK study.
- 4.48 The KiKK study gave the results on childhood cancer in the vicinity of 16 German nuclear power plants from a dataset established by the German Childhood Cancer Registry, which included over 1500 childhood cancer cases from 1980 to 2003. In comparison, the dataset used for COMARE's tenth report and the subsequent Bithell paper contained over 32,000 cases of childhood cancer from 1969 to 1993. This is a verified national database and is believed to be the largest national database on childhood cancer in the world. The size of the database used by COMARE therefore gives considerable confidence in the results of the tenth report.

- 4.49 COMARE is currently undertaking a further review of the incidence of childhood cancer around nuclear power stations, with particular reference to the KiKK study and COMARE's 10th and 11th reports. This will be published as COMARE's 14<sup>th</sup> report later this year.
- 4.50 Radioactive monitoring carried out in 2008<sup>31</sup> found low concentrations of artificial radionuclides in water, sediment and beach samples and in meat and seafood samples taken around the existing Sizewell nuclear power stations. From this sampling, the estimated total dosage levels to the public from all sources within the Sizewell area were assessed as being less than 4% of the dose limit for members of the public of 1mSv per year as specified in The Ionising Radiations Regulations 1999.

## Cultural Heritage

- 4.51 There are five scheduled monuments, two conservation areas, 98 listed buildings and one protected wreck site within an approximate distance of 5km around the existing power stations. However, none are located within or physically adjacent to the nominated site. There is also an extensive area of potential historic field boundaries adjacent to the site. Archaeological features of prehistoric and later date (Roman and Medieval) were identified in 1993 within the site as previously proposed for Sizewell 'C' nuclear power station.
- 4.52 The nearest SAMs are the original site of Leiston Abbey (National Monument No. 21404) on the RSPB estate and the second site of Leiston Abbey approximately 2.5km to the west of the site (National Monument No. 21405). The nearest listed buildings are Upper Abbey Farmhouse and the thatched barn at Upper Abbey (Grade II) both in the ownership of British Energy. The nomination information states that there will be no direct impact on any of these historic features.

## Landscape

- 4.53 The site falls wholly within the Suffolk Coast and Heaths AONB, an area designated as being of national landscape importance with statutory protection. Paragraphs 21-22 in PPS7: Sustainable Development in Rural Areas identifies this as the 'highest level of protection for nationally designated landscapes', where 'major developments should not take place ... except in exceptional circumstances'. The site also lies on the Suffolk Heritage Coast, a non-statutory defined area, recognised for its scenic beauty and with a function to conserve, protect and enhance the coastal landscape.
- 4.54 The site is situated within the Natural England's National Landscape Character Area No. 82: Suffolk Coast and Heaths, which is characterised by coastal towns and villages but is otherwise sparse in terms of settlement. This landscape comprises estuaries, saltmarsh, grazing marsh, reedbed, river valleys, arable, heath and woodland, with strong coastal influence. The coastline has distinctive shingle spits and ridges resulting from longshore drift.

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<sup>31</sup> Food Standards Agency (2008). Radioactivity In Food and the Environment (RIFE 14) report.

- 4.55 There is an old cliff line (the Bent Hills) to the east of the site, beyond which is a foreshore of undulating dune and shingle.
- 4.56 The Countryside Agency and Campaign to Protect Rural England (CPRE) county tranquillity map identifies the nominated site as lying within a tranquil part of the East of England region.

## Soils, Geology and Land Use

- 4.57 The site is located on agricultural Grade 4 and non-agricultural land that is not of high value for agriculture. The soils are noted to be either deep well-drained sandy soils or deep peat soils associated with clayey over sandy soils, in part very acid. The local geology is Norwich Crag, Red Crag and Chillesford Clay formation. The main geological hazard noted locally is related to the high risk of compressible ground stability probably related to the local peat. No other geological risks were noted.
- 4.58 Apart from the former 'A' and existing 'B' power stations, no other current industrial land use appears to be the present in the area. A historical landfill site was located adjacent to the south of the existing Sizewell power stations. Prior to 1994, an incinerator was in operation at the existing power station adjacent to the nominated site. The incinerator was an Integrated Pollution Control (IPC) registered waste site. Further information regarding the identified waste sites, including extent, nature and quantities of waste will be obtained and assessed as part of a site specific EIA.
- 4.59 Local mineral abstractions of sand and gravels have been used for previous phases of construction at the current Sizewell power station sites; however it is unlikely that they are of significance from a national perspective.
- 4.60 British Geological Survey (BGS) has assessed geological risks in the local area, which include:
- Potential for Shrinking or Swelling Clay Ground Stability Hazard – very low risk
  - Potential for Compressible Ground Stability Hazards – very low to high risk
  - Potential for Running Sand Ground Stability Hazards – very low risk
  - Potential for Landslide Ground Stability Hazards - very low risk

## Water Quality and Resources

- 4.61 The site is located in the Anglian River Basin District (RBD), one of the driest areas of England, because of low rainfall. In this RBD, only 5% of rivers (by length) meet the requirements for good ecological status (GES) or good ecological potential (GEP). In total, 15% of all surface waters are designated as artificial and 56% of all surface waters are designated as heavily modified.
- 4.62 65% of groundwater bodies in the Anglian RBD meet the requirements for good status, while currently none of the estuaries and transitional and coastal waters meets the requirements for GES or GEP. The European Water

Framework Directive (WFD) sets a target of achieving good ecological and chemical status for all water bodies by 2015, therefore significant improvements in water quality in the Anglian RBD are required.

- 4.63 Sizewell is located within the East Suffolk Zone (ESZ) of the Anglian RBD. Only 43km of rivers (approximately 10%) by length in the ESZ achieves GES. This is mainly a function of the impact of pressures such as high phosphate and low dissolved oxygen levels. Further, 71% of the rivers in the ESZ have been identified as candidate heavily modified or artificial water bodies under an EA classification process.
- 4.64 The EA website indicates that Leiston Brook is the nearest water course to the site, but has not yet been assessed under the WFD.
- 4.65 There are no identified Bathing Waters or Shellfish Waters in close proximity to the site.
- 4.66 Groundwater is an important resource in the Anglian RBD, as the majority of the drinking water comes from groundwater. Other pressures include agricultural supply, contamination with nitrates and saline intrusion near to the sea. The major aquifer present at Sizewell is the confined Chalk, which is overlain by the Crag Formation. The Chalk and Crag aquifers are currently assessed as poor (quantitative) with poor chemical quality. The status is not expected to improve by 2015.
- 4.67 There is a groundwater source protection zone (SPZ) located approximately 3km west of the site.
- 4.68 Sizewell is located within the area of the East Suffolk Catchment Abstraction Management Strategy (CAMS), at the eastern edge of Water Resource Management Unit (WRMU) 4, River Yox and within Groundwater Management Unit (GWMU) 16, Confined Chalk. WRMU4 resource availability status is classed as 'No Water Available', and GWMU16 resource availability status is classed as 'Over Abstracted'.
- 4.69 There are water-related SSSI, SAC, SPA and Ramsar designated sites adjacent to, crossed by and close to the site (please refer to the sections on Biodiversity and Ecosystems in this report).
- 4.70 The site is located within Essex and Suffolk Water's supply area and in the 'Blyth' Water Resource Zone (WRZ). The Water Resource Management Plan supply demand balance results for the Blyth WRZ show that there is a small water supply surplus in this WRZ to 2035.
- 4.71 The exact water requirements for the nominated site are not yet finalised. The nominator does not express a preference for a particular cooling process or cooling water source.
- 4.72 There is a continuous cycle of change to the beach profile at Sizewell, with wave action causing a two-way exchange of sand between the beach and the

backshore and dune sediment stores. This process of change within the system is important to the physical resilience of the region, allowing the systems to naturally adjust to external pressures. There is a long-term southerly movement of sedimentary material throughout this region with the episodic erosion of the soft cliffs at Dunwich and Minsmere being the main sources of sediment. Combined with the current management of the shingle beach and dunes fronting the power station at Sizewell the current inundation and erosion threat at the station is relatively low.

- 4.73 Although the coast at Sizewell is generally stable, with rising sea levels there would be natural retreat with cliff erosion, particularly during storm events. The stability of the cliffs would also be affected by any significant change in the Sizewell offshore bank. If the bank were to reduce in height the shoreline would be more vulnerable to wave attack and greater erosion would occur. However, the bank could well migrate inland with the beaches, maintaining similar levels of protection to today.
- 4.74 The main risk to the site is a decrease in supply of sediment from the north that would result in a thinning of the beach and increased wave action on the shoreline leading to coastal retreat. The cliffs between Dunwich and Minsmere are likely to continue to experience episodic erosion, releasing sediment into the system.

## Flood Risk

- 4.75 Part of the site is shown on the EA Floodmap as being located in Flood Zone 1 (low probability), but the site is almost completely surrounded to the west, north and south by land within Flood Zone 3, 'High Probability'. This means that the nominated site is at risk from coastal or fluvial flooding with an annual probability of flooding of >0.5% in any one year.
- 4.76 Ground levels at the site are generally +2.0m Ordnance Datum (OD). Current mean high and low water spring tide levels are +0.9m OD and -2.1m OD respectively. The current 1:50 year storm surge is estimated as +3.0m OD whilst the estimate for 2105, incorporating sea level rise (SLR), is +4.7m OD (United Kingdom Climate Impacts Programme, UKCIP 06 SLR) or +4.93m OD (based upon Defra SLR1). 'The threat posed by tsunamis to the UK' states that wave heights caused by tsunamis would be similar to those of major storm surges.
- 4.77 The site is currently protected from seaward flooding by a northward extension of the flood defences associated with the existing Sizewell B power station, comprising a sand and shingle vegetated embankment with a crest height of +10m OD. This bank lies landward of a further landscaped structure with a crest height of approximately +4m OD, the purpose of which is to absorb the impact of storm waves.
- 4.78 The Shoreline Management Plan (SMP2) policy for Sizewell is to 'hold the line', i.e. to maintain existing defences. The draft SMP2 also recommends that works in the long term may be required to adequately protect Sizewell village and the existing power station site.



## 5 Appraisal of Sustainability

### Introduction

- 5.1 This section considers the potential sustainability effects of including the site at Sizewell in the list of suitable/potentially suitable sites in the revised draft Nuclear NPS. The Main AoS Report considers the sustainability effects that may arise from the construction of nuclear power stations in general. The Site AoS looks specifically at the potential sustainability effects from constructing a new power station at Sizewell, should the application for development consent be successful.
- 5.2 In accordance with the strategic nature and intent of the AoS, this section focuses on potential effects that are considered to be strategically significant at the Sizewell site and, where possible, suggests possibilities for mitigation. Where mitigation is uncertain or difficult, or where effects are likely to remain even after mitigation, this is made clear. Strategic significance is defined in Table 5.1 below.
- 5.3 The findings of the AoS were used to help the SSA process to identify those sites that are potentially suitable for new nuclear power stations and will be listed in the revised draft Nuclear NPS. The detailed matrices are presented in Appendix 2 of this report and the key findings of the AoS are discussed in Sections 5 and 6 of this report.

**Table 5.1: The Assessment of Potential Significance in the Site-Level AoS**

<b>Local Significant Effects</b>
<p>The AoS Site Reports identify potentially significant benefits and disbenefits of locating a new nuclear power station at each of the nominated sites. Some of the effects identified are significant at the local level and are more appropriately addressed through the development consent process to the IPC. Applications for development consent will include EIA, undertaken by the developer. Such local effects may include, for example, an adverse effect on a County Wildlife Site or disturbances to local communities arising from increased construction traffic during the construction phase. Effects of local significance are discussed in the detailed appraisal matrices set out in Appendix 2 of this AoS Report and are available to inform the IPC and others of issues that are likely to arise at the next stage of the planning and assessment processes.</p> <p>As with any major infrastructure project, there are likely to be effects during construction that have the potential for nuisance<sup>32</sup> and disturbance to local communities, demands on local services and supporting community infrastructure, and the risk of pollution and/or damage to environmental assets, such as biodiversity and water. The significance of such effects will be investigated at project level through the EIA process. These effects can often be minimised and controlled through careful design, working in accordance with good site practices, and managed through the use of Construction Environmental Management Plans (CEMPs), which will be agreed with, and monitored by, the environmental regulators and planning authorities.</p>
<b>Strategic Significant Effects</b>
<p>Other identified adverse or beneficial effects are more significant strategically, as they are potentially of wider national, or even international, importance. These may include, for example, an effect on biodiversity of national and international value (see also the HRA Report for Sizewell). Where an effect is considered to have significant implications for the wider region (in this case, the East of England), for example, a benefit for the regional economy, this has been considered as a strategically significant effect. Effects that are primarily of concern at the local or district scale have not been considered in this category. The significance of the potential strategic effects identified for each stage of the nomination, construction, operation and decommissioning, is summarised in Table 6.2.</p>

<sup>32</sup> During the construction, operation and decommissioning of energy infrastructure there is potential for the release of a range of emissions such as odour, dust, steam, smoke, artificial light and for infestation of insects. All have the potential to have a detrimental impact on amenity or cause a common law nuisance or statutory nuisance under Part III, Environmental Protection Act 1990. For statutory nuisance effects section 4.21 of EN-1 applies.



## Air Quality

- 5.4 There is potential for air quality impacts during the construction, operation and decommissioning stages of nuclear power stations.
- 5.5 The construction of a nuclear power station at Sizewell is likely to have localised adverse effects on air quality in the short term (5-6 years), including dust and emissions from construction vehicles, Heavy Goods Vehicles (HGVs), and traffic movements generated by the estimated construction workforce of 4,000. This has the potential to affect residential properties in the surrounding area and villages.
- 5.6 During operation, the traffic generated by the operational workforce has the potential to create longer-term adverse effects on air quality. Traffic and air quality assessments should be undertaken as part of the detailed EIA process, and likely mitigations may include highway improvements, traffic and construction management plans and the use of rail and port facilities where possible. Whilst important at a local level, impacts on air quality arising from construction and increased traffic movements during operation and decommissioning are not considered to be of strategic significance.
- 5.7 Whilst important at a local level, impacts on air quality arising from construction and increased traffic movements during operation and decommissioning are not considered to be of strategic significance. There is a small risk that increased concentrations of airborne pollutants or nutrients could have an adverse effect on adjacent sites of nature conservation interest. This is discussed further in the Biodiversity and Ecosystems Section.
- 5.8 Radioactive releases to air, which could have a detrimental effect on local and regional air quality (in the event of a significant release), are strictly controlled in accordance with limits laid down in permits issued under the Environmental Permitting (England and Wales) Regulations 2010 and subject to monitoring and reporting. Further consideration of the control of radioactive discharges to air is given in Section 7 of the Main AoS Report.
- 5.7 There is a very low risk of an accidental release of radioactive emissions from the Sizewell site, which could have a significant strategic effect on air quality. There is also potential for transboundary effects due to the fact that the prevailing wind at the nominated site would tend to transport emissions across the North Sea towards the continent of Europe. The Health and Safety Executive (HSE) / Nuclear Installations Inspectorate (NII) and the EA will consider this matter during their risk assessments, which will be carried out as part of the consenting process to ensure that risks to public health and safety through accidental release of emissions is within acceptable limits. Whilst the risk is very low, the potential for a large number of people to be adversely affected means that, at this stage of assessment, the potential for strategic adverse sustainability effects has been identified.
- 5.8 **Strategic Effects on Air Quality: The AoS has identified that there is a low risk for a large number of people to be affected by accidental release**

**of radioactive emissions from the Sizewell site, combined with potential transboundary effects, has a potentially strategic effect on sustainability. It should be noted that the prevailing wind would tend to transport airborne contaminants' seaward over the North Sea and potentially beyond to northern continental Europe. Prevention measures include existing risk assessment and regulatory processes. The HSE/NII will need to be satisfied that the radiological and other risks to the public associated with accidental releases of radioactive substances are as low as reasonably practicable and within the relevant radiological risk limit.**

## Biodiversity and Ecosystems

- 5.9 Throughout the construction, operation and decommissioning phases of a nuclear power station, the potential exists for the accidental release of pollutants into the environment, which could have significant impacts on biodiversity. However, the risks of accidental releases would be minimised by the existing risk assessment and regulatory processes that are referred to in the sections on Air Quality and Water Resources. Construction activities, such as earthworks, new buildings and infrastructure could lead to direct habitat loss, increased noise disturbance and impacts on air and water quality, which, in turn, could affect sensitive ecosystems. During operation, the cooling and discharge of heated water and routine discharge of radioactive material could affect aquatic habitats and species if not managed appropriately.
- 5.10 There is the potential that activities may lead to detrimental effects on, and displacement of, important bird populations associated with the Minsmere-Walberswick SPA and Ramsar sites and Sizewell Marshes SSSI. This may include visual and noise disturbance from general construction and operation site activities, plus potential impacts from construction traffic and site lighting.
- 5.11 The site boundary indicates a land-take from Sizewell Marshes SSSI. Construction and the presence of development are likely to lead to direct loss and fragmentation of priority terrestrial and coastal habitats (including habitats within Minsmere-Walberswick Heaths and Marshes SAC; and Sizewell Marshes SSSI; and Outer Thames SPA) and wildlife corridors for protected species. This may include direct loss of grazing marsh and coastal habitats, through the construction of a new access road and a potential marine landing station. Indirect impacts may also occur at four National Nature Reserves (NNRs) in the region. Within 20km of the site.
- 5.12 Biodiversity would also be affected at a more local level if important habitats/species (for example, UK Biodiversity Action Plan habitats/species or legally protected species) are present within, or in close proximity to, the site.
- 5.13 There will be a need for the developer to avoid or minimise such losses and disturbance to protected species through careful site layout, design, routing, location of the development, associated infrastructure, and construction management and timings. There is potential for habitat creation within the wider area in order to replace lost 'wet meadows' habitats of the Sizewell

Marshes SSSI, but it may not be possible to fully compensate for losses of this habitat.. The developer will therefore need to develop an ecological mitigation and management plan to minimise the impacts.

- 5.14 Cooling water abstraction may impact on fish species as the coastal waters adjacent to the site are important and prosperous fisheries for a range of commercial species. The incorporation of fish protection measures within cooling water intake/system design will therefore need to be secured to safeguard the marine environment. Discharge of heated waters into the North Sea may affect aquatic ecology but further studies by the developer are necessary to determine impact. Increased boat activity in the Outer Thames Estuary SPA related to a marine landing station may also impact aquatic ecology but again further studies by the developer would be required to determine the impact.
- 5.15 Hydrologically the site is continuous with the Sizewell Marshes SSSI, a sensitive grazing marsh area. There is risk of pollution into watercourses from a range of sources during all phases of the power station life cycle. Risks would be minimised and impacts avoided through safe operation and monitoring procedures. Also, it is unclear what effect a development would have on the water table.
- 5.16 Further studies carried out by the developer through the EIA process will be required in order to fully understand the potential effects on designated sites and on biodiversity in the area as a whole. Design and mitigation measures should in the first instance seek to avoid and minimise loss of habitat and avoid disturbance of legally protected species. Once defined, mitigation measures could be implemented through an ecological mitigation and management plan or similar document. Opportunities for biodiversity enhancement may be possible.
- 5.17 A HRA report for Sizewell<sup>33</sup> has been undertaken. This report should be referred to for further information relating to the effects of a new nuclear power station at Sizewell on European-designated habitat sites.
- 5.18 **Potential Effects on Biodiversity and Ecosystems: The potential for adverse effects on sites and species considered to be of UK-wide and European nature conservation importance (the Minsmere to Walberswick Heaths and Marshes SAC/SPA/Ramsar/SSSI site, Outer Thames Estuary SPA, Sizewell Marshes SSSI sites, Leiston-Aldeburgh SSSI and the Alde-Ore Estuary SSSI) means that significant strategic effects on the biodiversity cannot be ruled out at this stage of the appraisal. There is, however, potential for the mitigation or compensation of biodiversity effects in some cases, including the creation of compensatory habitat for UK designated sites<sup>34</sup>. Detailed baseline studies will form part of the project level EIA. The HRA for**

<sup>33</sup> Habitat Regulations Assessment Pilot Sizewell: HRA Screening and Appropriate Assessment Report.

<sup>34</sup> For European Sites, compensation measures, such as creation of replacement habitat, may only be considered if it has been established that there are no alternative solutions and the plan or project is necessary for imperative reasons of overriding public interest

**Sizewell should be referred to for further details and advice on internationally designated sites.**

## Climate Change

- 5.19 The establishment of a new nuclear power station will contribute positively to climate change objectives at a local and national level. Short term increases in greenhouse gases during the construction and decommissioning phases of a new nuclear power station will be outweighed by the savings in overall emissions during the lifetime of the facility compared to fossil-fuel powered stations of equivalent output.
- 5.20 Given the relatively remote location of the site and the lack of sustainable transport links, a new nuclear power station at Sizewell may result in increased emissions from the transport of goods and labour throughout the construction, operation and decommissioning phases. However, there is some potential for the developer to promote increased use of public transport through provision of appropriate transport links.
- 5.21 Complementary carbon emission mitigation measures should include sustainable design and construction, sustainable and low carbon technologies and transport, and potential increased investment in public transport and renewable energy services infrastructure.
- 5.22 **Potential Effects on Climate Change: A new nuclear power station on the site would have positive long-term effects on climate change during the operational stage compared to conventional sources of energy, contributing positively to local and national climate change objectives. A lack of sustainable transport options to the site may result in increased emissions from the transport of goods and labour, but these emissions could be partially mitigated with green travel plans and investment in public transport.**

## Communities: Population, Employment and Viability

- 5.23 The operation of a new nuclear power station at Sizewell is likely to have significant positive effects for employment, the economy and communities at a local scale, with the magnitude of these effects reduced at a regional and national scale.
- 5.24 There is potential for short-term negative effects on local communities due to in-migration of workers to the area, especially during construction. This in-migration could bring pressure on basic services, housing and local traffic routes surrounding the site.
- 5.25 A potential, though uncertain, effect of strategic (regional) impact may be the increased demand in construction labour, which could lead to a shortage of local construction workers to meet the needs of other industries. Such pressures would increase if the construction phase were to coincide with other major projects in the sub-region, for example, the decommissioning of the existing Sizewell A reactor.

- 5.26 Job losses from closure of the existing power station adjacent to the site are likely to be offset by labour demands from construction and operation of a new nuclear power station. However, the time lag between job losses and job creation and possible differences in skill requirements may require workers to seek temporary employment elsewhere.
- 5.27 Increased labour demand within the region could lead to improved provision of education and training for the local population. Upskilling of employees and contractors associated with the new nuclear power station would also be beneficial to the region as a whole.
- 5.28 Positive cumulative effects are also likely for Eastern England when considered with development of a second nuclear power station in the region. Together, these could contribute to the regional economy and employment with potential for a specialist nuclear industry hub. There may also be synergies with the wider energy sector, for example with the existing offshore oil and gas and the emerging renewable energy sector, based further up the coast at Lowestoft and Great Yarmouth.
- 5.29 It is commonly perceived that proximity to a nuclear facility such as a power station would have an adverse effect on property values. However, the evidence for this is inconclusive and contradictory. A study of effects in America<sup>35</sup> found that property values were actually increased in the vicinity of nuclear facilities, although the authors caution that this finding is subject to several caveats including being based on a small sample and may be unrepresentative. It is suggested that in relatively poor areas, or where the local economy is depressed, the income generated by employment at a new nuclear facility may have a positive effect on local property values. For the present appraisal, any effect on property values is not considered to be strategically significant because it is limited to the local area.
- 5.30 **Potential Effects on Communities: Population, Employment and Viability: Positive effects of regional economic significance may occur when the project is considered cumulatively with other energy projects in the East of England region. A potential negative effect of regional significance is the project leading to a shortage of local construction labour available to other industries.**

## Communities: Supporting Infrastructure

- 5.31 Transport: Local villages (on the A12) currently suffer from heavy traffic flows, particularly heavy goods vehicles and this leads to problems of community severance, noise and other quality of life concerns. This is considered to be a local effect, and will require further assessment at detailed planning stage were the site to be developed.

<sup>35</sup> Bezdek, R.H. and Wendling, R.M. (2006) 'The impacts of nuclear facilities on property values and other factors in the surrounding communities', Int. J. Nuclear Governance, Economy and Ecology, Vol. 1, No. 1, pp.122–144

- 5.32 There could be effects on national road infrastructure through increased congestion and disruption of traffic on some of main regional routes (for example the A12 and the A14). These effects will be most prominent during the construction phase, but may also have impacts during the operational and decommissioning phases. However, these issues are primarily localised and can likely be mitigated, provided the design includes transportation management plans, green travel plans and consideration of alternatives to road for the transport of large loads (for example, transport by sea). Nevertheless, further studies should be undertaken by the developer.
- 5.33 There is a strategic intent to improve capacity on the East Suffolk Rail Line in order to improve links between Ipswich and Lowestoft. East Suffolk Rail Line improvements would be of strategic importance in developing increased nuclear capacity. The primary access to rail and sea transport routes is the local road and rail infrastructure.
- 5.34 Sizewell A closed in 2006 and rail freight traffic is expected to continue for about seven years after this time to aid the decommissioning process, after which there is likely to be no further traffic for the branch (and closure of this freight-only line would be expected). Any nuclear capacity development in this area would pick up this rail capacity and stimulate access route improvements in line with current local and strategic initiatives. Local railways are already noted to be in need of feasibility studies, which may benefit from British Energy studies currently under way.
- 5.35 Conventional waste: Waste material will be generated during the construction, operation and decommissioning of a development. Local impacts may be expected upon local regional facilities however the scale of operation is not considered to be significant in the long/medium term. Waste management facilities will be available to deal with construction projects for the foreseeable future and waste/recycling sites should not be detrimentally impacted. Good site practices and the site-specific EIA should look to further mitigate these risks and many impacts may be positive such as the generation of significant quantities of secondary aggregate during demolition.
- 5.36 Radioactive Waste<sup>36</sup>: The operation of a new nuclear power station at the site would require the interim storage of spent fuel and intermediate level waste on site for a period of up to 100 years after operation has ceased. Developers were asked that when nominating a site for the SSA, they make provision within the area of land nominated for the safe and secure storage of all the spent fuel and intermediate level waste produced through operation and decommissioning until it can be sent for disposal in a geological disposal facility. The detailed design and location of the storage facility within the site boundary will be determined at the project level, within the design submitted by the developer. The generic process for dealing with all types of radioactive and hazardous waste arising from the operation and decommissioning of new nuclear power stations, (including gaseous and liquid radioactive discharges), are appraised in Chapter 7 of the Main AoS Report.

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<sup>36</sup> Radioactive waste is waste regulated under Environmental Permitting (England and Wales) Regulations 2010. The Radioactive Substances Act 1993 still applies in Scotland and Northern Ireland.

- 5.37 Electricity transmission: The development of a new nuclear power station at Sizewell may require the further development or upgrade of the National Grid network in the area. The potential impact of new or upgraded power lines will be considered in a separate Networks NPS.
- 5.38 **Potential Effects on Communities: Supporting Infrastructure:** There may be some adverse impacts locally from additional traffic generated during construction. There is some potential for wider negative effects on regional road infrastructure. However, these effects can be mitigated through measures such as green travel plans and by consideration of transport alternatives, for example by transferring large freight from road to sea and rail transport. Locally adverse impacts may be expected upon waste facilities from non-radioactive waste produced at the site, but the scale of this activity is not considered to be significant in the long/medium term.

## Human Health and Well-Being

### Radiological Health Issues

- 5.39 Radiation occurs naturally in the environment. The Health Protection Agency (HPA) which regularly reviews the radiation exposure of the UK population has calculated that the overall average annual dose to a member of the general public from all sources of radioactivity is 2.7 millisieverts (mSv, a measure of dose) per year, about 84% of which is from natural sources and about 15% is from medical procedures. The HPA calculates that the average dose to a member of the public due to radioactive discharges from the nuclear power industry is less than 0.01% of the annual dose from all sources.<sup>37</sup>
- 5.40 By law, the radiation to which members of the public are exposed by the operations of a nuclear power station is limited to 1 mSv per year.<sup>38</sup> This limit applies to all members of the public, including those who receive the highest doses as a result of the location of their homes and their habits of life. It also applies to the cumulative effects of planned exposures from all sources of radiation, excluding medical exposures of patients and natural background radiation. Therefore, the exposures of people living near to a new nuclear power stations have to be less than the dose limit taking into account exposures from any other nearby sites and any past controlled releases. This statutory dose limit is reinforced by the concept of ALARP (As Low As Reasonably Practicable), which is used by the nuclear regulators to reduce doses to as low as is reasonably practicable.

<sup>37</sup> Ionising Radiation Exposure of the UK Population: 2005 Review HPA-RPD-001

<sup>38</sup> This is through the Ionising Radiations Regulations 1999 <http://www.statutelaw.gov.uk> (which includes all activities carried out under a nuclear site licence granted by the Nuclear Installations Inspectorate under the Nuclear Installations Act 1965) [http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1965/cukpga\\_19650057\\_en\\_1](http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1965/cukpga_19650057_en_1), the Radioactive Substances Direction 2000 <http://www.defra.gov.uk/ENVIRONMENT/radioactivity/government/legislation/pdf/rsd2000.pdf> and the Radioactive Substances (Basic Safety Standards) (Scotland) Regulations 2000 <http://www.opsi.gov.uk/legislation/scotland/ssi2000/20000100.htm>

- 5.41 The environment agencies run monitoring programmes to provide an independent check on the impacts of radioactive discharges. In 2009, they published a report covering 2008, showing that radiation doses to people living around nuclear sites remained below the statutory dose limit of 1 mSv per year.<sup>39</sup> In England and Wales, the main regulatory bodies are the Nuclear Installations Inspectorate (NII), a division of the Health and Safety Executive and the EA. These agencies regulate radioactive discharges from nuclear power stations and have responsibilities for ensuring that workers, the general public and the environment are protected against exposure to radioactivity. Regulation of all disposals, including discharges to air, water and land, of radioactive waste off or on nuclear sites is regulated under the Environmental Permitting (England and Wales) Regulations 2010<sup>40</sup>. This regulatory system will apply to a potential new nuclear power station at Sizewell and should ensure that permitted radioactive discharges do not cause unacceptable risk to health.

#### Regulatory Justification

- 5.42 European Council Directive 96/29/Euratom of 13 May 1996 (the Basic Safety Standards Directive) requires Member States to ensure that all new classes or types of practice resulting in exposure to ionising radiation are justified in advance of being first adopted or first approved by their economic, social or other benefits in relation to the health detriment they may cause. This process is known as Regulatory Justification and the Secretary of State for Energy and Climate Change, after public consultation, has decided that two nuclear reactor designs, Westinghouse's AP1000 and Areva's EPR, should be Justified.<sup>41</sup>
- 5.1 The Government believes that the regulatory regime will effectively limit and minimise the radiation dose and release of radioactivity from new nuclear power stations, until they have been fully decommissioned, to very low levels, and that the health detriments associated with the operation of new nuclear power stations will be very low.

#### Construction and Operational Effects

- 5.42 During the operation of a nuclear power station, there is a risk of unplanned radioactive discharges into the environment which could potentially lead to adverse health impacts. However, the risk of such an accident is judged to be very small because of the strict regulatory regime in the UK<sup>42</sup>. The HSE site licensing process will also ensure that accident management and emergency preparedness strategies are prepared and that all reasonably practicable

<sup>39</sup> Radioactivity in Food and the Environment, 2008 RIFE-14, Environment Agency, Scottish Environment Protection Agency, Food Standards Agency, Northern Ireland Environment Agency 2009

<sup>40</sup> Environmental Permitting (England and Wales) Regulations 2010, [www.opsi.gov.uk/si/si2010/draft/ukdsi\\_9780111491423\\_en\\_1](http://www.opsi.gov.uk/si/si2010/draft/ukdsi_9780111491423_en_1). The Radioactive Substances Act 1993 still applies in Scotland and Northern Ireland.

<sup>41</sup> [www.decc.gov.uk](http://www.decc.gov.uk)

<sup>42</sup> <http://www.defra.gov.uk/environment/radioactivity/mrws/pdf/white-paper-final.pdf>



steps have been taken to minimise the radiological consequences of an accident.

- 5.43 The transportation of radioactive materials to and from a nuclear power station increases the possibility of an accident resulting in an unplanned radioactive discharge. However, the safety record for the transport of nuclear material suggests that the risks are very low. Data from the Radioactive Materials Transport Event Database (RAMTED) for the period 1958 to 2006 showed that of the recorded 850 events associated with the transport of radioactive materials no 'significant dose events' were associated with the nuclear power industry.
- 5.44 The scale of construction work associated with a potential new nuclear power station at Sizewell may result in higher risk of health and safety incidents at the site. Construction would be subject to the Construction (Design and Management) Regulations and other relevant regulations applicable to construction.
- 5.45 During the operation of a potential nuclear power plant at Sizewell, activities will be regulated in accordance with the Health and Safety at Work Act 1974, Nuclear Installations Act 1965 and the Ionising Radiations Regulations 1999. The potential operator must have a Nuclear Site Licence from the Nuclear Installations Inspectorate (NII) prior to the construction commencing and this licence will only be granted if the NII is satisfied that the power station can be built, operated and decommissioned safely with risks being kept to 'as low as reasonably practicable' (ALARP) at all times. The licence will, therefore, have conditions attached to it which will allow the NII to monitor safety risks throughout the lifetime of the project.
- 5.46 It is possible that the proposed power station will require an upgrade to existing electricity transmission lines or additional transmission lines to link its output to the National Grid. The potential impact of new power lines will be considered in a separate Electricity Networks National Policy Statement, due to be published by the Government in autumn 2009. Given the current uncertainty regarding the health effects of prolonged low level exposure to electromagnetic fields (EMFs) it is recommended that, in keeping with Health Protection Agency advice<sup>43</sup>, a precautionary approach is adopted to the routing of any required power lines.
- 5.47 The presence of, and more particularly the construction of, a new nuclear power station at the Sizewell site may increase community disturbance to some degree. Such disturbance may include noise and vibration, dust in the construction phase and increased traffic in all phases. To mitigate construction phase disturbances an EMP would be developed, implemented and monitored for effectiveness throughout the construction period. Potential traffic issues in all the project's phases can be mitigated through the adoption of a transport plan aimed at minimising community disturbance whilst also promoting 'green' travel.

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<sup>43</sup> [http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb\\_C/1195733817602](http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733817602)

- 5.48 Noise emissions will arise from both the construction and operational phases. Construction noise will arise from plant/activity and transportation sources. Similarly, operational noise levels will arise from both fixed installation and mobile transport sources. Construction noise will be variable and transient in nature and will need to be mitigated by the use of good construction practice, regulation and timing of construction operations, the use of noise controlled plant and equipment and noise and vibration monitoring. These would be strategically managed through the construction management plan procedures.
- 5.49 Noise emissions from nuclear power stations are relatively low. Minimisation of operational noise emissions would require consideration at the design/layout stage of the scheme. In particular, significant benefits would result if potential sources of noise emissions could be reduced through a combination of engineering design solutions. These could include the careful siting of noise emitting plant within the overall facility (at high or low level and in relation to local noise sensitive locations) and careful selection of trafficking routes and access points. Particular emphasis would need to be taken of any low frequency and constant emission sources. Overall background noise and noise prediction assessment, following relevant International (ISO) and British (BS) standards, would need to be applied so that the noise impact of the proposals could be determined for planning purposes. Given the relatively lightly populated locality, it is considered that noise and vibration impacts would not be a significant issue and pose a constraint to development at Sizewell.

### Local Health and Recreation

- 5.50 During development of the AoS, consideration was given to potential non-radiological impacts on health and well-being. These can be both potentially positive, for example through providing job opportunities to communities or negative, for example provision of adequate healthcare services to the local community during the construction phase resulting from construction workforce. It is recommended that the potential effects on health and well-being of the population (not covered by specific regulations) are considered by a developer proposing to develop a new nuclear power station on this site.
- 5.51 There is a possibility that the influx of workers required for the construction and operational phases of the proposed new power station may put a strain on local health and other services and lead to community integration and conflict issues. In order to realistically gauge whether or not this will be a problem, a review should be carried out during the planning process to determine the need for additional health service capacity and community assistance in the area. This review could comprise a Health Impact Assessment (HIA). However, whilst this may be considered good practice it is noted that HIA is not a statutory requirement for current energy applications. The applicability of an HIA may be considered on a case by case basis.

- 5.52 With regard to recreation, there is a potential impact associated with the Suffolk Coastal Path<sup>44</sup>, which passes the site. It is likely that this path may need to be closed during some phases of power station construction, but this effect will be temporary and can readily be mitigated by providing a bypass path around the site.
- 5.53 It is possible that the presence of a nuclear power plant may lead to increased stress levels in certain individuals, due to potential perception of risk associated with living or working near a power station. However, there is little literature available on this potential impact which suggests that it has not been a significant problem in the past. In any event, in the case of the nominated site, people living and working nearby have had a long time to get used to there being an adjacent nuclear plant so this is unlikely to be a problem at this location.
- 5.54 It is probable that building, operating and decommissioning a new nuclear power station at Sizewell will lead to an increase in employment, community wealth, housing stock and other associated neighbourhood infrastructure. These positive effects on the community are likely to be much more significant than any potential negative consequences of the project assuming there are no adverse effects on the health of the local population.
- 5.55 **Potential Effects on Human Health and Well-Being: The rigorous system of regulating routine radioactive discharges from the potential nuclear power station at Sizewell should ensure that there are no unacceptable risks to health when the plant is operating normally. There is a very small risk of adverse health impacts arising from an accidental radioactive discharge but the multiple safety features and operating systems within modern nuclear plants makes such an event exceedingly unlikely. It is possible that the presence of a nuclear power plant may lead to increased stress levels in certain individuals although this is less likely at this site where there is a history of nuclear power generation. Overall, development of the site is likely to enhance employment opportunities, community wealth, housing stock and other associated neighbourhood infrastructure which is anticipated to improve community well-being and health, both at a local and regional scale.**

## Cultural Heritage

- 5.57 The main effects of the development of a new nuclear power station at Sizewell would be at a local scale, within the footprint of the new facility. Prehistoric, Roman and Medieval activity is evident from an earlier investigation within the existing nuclear power station site boundary and an unknown archaeological (buried) resource is potentially present within the nominated site, and such remains are likely to be permanently lost. Detailed investigations (including consultation with the Local Authority Archaeologist, geophysical survey, trial trenching etc.) may be required to inform the project level EIA. This should include an assessment of the impact on any maritime

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<sup>44</sup> This path might in future form part of an English coastal route, in accordance with the objectives of the Marine and Coastal Access Act 2009.

archaeology including undesignated wreck sites. Depending on the results this may lead to an excavation prior to construction and/or a watching brief during the construction phase (during ground preparations and excavations).

- 5.58 In addition there may be potential off-site effects on cultural heritage assets caused by an increase in traffic and the development of new infrastructure. Detailed assessment will be required at the project level EIA stage.
- 5.59 Potential setting impacts upon SAMs, Conservation Areas and Listed Buildings could be of regional or national importance, depending on distance and sight lines. However, this could be mitigated by consideration of placement of the new station and adherence to the principles of good design<sup>45</sup>. Detailed assessment, including consultation of the County Historic Landscape Characterisation and a views analysis, will be required at the project level EIA stage.
- 5.60 **Potential Effects on Cultural Heritage: There is potential for adverse setting impacts upon SAMs, Conservation Areas, Listed Buildings, historic landscape and historic townscapes. There is also potential for adverse physical impacts upon significant buried archaeology. However, these may be mitigated to some degree by appropriate facility location. Further detailed assessment at project level, possibly through the provision of an integrated landscape, heritage and architectural plan, will be required.**

## Landscape

- 5.61 During construction and operation the main direct effects of a nuclear power station development at Sizewell on landscape character would be on a localised area within the Suffolk Coast and Heaths AONB and on the Suffolk Heritage Coast. In combination adverse effects are likely to arise from potential new raised roadways and access connections to the rail head and potentially new associated transmission lines/ grid connectivity. The new power station will be seen within the context of the existing power stations, before decommissioning. However, given the likely scale of the development there are likely to be some long lasting adverse direct and indirect effects on landscape character and visual impacts on the AONB, within which the nominated site lies, with limited potential for mitigation. Detailed work at the EIA stage will need to consider landscape character and visual impact.
- 5.62 The existing power station structures are already prominent features within the AONB from local viewpoints and are visible from some longer-distance viewpoints, including from higher ground inland and from Southwold on the coast to the north.
- 5.63 Development on the site is highly likely to lead to localised direct effects on landscape features including mixed woodland, dunes and the foreshore, which could be potentially mitigated for over time, for example by new planting

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<sup>45</sup> Adherence to good design is outlined in Planning Policy Statement 1: Delivering Sustainable Development

and potentially through compensatory planting in the surrounding area. However, there is likely to be a noticeable deterioration in local views, which would not be able to be fully or effectively mitigated, including, in particular, those effects arising from the main power station buildings, some of which could be potentially up to 70m in height.

- 5.64 The decommissioning of the facilities may allow some landscape restoration of previously developed areas in the long term, however, long term land uses for the restored areas are difficult to predict at this stage.
- 5.65 **Potential Effects on Landscape: There is potential for some long lasting adverse direct and indirect effects on landscape character and visual impacts on the Suffolk Coast and Heaths AONB, a nationally recognised landscape, with limited potential for mitigation. Further detailed assessment at project level, possibly through the provision an integrated landscape, heritage and architectural plan, will be required.**

## Soils, Geology and Land Use

- 5.66 The construction of a power station and associated infrastructure at Sizewell will lead to the direct loss of soil structure. Specifically, impact upon the peat geology is likely to have a significant effect upon other areas such as groundwater and future potential land use. This may include impacts on soils that maintain terrestrial habitats, including designated nature conservation sites; the Sizewell Marshes SSSI and Minsmere-Walberswick Heaths and Marshes SAC/SPA/SSSI, considered further in the sections on Biodiversity and Ecosystems in this report.
- 5.67 Such effects could be mitigated through limitation of the footprint of the development reducing the area of soils affected, and recognised best practice soil and water management measures during construction.
- 5.68 Blight of land is a likely effect of the development of a new nuclear power station on the nominated site, but is considered of local or district significance. Likewise, effects on existing land uses, including surrounding tourist areas are considered to be of local impact.
- 5.69 **Potential Effects on Soils, geology and Land Use: There is potential for adverse effects on soil structure which are likely to impact upon groundwater and future potential land use. Such effects can be mitigated by minimising the development's footprint and adopting soil and water management best practice during construction.**

## Water Quality and Resources

- 5.70 The site is surrounded by areas which are shown on EA maps as being at risk of flooding from rivers and sea without defences. During the lifespan of the proposed nuclear power station, and as a result of potential sea-level rises, the site is likely to require the construction of new flood defences. These defences would be designed to counteract the effects of existing fluvial and coastal processes, but are likely to have the secondary effect of impacting the

movement of sediment in the river system and along the coast. The effects of the construction and long-term presence of upgraded coastal defences on coastal process, hydrodynamics and sediment transport along the coast could be reduced or possibly eliminated by the adoption of suitable, environmentally-friendly designs.

- 5.71 A potentially significant effect could occur as a result of the return of cooling water to the sea at elevated temperatures. This could result in adverse impacts on both sediment transport and water quality. A more detailed appraisal is required by the nominator at the project EIA level to assess the implications of this thermal discharge. Any future thermal discharge will require an Environmental Permit<sup>46</sup> from the Environment Agency and will need to meet existing regulatory standards and the requirements of the Water Framework Directive, including the objective of no deterioration in ecological status (whichever is the most stringent). In addition to the thermal effects from direct cooling, there are other potential water quality issues, for example from discharge of radioactive or non-radioactive materials, such as anti-fouling agents, associated with the cooling water process. These discharges will also be subject to permitting by the EA.
- 5.72 The Marine and Coastal Access Act 2009 makes provision for the production of Marine Policy Statements. It is intended to produce a Marine Policy Statement (MPS) that, for the first time, brings together the policies for all UK administrations. The second stage in the new planning system will consist of a series of Marine Plans. The Marine Management Organisation (MMO) set up under the Marine and Coastal Access Act, is responsible for preparing marine plans for the English inshore and offshore regions according to the policies and objectives set out by the Government. Similar plans will be produced for Welsh marine waters. The MPS will interact with National Policy Statements and, in reaching its decisions, the IPC must have regard to the MPS but, subject to certain exceptions, must decide in accordance with the relevant National Policy Statements.
- 5.73 To maintain water quality standards, any future discharges from the power station will need to be considered as part of the project level EIA for the proposed development. This process will include an assessment of the impacts of any discharges to the aquatic environment, including impacts on specific designated sites under both the Habitats and Shellfish Directives.
- 5.74 The development of a new nuclear power station on the site may have the short-term effect of increasing water demand during the construction phase, due to an increased population. The potential magnitude and duration is dependent on the timing of new development in relation to the activities (operation or decommissioning) of the existing nuclear facilities. It is anticipated that, as the operation of a new nuclear power station on the site is likely to have a similar or lower demand for water to the existing power station, no adverse long-term impacts are expected on water resources,

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<sup>46</sup> The Environmental Permitting (England and Wales) Regulations 2010 came into force on 6 April 2010 and cover all water discharge activities. Water discharge consents will become Environmental Permits, and applications for new discharges will fall under the new regulations.

although this will need to be confirmed as part of the planning for this site. Similar comments apply to wastewater production from the nominated site, although there is likely to be a short-term effect of increasing wastewater production due to an increased population during the construction phase.

- 5.75 There is the potential for adverse long-term impacts on water resources at the site and a more detailed appraisal is required to assess these implications. A small increase in water supply is available within the existing water resource zone. A larger increase in water supply would probably need to be transferred from adjacent water resource zones, which could impact other catchments or groundwater bodies.
- 5.76 Effects on groundwater could lead to adverse impacts on groundwater dependent surface water features and aquatic ecosystems, including internationally and nationally designated water-related nature conservation sites (please refer to the sections on Biodiversity and Ecosystems in this report).
- 5.77 A further significant effect could occur as a result of the impact of the development on the quality and quantity of groundwater at the site. Sizewell lies within the Chalk major aquifer which is overlain by the Crag Formation aquifer. Groundwater from the Crag aquifer is currently used for water supply in the vicinity of the site. Localised groundwater pathways are likely to exist, hence accidental discharges or construction disturbance at Sizewell could cause deterioration in groundwater quality and flow quantity. Impacts on the groundwater can be mitigated through good environmental management processes during construction, operation and development stages.
- 5.78 **Potential Effects on Water Quality and Resources: The AoS has identified potential adverse direct and indirect effects on water. Direct effects, particularly during construction, on water resources, through increased demand, and on groundwater quality, through accidental discharges are considered significant possibilities. Indirect effects on nationally and internationally designated habitats, including from the thermal impact of cooling water discharges have also been identified. This is of potential wider significance because of indirect effects on national and European designated habitat sites.**

## Flood Risk

- 5.79 Development of the site is not likely to increase the risk of flooding. However, as a result of climate change and sea level rise, flood risks to the site over the lifetime of the development are likely to increase. To mitigate against this risk, the continued management of the existing natural defences will be required, and improvement of these defences may also be required.
- 5.80 New coastal defences and a new marine landing station have the potential to modify existing fluvial and coastal hydrodynamics and associated movement of sediment, which may have secondary effects on river and marine ecosystem structure and functioning. However, the use of an appropriate

location and design for these works and a full understanding of the hydrodynamics and sediment transport could minimise the potential effects.

- 5.81 To manage residual flood risk and to ensure that extensive mitigation is not required, the most vulnerable parts of the development should be located in the areas at lowest flood risk.
- 5.82 The immediate hinterland of the site is at risk of flooding. To mitigate against the risk of the site becoming isolated by flooding, taking account of climate change and sea level rise, it may be necessary to protect existing and proposed new access routes, or to raise sections of the routes above predicted flood levels.
- 5.83 To fully assess any potential flood risks arising to and from the proposed development, a detailed site-specific Flood Risk Assessment would need to be undertaken by the developer. This would need to assess the current standard of protection afforded by existing defences, what protection would be required over the lifetime of the development, and an investigation into residual flood risk, particularly flood hazards associated with overtopping, breach or failure of the defences.
- 5.84 **Potential Effects on Flood Risk: The AoS has identified potential, adverse effects relating to flood risk due to rising sea levels, especially during the later stages of operation and decommissioning. This is considered a wider national issue, because of the potential impact on national energy supply and infrastructure. Possible impacts on coastal processes, hydrodynamics and sediment transport from any necessary new or upgraded coastal defences have also been identified. Mitigation may be possible through appropriate design and construction of defences.**

## Key Interactions between Sustainable Development Themes

- 5.85 Interactions and synergistic effects can occur between the different topics or sustainable development themes being appraised. A number of interactions and potential interactions have been identified for the AoS Site Reports. For example, rising sea levels and increased predictions for coastal flooding due to climate change will require new coastal defences. Construction of coastal defences could have adverse effects on water quality and biodiversity through changes to hydrology, sedimentation and loss of habitat.
- 5.86 Where applicable, key interactions have been considered in the topic-specific paragraphs above.

## Interactions and Cumulative Effects with other Key Plans, Programmes and Projects

- 5.87 Interactions and cumulative effects can occur between the plan or proposal being appraised and other key plans, programmes and projects. This AoS



identified the other relevant plans and programmes with sustainability objectives that need to be considered. This is reported in Section 3 Policy Context and Appendix 3: Plans and Programmes Review. The key plans that might have significant interactions with cumulative effects for the revised draft Nuclear NPS and Sizewell were identified as follows:

- Suffolk Coast and Heaths AONB Management Plan 2008 – 2013, Local Authorities and Suffolk Coast and Heaths Partnership (2008)
- Suffolk Local Biodiversity Action Plan 2000-2007, Suffolk Biodiversity Partnership
- Lowestoft to Harwich Shoreline Management Plan, Halcrow (1997)
- River Basin Management Plan - Anglian River Basin District, Environment Agency (2009)
- Suffolk Coastal and Waveney District Strategic Flood Risk Assessment, Scott Wilson for Suffolk Coastal and Waveney District Councils (February 2008)

5.88 Other key projects that might have significant interactions with the proposals for a new nuclear power station at Sizewell were identified as follows:

- The operation and decommissioning of the existing nuclear facilities at Sizewell
- The potential for a new nuclear power station at Bradwell (located to the south west of Sizewell)
- Wind farm developments within the region<sup>47</sup>:
- Operational sites - Ness Point, Scroby Sands and Somerton
  - Under construction offshore - Greater Gabbard and Gunfleet Sands Consented onshore and offshore – South Beach, Parham Airfield and London Array
  - Round 3 Potential Development Zone 5 (Norfolk)
  - Lowestoft is to become the regional focal point for the industry with a £5 million Centre of Excellence. Located between two strategic development areas – the Greater Wash and Thames Estuary – this new industry is expected to create 60,000 jobs in the Eastern Region by 2020.
- Haven Gateway Partnership – includes a major study into the provision of employment land and strategic sites in the Suffolk Haven Gateway area up until 2021, with the aim of achieving 30,000 additional jobs
- Key regional transport priorities, including:
  - Felixstowe to Nuneaton Railway
  - A12 Improvements - including Cuckoo Farm Junction and Four Village bypass
  - A14 Enhancement including Copdock Interchange
  - A120
  - London-Norwich Eastern main line

5.89 The cumulative effects associated with the potential development of a nuclear power station at Bradwell have been considered as part of this assessment

<sup>47</sup> Source: British Wind Energy Association website ([www.bwea.com](http://www.bwea.com))

5.90 The appraisal of cumulative sustainability effects arising through interactions between Sizewell and the other key plans, programmes and projects is presented in Table 5.2.

**Table 5.2: Interactions with Other Key Regional Programmes, Plans and Projects**

<b>AoS Sustainable Development Theme</b>	<b>Interactions and Cumulative Effects, both positive and negative</b>
<b>Biodiversity and Ecosystems</b>	<ul style="list-style-type: none"> <li>• Potential conflicts with the Suffolk Local Biodiversity Action Plan which aims to protect regional habitats and species</li> <li>• The potential for adverse effects from Sizewell and Bradwell on the European designated site of the Outer Thames Estuary indicates that there may be interactions and cumulative effects on biodiversity.</li> </ul>
<b>Climate Change and Energy</b>	<ul style="list-style-type: none"> <li>•</li> <li>• The existing Sizewell power station influences the level of coastal protection required in the area and is therefore helping to manage coastal erosion in the vicinity of the power station, which would continue and be extended if the nominated site was progressed</li> <li>• Suffolk Climate Action Plan, although now revoked, encouraged the increasing use of decentralised, renewable and low carbon energy. A new nuclear power station on the nominated site would support this target, as nuclear energy is a low-carbon energy source as defined by Government's Nuclear White Paper</li> </ul>
<b>Communities: Population and Employment</b>	<ul style="list-style-type: none"> <li>• Creation of further employment and expansion of energy hub in the area which could lead to local and wider economic and social benefits, in line with Suffolk Coastal LDF Core Strategy objectives</li> <li>• Cumulative social effects and interactions with Suffolk Coastal LDF Core Strategy aims to provide additional affordable housing at Leiston, to increase the tourism potential of the town, and to maximise the local benefits which could accrue if a new nuclear power station was built at Sizewell</li> </ul>
<b>Communities: Supporting Infrastructure</b>	<ul style="list-style-type: none"> <li>• Potential cumulative effects on regional transport corridors from regional housing growth proposals, and expansion of the ports of Harwich and Felixstowe to the south</li> <li>• Decommissioning of existing nuclear facilities at Sizewell may coincide with construction of a new nuclear power station to create adverse effects on supporting infrastructure, in particular transport networks</li> </ul>

<b>AoS Sustainable Development Theme</b>	<b>Interactions and Cumulative Effects, both positive and negative</b>
<b>Landscape</b>	<ul style="list-style-type: none"> <li>• In combination effects are likely including the offsite impacts of new transmission lines/grid connectivity, access links to the railhead</li> <li>• Potential in combination effects causing changes to the character of the shoreline/single beaches elsewhere on the Heritage Coast arising from the sea defence strategy for the nominated site</li> <li>• Potential in combination effects arising from climate change adaptations including land raising and the resultant visual and landscape effects</li> <li>• Likely conflict with Suffolk Coasts and Heaths AONB Management Plan which aim to protect the nationally designated landscape. However the AONB Management Plan also offers a potential means of guiding landscape enhancement measures in the AONB</li> </ul>
<b>Water Quality and Resources; Flooding</b>	<ul style="list-style-type: none"> <li>• Surface and ground water quality should be improved to 'good' status in the long-term by actions proposed in the River Basin Management Plan</li> <li>• A new power station in combination with the existing power stations will further influence the Shoreline Management Plan strategies used along this stretch of coast which help manage coastal processes and sediment movement, and influence coastal flooding</li> </ul>

## 6 Summary of Appraisal of Sustainability, Key Findings and Possible Mitigation

- 6.1 This Section summarises the key findings of the AoS assessment and explores possible mitigation which could be undertaken to reduce impacts. Table 6.1 presents a summary of significance of potential effects and Table 6.2 provides a more detailed breakdown of the potential effects and possible mitigation.
- 6.2 The AoS has explored both adverse and beneficial potential effects of building a new nuclear power station at Sizewell. Both beneficial and adverse effects were identified as potentially significant at the local level and it is recommended that these need to be further considered by the developer, regulators and the decision-maker (the IPC), during project level assessments.
- 6.3 The AoS process has included recommendations to inform the development of the revised draft Nuclear NPS. This site report for Sizewell has helped to inform the decision-making for the SSA. It has included advice as to the strategic significant effects arising from the construction of a new nuclear power station at Sizewell, and suggestions for how adverse effects may be mitigated, including proposed mitigation measures which could be considered as part of project level EIA.
- 6.4 A number of the potential effects identified for Sizewell will be similar across all the sites, including positive effects for employment and well being. However a number of potential effects have been identified that are of particular note for the site at Sizewell. These are discussed below:
- 6.5 Of particular note for the revised draft nuclear NPS is that the site lies on the Suffolk Heritage Coast and is wholly within the Suffolk Coast and Heaths AONB. Although set in the context of the existing power station, the development may have an adverse impact on landscape character and an adverse visual impact on a nationally designated landscape; this could not be fully mitigated.
- 6.6 There are also potential adverse effects on at least five nature conservation sites of UK and European importance, including Minsmere to Walberswick Heaths and Marshes, Sizewell Marshes, Leiston-Aldenburgh SSSI, the Outer Thames Estuary, and the Alde-Ore Estuary; and effects on water quality and fish/shellfish populations in nearby coastal waters due to the abstraction and release of sea water for cooling. There are existing sand and shingle flood defences in place, which may require upgrading to protect the site for the full life time of a new power station, which may have potential effects on erosion and visual appearance of the coastline. These effects could be significant, but mitigation opportunities could be available following further study at the project level.
- 6.7 There is potential for adverse effects on the European designated site of the Outer Thames Estuary if new nuclear power stations are built at both Sizewell and Bradwell, due to adverse effects on water quality, resources and habitats.
- 6.8 There remains some uncertainty relating to the significance of some effects and the most appropriate mitigation. It is expected that the mitigation measures will be refined

iteratively as part of the development of the proposals for the nominated site, and will be assessed further in the project level EIA.

- 6.9 The table following provides an overall summary of the significance of the environmental and sustainability effects for the Sizewell site. Each sustainable development theme and each development stage has been considered. The symbols and colours used are explained in the key.

**Table 6.1: Summary of the Significance of Potential Strategic Sustainability Effects**

Sustainable Development Themes:		Significance of potential Strategic effect at each Development stage:		
		Construction	Operation	Decommissioning
Air Quality		-	-?	-?
Biodiversity and Ecosystems		--?	--?	--?
Climate Change		-	++	-?
Communities: Population, Employment and Viability		+?	+?	0
Communities: Supporting Infrastructure		-	-	-
Human Health and Well-Being		+	+	+
Cultural Heritage		-	-	-
Landscape		--	--	0?
Soils, Geology and Land Use		-	-?	-?
Water Quality and Resources		-	-	-
Flood Risk		-	-	-
<b>Key: Significance and Categories of Potential Strategic Effects</b>				
++	Development actively encouraged as it would resolve an existing sustainability problem; effect considered to be of regional/national/international significance			
+	No sustainability constraints and development acceptable; effect considered to be of regional/ national/international significance			
0	Neutral effect			
-	Potential sustainability issues, mitigation and/or negotiation possible; effect considered to be of regional/national/international significance			
--	Problematical because of known sustainability issues; mitigation or negotiation difficult and/or expensive; effect considered to be of regional/national/ international significance			
<b>Uncertainty</b>				
?	Where the significance of an effect is particularly uncertain, for example because insufficient information is available at the plan stage to fully appraise the effects of the development or the potential for successful mitigation, the significance category is qualified by the addition of '?'			

6.10 Potential environmental and sustainability effects considered to be of a wider strategic significance were also identified. These are summarised in Table 6.2. This table includes a summary of how the potential adverse effects may be mitigated and includes possible feasible suggestions for mitigation to be considered at the project level. Some of these mitigation options could be addressed by the HSE, EA, HPA and others when they consider the development consent application stage. Other mitigation options could be proposed by the developer as part of the project design process and through EIA. However, mitigation measures can in themselves produce impacts and these would need to be assessed at the project level.

- 6.11 At this strategic level of appraisal, there are some uncertainties on the significance of some impacts and the effectiveness of suggested mitigation measures. Further detailed studies should therefore be carried out by the developer and the regulators at the project level stage.
- 6.12 Mitigation measures should be considered in all stages of the project with the aim to develop a strategy that avoids impacts, and if they cannot be avoided, to reduce them. The suggested mitigation measures shown in Table 6.2 include examples from all levels of the mitigation hierarchy that comprises:
- Enhance
  - Avoid
  - Reduce
  - Repair
  - Compensate
- 6.13 Options for mitigating through project design or management should firstly consider avoidance, addressing impacts at source before considering impacts at the receptor, and ensuring that a commitment is made to implementing and monitoring the effectiveness of the proposed mitigation. For European Sites, compensatory measures to offset damage to biodiversity and ecosystems and ensure coherence of the Natura 2000 network may only be considered if it has been established that there are no alternative solutions and the plan or project is necessary for imperative reasons of overriding public interest.



**Table 6.2: Summary of Potential Strategic Significant Effects and Mitigation Possibilities (for Adverse Effects)**

Potential Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
<b>Air Quality</b>	
<p><b>Adverse Effects:</b></p> <ul style="list-style-type: none"> <li>Potential for related effects on national and European-designated wildlife sites due to increase in airborne pollutants and nutrients during construction</li> </ul>	<p><b>Mitigation Possibilities:</b></p> <ul style="list-style-type: none"> <li>Preparation of an environmental management plan for construction, operation and decommissioning should include methods to reduce airborne pollutants</li> </ul>
<ul style="list-style-type: none"> <li>Potential release of radioactive emissions (planned and accidental) could have a significant strategic effect on air quality</li> </ul>	<ul style="list-style-type: none"> <li>The nuclear regulators will need to be satisfied that the radiological and other risks to the public associated with accidental releases of radioactive substances are as low as reasonably practicable and within the relevant radiological risk limit</li> </ul>
<b>Biodiversity and Ecosystems</b>	
<p><b>Adverse Effects:</b></p> <ul style="list-style-type: none"> <li>Disturbance to nationally and internationally important breeding and wintering bird species associated with the Minsmere-Walberswick SPA, Sandlings SPA and Sizewell Marshes SSSI</li> </ul>	<p><b>Mitigation Possibilities:</b></p> <ul style="list-style-type: none"> <li>Further ecological surveys and impact assessments to be commissioned by the developer to define detailed mitigation measures</li> <li>Avoidance of need to develop in or disturb sensitive areas</li> <li>CEMP to avoid significant disturbance, minimise important habitat loss and water pollution</li> </ul>
<ul style="list-style-type: none"> <li>Construction of associated infrastructure leading to direct or indirect habitat loss, fragmentation or hydrological impacts on the adjacent, Minsmere to Walberswick Heaths and Marshes SAC, Minsmere-Walberswick SPA, Sandlings SPA and Sizewell Marshes SSSI, and impacts on priority and protected species</li> </ul>	<ul style="list-style-type: none"> <li>Developer should ensure further ecological surveys and impact assessments to define detailed mitigation measures</li> <li>Strategy for habitat retention and species protection measures</li> <li>Habitat creation on site and wider estate to maintain ecological networks</li> <li>Monitoring by nominator to identify and manage effects on priority species and habitats</li> </ul>
<ul style="list-style-type: none"> <li>Changes in water quality from routine discharges and pollution incidents on adjacent designated sites</li> </ul>	<ul style="list-style-type: none"> <li>Regulation of routine discharges, avoid accidental discharges</li> </ul>
<ul style="list-style-type: none"> <li>There is the potential for new habitats to be created, or extension of current habitats. Further management and monitoring of the current protected areas could also be undertaken</li> </ul>	

Potential Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
<b>Climate Change</b>	
<b>Adverse Effects:</b> <ul style="list-style-type: none"> <li>Potential short term increases in greenhouse gas emissions during construction and decommissioning</li> </ul>	<b>Mitigation Possibilities:</b> <ul style="list-style-type: none"> <li>Monitor greenhouse gas emissions</li> </ul>
<ul style="list-style-type: none"> <li>A lack of sustainable transport options may result in emissions from the transport of goods and labour throughout construction, operation and decommissioning phases</li> </ul>	<ul style="list-style-type: none"> <li>Green travel plans</li> <li>Further investment in public transport</li> </ul>
<b>Beneficial Effects</b> <ul style="list-style-type: none"> <li>A nuclear power station on the site would result in lower greenhouse gas emissions during the operational stage compared to fossil fuel sources, with positive long-term effects on climate change</li> </ul>	
<b>Communities: Population, Employment and Viability</b>	
<b>Adverse Effects:</b> <ul style="list-style-type: none"> <li>Potential negative disruption effects on local communities and services from likely large scale in-migration of construction workers</li> </ul>	<b>Mitigation Possibilities:</b> <ul style="list-style-type: none"> <li>Measures to manage potential negative effects on local communities; enhance employment capacity through training; provision of services for staff and local community</li> </ul>
<ul style="list-style-type: none"> <li>Project may lead to a shortage of local construction workers to meet the needs of other industries and major projects in the East of England region</li> </ul>	<ul style="list-style-type: none"> <li>Measures to address likely difficulties in sourcing labour and the effects of this on the local/regional construction industry</li> </ul>
<b>Beneficial Effects:</b> <ul style="list-style-type: none"> <li>Strategic effects considered positive with regard to the creation of temporary jobs during construction and permanent full-time employment during operation.</li> <li>New power station may offset job losses from decommissioning of the existing power station at the site. However, time differences between decommissioning may require workers to seek employment elsewhere</li> <li>Provision of education, training, upskilling for employees and contractors in the region</li> <li>Positive multiplier effects as income from new population of workers will help support local economy</li> <li>Potential for property values to increase within vicinity of the site, based on previous studies</li> </ul>	
<b>Communities: Supporting Infrastructure</b>	
<b>Adverse Effects:</b> <ul style="list-style-type: none"> <li>Potential for heavier traffic flow on regional road infrastructure</li> </ul>	<b>Mitigation Possibilities:</b> <ul style="list-style-type: none"> <li>Provision of transportation management plans and green travel plans</li> </ul>

<b>Potential Significant Effects (adverse and beneficial effects)</b>	<b>Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC</b>
	<ul style="list-style-type: none"> <li>• Consideration of alternatives to road for the transport of large loads</li> </ul>
<ul style="list-style-type: none"> <li>• Potential for significant impacts regarding radioactive and conventional waste</li> </ul>	<ul style="list-style-type: none"> <li>• Conventional waste: good site practices, implementation of waste hierarchy (reduce, reuse recycle) and waste management</li> <li>• Radioactive waste: appropriate storage and management</li> </ul>
<b>Beneficial Effects:</b> <ul style="list-style-type: none"> <li>• Potential for positive effects on regional rail and road infrastructure.</li> </ul>	
<b>Human Health and Well-Being</b>	
<b>Adverse effects:</b> <ul style="list-style-type: none"> <li>• Possibility of local and regional health risks from accidental discharges</li> </ul>	<b>Mitigation Possibilities:</b> <ul style="list-style-type: none"> <li>• Ensure continuation of current programme of monitoring power station discharges and their effects on health</li> </ul>
<ul style="list-style-type: none"> <li>• The potential requirement for appropriate additional health service capacity for the influx of both construction and operational workers</li> </ul>	<ul style="list-style-type: none"> <li>• The developer should carry out a review of local health provision to ensure it is adequate for the expected influx of power station workers</li> </ul>
<ul style="list-style-type: none"> <li>• The construction and operation of the proposed nuclear power station may lead to unacceptable community disturbance</li> </ul>	<ul style="list-style-type: none"> <li>• The developer should ensure a CEMP and an all-phase Travel Plan are produced, observed and monitored</li> </ul>
<b>Beneficial Effects:</b> <ul style="list-style-type: none"> <li>• Likely positive effects on health via increase in employment, community wealth, additional housing, additional health care facilities and other associated neighbourhood infrastructure</li> </ul>	
<b>Cultural Heritage</b>	
<b>Adverse Effects:</b> <ul style="list-style-type: none"> <li>• If a buried archaeological resource is present the main effects would be at a local scale, within the footprint of the proposed new facility. Effects would be permanent and irreversible</li> </ul>	<b>Mitigation Possibilities:</b> <ul style="list-style-type: none"> <li>• Detailed investigations (trial trenching, etc.) will be required during the planning stage, prior to construction</li> </ul>
<ul style="list-style-type: none"> <li>• Immediately surrounding the site, there may be potential effects on the settings of historic assets. The significance will depend on distance, topography and the ability to mitigate</li> </ul>	<ul style="list-style-type: none"> <li>• It may be possible to mitigate against potential adverse setting effects on heritage assets through appropriate landscaping/planting schemes and application of principles of good design in accordance with PPS1</li> </ul>

Potential Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
<b>Landscape</b>	
<p><b>Adverse Effects:</b></p> <ul style="list-style-type: none"> <li>Likely long-term direct and indirect adverse impacts on distinctive landscape character and features at local scale within an area of nationally designated landscape character and quality (Suffolk Coasts and Heaths AONB, Suffolk Heritage Coast). The new power station will be seen within the context of the existing power stations, however, there is still likely to be long term deterioration in some views within a nationally designated landscape and on a Heritage Coast</li> </ul>	<p><b>Mitigation Possibilities:</b></p> <ul style="list-style-type: none"> <li>Full and effective mitigation unlikely given the scale of new buildings and associated infrastructure within AONB and Heritage Coast</li> <li>Application of principles of good design in accordance with PPS1</li> <li>Significant strategic compensatory landscape planning and management measures, and restoration of temporary construction areas may be required. There are opportunities for heathland habitat restoration and furthering the local landscape character area enhancement guidelines</li> <li>The decommissioning of the facilities may allow some landscape restoration of previously developed areas in the long term, however, long term land uses for the restored areas is difficult to predict at this stage</li> </ul>
<b>Soils, Geology and Land Use</b>	
<p><b>Adverse Effects:</b></p> <ul style="list-style-type: none"> <li>The construction of the power station and associated infrastructure (including transmission lines/towers) will lead to the direct loss of soil structure. This may include impacts on soils that maintain terrestrial habitats, including designated nature conservation sites; the Sizewell Marshes SSSI and Minsmere-Walberswich Heaths and Marshes SSSI/SPA/SAC.</li> </ul>	<p><b>Mitigation Possibilities:</b></p> <ul style="list-style-type: none"> <li>Such effects could be mitigated through limitation of the footprint of the development reducing the area of soils affected, and recognised best practice soil and water management measures during construction.</li> </ul>
<b>Water Quality and Resources</b>	
<p><b>Adverse Effects:</b></p> <ul style="list-style-type: none"> <li>New coastal and fluvial defence works and marine landing station may potentially impact on coastal processes, hydrodynamics and sediment transport, and any indirect effects on internationally</li> </ul>	<p><b>Mitigation Possibilities:</b></p> <ul style="list-style-type: none"> <li>Further investigations into possible impacts will be required during design of coastal and defence works.</li> <li>Suitable design and location of coastal and fluvial flood defence works and marine landing station. May include use of</li> </ul>

<b>Potential Significant Effects (adverse and beneficial effects)</b>	<b>Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC</b>
designated habitats	SUDS <ul style="list-style-type: none"> <li>• Selection of appropriate construction methods</li> <li>• Sediment transport modelling</li> </ul>
<ul style="list-style-type: none"> <li>• Works to provide (and discharge) cooling water on coastal processes, hydrodynamics and sediment transport, and any indirect effects on internationally designated habitats</li> </ul>	<ul style="list-style-type: none"> <li>• Further investigations required</li> <li>• Suitable design and location of cooling water abstraction and discharge points</li> <li>• Selection of appropriate construction methods</li> </ul>
<ul style="list-style-type: none"> <li>• Thermal impact of cooling water discharges. This effect is of local and regional significance</li> </ul>	<ul style="list-style-type: none"> <li>• Thermal discharges will need to be permitted by the EA</li> </ul>
<ul style="list-style-type: none"> <li>• Increased demand for water during the construction phase. The potential magnitude and duration of increased water demand will depend on the timing of the development in relation to the activities (operation or decommissioning) of the existing site. Similar significant effects are likely to apply to wastewater production from the site</li> </ul>	<ul style="list-style-type: none"> <li>• Further investigations required</li> <li>• Developer to commission further studies to ensure that capacity of water and wastewater infrastructure in the water resource zone is sufficient</li> </ul>
<ul style="list-style-type: none"> <li>• Potential impacts on local groundwater bodies. Impacts from construction disturbances and accidental discharges. Potential impacts on other linked groundwater bodies resulting from water abstraction</li> </ul>	<ul style="list-style-type: none"> <li>• Further investigations required</li> <li>• Developer should commission further studies to ensure that local groundwater bodies are investigated and suitable design is adopted to mitigate potential impacts</li> <li>• Potential for ongoing monitoring of impacts on groundwater bodies</li> </ul>
<b>Flood Risk</b>	
<p><b>Adverse Effects:</b></p> <ul style="list-style-type: none"> <li>• Sea level rise could be a threat during the latter stages of the operational phase/ decommissioning phase</li> </ul>	<p><b>Mitigation Possibilities:</b></p> <ul style="list-style-type: none"> <li>• Flood defence barriers to be upgraded or constructed</li> <li>• Developer to ensure further studies are carried out</li> </ul>

## Abbreviations

AA	Appropriate Assessment
AGR	Advance Gas Cooled Reactors
ALARP	As Low As Reasonably Practicable
AOD	Above Ordnance Datum
AONB	Area Of Outstanding Natural Beauty
AoS	Appraisal of Sustainability
AoS Report	Report setting out environmental and sustainability effects of the Nuclear NPS. It will incorporate the requirements of the SEA Directive
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BGS	British Geological Survey
BS	British Standard
CAMS	Catchment Abstraction Management Plan
CO	Carbon Monoxide
CO <sub>2</sub>	Carbon Dioxide
COMARE	Committee on Medical Aspects of Radiation in the Environment
CPRE	Campaign to Protect Rural England
DECC	Department of Energy and Climate Change
Defra	Department for the Environment, Food and Rural Affairs
EA	Environment Agency
EfW	Energy from Waste
EIA	Environmental Impact Assessment
EMF	Electromagnetic fields
ESZ	East Suffolk Zone
EU	European Union
GEP	Good Ecological Potential
GES	Good Ecological Status
GP	General Practitioner
GW	Giga Watt
GWMU	Groundwater Management Unit
HRA	Habitats Regulations Assessment
HSE	Health and Safety Executive
IPC	Infrastructure Planning Commission.
ISO	International Organization for Standardization
LAQM	Local Air Quality Management
MBT	Mechanical Biological Treatment
MMO	Marine Management Organisation
MOLF	Marine Off Loading Facility
MRF	Materials Recycling Facility
mSv	Millisievert
MWe	Mega Watt (electrical)
MWt	Mega Watt (thermal)
NCA	National Character Area
NDA	Nuclear Decommissioning Authority
NETA	North European Transport Axis
NII	Nuclear Installations Inspectorate
Nuclear NPS	The revised draft National Policy Statement for new nuclear power stations

NPS	National Policy Statement
OSPAR	Oslo and Paris Conventions
PM <sub>10</sub>	Particles Measuring 10µm or less
PWR	Pressurised Water Reactor
RAMTED	Radioactive Materials Transport Events Database
RBD	River Basin District
RES	Regional Economic Strategy
RSS	Regional Spatial Strategy
SA	Sustainability Appraisal
SAC	Special Area of Conservation
SAM	Scheduled Ancient Monument
SEA	Strategic Environmental Assessment
SMP	Shoreline Management Plan
SOA	Super Output Area
SPA	Special Protection Area
SRF	Solid Recovered Fuel
SSA	Strategic Siting Assessment
SSSI	Site of Special Scientific Interest
SWCCAP	South West Climate Change Action Plan
TEN	Trans European Network
UKCIP	UK Climate Impacts Programme
WDA	Waste Disposal Authority
WHO	World Health Organisation
WFD	Water Framework Directive
WRMP	Water Resources Management Plan
WRMU	Water Resources Management Unit

## Appendices Available Separately

- 1 Sustainable Development Themes and AoS/SEA Objectives
- 2 Appraisal Matrices
- 3 Plans and Programmes Review (Regional)
- 4 Baseline Information (Regional and Local)



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