

Appraisal of Sustainability: Site Report for Oldbury

EN-6: National Policy Statement for Nuclear Power Generation

Preface:

Appraisal of Sustainability of the draft Nuclear National Policy Statement

The Appraisal of Sustainability (AoS), incorporating Strategic Environmental Assessment (SEA), of the 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 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 (DECC) at <http://www.energynpsconsultation.decc.gov.uk>

This document is the Appraisal of Sustainability: Site Report for Oldbury of the draft Nuclear NPS and is subject to consultation alongside the draft Nuclear NPS for a period of a minimum of 12 weeks from the date of publication.

This report has been prepared by the Department of Energy and Climate Change (DECC) 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 Oldbury 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)

This Appraisal of Sustainability Report has been prepared by the Department of Energy and Climate Change (DECC) with expert input from a team of specialist planning and environmental consultancies led by MWH UK Ltd with Enfusion Ltd, NPA Ltd, Studsvik UK Ltd and Metoc plc.

Summary of Key Findings

This report considers the nomination of the site at Oldbury as a possible location for new nuclear power station(s). The purpose of this Appraisal of Sustainability Report is to assess environmental and sustainability impacts on the Oldbury site and surrounding area. This report also identifies the significance of those effects, and suggests possible ways of mitigation. 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 a 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 mitigations of the potential effects identified of developing a nuclear power station at Oldbury are included in Section 6.

Summary of Key Findings

The Appraisal of Sustainability process has included recommendations to inform the development of the Nuclear National Policy Statement. This site report for Oldbury has helped to inform the decision-making for the Strategic Siting Assessment. It has included advice as to the strategic significant effects arising from the construction of a new nuclear power station at Oldbury, and suggestions for how adverse effects may be mitigated, including proposed mitigation measures which could be considered as part of project level Environmental Impact Assessment.

A number of the strategic effects identified for Oldbury will be similar across all the nominated sites, including positive effects for employment and well being. However a number of potential strategic effects have been identified that are of particular note for the Nuclear National Policy Statement. These are discussed below:

There are potential negative effects on two national and internationally protected conservation sites, namely the Severn Estuary and the River Wye. The area is a high risk flood zone. Existing flood defences are in place, but these are likely to need upgrading to protect against sea level rise and erosion during the lifetime of the facility. These effects are significant, but mitigation opportunities are likely to be available following further study.

Due to the large tidal range the existing power station needs a tidal reservoir to allow for continual abstraction and release of cooling water. The capacity of the Severn Estuary at this location is insufficient for a new larger nuclear power station, and cooling towers are therefore required. Although adjacent to the existing power station the cooling towers could be up to 200m high and would be visible from parts of the Wye Valley and the Cotswolds Areas of Natural Beauty (AONB). This would have a negative visual impact on the landscape at a sub-regional level, which could not be fully mitigated.

There is the potential for very significant negative cumulative effects if two new power stations (Oldbury and Hinkley Point) and the Severn Barrage are all developed. These include the loss of nationally and internationally important estuarine habitats, which are unlikely to be fully mitigated.

There is also potential for positive cumulative effects associated with long term employment and enhanced prosperity for communities at the sub-regional level if both power stations are built in the Severn Estuary.

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 Environmental Impact Assessment.

1 Introduction

This Appraisal of Sustainability Report

- 1.1 This report considers the site at Oldbury 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 Oldbury. The nomination of land, as well as supporting information, was put forward by a developer. 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 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,¹ which accompanies the draft Nuclear National Policy Statement² (NPS). The Main AoS Report for the 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 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). 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 draft Nuclear NPS will also be subject to other regulatory and licensing requirements.

The draft Nuclear National Policy Statement

- 1.4 In the White Paper on Nuclear Power³, the Government set out its policy on the role that new nuclear power stations could play alongside other low-carbon sources in the UK's future energy mix. The 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 SSA to assess the potential suitability of nominated sites. The SSA process⁴ drew on the emerging findings of the site AoSs and the Habitats Regulations Assessment (HRA)⁵.

¹ DECC 2009 link to Main AoS Report

² DECC 2009 link to Nuclear NPS

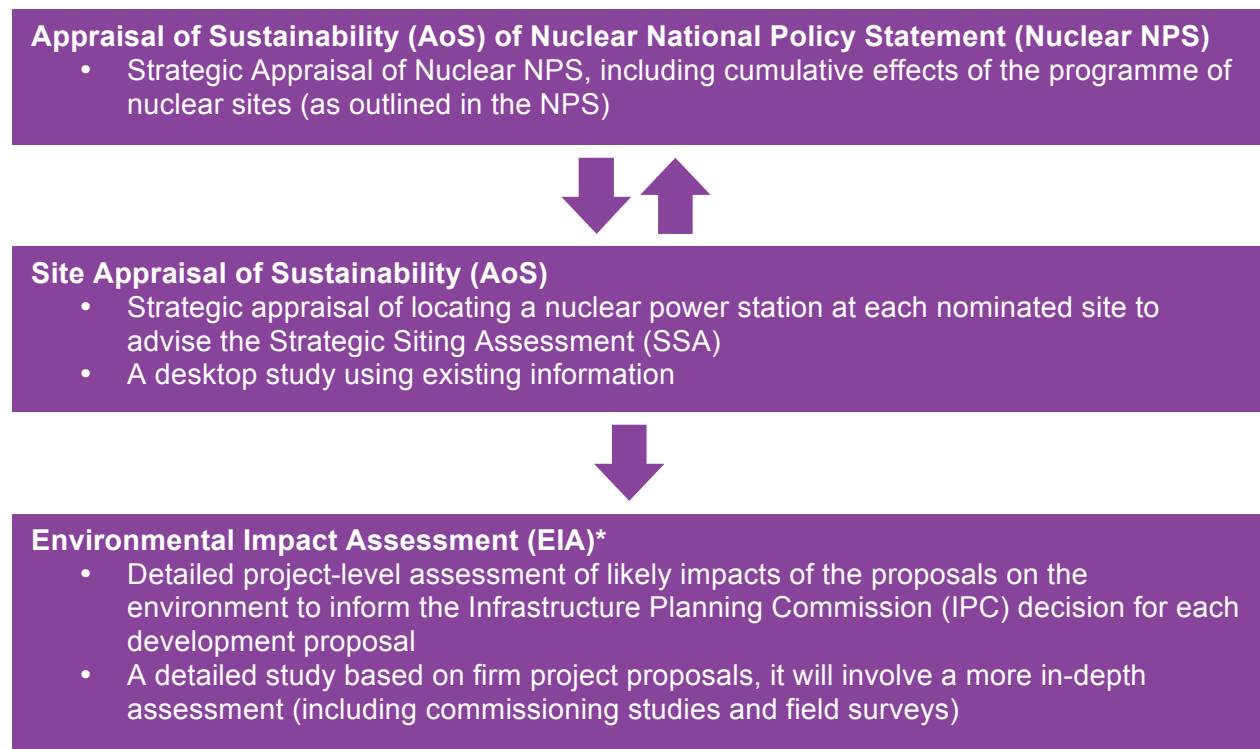
³ BERR (Jan 2008) Meeting the energy challenge: a white paper on nuclear power, URN 08/525

⁴ 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>

⁵ DECC 2009 link to Oldbury HRA Report

Appraisal of Sustainability incorporating Strategic Environmental Assessment

- 1.5 The Planning Act (2008)⁶ 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 Directive⁷ 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 draft Nuclear NPS.
- 1.6 The purpose of this AoS is to assess environmental and sustainability impacts on the Oldbury site. This AoS also identifies the significance of those effects, and to suggest possible ways of mitigation. The AoS for Oldbury site fed into the Strategic Siting Assessment (SSA) and the preparation of the 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.



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

⁶ Planning Act 2008

⁷ 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*

Appraisal of Sustainability Methods

- 1.7 In undertaking the AoS of each nominated site, a wide range of information was considered including, the Scoping Report⁸, the Environmental Study⁹, the Update Report¹⁰, 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 draft Nuclear NPS are detailed in Annex E of the Environmental Study and the Main AoS Report. Appendix 1 of this AoS 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

Sustainable Development Theme	AoS/SEA Objective (Numbers refer to Scoping Report¹¹ and Environmental Study¹²)
Air Quality	to avoid adverse impacts on air quality (12)
Biodiversity and Ecosystems	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)
Climate Change	to minimise greenhouse gas emissions (13)
Communities: population, employment and viability	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)

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

⁹ BERR July 2008 Environmental Study

¹⁰ BERR January 2009 Update Report

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

¹² BERR July 2008 Environmental Study

Sustainable Development Theme	AoS/SEA Objective (Numbers refer to Scoping Report¹¹ and Environmental Study¹²)
Communities: Supporting Infrastructure	to avoid adverse impacts on the function and efficiency of the strategic transport infrastructure (8) to avoid disruption to basic services and infrastructure (9)
Human Health and Well-Being	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)
Cultural Heritage	to avoid adverse impacts on 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)
Landscape	to avoid adverse impacts on nationally important landscapes (24) to avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness (25)
Soils, Geology, Land Use	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)
Water Quality and Resources	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)
Flood Risk	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 regional level, which helped 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 (HSE), 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 Safely¹³. 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 Government on the possibility of hosting a geological disposal facility at some point in the future.

¹³ <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 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 Oldbury AoS provided in the right hand column.

Table 1.2: Base Case Assumptions and Variations Considered for Oldbury

Base Case	Variations considered in AoS of Oldbury (as proposed in nomination)
1 nuclear reactor	
Technology neutral (i.e. unknown reactor type)	
A requirement for cooling water abstraction	The nominator considers a water cooling tower system to be the most

Base Case	Variations considered in AoS of Oldbury (as proposed in nomination)
	appropriate cooling method for the site, rather than direct cooling water abstraction.
Discharges of cooling water	Nomination states likely use of cooling towers
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 ¹⁴	The Oldbury nomination states 60 years operation.
<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 ¹⁵ Associated employment creation: 2000	
Coastal flood and protection measures (where relevant)	
Infrastructure for transporting reactor (for example, jetty, landing facility)	
Interim radioactive waste storage facilities will be onsite for at least 160 years	
Highway improvements, access routes	
Associated transmission infrastructure	
Radioactive discharges will be within legal limits	

¹⁴ A 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 therefore 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. However, this is based on some conservative assumptions and there are a number of factors that could reduce or potentially increase, the total duration of onsite spent fuel storage.

¹⁵ 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: Oldbury

- 2.1 The site at Oldbury is located on the south side of the Severn Estuary in the South West of England. The site is located to the north of the existing Oldbury Nuclear Power Station, approximately 1.5km from the village of Oldbury-on-Severn, and 24km north east of Bristol. The majority of the area surrounding Oldbury is classed as agricultural land. 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 Oldbury site has supported nuclear power facilities since 1967. The existing nuclear power station is operated by British Nuclear Group, a subsidiary of BNFL. The facility has two Magnox reactors producing 435 MW of electricity, which is sufficient to power a city 1.5 times the size of nearby Bristol. The power station was due to cease operation in 2008, with decommissioning due to begin in 2009. An announcement on 18 December 2008 by the UK Nuclear Decommissioning Authority stated that the station would continue to operate for another two years. Oldbury is one of four nuclear power stations located close to the mouth of the River Severn and the Bristol Channel, the others being Berkeley, Hinkley Point A and Hinkley Point B.
- 2.3 The nomination for Oldbury identifies an area of approximately 150 ha. The south western part of the nominated site comprises two silt lagoons (which form part of the existing power station). The remainder of the nominated site is agricultural land bounded in most places by Shepperdine Road, but with a small area extending beyond to the north. To the west, the nominated site is bounded by the existing flood defences of the Severn Estuary. The Oldbury nomination acknowledges that some additional infrastructure may be required outside the official nominated area. This includes additional flood protection measures and cooling water intake and outfall structures, which would extend into the Severn Estuary.
- 2.4 The nomination for a nuclear power station development incorporates the following features:
- At least one nuclear reactor
 - Construction of additional flood defences along the Severn Estuary frontage of the nominated site
 - Construction stage areas and facilities
 - Infrastructure and facilities related to the operation of a nuclear power station
 - Access road infrastructure; transmission and cooling water infrastructure
 - Interim waste storage facilities
- 2.5 The site at Oldbury was nominated into the Strategic Siting Assessment (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 draft Nuclear NPS (through this Site AoS Report).

- 2.6 The SSA required the site nominator to supply an annotated Ordnance Survey map at 1:10,000 scale showing the boundary of the 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 scoping¹⁶ 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 Oldbury 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 new nuclear 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:
- South West Climate Change Action Plan 2008 - 2010, South West Regional Assembly (2008)
 - Draft Regional Spatial Strategy for the South West 2006-2026, South West Regional Assembly (2007 - 2008)
 - Regional Economic Strategy for the South West 2006-2015, South West RDA (May 2006)
 - Creating Sustainable Communities in the South West, Government Office for the South West (2005)
 - Our Environment: Our Future -The Regional Strategy for the South West Environment 2004-2014, South West Regional Assembly
 - South West Biodiversity Action Plan, UK Biodiversity Action Plan (1997)
 - From Rubbish to Resource: The South West Regional Waste Strategy 2004-2020, South West Regional Assembly (2004)
 - Draft River Basin Management Plan for the Severn, Environment Agency (2008)
 - Severn Estuary Shoreline Management Plan, Severn Estuary Coastal Group (2000)
- 3.4 The key objectives for sustainability from these regional policy documents can be summarised as follows:
- Protecting and enhancing biodiversity

¹⁶ BERR (March 2008) Scoping Report

- Mitigating and adapting to the effects of climate change
- Reducing flood risk: fluvial and coastal
- Protecting and enhancing landscape, recreation and cultural heritage
- Protecting water quality and resources
- Increasing provision of affordable homes
- Preventing inappropriate development on flood plains
- Reducing the amount of waste produced, increase recycling and make better use of resources
- Improving sustainable transport and accessibility
- Ensuring good local air quality for all

3.5 These may have indirect and/or cumulative interactions and this is discussed further in Section 5: Interactions and Cumulative Effects with Other Plans and Projects.

4 Site Characterisation

Introduction

- 4.1 A general description of the nominated site at Oldbury and its location is provided in Section 2.
- 4.2 This section describes the general characteristics of the nominated site at Oldbury 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 Oldbury is presented in Table 4.1 below.

Table 4.1: Summary of Scope of Baseline Data Collated for Oldbury

Sustainable Development Theme	Scope of baseline data collated in this AoS
Air Quality	<ul style="list-style-type: none"> Regional air quality index. Location of Air Quality Management Areas.
Biodiversity and Ecosystems	<ul style="list-style-type: none"> 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.
Climate Change	<ul style="list-style-type: none"> Regional precipitation and temperatures. Greenhouse gas emissions regional, county and local.

Sustainable Development Theme	Scope of baseline data collated in this AoS
Communities and Supporting Infrastructure: Population Employment Community Viability Transport Waste and Minerals Energy	<ul style="list-style-type: none"> • Location of major settlements and areas of population. • Age structure of population. • Employment/unemployment and economic activity rates. • Employment profile by industry. • Socio-economic classification of population. • Energy from low-carbon/renewable resources: regional. • Transport network and links. • Landfill sites and waste management facilities.
Human Health and Well-Being	<ul style="list-style-type: none"> • Index of Multiple Deprivation. • Age profile. • General health. • Life expectancy. • Infant mortality. • Proximity to medical services.
Landscape and Cultural Heritage	<ul style="list-style-type: none"> • Location and description of National Parks, Areas of Outstanding Natural Beauty, Heritage Coasts. • National landscape Character Areas. • Local landscape character areas/ types. • CPRE Tranquil Areas and Light Pollution mapping. • Location and description of World Heritage Sites, Scheduled Monuments, Historic Battlefields, Historic Parks and Gardens, Designated Protected Wrecks, Conservation Areas, Listed Buildings.
Soils, Geology and Land Use	<ul style="list-style-type: none"> • Agricultural land classification • Soil types • Geological SSSIs • Geological hazards • Environmental hazards • Historic land use
Water Hydrology Quality Resources Flood Risk	<ul style="list-style-type: none"> • Location of areas at risk of flooding • Stat of surface and ground waters: in river basin district and catchment • Predicted water demand and availability by Water Resource zone. • Designated waters under EU Directive. • Information from the River Basin Management Plan for the Severn River Basin District. • Information based on requirements for good ecological status (GES) or good ecological potential (GEP). • Information on Bathing Waters. • Information on Designated Shellfish Waters.

Sustainable Development Theme	Scope of baseline data collated in this AoS
	<ul style="list-style-type: none"> • Information on groundwater. • Ecological and chemical quality of the estuarine waters. • Information on the Bristol Avon and North Somerset Streams Catchment. • Information on the Little Avon Catchment Abstraction Management Strategy. • Information from Bristol Water plc.

Air Quality

- 4.4 Air quality in the South West is generally good, with low levels of sulphur dioxide, nitrogen dioxide and particulates in comparison with the rest of England. However, pockets of poor air quality exist in the region, especially within large urban industrial areas such as Bristol.¹⁷
- 4.5 There are 28 Air Quality Management Areas (AQMA) in the South West, but none of these are located in the South Gloucestershire Council region.¹⁸
- 4.6 The average number of days with moderate or higher air pollution has generally decreased significantly in urban areas since 1993; largely due to a reduction in particles and sulphur dioxide. In rural areas, where ozone is the main cause of pollution, there has been no overall trend. Ozone levels are naturally high in the South West due to factors such as the close proximity to the coast.
- 4.7 Pollution levels for key pollutants (such as sulphur dioxide, nitrogen dioxide and particulates) in the rural area around Oldbury are typically low, and there are no other major industrial sites in close proximity other than the existing Oldbury nuclear power station.
- 4.8 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 EA's most recent available assessment of radioactive aerial emissions for regulated nuclear power stations indicates that all fall within authorised limits.¹⁹
- 4.9 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.

¹⁷ South West Observatory State. State of the South West 2008 [online] available: <http://www.swo.org.uk/observatory/links-1/state/state-of-the-south-w-1.shtm> [accessed 03 March 2009].

¹⁸ UK Air Quality Archive (online) available: <http://www.airquality.co.uk/archive/laqm/laqm.php>

¹⁹ Measuring Environmental Performance: Sector Report for the Nuclear Industry (Environment Agency, Nov 2005)

Biodiversity and Ecosystems

- 4.10 The biodiversity interest around the nominated site includes a number of nationally designated sites and European designated sites. Further information on the European designated sites and their current condition is given in the separate HRA Report for Oldbury.
- 4.11 The site at Oldbury is located in close proximity to two European designated sites. It is immediately adjacent to the Severn Estuary, which is designated as a Special Area of Conservation (SAC), Special Protection Area (SPA) for birds and a Ramsar²⁰ wetland site. The Severn Estuary is protected for its tidal habitats and internationally important bird and migratory fish populations. It is understood that brook lamprey, white-clawed crayfish or bullhead are not likely to be issues in the site area, however, otter may well be subject to significant effects.
- 4.12 The silt lagoons at Oldbury Power Station are used as a high tide roosting site by birds (these include a number of vagrants) which feed on the Severn Estuary. Between 1979 and 2005, 199 bird species were recorded at the site.
- 4.13 Situated south of the nominated site is the mouth of the River Wye SAC, which is directly linked to the Severn Estuary. It supports a number of European protected species, including migratory fish and otter. The river Usk SAC should also be considered due to its link with Severn Estuary systems.
- 4.14 The Littleton Brick Pits nature reserve is located next to the Severn Estuary, approximately 5km east of the nominated site. The nature reserve is one of a chain of reed beds close to the Severn Estuary, and is recognised as an important feeding and resting place for migrating birds²¹.
- 4.15 It is important that further assessment is undertaken on issues relating to sediment flows. The potential effects on the migratory features of the Severn including potential impacts on migratory species in Wye and Usk SACs should be included as part of this overall assessment.

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 sections on Flood Risk.
- 4.17 CO₂ emissions from the South West account for 8% of the UK total, with 27% from transport, 33% from homes and 36% from industry and commerce.

²⁰ 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

²¹ <http://www.avonwildlifetrust.org.uk/reserves/littleton.htm>

- 4.18 The South West Regional Spatial Strategy (RSS) has set a series of ambitious and positive targets to reduce emissions by at least 30% by 2026 and 60% by 2050 through addressing both energy efficiency and accelerating the use of renewable energy sources, including²²:
- Achieving zero carbon housing within 10 years, and zero carbon non-domestic buildings by 2019
 - Improved energy efficiency for existing building stock
 - Concentrating growth in larger or 'Strategically Significant Cities and Towns' (SSCTs)
 - Improved public transport and demand management
 - Producing more energy locally and from renewable sources
- 4.19 There are currently three power stations within 80km radius of the nominated site, with a combined capacity of 4473MW. These are primarily coal, CCGT and nuclear. The current power station at Oldbury is currently being decommissioned.

Communities: Population, Employment and Viability

- 4.20 Population in the South West has steadily increased over the past 30 years to more than 5 million, which represents approximately 10% of England's total population. According to the Office for National Statistics, the region's population grew faster than any other region between 1981 and 2006 at 16.9%. This was mostly attributable to migration, mainly from London and the South East. The largest percentage change occurred in North Dorset, with an increase of 36%. For Gloucestershire, growth between 1991 and mid-2006 was 8%, above the average of 5.8% for England and Wales.
- 4.21 The population density of South Gloucestershire District is 4.8 people per ha (516 people per km²), which is above the England and Wales average of 3.4 per ha.
- 4.22 Of the nine English regions, the South West has the lowest percentage of people of working age, the lowest percentage of children and young people and the highest proportion of older people.²³ The South West has a high level of employment amongst working age people (78%) when compared to the English average (74%). Full-time employment levels for South Gloucester District are higher than the regional and national average. Unemployment levels for the District have remained relatively constant over the past five years, with levels in October 2007 at 0.8% compared to a British average of 2.1%.²⁴

Communities: Supporting Infrastructure

- 4.23 Transport: The strategic transport routes in the vicinity comprise the M5 motorway and A38 which run north to south, and the M4 motorway which runs

²² <http://southwest-ra.gov.uk/media/SWRA/RSS%20Documents/Final%20Draft/draftRSSfull.pdf>

²³ <http://www.swo.org.uk/information-publications/state-of-the-south-west>

²⁴ Quality of Life Better or Worse: The annual quality of life indicators report for South Gloucestershire – Spring 2008 (<http://www.southglos.gov.uk/>)

east to west to the south of the nominated site. Oldbury is accessed from the A38 by unclassified minor roads (generally more than 4m wide) and is approximately 8km from the A38. The motorway network in the vicinity forms part of the National Freight Route and the A38 is recognised as an important freight route within South Gloucestershire, although it is not officially classified as such.

- 4.24 The nominated site at Oldbury is not served by a rail link. The nearest station is at Pilning, 18km south of the nominated site, on the Bristol to Cardiff line. There is also a rail line running along the opposite bank of the estuary from the nominated site, with stations at Lydney and Chepstow.
- 4.25 The estuarine location of the nominated site may provide the potential for the construction of a temporary wharf facility at the nominated site, although access may not be possible due to the existing tidal reservoir. The nearest existing port facilities to the nominated site are at Avonmouth, 24kms to the south.
- 4.26 Conventional waste²⁵: In 2006/2007 South Gloucestershire County Council was ranked 5th out of the 80 Unitary Authorities for recycling and composting 39.54% of household waste. Landfill remains the principal method of waste disposal in South Gloucestershire. A total of 84,711 tonnes (57%) of municipal waste was sent to landfill in the region in 2006/2007, which almost equates to the English average of 58%.²⁶
- 4.27 There are currently three operational landfill sites within the South Gloucestershire District Council area, accepting non-hazardous waste. It has not been possible to identify the capacity of these landfill sites at this stage. There are no hazardous waste landfill sites in operation in the West of England region, however, a number of specialist waste management contractors operate in the region and provide services to deal with a range of hazardous wastes.²⁷
- 4.28 Planning and development of waste infrastructure within the region are dealt with through the West of England Waste Management and Planning Partnership. There are currently no waste treatment facilities operational in the region. However, a three partner group (comprising Bristol, North Somerset and South Gloucestershire Councils) are exploring options related to the procurement of waste treatment facilities in the future.²⁸

²⁵ Conventional waste is waste controlled under Part II of the Environment Act 1990

²⁶ Department for Environment, Food and Rural Affairs. Municipal Waste Management Statistics. <http://www.defra.gov.uk/environment/statistics/wastats/bulletin07.htm>

²⁷ South Gloucestershire Council – Sites Licensed under the EPA.

<http://www.southglos.gov.uk/NR/exeres/96467823-c33a-4de2-953d-776f6d814d40>

²⁸ West of England Waste Management and Planning Partnership – Joint Residual Waste Management Strategy, Summary Version, 2008.

http://www.rubbishresource.co.uk/2007/index.php?option=com_content&task=section&id=20&Itemid=67

Human Health and Well-Being

- 4.29 The nominated site at Oldbury is within the Super Output Area (SOA) known as South Gloucestershire 004C²⁹. Indices of deprivation show that the South Gloucestershire SOA is not a deprived area although barriers to housing and services are much greater than average and living environment deprivation is greater than average. The age profile for this SOA shows that there are fewer children under sixteen and more senior citizens (males over 65 and females over 60) than the average for England. The profile also shows that there are fewer people of working age than average.
- 4.30 The most recent census (2001) found that people within the South Gloucestershire SOA generally reported good or fairly good health. The life expectancy is greater than the average for England, and is also higher than that of the population of the South West of England region. Infant mortality is also below the average for the region and England as a whole.
- 4.31 With regard to mental health, the Health Profile 2007³⁰ for South Gloucestershire shows that estimates of the number of people claiming incapacity benefit for mental illness in the area (15.1 per 1000 population) are significantly lower than the average for England (27.4 per 1000 population).
- 4.32 As would be expected from the favourable deprivation figures referred to above, pupils in the South Gloucestershire 004C area perform better in their GCSE equivalent examinations than their peers in the rest of England.
- 4.33 Housing stock within South Gloucestershire Council's area is generally good with a smaller percentage of unfit housing³¹ than in England as a whole.
- 4.34 Figures from the Audit Commission for 2005³² suggest that the crime rate in South Gloucestershire Council's area is much lower than the average for England.
- 4.35 The economic well-being of the area is positive as can be seen from the local employment figures³³ (see the section on Communities: Population, Employment and Viability above - noted here as a measure of well-being). From July 2007 to June 2008, 83.2% of the population of the South Gloucestershire Council area were employed. This number compares favourably with figures for the South-west of England region (78.5%) and England as a whole (74.5%).
- 4.36 Local access to medical services is reasonable although there are no general practitioner (GP) practices within 5km of the nominated site. There are, however, seven GP practices within 10km of the nominated site and a local

²⁹ 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

³⁰ <http://www.apho.org.uk/resource/view.aspx?RID=50213>

³¹ Dwellings not suitable for occupation as defined by various criteria in Section 604 of the Housing Act 1985 (as amended)

³² [http://www.areaprofiles.audit-commission.gov.uk/\(rkqonp45u4sp1o55bc5scf55\)/SingleAreaSearch.aspx](http://www.areaprofiles.audit-commission.gov.uk/(rkqonp45u4sp1o55bc5scf55)/SingleAreaSearch.aspx)

³³ <https://www.nomisweb.co.uk/reports/lmp/la/2038431858/report.aspx?pc=IP164UR>

hospital, though without an accident and emergency department, some 5.1km distant. The nearest accident and emergency department is at Frenchay Park Road, Bristol (16.9km), whilst the nearest mental health hospital is Elms Day Hospital (5.1km).

- 4.37 One of the wider determinants of health and well-being is access to local recreational facilities. In this regard, the nominated site is well served, with approximately eighteen leisure centres within 20km of the site. In addition, as South Gloucestershire is in 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 seven local nature reserves, unspoilt countryside and the nearby Cotswolds Area of Outstanding Natural Beauty (AONB).
- 4.38 Oldbury has supported nuclear facilities since 1967. Therefore the necessary data exist to enable a comparative study between the incidence of cancer in the area and the average incidence of cancer in the UK population as a whole.
- 4.1 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.
- 4.2 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.
- 4.3 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 25km of a nuclear generating site in Britain is associated with an increased risk of childhood cancer'.
- 4.4 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.'
- 4.5 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.

- 4.6 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. In this context, the HPA and the German Commission on Radiological Protection have commented on the very low levels of radiation around nuclear power stations.
- 4.7 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. COMARE hope that the outcome of their review will be available at the start of 2010.
- 4.39 Radioactive monitoring carried out in 2007³⁴ of environmental radioactivity attributable to discharges from Oldbury power station found low concentrations of artificial radionuclides in water, sediment and beach samples, and in meat and seafood samples. However, the presence in the area of other nuclear activities (unconnected with nuclear power stations) makes the apportioning of radiological effects in the area difficult. Nevertheless, from this sampling, the estimated total dosage levels to the public from all sources within the Oldbury area were assessed as being less than 7% of the dose limit for members of the public of 1mSv per year as specified in The Ionising Radiations Regulations 1999.

Cultural Heritage

- 4.40 There are four scheduled monuments, one registered park and garden (Berkley Castle), one Conservation Area and 250 listed buildings within an approximate distance of 5km of the nominated site at Oldbury. However, none of these are located within or physically adjacent to the existing nuclear power station. There is also an area of potential historic field boundaries and medieval ridge and furrow earthworks close to the nominated site. Archaeological features of prehistoric and later date have previously been identified within the general area and the potential exists for the presence of maritime archaeology.
- 4.41 There are two Grade II listed buildings within the nominated boundary, and a further five Grade II listed buildings within 1km of the boundary. The nearest Grade I listed buildings are 4km south east of the nominated site at Thornbury. In addition, the Historic Park and Garden of Berkeley Castle is close by (within 5km of Oldbury).

³⁴ Food Standards Agency (2007). Radioactivity in Food and the Environment (RIFE 13) report.

Landscape

- 4.42 The nominated site is situated within the Severn and Avon Vales National Character Area (NCA), which is characterised by riverside landscapes with little woodland. These landscapes are often very open, with land use varying from small pasture fields and commons in the west to intensive agriculture in the east with prominent views of hills.
- 4.43 At a local level, the nominated site lies within the South Gloucestershire Severn Shoreline and Estuary landscape character area. The landscape is open and exposed and landscape features include salt marshes (some of them grazed), tidal wetlands, mudflats, rock outcrops, lagoons, agricultural land and scattered trees. The Severn Estuary has one of the highest tidal ranges in the world, approximately 14-15m. The estuary's funnel shape, its tidal range, and the underlying solid and superficial geology produce strong tidal streams and high turbidity resulting in a distinct coastal mudflat geomorphology. The tidal range has resulted in the development of an extensive intertidal area comprising mudflats, sandflats, rock platforms and islands. These intertidal areas provide extensive wildlife habitats supporting diverse plant and animal communities.
- 4.44 Whilst there are no national landscape designations within the immediate vicinity of the site, the lack of local landscape designations is due to a system in South Gloucestershire of landscape character analysis and protection via policy in line with national guidance. The lack of designation does not mean there is no landscape value. The site lies within the undeveloped coastal zone and has a strongly rural, tranquil character away from the existing power station. The pattern of listed buildings, hedgerows, ponds, orchards and small fields of ridge and furrow are attractive and characteristic of the levels landscape.
- 4.45 The existing power station, the two Severn Bridges and large scale industrial structures are all dominant features of the landscape, as are the network of power lines that stretch through the adjoining Oldbury Levels and Severn Ridges character areas.
- 4.46 The nearest National Park is the Brecon Beacons, at a distance of over 30km west of the nominated site. There are two Areas of Outstanding Natural Beauty (AONB) within 20km of the nominated site: the Wye Valley (AONB), which is 7km to the north-west, and the Cotswolds AONB, which is 13km to the east.
- 4.47 The Countryside Agency/CPRE county tranquillity map identifies the nominated site as lying within one of the most tranquil parts of the former county of Avon³⁵.

³⁵ <http://www.cpre.org.uk/campaigns/landscape/tranquillity/national-and-regional-tranquillity-maps/county-tranquillity-map-avon>

Soils, Geology and Land Use

- 4.48** The nominated site is located on Grade 3 agricultural land within an area of an agri-environmental designation by Natural England. The soils are noted to be deep, stoneless, mainly calcareous, clayey soils.
- 4.49 The local geology is Tidal Flat Deposits underlain by solid geological strata of the Mercia Mudstone Group. There are a number of geological hazards noted locally related to the tidal flats. The tidal mudflat deposits are potentially compressible deposits and special precautions are required for the design of load bearing structures.
- 4.50 The land use surrounding the existing power station is primarily farmland, with a few small villages and individual properties. The existing nuclear power station is the only notable industrial use in the vicinity of the nominated site.
- 4.51 There is a historical landfill located at the southern section of the nominated site. Inert waste has been deposited at this landfill. There is also a historical landfill located south of the nominated site. Both of these closed landfills were regulated under the Waste Management Licensing Regulations (now Environmental Permitting Regulations). Two lagoons for waste storage are located at the southern section of the nominated site and to the south at the existing power station respectively. Both lagoons are Licensed Waste Management Facilities and Registered Waste Treatment/Disposal sites operated by Magnox Electric Ltd. 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.
- 4.52 No mineral abstractions have been noted within, or in proximity to, the boundary of the nominated site. However, there are some historical brick pits in the local area.
- 4.53 The British Geological Society (BGS) has assessed geological risks in the local area, which include:
- Potential for Compressible Ground Stability Hazards - moderate risk
 - Potential for Landslide Ground Stability Hazards - very low risk
 - Potential for Running Sand Ground Stability Hazards - moderate risk
 - Potential for Shrinking or Swelling Clay Ground Stability Hazard - low risk

Water Quality and Resources

- 4.54 The nominated site at Oldbury is located within the Severn River Basin District (RBD). Within this RBD, only 14% of rivers (by length) meet the requirements for good ecological status (GES) or good ecological potential (GEP). In total, 4% of all surface waters are designated as artificial and 17% of all surface waters are designated as heavily modified.
- 4.55 70% of groundwater bodies in the RBD meet the requirements for good status. 19% of lakes in the RBD meet the requirements for good status. The European Water Framework Directive sets a target of achieving good

ecological and chemical status for all water bodies by 2015, therefore significant improvements in water quality in the RBD are required.

- 4.56 The nominated site is located within the Bristol Avon and North Somerset Streams catchment. Within this catchment, 18% of surface water bodies achieve GES. The nearest watercourse to the nominated site is the Oldbury Naite Rhine. The ecological and chemical quality of this watercourse has not yet been assessed. The estuarine waters near the nominated site have been assessed as having moderate ecological quality, with this status to be maintained to 2015. The chemical quality of the estuary has not been assessed.
- 4.57 There are no bathing waters designated under the Bathing Water Directive in the vicinity of the nominated site and no Designated Shellfish Waters.
- 4.58 The site is located on the Avonmouth Mercia Mudstone aquifer. The current quantitative quality of the groundwater is good and is predicted to maintain good status to 2015. The current chemical quality of the groundwater is good and is predicted to maintain good status to 2015.
- 4.59 There are no groundwater source protection zones in the immediate vicinity of the site. There are some groundwater source protection zones at Wotton-under-Edge in the upper part of the local Catchment Abstraction Management Strategy (CAMS) area, within the Michael Wood Water Resource Management Unit (WRMU2).
- 4.60 The nominated site is located within the Little Avon CAMS area, but it is not located in either of the two Water Resource Management Units (Berkeley and Michael Wood WRMUs) within the CAMS area. Both WRMUs are currently designated as having no water available status; the Environment Agency aims to maintain both WRMUs at this status.
- 4.61 The Severn Estuary is internationally recognised for nature conservation; it is designated as a Special Protection Area (SPA), Ramsar site and Special Area of Conservation (SAC). This water body is the key local feature that affects water availability within the Berkeley WRMU. For the Michael Wood WRMU there are 8 water-related SSSIs that affect water availability within this WRMU.
- 4.62 The nominated site is located within the region supplied by Bristol Water plc. Bristol Water operates its jurisdiction as a single resource zone, with all sources used conjunctively. If growth in population and housing within the region takes place at the forecast rate there would be a deficit in water supply by 2012. However, Bristol Water plc intends to deal with this deficit through a series of planned efficiency improvements and the development of existing and new water sources.
- 4.63 The exact water requirements for the nominated site are not yet finalised. The nominator considers a wet cooling tower system to be the most appropriate cooling method, rather than direct cooling water abstraction. An existing

power station at the nominated site discharges cooling water into the Severn Estuary. It is unlikely that a detailed environmental assessment was made of the existing discharge when the consent application was submitted in 1983. It cannot be assumed that existing consent standards will continue to be appropriate in the future.

- 4.64 The Severn Estuary has the second highest tidal range in the world. Locally, the tidal range increases eastwards as far as Hinkley Point, where the highest recorded ranges have been up to 15m. Adverse weather conditions can raise water levels by more than 2m above predicted levels and the low-lying coasts on the southern side of the Bristol Channel are particularly vulnerable due to the very high tidal range.
- 4.65 The tidal currents in the Bristol Channel generally exceed 1.5m/s at spring tides for long periods and over wide areas. At times, a tidal bore forms in the Severn Estuary which can be up to 2m high. The shoreline is subject to strong winds, powerful waves and substantial storm surges. The general geomorphological context is one of on-going marine transgression with the inner Bristol Channel undergoing enlargement. The rate of marine transgression is very uncertain, however an advance (of the estuary) north eastwards along the Severn Vale of up to the order of 20km over the last few millennia may give some indication of change. This process can only accelerate as sea level rises into the future, putting increased pressure on the existing embankments and other defences.
- 4.66 The turbulent kinetic energy generated by the high tidal currents in the Bristol Channel maintains high levels of particulate material in suspension. However, the asymmetrical tidal current also means that there is a general westward transport of suspended material with a bed load parting region between Barry and Bridgwater, which lie on opposite sides of the Bristol Channel. It should be noted that each of the possible Severn Tidal Power options will sever the sedimentary dynamic of the Estuary and thus lead to an increase in sedimentation and sedimentary load within the water of the Estuary. The Government is carrying out a two-year feasibility study to determine whether the Government could support a tidal power project in the Severn Estuary. The Government is assessing a range of different schemes and the scope and scale of environmental effects is likely to vary widely between them. The Government is conducting separate environmental studies into these impacts and whether they could be mitigated. These environmental studies are not yet complete so the assessment in this report is based upon the potential effects outlined in the preliminary habitats screening report for Severn Tidal Power. This preliminary habitats screening report is not final and will be reviewed in the light of the feasibility study's findings. It covers all five options but does not distinguish between the individual options where environmental impacts will vary. There will be a further consultation on the Feasibility's study findings, likely in 2010.
- 4.67 The design of the nominated site may have to cope with a significant increase in the sedimentary load of the Estuary's waters and even persistent dredging.

Flood Risk

- 4.68 The Severn Estuary is one of the largest estuaries in Britain and the funnelling effects of the Bristol Channel mean that the area has the second highest tidal range in the World. Locally, the tidal range varies considerably with the spring and neap tidal phase of the moon, as well as the weather, and the highest recorded tidal ranges have been up to 15m. Adverse weather conditions can raise water levels by more than 2m above predicted levels and the low-lying coasts on the southern side of the Bristol Channel.
- 4.69 The majority of the nominated site is located in Flood Zone 3a, 'High Probability'. Land to the North of the nominated site and part of the site of the existing power station is shown to be in Flood Zone 1 'Low Probability' and a small proportion of land located immediately adjacent to the estuary edge is shown to be in Flood Zone 3b 'Functional Floodplain'. This is according to the Level 1 South Gloucestershire Strategic Flood Risk Assessment (May 2009)
- 4.70 This means that the majority of the nominated site is at risk from tidal flooding with an annual probability of flooding of >0.5% in any one year. With a small proportion of the site at risk from tidal flooding with an annual probability of >5% in any one year.
- 4.71 A Shoreline Management Plan (SMP) is being undertaken by WS Atkins for the Environment Agency. This SMP includes a review of existing flood defences along the Severn Estuary. It is essential that there is a coordinated approach towards this issue by all parties involved in this matter.
- 4.72 The South Gloucestershire Strategic Flood Risk Assessment³⁶ (SFRA) provides a map showing areas at risk of flooding. The SFRA map indicating the delineation of Flood Zones shows the following information:
- Flood Zone 1 covers the lagoon and an area immediately north within the existing power station site
 - Flood Zone 3a extends from Jobsgreen Farm to the north, east and south
 - Flood Zone 3b: narrow extent of land immediately adjacent to the estuary edge and commencing just north of the existing power station site
- 4.73 The Flood Zones only relate to tidal and fluvial flood risk. In relation to fluvial flood risk, the maps only show the risk associated with Environment Agency mapped watercourses. In this area there are a significant number of smaller watercourses, not mapped by the EA, which represent a flood risk and discharge into the Severn through a very limited number of outfalls. Water is pumped via these watercourses to the outfalls to reduce flood risk. It is considered that this additional flood risk should be identified through more detailed assessment.
- 4.74 The existing power station is approximately 10m AOD and is protected by raised embankments. The whole of the area alongside the estuary at Oldbury

³⁶ South Gloucestershire Strategic Flood Risk Assessment, Level 1 Report, February 2009.

is low lying at approximately 5-6m AOD, is subject to tidal inundation and is regarded as a potential problem area with regards to erosion. There are substantial sea defences at Oldbury but there is evidence of erosion of the tidal flats.

- 4.75 The nominated site is shown to be defended from a combination of flood defence structures and sea defences. According to the South Gloucestershire SFRA the average standard of protection provided by these defences is thought to be an annual flood risk of 5% or better.

5 Appraisal of Sustainability

Introduction

- 5.1 This section considers the potential sustainability effects of including the nominated site at Oldbury in the list of suitable/potentially suitable sites in the draft Nuclear NPS. Whilst the Main AoS Report considers the environmental sustainability effects that may arise from the construction of nuclear power stations in general, the site-level appraisal of sustainability looks specifically at the potential sustainability effects that could occur from constructing a new power station at Oldbury, should the nominated site be listed as potentially suitable in the draft Nuclear NPS and should an 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 Oldbury 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 appraisal 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 draft Nuclear NPS. The detailed matrices are presented in Appendix 2 of this report and the key findings of the appraisal are discussed in Sections 5 and 6 of this report.

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

Local Effects
<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 an 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 nuisance³⁷ 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, which will be agreed with, and monitored by, the environmental regulators and planning authorities.</p>
Strategic Significant Effects
<p>Other identified adverse or beneficial effects are more significant strategically as they have the potential to affect a matter of wider regional, national or even international importance. These may include, for example, an effect on biodiversity of national and international value (see also the site level HRA Reports). Where an effect is considered to have significant implications for the wider region, for example, a benefit for the regional economy, this has been considered as a strategic significant effect. Effects which are better assessed at local or district level when more detailed site specific information is available have not been considered in this category. The significance of the potential strategic effects identified for each stage of the project (construction, operation and decommissioning) is summarised in Table 6.2.</p>

Air Quality

- 5.4 There is potential for air quality impacts during the construction, operation and decommissioning stages of developing new nuclear power stations. However, relative to some other forms of power generation, nuclear power plants do not

³⁷ 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.

emit significant quantities of carbon dioxide, sulphur dioxide nitrogen oxides or particulates. Therefore, significant air pollution leading to deterioration in local or regional air quality is unlikely to arise during normal operation of the new nuclear power station. Construction and decommissioning impacts are potentially more problematic and will require control and management.

- 5.5 The construction of a nuclear power station on the nominated site is likely to have some localised adverse effects on air quality in the short term (5-6 years), including dust and emissions from construction vehicles, HGVs, and traffic movements generated by the construction workforce. This has the potential to affect residential properties along local access/haul routes in the immediate surrounding area. In particular construction traffic may need to be routed through Thornbury, Alveston and Oldbury. Similar local impacts may arise during the decommissioning phase of the project, at the end of the plant's operational life.
- 5.6 During operation, the traffic generated by the operational workforce also has the potential to create longer-term adverse effects on local air quality, including in Oldbury-on-Severn, Thornbury and Alveston. Traffic and air quality assessments will 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.
- 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 authorisations issued under the Radioactive Substances Act 1993 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.
- 5.9 There is a very low risk of an accidental release of radioactive emissions from the nominated site at Heysham, which could have a significant strategic effect on air quality. The Health and Safety Executive (HSE)/Nuclear Installations Inspectorate (NII) and the Environment Agency 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 significant population to be adversely affected means that, at this stage of assessment, the potential for strategic adverse sustainability effects has been identified.

- 5.10 **Strategic Effects on Air Quality:** The AoS has identified that the potential exists for a large population to be affected by any significant accidental release of radioactive emissions from the Oldbury site, which has a potentially strategic effect on sustainability. However, it is noted that there is a very low risk of such an event occurring. Prevention measures include existing risk assessment and regulatory processes. The nuclear regulatory bodies 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

- 5.11 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. 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, cooling and discharge of heated water and routine discharge of radioactive material could affect aquatic habitats and species.
- 5.12 Of greatest concern are activities which might lead to detrimental effects on the Severn Estuary Special Area of Conservation (SAC)/Special Protection Area (SPA)/Ramsar/SSSI sites, and the River Wye SAC site. Some of these designations fall immediately adjacent to the nominated site and development activities may encroach into these designated areas, for example the potential for a marine landing facility, cooling water infrastructure, the tidal lagoon and upgraded flood protection measures could all have adverse impacts.
- 5.13 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 nominated site.
- 5.14 Water abstraction could potentially cause an adverse effect on a major fish migration route, as well as mortality from fish entrapment in the cooling water intake. This could be to a certain extent be mitigated by the installation of fish protection measures in cooling water intake/outfall systems.
- 5.15 The discharge of the heated water used in the power station's cooling system into the Severn Estuary may result in changes to aquatic ecology, which may be negative for some species, or positive for certain species. Both changes to water quality and water temperature can impact species composition and encourage excessive algal growth, which could result in wider impacts on migratory fish and otters within the Severn Estuary and River Wye internationally protected areas. However, the nominator indicates that cooling

towers are likely to be required at this site. Further studies will be required, once a detailed design has been specified, to understand fully the extent and likely significance of effects on biodiversity of either cooling towers or the discharge heated water to the estuary.

- 5.16 There is a possible need to retain the tidal lagoon as part of the development, and impact of its retention (as opposed to its removal under existing decommissioning proposals) will need to be considered further. However, no further analysis of impacts can be undertaken without further details of proposals for decommissioning. It is currently understood that "the decommissioning works currently propose removal of the tidal lagoon would not represent a significant impact on the Severn Estuary, as it is not anticipated to increase erosion rates along the River Severn". However, removal of the lagoon would lead to possible disruption of the roosting site used by birds. Further investigation and assessment of the tidal lagoons will be required as part of the EIA for the project.
- 5.17 The nominated site is directly adjacent to the Severn Estuary SAC, with potential for coastal squeeze, which prevents the managed retreat of intertidal habitats necessary to support its favourable condition. All supporting habitats with SPA designation are sensitive to removal by land reclamation and construction activity. Consideration should be given to site layout and land-take at an early stage.
- 5.18 Further studies carried out by the potential 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.
- 5.19 A separate report, documenting the Habitats Regulation Assessment (HRA) for Oldbury³⁸ has been undertaken. This report should be referred to for further information relating to the effects of a new nuclear power station at Oldbury on European-designated habitat sites.
- 5.20 **Strategic 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 Severn Estuary SAC, SPA/Ramsar/SSSI site, the Upper Severn Estuary SSSI, River Wye (Lower Wye) SSSI and the River Wye SAC site) 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, including the creation of replacement habitat for UK designated sites. Detailed baseline studies will form part of the project-level Environmental Impact Assessment.**

³⁸ Habitat Regulations Assessment Pilot Oldbury: HRA Screening and Appropriate Assessment Report.

The Habitats Regulations Assessment for Oldbury should be referred to for further details and advice for international designated sites.

Climate Change

- 5.21 The establishment of a new nuclear power station will contribute positively to the South West region's climate change objectives. 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.
- 5.22 Given the relatively remote location of the nominated site and the lack of sustainable transport links, a new nuclear power station at Oldbury may result in emissions from the transport of goods and labour throughout the construction, operation and decommissioning phases. However, there is some potential for the nominator to promote increased use of public transport through provision of appropriate transport links to the power station.
- 5.23 Complementary carbon emissions 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.
- 5.24 **Strategic Effects on Climate Change: A new nuclear power station on the nominated site would have positive long-term effects on climate change during the operational stage compared to conventional sources of energy, contributing positively to the South West's climate change objectives. A lack of sustainable transport options to the nominated site may result in 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

- 5.25 The operation of a new nuclear power station at Oldbury is likely to have significant positive effects for employment, the economy and communities at the local level. The significance of these effects is reduced at a regional and national scale.
- 5.26 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 and housing, local traffic routes surrounding the nominated site. If public transport access is improved, impacts on local roads may be reduced.
- 5.27 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.

- 5.28 Job losses from closure of the existing power station adjacent to the nominated 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.
- 5.29 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.
- 5.30 Positive cumulative effects are also likely for the South West Region when considered with nominations for a second nuclear power station (Hinkley) and the Severn Tidal Barrage project in the region. Together, these could contribute to the regional economy and employment with potential for specialist regional skills to be developed.
- 5.31 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 America³⁹ found that property values 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.
- 5.32 **Strategic 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 South West. 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

- 5.33 Negative effects at a local scale are likely due to increased pressure on basic services and infrastructure in South Gloucestershire, including conventional waste management facilities, waste water treatment, electricity and on local transport networks. The significance of effects is dependent on the detailed timing of decommissioning of the existing facilities and construction of a new power station on the nominated site. For example, if substantial volumes of construction and decommissioning work were undertaken concurrently, it would place increased pressure on transport and conventional waste networks. This is considered to be a local, rather than strategic effect.

³⁹ 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

- 5.34 Transport: There is potential for negative effects on national road infrastructure through increased congestion/disruption of traffic on the region sections of the M4 and M5 motorways, and the A38. The roads linking the nominated site to the motorway, and the motorway junction itself (Junction 14) are not designed to handle large volumes of traffic, and may require improvement. Overall and in isolation, however, this is not considered to be a significant factor as the effect can likely be mitigated through transport management plans, green travel plans and consideration of alternatives to road for the transport during the construction phase, such as the existing freight line serving Tytherington Quarry.
- 5.35 Conventional waste: Waste material will be generated during 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 waste⁴⁰: The operation of a new nuclear power station at the nominated 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. Nominators 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 nominated 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.
- 5.37 Electricity transmission: The development of a nuclear power station at Oldbury may require new power lines to be built, or existing lines to be upgraded, to connect the facility with the National Grid. The potential impact of new or upgraded power lines will be considered in a separate Networks National Policy Statement (NPS).
- 5.38 **Strategic Effects on Communities: Supporting Infrastructure: There is the potential for adverse effects on supporting infrastructure, including waste, transport and basic services. These effects are of local significance. However, there is some potential for wider significant effects on national road infrastructure, which may require improvement to handle increased volumes of construction traffic. Other mitigation**

⁴⁰ Radioactive waste is waste regulated under Radioactive Substances Act 1993.

options such as Green Travel Plans and Transport Management Plans will be required.

Human Health and Well-Being

Radiological Health Issues

- 5.39 Radiation occurs naturally in the environment. The Health Protection Agency (the 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.⁴¹
- 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.⁴² 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.
- 5.41 The environment agencies run monitoring programmes to provide an independent check on the impacts of radioactive discharges. In 2008, they published a report covering 2007, showing that radiation doses to people living around nuclear sites remained below the statutory dose limit of 1 mSv per year.⁴³ 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 Radioactive Substances Act 1993⁴⁴. This regulatory system will apply to a potential new

⁴¹ Ionising Radiation Exposure of the UK Population: 2005 Review HPA-RPD-001

⁴² 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, 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>

⁴³ Radioactivity in Food and the Environment, 2007 RIFE-13, Environment Agency, Scottish Environment Protection Agency, Food Standards Agency, Northern Ireland Environment Agency 2008 <http://publications.environment-agency.gov.uk/pdf/GEHO1108BPBH-e-e.pdf?lang=e> (see Table S.1 "Radiation doses due to discharges of radioactive waste in the United Kingdom, 2007" of this publication).

⁴⁴ Radioactive Substances Act 1993 http://www.opsi.gov.uk/acts/acts1993/ukpga_19930012_en_1

nuclear power station at Oldbury and should ensure that permitted radioactive discharges do not cause unacceptable risk to health.

Regulatory Justification

- 5.42 Before the UK can adopt any new class or type of practice involving the use of ionising radiation, it must first be 'Justified', i.e. it must be demonstrated that any benefits resulting from its introduction outweigh the associated health detriment. European Council Directive 96/29/Euratom of 13 May 1996 (the Basic Safety Standards Directive)⁴⁵ requires Member States to ensure that, in advance of being first adopted or first approved, all new classes or types of practice resulting in exposure to ionising radiation are justified 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 is the Justifying Authority⁴⁶.
- 5.43 The basic safety standards for the protection of the workforce and general public against the dangers of ionising radiation set out in the Directive are further enforced before, during and after operation of nuclear power stations, including the management and disposal of waste by the UK's regulatory framework. This aims to reduce potential health impacts to acceptable levels and ensure that radiation doses are within internationally agreed limits.

Construction and Operational Effects

- 5.44 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 UK⁴⁷. The HSE site licensing process will also ensure that accident management and emergency preparedness strategies are prepared and that all reasonably practicable steps have been taken to minimise the radiological consequences of an accident.
- 5.45 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 2008 showed that of the recorded 913 events associated with the transport of

⁴⁵ Council Directive 96/29/Euratom of 13 May 1996, laying down basic safety standards for the health protection of the workforce and general public against the dangers of ionising radiation. Official Journal of the European Communities (OJ L 159, 29.6.1996, p.1)
http://ec.europa.eu/energy/nuclear/radioprotection/doc/legislation/9629_en.pdf

⁴⁶ Completion of the Regulatory Justification process is not dependent on consent being granted by the IPC and similarly there is no need for the IPC to wait for completion of the Regulatory Justification process before granting consent.

⁴⁷ [White](#) Paper Website Ref

radioactive materials no 'significant dose events' were associated with the nuclear power industry⁴⁸.

- 5.46 The scale of construction work associated with a potential new nuclear power station at Oldbury 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.
- 5.47 During the operation of a potential nuclear power plant at Oldbury, 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.
- 5.48 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. 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 advice⁴⁹, a precautionary approach is adopted to the routing of any required power lines.
- 5.49 The presence of, and more particularly the construction of, a new nuclear power station at the Oldbury site, will increase community disturbance to some degree. Such disturbance may include noise and vibration, dust during the construction phase and increased traffic during all phases. To mitigate construction phase disturbances, an environmental management plan should be developed, implemented and monitored for effectiveness throughout the construction period. Potential traffic issues in all the project's phases could be mitigated through the adoption of a transport plan aimed at minimising community disturbance whilst also promoting 'green' travel.
- 5.50 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.

⁴⁸ <http://www.hpa.org.uk/HPA/Publications/Radiation/HPARPDSeriesReports/>

⁴⁹ http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733817602

- 5.51 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, noise background and 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 Oldbury.

Local Health and Recreation

- 5.52 With regard to recreation, there is a potential impact associated with the coastal path which passes the nominated 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 nominated site.
- 5.53 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.
- 5.54 It is probable that building, operating and decommissioning a new nuclear power station at Oldbury would 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 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 **Strategic Effects on Human Health and Well-Being: The rigorous system of regulation of routine discharges from the proposed nuclear power station at Oldbury should ensure that there are no unacceptable risks to the health of the local population when the plant is operating normally. There is also a very small risk of adverse health impacts arising from an accidental release of radiation but the multiple safety features within modern nuclear plants makes such an event exceedingly unlikely. From a mental health perspective, 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, the likely enhancement in employment, community wealth, housing stock and other associated neighbourhood infrastructure should improve community well-being and health generally.

Cultural Heritage

- 5.56 The main effects of the development of a new nuclear power station would be local and within the footprint of the facility itself. However, potential setting impacts upon scheduled monuments, conservation areas, a registered park and garden and listed buildings could be of regional or national importance, depending on distance and sight lines. However, this could be mitigated by placement of the new station adjacent to existing nuclear facilities. Detailed assessment, including historic landscape characterisation and a views analysis into and out of Berkley Castle, will be required at the project level EIA stage.
- 5.57 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.
- 5.58 Prehistoric, Roman, Medieval and later activity is evident within the general area and an unknown archaeological (buried) resource is potentially present within the nominated site. Maritime archaeology may also be present which could be impacted upon by new sea defences and wharf facilities. Detailed investigations (including consultation with Local Authority Archaeologist, geophysical survey, trial trenching etc.) may be required to inform the project level EIA. 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).
- 5.59 **Strategic Effects on Cultural Heritage: The AoS has identified potential, adverse effects on Scheduled Ancient Monuments (SAM), conservation areas, a registered park and garden and listed buildings, which may be of regional or national heritage significance, as well as on medieval agricultural earthworks and buried archaeology of potentially high importance. However, there is a possibility that this can be mitigated. Further detailed assessment at project level will be required.**

Landscape

- 5.60 During construction, operation and decommissioning, the main direct adverse impacts on landscape would be local, on landscape features within the nominated site, including, hedges, trees and grassland. However, there are likely to be some long lasting adverse direct (potentially arising from offsite grid connectivity) and indirect landscape and seascape visual impacts on the surrounding area, including parts of the nearby Areas of Outstanding Natural Beauty (AONB) and Forest of Dean, with limited potential for mitigation.

- 5.61 The existing power station at Oldbury is already a prominent feature from local viewpoints along both banks of the Severn Estuary and is visible from some long-distance viewpoints, particularly from areas of high ground (for example, the Cotswolds). The new power station will be seen in the context of the existing power station, prior to decommissioning, as the nominated site is situated alongside. However, further development at Oldbury is highly likely to lead to a perceptible deterioration in some views, (including from within AONB's), which would not be able to be mitigated, given the scale of possible new buildings. One of the key visual impacts will be on the estuary itself and views from the bridges, which are listed structures.
- 5.62 The nomination for Oldbury indicates that cooling towers are considered a likely option to support or replace cooling water abstraction from the River Severn. The size or quantity of the tower arrangement is not known at this stage, but the nomination indicates that heights could be between 70 to 200m. The presence of any cooling towers is likely to increase the negative impacts on the local landscape. The degree of negative impact is scalable to the height of the towers, as larger towers are likely to be visible from further away.
- 5.63 In light of the potential scale of a new power station on the nominated site, fully effective mitigation during the construction and operational phases of adverse effects is unlikely. 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.
- 5.64 **Strategic Effects on Landscape: The AoS has identified potential, adverse effects on the local landscape. And indirect effects on the wider landscape. These include lasting adverse indirect landscape and visual impacts from the proposed development on parts of the Wye Valley and the Cotswolds AONB's. In combination effects potentially could also arise from new offsite grid connectivity. Overall the new power station would be seen in the context of existing power station facilities, prior to any decommissioning. However, further development is still likely to lead to a perceptible deterioration in some views, which would not be able to be fully mitigated, given the scale of the possible new buildings. These adverse effects could be increased further by the inclusion of cooling towers as part of the proposed development. Further detailed design at project level will be required to ensure that attempts are made to avoid and reduce any adverse effects. All effects including possible cumulative effects are to be assessed fully as part of the EIA project stage.**

Soils, Geology and Land Use

- 5.65 The construction of a new nuclear power station at the Oldbury site and associated infrastructure (including transmission lines/towers) would result in the direct loss of soil structure, further coastal squeeze, loss of intertidal land use and associated habitats. This may include impacts on designated nature conservation sites, including the Severn Estuary SSSI/SPA/SAC/Ramsar.

The development and associated flood protection may have an impact on the coastal processes including erosion/accretion and sediment transport.

- 5.66 Such effects can be mitigated through limitation of the footprint of the development, which would reduce the area of soils affected, and recognised best practice soil and water management measures during construction
- 5.67 The development of the nominated site may result in the increased risk of pollution and potential contamination of soils and controlled waters. These risks can be mitigated by the use of Environmental Management Plans during the construction and decommissioning stages of the site redevelopment. Any decommissioning would be required to meet specific clean-up criteria approved by the regulators.
- 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 areas of touristic value, are considered to be of local impact.
- 5.69 Strategic Effects on Soils, Geology and Land Use: The AoS has identified potential, adverse, indirect effects on soils that are important for biodiversity sites. However, there is potential for mitigation through careful planning of construction and operational facilities.**

Water Quality and Resources

- 5.70 The nominated site is surrounded by areas which are shown on Environment Agency (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 nominated 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 Although there are existing discharges from the current Oldbury power station, the return of cooling water to the Severn Estuary (via a tidal reservoir) at elevated temperatures may cause failures to existing water quality standards and could also impact on coastal processes, including sediment transport. Any future thermal discharge will therefore be subject to discharge consent from the Environment Agency and will require the discharge to meet existing water quality standards. Standards for the discharge will need to be based on the outcome of studies to be undertaken on the impact of the new discharge, as proposed elsewhere in the report. Through appropriate mitigation planning and control the more sustainable objective in terms of

water quality would be to make improvements on the current water quality situation.

- 5.72 The new Marine Management Organisation (MMO) set up under the forthcoming Marine and Coastal Access Bill will have a role in advising the IPC on conditions that should be imposed to mitigate any adverse impacts the development may have on the marine environment or other uses of the sea.
- 5.73 It should be noted that poor water quality can result from changes in salinity, temperature and radioactive discharges. Given more details of the development it will be important to consider issues such as the synergistic effects relating to endocrine disruptors and in-combination effects with toxic organic compounds (such as PCBs) and input into sediments and movement within sediments in the lower river and estuary. Consideration will also need to be given to the implications of adding water to the ecological systems, not just the implications of abstraction. These studies will be required at the EIA stage of the project. Barrier effects due to thermal inclines and chemical barriers (including low dissolved oxygen) will need to be considered at the project EIA stage.
- 5.74 A new power station on the nominated site may have the short-term effect of increasing water demand, particularly during the construction phase. The potential magnitude and duration of increased water demand will depend upon the timing of any development on the nominated site in relation to the activities (operation or decommissioning) of the existing nuclear power station). The in-combination effect of the decommissioning of the current power station requires further assessment. There may be potential impacts on water quality and disturbance arising from the process, and it is possible that the early stages of the decommissioning process will coincide with the construction of the new station. Any other developments subsidiary to or resulting from the development, for example extraction of aggregates, rebuilding the tidal lagoon etc, will require further assessment at the EIA stage.
- 5.75 It is anticipated, however, that as the development is likely to have a similar or lower demand for water to the existing power station, there would be no adverse long-term impacts on water resources. However, there may be shorter-term impacts on Bristol Water's (the local water supply company) supply-demand balance during the construction phase. The potential impacts of this will need to be assessed, ensuring that the planned measures to deal with the currently forecast deficit are sufficient to meet any additional demand. Similar comments apply to wastewater production from the nominated site.
- 5.76 The nomination states that direct cooling for the proposed station is not felt to be appropriate at this site as the required water amounts would be considerably larger than those required for the existing Magnox power station. This would be expected to give rise to unacceptable environmental impacts by virtue of the size of thermal plume discharged in the Severn Estuary. Therefore, the adoption of a wet cooling tower arrangement for the nominated

site is considered the most likely solution. This will reduce or negate the need to abstract cooling water from the existing tidal reservoir on the River Severn.

- 5.77 The nominated site is situated on the Avonmouth Mercia Mudstone aquifer. There are no Groundwater Source Protection Zones near the nominated site, but in other areas the same aquifer is used for water supply. Localised groundwater pathways may exist between the nominated site and the wider aquifer, hence accidental discharges or construction disturbance at the nominated site could lead to impacts on groundwater-dependent surface water features and aquatic ecosystems. Studies should be undertaken to ensure that local groundwater bodies are investigated and a suitable design is adopted to mitigate potential impacts.
- 5.78 **Strategic Effects on Water Quality and Resources: The AoS has identified potential, adverse, indirect effects on water. Direct effects on water resources could be brought about through increased demand, particularly during construction. Indirect effects on nationally and internationally designated habitats, including 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 The Severn Estuary is subject to high tidal range and the nominated site and surrounding area is designated as Flood Zone 3 on published Environment Agency flood zone maps. The area is therefore considered to be at high risk of flooding, with a statistical flood risk of greater than or equal to 1% for fluvial flooding, and/or 0.5% for coastal and tidal flooding.
- 5.80 A Shoreline Management Plan (SMP) is being undertaken by Atkins Ltd for the Environment Agency. This SMP provides a review of existing flood defences along the Severn Estuary. It is essential that there is a coordinated approach towards this issue is undertaken by all parties involved in this matter.
- 5.81 Climate change-driven rises in sea-level may increase flood risk over the coming decades. The nominated site will require additional coastal defences and flood protection works (i.e. embankments, sea walls) to safeguard it from future coastal erosion and coastal flooding. Mitigating for the flood risk using hard engineering solutions in addition to those already present at the nominated site will possibly alter the system hydrodynamics, which will then be reflected in the positions of the channel banks and networks, so that the mudflats, sand flats and saltmarshes can be expected to erode or accrete in response accordingly. In this instance, sediment transport and hydrodynamic modelling would be useful in determining the likely impacts that the engineering works would have on the coastal and estuarine system and possibly explore alternative engineering solutions to combat the effects of sea level rise. Therefore, it is recommended that hydrodynamic and sediment transport surveying and modelling should be conducted as part of the detailed

appraisal to determine baseline conditions. This data can then be used to determine an appropriate management strategy for combating the long term effects of climate change on the coastline.

- 5.82 Upgraded defences may be required to mitigate this increase in flood risk. These defences have the potential to modify existing estuarine hydrodynamics and associated movement of sediment, which may have secondary effects on estuarine ecosystem structure and functioning. However, the use of an appropriate design and a full understanding of the hydrodynamics and sediment transport within the Severn Estuary could minimise the potential effects.
- 5.83 To manage residual flood risk, the most vulnerable parts of the development should be located in the areas at lowest flood risk.
- 5.84 There are potential cumulative effects with other proposed projects, including a site nominated for a new nuclear power station at Hinkley in the Severn Estuary area. Options being considered for the Severn Tidal Power project could impact on estuarine hydrodynamics and associated sediment movement. These effects may be more significant than the potential effects of the development at Oldbury⁵⁰.
- 5.85 Strategic 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

- 5.86 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

⁵⁰ The Government is carrying out a two-year feasibility study to determine whether the Government could support a tidal power project in the Severn Estuary. The Government is assessing a range of different schemes and the scope and scale of environmental effects is likely to vary widely between them. The Government is conducting separate environmental studies into these impacts and whether they could be mitigated. These environmental studies are not yet complete so the assessment in this report is based upon the potential effects outlined in the preliminary habitats screening report for Severn Tidal Power. This preliminary habitats screening report is not final and will be reviewed in the light of the feasibility study's findings. It covers all five options but does not distinguish between the individual options where environmental impacts will vary. There will be a further consultation on the Feasibility's study findings, likely in 2010.

defences could have adverse effects on water quality and biodiversity through changes to hydrology, sedimentation and loss of habitat.

- 5.87 Where applicable, key interactions have been considered in the topic-specific paragraphs above.

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

- 5.88 Interactions and cumulative effects can occur between the plan or proposal being appraised and other key plans and policies. This AoS has identified other relevant strategic plans and programmes with sustainability objectives, which need to be considered. These are reported in Section 3: Policy Context and Appendix 3: Plans and Programmes Review. The key strategic plans that might lead to cumulative effects when combined with the draft Nuclear NPS and Oldbury were identified as follows:

- Regional Economic Strategy for the South West 2006-2015, South West RDA (May 2006)
- Creating Sustainable Communities in the South West, Government Office for the South West (2005)
- South West Climate Change Action Plan 2008 - 2010, South West Regional Assembly (2008)
- Draft Regional Spatial Strategy for the South West 2006-2026, South West Regional Assembly (2007 - 2008)

- 5.89 Additional plans need to be considered including: Catchment Flood Management Plans, relevant utilities companies Water Resource Management Plans, addition Regional Spatial Strategies (for example West Midlands RSS Phase 2). Reference to the Environment Agency Review of Consents programme should be carried out as part of the detailed EIA stage. Other key projects that might have significant interactions and combined effects with a new power station at Oldbury were identified as follows:

- Proposals for Tidal Power in the Severn Estuary (DECC, 2009)
- Potential development of a new nuclear power station at Hinkley (downstream on the Severn Estuary on the north Somerset coast)
- Inter-regional Rail Network: Rail infrastructure, signalling systems and stations on the strategic inter-regional rail routes will be enhanced so as to ensure the provision of reliable train services with enhanced capacity to meet the growth in demand embodied in the Spatial Strategy - New/improved Parkway stations at Gloucester, Worle, Bristol Parkway and Tiverton
- A Shoreline Management Plan is being undertaken by Atkins Ltd for the Environment Agency. This SMP provides a review of existing flood defences along the Severn Estuary. It is essential that there is a coordinated approach towards this issue is undertaken by all parties involved in this matter

- 5.90 Other major schemes proposed in the Severn will likely result in significant in-combination effects, including the Severn Tidal Power Schemes and the Bristol Deep Sea Container Terminal. The in-combination effects require more detailed assessment, at present it is not understood whether the proposed Severn Barrage tidal power schemes (5 schemes considered) would have a detrimental impact on coastal erosion at the nominated site. It is possible that some schemes may result in reduced coastal erosion due to some of the schemes resulting in impounding of the estuary restricting transfer of energy built up over long distances to the coastline at the nominated site, and preventing tidal currents and flooding by storm surge reaching the nominated site. However, all proposed schemes need to be looked at more closely within the EIA process to determine if in-combination effects are likely.
- 5.91 The appraisal of cumulative sustainability effects arising through interactions between the proposal for Oldbury and other key plans is presented in Table 5.2.

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

AoS Sustainable Development Theme	Interactions and Cumulative Effects
Biodiversity and Ecosystems	<ul style="list-style-type: none"> The area could be a focus for other high profile energy or development projects, such as tidal power generation at the Severn Barrage. The cumulative effects on flooding and biodiversity could be significant.
Climate Change	<ul style="list-style-type: none"> Reductions in greenhouse gas emissions, resulting from the cumulative benefits of a nuclear power programme, will have positive long-term effects during the operational stage when compared to fossil fuel powered plants.
Communities: Supporting Infrastructure	<ul style="list-style-type: none"> Construction workforce supply shortages may result, particularly with regard to specialist workers required for possible multiple builds within the region as part of the nuclear new build programme. Transient workforces may put additional strain on local services. There is potentially a large cumulative impact associated with the generation of various waste streams in association with other major development schemes. Decommissioning of existing nuclear facilities at Oldbury may coincide with construction of a new nuclear power station to create adverse effects on supporting infrastructure, in particular transport networks
Human Health and Well-Being	<ul style="list-style-type: none"> Enhanced prosperity and long-term employment benefits resulting from the plans are likely to have positive effects on health and well-being.
Landscape	<ul style="list-style-type: none"> In-combination effects through associated off-site works carried out by National Grid with regard to transmission infrastructure.
Water Quality and	<ul style="list-style-type: none"> Water supply issues may result during the construction stages

Resources	when large increases in local population are likely.
Flood Risk	<ul style="list-style-type: none">• It is noted at this stage that there is a great deal of uncertainty surrounding the possible cumulative effects on coastal erosion of a Severn Tidal Power structure.

6 Summary Appraisal of Sustainability Key Findings and Possible Mitigations

- 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 Oldbury. 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 Appraisal of Sustainability process has included recommendations to inform the development of the draft Nuclear NPS. This site report for Oldbury has helped to inform the decision-making for the Strategic Siting Assessment. It has included advice as to the strategic significant effects arising from the construction of a new nuclear power station at Oldbury, and suggestions for how adverse effects may be mitigated, including proposed mitigation measures which could be considered as part of project level Environmental Impact Assessment.
- 6.4 A number of the strategic effects identified for Oldbury will be similar across all the nominated sites, including positive effects for employment and well being. However a number of potential strategic effects have been identified that are of particular note for the draft Nuclear NPS. These are discussed below:
- 6.5 There are potential negative effects on two national and internationally protected conservation sites, namely the Severn Estuary and the River Wye. The area is a high risk flood zone. Existing flood defences are in place, but these are likely to need upgrading to protect against sea level rise and erosion during the lifetime of the facility. These effects are significant, but mitigation opportunities are likely to be available following further study.
- 6.6 Due to the large tidal range the existing power station needs a tidal reservoir to allow for continual abstraction and release of cooling water. The capacity of the Severn Estuary at this location is insufficient for a new larger nuclear power station, and cooling towers are therefore required. Although adjacent to the existing power station but the cooling towers could be up to 200m high and would be visible from parts of the Wye Valley and the Cotswolds AONB. This would have a negative visual impact on the landscape at a sub-regional level, which could not be fully mitigated.
- 6.7 There is the potential for significant negative cumulative effects if two new power stations (Oldbury and Hinkley Point) and any of the Severn tidal power schemes are developed and the effects of the latter project are likely to be

more significant than two new nuclear power stations. These include the potential loss of nationally and internationally important estuarine habitats, where it may not be possible to mitigate fully. The Government is carrying out a two-year feasibility study to determine whether the Government could support a tidal power project in the Severn Estuary. The Government is assessing a range of different schemes and the scope and scale of environmental effects is likely to vary widely between them. The Government is conducting separate environmental studies into these impacts and whether they could be mitigated. These environmental studies are not yet complete so the assessment in this report is based upon the potential effects outlined in the preliminary habitats screening report for Severn Tidal Power^[1]. This preliminary habitats screening report is not final and will be reviewed in the light of the feasibility study's findings. It covers all five options but does not distinguish between the individual options where environmental impacts will vary. There will be a further consultation on the Feasibility's study findings, likely in 2010.

- 6.8 There is also potential for positive cumulative effects associated with long term employment and enhanced prosperity for communities at the sub-regional level if both power stations are built in the Severn Estuary.
- 6.9 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.
- 6.10 Table 6.1 provides an overall summary of the significance of the environmental and sustainability effects for the Oldbury site. Each sustainable development theme and each development stage has been considered. The symbols and colours used are explained in the key.

^[1] This was published in January 2009. For more details see http://severntidalpowerconsultation.decc.gov.uk/supporting_documents

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	-	-	-
Key: Significance and Categories of Potential Strategic Effects			
++	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		
Uncertainty			
?	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 '?'		

6.11 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.

- 6.12 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.
- 6.13 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. Levels of mitigation can range from the highest (avoidance at source), through to minimisation, and lastly to compensation. 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.

Table 6.1: Summary of Potential Strategic Significant Effects and Mitigation Possibilities (for Adverse Effects)

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
Air Quality	
<p>Adverse Effects:</p> <ul style="list-style-type: none"> Potential for related effects on national and European-designated wildlife sites due to increase in airborne pollutants and nutrients during construction 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> Please refer to mitigation measures contained in the Biodiversity and Ecosystems sections of this AoS Report
<ul style="list-style-type: none"> Potential accidental release of radioactive emissions could have a significant strategic effect on air quality 	<ul style="list-style-type: none"> 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.
Biodiversity and Ecosystems	
<p>Adverse Effects:</p> <ul style="list-style-type: none"> Noise, visual and light disturbance during construction to important bird populations associated with the Severn Estuary SAC/SPA/Ramsar /SSSI site 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> Minimise need for encroachment of construction into sensitive habitat areas through site design Construction Environmental Management Plan to minimise disturbance, for example, through timing of construction programmes, visual/noise screening
<ul style="list-style-type: none"> Direct loss and fragmentation of priority terrestrial habitats and disturbance to species (particularly migratory fish species and otter) during construction of power station and related infrastructure 	<ul style="list-style-type: none"> Nominator to ensure further studies to fully assess impacts; careful design of the nominated site to avoid entering sensitive areas Construction, decommissioning and operational Environmental Management Plans to be developed and implemented
<ul style="list-style-type: none"> Abstraction of water and discharges of heated water (if required instead of cooling towers) could impact on aquatic ecosystems, migratory fish, otters all qualifying features of Severn Estuary SAC and River Wye 	<ul style="list-style-type: none"> Incorporation of fish protection measures within cooling water intake/system design Nominator to ensure further studies required to fully assess impacts and to inform careful

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
SAC	design of the nominated site to mitigate impacts associated with discharges and abstraction
<ul style="list-style-type: none"> Pollution of water courses from construction, decommissioning and operational activities, with impacts on Severn Estuary and associated species 	<ul style="list-style-type: none"> Avoidance through approved methods of operation and decommissioning, safety measures, water quality monitoring, and waste storage and transfer
<ul style="list-style-type: none"> Construction of nominated site close to coast leading to coastal squeeze, preventing the managed retreat of inter-tidal habitats associated with the Severn Estuary SAC 	<ul style="list-style-type: none"> Avoid or minimise losses through site layout design. Potential for habitat creation to replace lost habitats and maintain connectivity of wildlife corridors around nominated site. Ecological mitigation and management plan, adapted for the nominated site
Climate Change	
<p>Adverse Effects:</p> <ul style="list-style-type: none"> Potential short term increases in greenhouse gas emissions during construction and decommissioning 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> Monitor greenhouse gas emissions
<ul style="list-style-type: none"> A lack of sustainable transport options may result in emissions from the transport of goods and labour throughout construction, operation and decommissioning phases 	<ul style="list-style-type: none"> Green travel plans Further investment in public transport
<p>Beneficial Effects:</p> <ul style="list-style-type: none"> A nuclear power station on the nominated 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 	
Communities: Population, Employment and Viability	
<p>Adverse effects:</p> <ul style="list-style-type: none"> Pressure on basic services from likely large scale in-migration of construction workers 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> Potential negative effects/difficulties in sourcing labour need to be addressed with regard to the effects on the local/regional construction industry
<ul style="list-style-type: none"> Project may lead to a shortage of local construction workers to meet the needs of other industries and major projects in the region 	<ul style="list-style-type: none"> Measures to address likely difficulties in sourcing labour and the effects of this on the local/regional construction industry

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
<p>Beneficial Effects:</p> <ul style="list-style-type: none"> • Short to medium-term positive effects due to creation of new jobs for local and regional populations • New power station may offset job losses from decommissioning of the existing power station at the nominated site. However, time differences between decommissioning may require workers to seek employment elsewhere • Provision of education, training, upskilling for employees and contractors in the region • Positive multiplier effects as income from new population of workers will help support local economy • Potential for property values to increase within vicinity of nominated site, based on previous studies 	
Communities: Supporting Infrastructure	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Potential for significant effects on national road infrastructure through increased congestion/ disruption of traffic on the M5 Motorway and at junction 14 linking to the A38. In isolation, this is not considered likely to be significant; however, the cumulative effect of development in the region, including planned development in and around Bristol, may lead to increased congestion during construction, operation and decommissioning stages 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Further studies will be required to assess in detail the effects on the road network, including the M5 Motorway
<ul style="list-style-type: none"> • Potential for effects on strategic road network through transportation of large loads during construction, however, this can be mitigated 	<ul style="list-style-type: none"> • Appropriate mitigation measure to reduce the effects of transportation could include a Transport Management Plan (construction and decommissioning) and Green Travel Plan (construction, operation and decommissioning). Consideration of alternatives to road for the transport of large loads (for example, transport by rail or sea freight)
<ul style="list-style-type: none"> • Potential for the generation of conventional and radioactive waste streams 	<ul style="list-style-type: none"> • Further studies of the potential waste streams and disposal routes will be required
<ul style="list-style-type: none"> • Potential for significant impacts regarding radioactive and conventional waste 	<ul style="list-style-type: none"> • Conventional waste: good site practices, implementation of waste hierarchy (reduce, reuse recycle) and waste management • Radioactive waste: appropriate

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
	storage and management
Human Health and Well-Being	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Possibility of local and regional health risks from accidental discharges 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Ensure continuation of current programme of monitoring power station discharges and their effects on health
<ul style="list-style-type: none"> • The potential requirement for appropriate additional health service capacity for the influx of both construction and operational workers 	<ul style="list-style-type: none"> • The nominator should carry out a review of local health provision to ensure it is adequate for the expected influx of power station workers
<ul style="list-style-type: none"> • The construction and operation of the proposed nuclear power station may lead to unacceptable community disturbance 	<ul style="list-style-type: none"> • The nominator should ensure a Construction Environmental Management Plan and an all-phase Travel Plan are produced, observed and monitored
<p>Beneficial Effects:</p> <ul style="list-style-type: none"> • Likely positive effects on health via increase in employment, community wealth, additional housing and other associated neighbourhood infrastructure 	
Cultural Heritage	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Prehistoric, Roman, Medieval and later activity is evident within the nominated site area. Main effects would be at a local scale, within the footprint of the proposed new facility. Effects would be permanent and irreversible 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Further desk based studies and more detailed archaeological investigations (field evaluation, trial trenching etc.) will be required prior to confirming layout and construction, with an excavation and/or watching brief required during the construction phase (during ground preparation and excavations) • A maritime Desk Based Assessment (DBA) for the nominated site will be required. Where any new sea defences and potential works to construct wharf facilities are proposed it will be necessary to undertake in depth investigation techniques to establish whether any maritime archaeology may be affected by them. This work should be carried out as early as possible to avoid potential complications later

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
<ul style="list-style-type: none"> Immediately surrounding the nominated site, there may be potential effects (i.e. through traffic and development of new infrastructure) on the settings of historic assets. The significance will depend on distance, topography and the ability to mitigate 	<p>in the process</p> <ul style="list-style-type: none"> A comprehensive historic landscape characterisation study should be undertaken for the proposed power station development to inform the process of identifying the most appropriate location for the developments It may be possible to mitigate against potential adverse setting effects on heritage assets through appropriate landscaping/planting schemes
Landscape	
<p>Adverse effects:</p> <ul style="list-style-type: none"> During construction and operation the main direct impacts would be at local level and over time these could be largely compensated for. However, there are likely to be some long lasting adverse indirect landscape and visual impacts on the surrounding areas including parts of the AONBs of Wye Valley and the Cotswolds; the Forest of Dean District and land to the east including the Oldbury Levels and Severn Ridges, with limited potential for mitigation 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> A full and robust views analysis should be undertaken to identify any important views into or out of nearby parks and gardens and what impact the new plant proposals will have on this asset
<ul style="list-style-type: none"> The Severn Estuary has one of the highest tidal ranges in the world. The tidal range has resulted in the development of an extensive intertidal area comprising mudflats, sandflats, rock platforms and islands. These intertidal areas provide extensive wildlife habitats supporting diverse plant and animal communities. The construction and operation of the power station would have an impact on these habitats 	<ul style="list-style-type: none"> Potential for landscape/ecological mitigation and restoration and the potential for these to be delivered and monitored through an integrated Management Plan
<ul style="list-style-type: none"> The existing power station is already a prominent built feature from local viewpoints and is visible from some long-distance viewpoints, particularly from areas 	<ul style="list-style-type: none"> Visual impact assessment to be completed

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
of high ground. Further development is highly likely to lead to a perceptible deterioration in some views	
<ul style="list-style-type: none"> The decommissioning of the facilities may allow some landscape restoration of previously developed areas in the long-term, however, the long-term land uses for restored areas is difficult to predict 	<ul style="list-style-type: none"> Potential for landscape/ecological mitigation and restoration during decommissioning and the potential for these to be delivered and monitored through an integrated Management Plan
Soils, Geology and Land Use	
<p>Adverse effects:</p> <ul style="list-style-type: none"> The solid and superficial geology of the nominated site together with the sites intertidal mudflat geomorphology result in the site's rich geodiversity. 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> Further assessment of the geology, soils and geomorphology will be required as part of the EIA process to identify important interrelationships supporting the geodiversity.
<ul style="list-style-type: none"> Construction combined with new infrastructure would impact on existing agricultural land uses and also sensitive parts of the intertidal geomorphological system, resulting in coastal squeeze, loss of intertidal land use and associated habitats. This may include impacts on soils that maintain terrestrial habitats, including designated nature conservation sites, the Severn Estuary SSSI/SPA/SAC/RAMSAR. 	<ul style="list-style-type: none"> Effects could be mitigated by careful planning of the development footprint thereby minimising disturbance to sensitive geomorphological processes and their associated landforms and habitats
Water Quality and Resources	
<p>Adverse effects:</p> <ul style="list-style-type: none"> Works to provide (and discharge) cooling water on coastal processes, estuarine hydrodynamics and sediment transport, and any indirect effects on internationally designated habitats 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> Further investigations required Selection of appropriate design and construction methods for provision of cooling water The discharge quality will need to comply with existing standards or meet the no deterioration standard Sediment transport modelling
<ul style="list-style-type: none"> Additional coastal defence works on coastal processes, estuarine hydrodynamics and sediment transport, and any indirect effects 	<ul style="list-style-type: none"> Suitable coastal defence design, including use of SUDS

Potential Strategic Significant Effects (Benefits and/or Disadvantages)	Suggested Mitigation for adverse effects for the NPS and IPC
on internationally designated habitats	
<ul style="list-style-type: none"> Thermal impact of cooling water discharges (if this mode of cooling were to be adopted). However, this effect is of local and regional significance, particularly because of the potential impacts on the SAC, SPA, SSSI and RAMSAR sites of the Severn Estuary 	<ul style="list-style-type: none"> Further investigations required Thermal discharges will need to be consented by the EA
<ul style="list-style-type: none"> Increased demand during the construction phase. The potential magnitude and duration of increased water demand will depend on the timing of the nominated site development in relation to the activities (operation or decommissioning) of the existing nuclear power station. Similar significant effects are likely to apply to wastewater production from the nominated site 	<ul style="list-style-type: none"> Further investigations required Studies to ensure that capacity of water and wastewater infrastructure in WRZ is sufficient, and that plans to address Bristol Water Co. supply-demand deficit are sufficient to meet any increase in demand associated with the development of the nominated site
<ul style="list-style-type: none"> Potential impacts on local groundwater bodies including impacts of construction disturbances and accidental discharges. Potential impacts of abstraction on aquifer currently used for water supply 	<ul style="list-style-type: none"> Further investigations required Studies to ensure that local groundwater bodies are investigated and suitable design is adopted to mitigate potential impacts Potential for ongoing monitoring of impacts on groundwater bodies
Flood Risk	
<ul style="list-style-type: none"> Main flooding effects are through the continued management and improvement of existing natural defences, which could affect coastal processes 	<ul style="list-style-type: none"> It may be possible to mitigate flooding effects with appropriate management and techniques for improving the existing defences

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 ₂	Carbon Dioxide
COMARE	Committee on Medical Aspects of Radiation in the Environment
CPRE	Campaign to Protect Rural England
DECC	Department for 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
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
NO ₂	Nitrogen Dioxide
NO _x	Oxides of Nitrogen
Nuclear NPS	The proposed National Policy Statement for new nuclear power stations
NPS	National Policy Statement
OSPAR	Oslo and Paris Conventions
PM ₁₀	Particles Measuring 10µm or less
PWR	Pressurised Water Reactor
RAMTED	Radioactive Materials Transport Events Database
RBD	River Basin District
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
UKCIP	UK Climate Impacts Programme
VOC	Volatile Organic Compound
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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