

Appraisal of Sustainability: Site Report for Heysham

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

Preface:

Appraisal of Sustainability of the revised draft Nuclear National Policy Statement

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

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

AoS Non-Technical Summary

Main AoS Report of revised draft Nuclear NPS

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

Annexes to Main AoS Report: Reports on Sites

- Site AoS Reports
- Technical Appendices

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

This document is the Appraisal of Sustainability Site Report for Heysham.

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

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Summary of Key Findings

This report considers the nomination of the site at Heysham as a possible location for new nuclear power station(s). The purpose of this Appraisal of Sustainability (AoS) Site Report is to assess environmental and sustainability impacts on the Heysham site. 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 1. The national policy context, which also provides a background to the assessment, is included in Section 3.

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

Summary of Key Findings

The Appraisal of Sustainability process has included recommendations to inform the development of the revised draft Nuclear National Policy Statement. This site report for Heysham 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 Heysham, 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.

There are potential negative effects on three national and internationally protected conservation sites, namely Morecambe Bay, the Lune Estuary and Leighton Moss; and effects on water quality in the region due to the abstraction and release of sea water for cooling. Although no common sites of European nature conservation importance are assessed as being potentially affected by both power stations, there may be significant adverse effects on wider biodiversity if both Heysham and Sellafield nuclear power stations are developed.

River and coastal flood defence schemes already exist in the area of the nominated site, but these may need to be upgraded to protect against sea level rise and coastal erosion during the lifetime of the facility. These effects are significant, but mitigation opportunities may be available following further study.

The development of a new nuclear power station will have a negative visual impact on the landscape and could potentially be seen from parts of the Lake District National Park. This impact could not be fully mitigated, however, the nominated site is adjacent to existing nuclear power stations, in an area that is already heavily industrialised, and so the additional impact on the landscape would be less significant at a regional level.

There will be significant positive effects associated with long term employment and enhanced prosperity for communities locally. These benefits are likely to be significant at the sub-regional level if two power stations (Heysham and Sellafield) are built in the North West. Benefits may be further enhanced if other proposals for regeneration in the region go ahead. The Heysham site is adjacent to an existing rail link and sea port, which presents opportunities for sustainable transport, particularly during construction.

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.

Heysham is approximately 60km south east of the nominated site at Sellafield in Cumbria. Potential cumulative effects could arise as a result of interactions between the sites due to their relative proximity and the way in which effects may act together. Cumulative effects may also occur in relation to existing facilities, such as the existing nuclear power stations at Heysham and the nuclear facilities at Sellafield.

No common sites of European nature conservation importance are assessed as being potentially affected by both power stations. However, the Appraisal of Sustainability found that there may be significant adverse effects on wider biodiversity if both Heysham and Sellafield are developed due to the prevalence of nationally designated sites at both Sellafield and Heysham sharing similar habitats or species, meaning that there is a chance that if both sites were developed and impacted on similar sites a cumulative effect could arise.

There may be negative effects, during the construction of any new power stations, if the development produces a local shortage of specialist construction labour. This negative effect could be increased if more than one power station is developed in the region. However, these effects may be mitigated if the education and upskilling opportunities noted above are taken and by appropriate phasing of construction.

1 Introduction

This Appraisal of Sustainability Report

- 1.1 This report considers the site at Heysham 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 Heysham. 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 revised draft Nuclear National Policy Statement² (NPS). The Main AoS Report for the revised draft Nuclear NPS sets out the details of the AoS process, its methods, findings, conclusions and a summary of the appraisal of the nominated sites. The main report also includes a non-technical summary.
- 1.3 This AoS has been undertaken at a strategic level and is intended only as a high level assessment of the suitability of the site from an environmental and sustainability perspective. The AoS is part of an assessment process that started in March 2008. The revised draft Nuclear NPS lists sites that have been assessed to be potentially suitable by the Government for new nuclear power stations. Developers will be able to apply for development consent for these sites from the Infrastructure Planning Commission (IPC)³. Each application from the developer for consent to build a new power station will need an Environmental Statement with a detailed Environmental Impact Assessment (EIA). The sites included in the revised draft Nuclear NPS will also be subject to other regulatory and licensing requirements.

The Revised draft Nuclear National Policy Statement

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

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

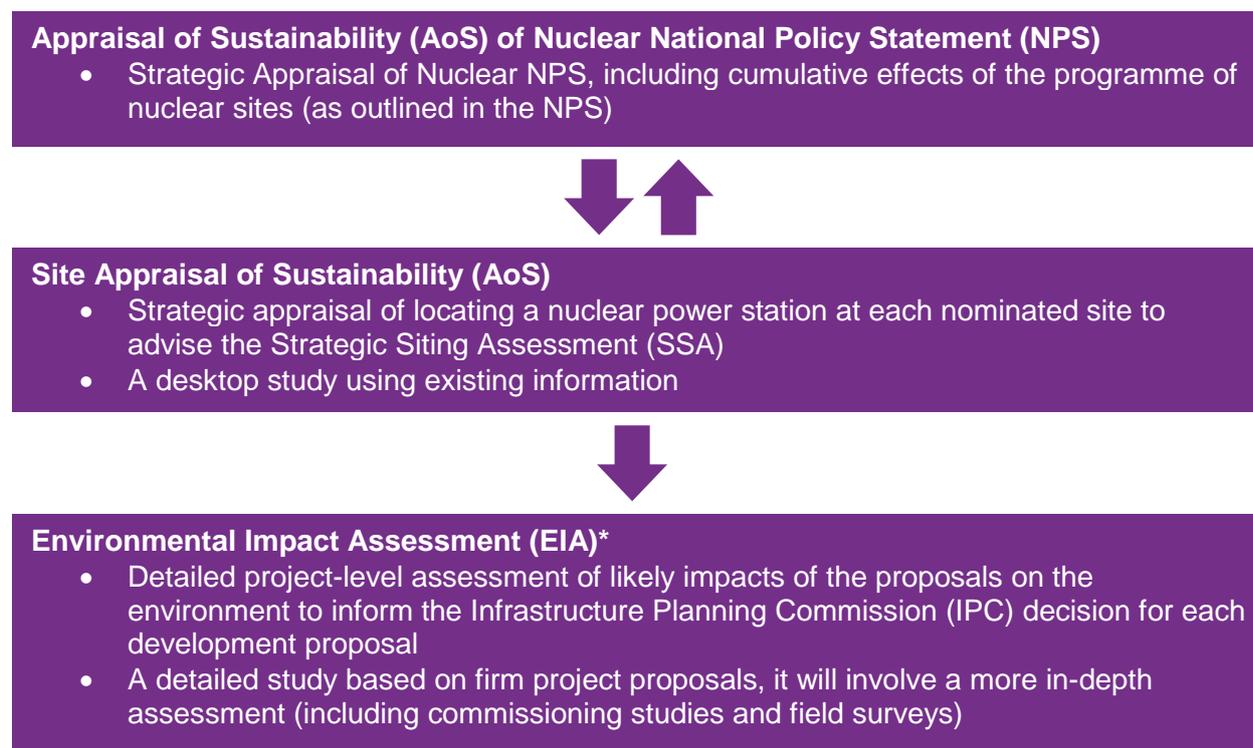
² Nuclear NPS <http://www.energynpsconsultation.decc.gov.uk>

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

sites. This SSA process⁴ drew on the emerging findings of the site AoSs and the Habitats Regulations Assessment (HRA)⁵.

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 revised draft Nuclear NPS.
- 1.6 The purpose of this AoS is to assess environmental and sustainability impacts on the Heysham site. This AoS also identifies the significance of those effects, and to suggest possible ways of mitigation. The AoS for Heysham site fed into the Strategic Siting Assessment (SSA) and the preparation of the revised draft Nuclear NPS. There would be further detailed studies at the EIA stage of any construction project. The following diagram explains the relationship between the Main AoS Report, the AoS Site Report and an EIA.



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 Heysham HRA Report <http://www.energynpsconsultation.decc.gov.uk>

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*

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

Appraisal of Sustainability Methods

- 1.7 In undertaking the AoS of each nominated site, a wide range of information was considered including, the Scoping 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 revised draft Nuclear NPS are detailed in Annex E of the Environmental Study and the Main AoS Report. Appendix I 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 Report ¹¹ and Environmental Study ¹²)
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 the internationally and nationally important features of the historic environment (22) to avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes (23)
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 a regional level, which helped to identify key sustainability objectives that need to be taken into account in the appraisal and potential cumulative effects that could arise with other plans and projects. Policy context at the local government level is changing as a result of the new planning system. However, local planning policy will be required to conform to regional plans and programmes. Existing and emerging local policy documents were considered, where relevant, for the characterisation of

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

Background to Nuclear Power Stations

- 1.10 This section provides some wider context on nuclear power stations. Nuclear power generation 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 EA 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 decommissioning). 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 will be 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 Heysham AoS provided in the right hand column.

Table 1.2: Base Case Assumptions and Variations Considered for Heysham

Base Case	Variations considered in AoS of Heysham (as proposed in nomination)
1 nuclear reactor	
Technology neutral (i.e. unknown reactor type)	
A requirement for cooling water abstraction	The nomination states a preference for direct cooling in order to maximise plant output.
Discharges of cooling water	

Base Case	Variations considered in AoS of Heysham (as proposed in nomination)
Site boundary as indicated on nomination form	
<u>Timescales:</u> Construction: approximately 5-6 yrs Operation: approximately 60 years (life extension, which is subject to regulatory approval, could mean that the operational lifetime is longer) Decommissioning: approximately 30 years Lifetime of site: approximately 166 years ¹⁴	
<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 capable for at least 160 years	
Highway improvements, access routes	
Associated transmission infrastructure	
Other associated infrastructure/plant, where identified by nominator shown in the next column	
Radioactive discharges will be within legal limits	

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

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: Heysham

- 2.1 The nominated site is located to the east of the existing Heysham Nuclear Power Station, on the Lancashire coast to the south of Morecambe Bay, 8km west of Lancaster. The nominated site is located within the City of Lancaster Council area, in the County of Lancashire. 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 site at Heysham has supported nuclear power facilities since 1983. The current power station has two stages; Heysham 1 and Heysham 2. Heysham 1 is a twin-reactor Advanced Gas-Cooled (AGR) power station which commenced operation in 1983 and is expected to operate until at least 2014. Heysham 2 is also a twin-reactor AGR power station which commenced operation in 1988 and is expected to operate until at least 2023. Heysham 1 has a generating capacity of 1150 MWe and Heysham 2 has a generating capacity of 1250 MWe.
- 2.3 The nominated site occupies an area of drained marsh at the western side of a generally low-lying area of land between the River Lune and Morecambe Bay. This site lies in the mouth of the Lune Estuary which is a designated Site of Special Scientific Interest (SSSI), and overlaps with the Morecambe Bay European Marine Site. The nominated site is adjacent to residential and industrial areas with grazing land to the east. The nominated site also includes the area currently occupied by Heysham Golf Course and Ocean Edge Leisure Park.
- 2.4 The nomination identifies an area of approximately 115ha, bounded by the high water mark along the coast to the south, a sewage works and other industrial uses border the nominated site to the east, the existing nuclear power station is located to the west of the nominated site, and there are residential properties bounding the nominated site to the north. The nominator anticipates that the main part of the new nuclear power station would be located in the south western part of the nominated site.
- 2.5 The nomination is for a nuclear power station development incorporating:
- at least one nuclear reactor
 - construction of additional flood defences incorporating land raising, improvements to existing defences, and coastal protection measures
 - construction stage areas and facilities
 - infrastructure and facilities related to the operation of a nuclear power station,
 - access road infrastructure; transmission and cooling water intake and outfall structures; marine off-loading facilities
 - interim waste storage facilities

- 2.6 The site at Heysham 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 revised draft Nuclear NPS (through this AoS Site Report).
- 2.7 The SSA required the site nominator to supply an annotated Ordnance Survey map at 1:10,000 scale showing the boundary of the nominated site, which is provided in Figure 3.

3 Policy Context

Introduction

- 3.1 The Main AoS Report sets out the national policy context in relation to nuclear power stations, energy, climate change mitigation, use of natural resources, environmental protection and sustainability of communities. During the 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 level relevant to the potential new nuclear power station at Heysham 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 AoS Site 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:
- North West Climate Change Action Plan 2007-2009, Northwest Climate Change Partnership (November 2006)
 - Regional Spatial Strategy for the North West 2008-2021, North West Regional Assembly (September 2008)
 - Regional Economic Strategy for the North West 2006-2026, North West Regional Assembly (May 2006)
 - Sustainable Communities in the North West, Office of the Deputy Prime Minister (2003)
 - Lancashire Biodiversity Action Plan, Lancashire Biodiversity Partnership (2008)
 - River Basin Management Plan for the North West, Environment Agency (2009)
 - Water Resources Management Plan, United Utilities (2009)
 - River Wyre to Walney Island Shoreline Management Plan, Wyre Borough Council (2008)
 - Shoreline Management Plan 2 (SMP2) – River Wyre to Walney Island, Northwest and North Wales Coastline, Consultation Draft (October 2009)
 - A greener strategy for a greener future - Lancashire's Municipal Waste Management Strategy 2001-2020, Lancashire Waste Management Strategy Steering Group (2001)

¹⁶ BERR (March 2008) Scoping Report

- Lancaster District Strategic Flood Risk Assessment, Lancaster City Council (September 2007)

3.4 The key objectives for sustainability from these regional policy documents are as follows:

- Enhancing biodiversity and protecting internationally important species/habitats
- Mitigating and adapting to effects of climate change
- Reducing flood risk and improving coastal defences
- Protecting and enhancing landscape, recreation, cultural heritage
- Recovering rural economy: agriculture, tourism, employment
- Improving sustainable transport and accessibility
- Increasing recycling and improving waste management
- Protecting water quality and resources
- Accommodating increased population growth
- Increasing provision of affordable homes
- Improving quality of life: employment, health and crime

3.5 The plans that are still in place may have indirect and/or cumulative interactions and this is discussed further in Section 5: Interactions and Cumulative Effects with other Key Regional Plans, Programmes and Projects.

4 Site Characterisation

Introduction

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

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

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, Local Biodiversity Action Plan, Legally Protected Species
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 • Areas of Search for the Lake District and Yorkshire Dales National Parks extensions, and Arnsdale and Silverdale AONB extension (identified in 2006 as having potential for national designation) • 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

Air Quality

4.4 Air quality in the North West Region is generally good. Emissions to air from major industrial sites have reduced substantially in recent years; however emissions from traffic sources (major route corridors and areas of congestion) continue to cause pressures on local air quality across the region¹⁷. The UK Air Quality Archive estimated Background Air Pollution Maps show UK background concentrations of nitrogen oxides (NO_x), nitrogen dioxide (NO₂) and particulates (PM₁₀, PM_{2.5}) for each pollutant and for each year from 2006 to 2020. Data available for Lancaster County Council as a whole in 2009 show pollutant levels to be below current UK Air Quality objectives.

¹⁷ Environment Agency: State of the Environment – North West [online] available: <http://www.environment-agency.gov.uk/research/library/publications/34061.aspx> [accessed 04 March 2009]

- 4.5 There are 47 Air Quality Management Areas (AQMAs) declared in the North West region of England, the majority of which serve to control emissions of nitrogen dioxide and particulate matter from traffic. Two AQMAs have been declared within the Lancaster City Council boundary: one in Lancaster (approximately 7km north east of the nominated site and close to the major route which will be taken by traffic to the nominated site from the motorway) and one in Carnforth (approximately 16km north-north east of the site)¹⁸.
- 4.6 The average number of days with moderate or higher air pollution in 2006 rose from 2005 levels, and was slightly higher than the average for urban sites in England, but lower than the England rural average. The increase in 2006 (as with an increase in 2003) correlates with hot, sunny weather experienced during these years, causing the production of elevated levels of ozone.
- 4.7 The Heysham site, despite its relatively local isolation, is supported by relatively good transport systems, although the M6 immediately south of Lancaster, the main arterial road to the North West is currently near capacity. Traffic in the region increased by 15% between 1995 and 2005, leading to air quality problems from major route corridors, and particularly congestion areas and at peak travelling times. Continuance of this trend will add further pressures on meeting air quality objectives.
- 4.8 The Environment Agency (EA) assesses that non-radioactive aerial emissions (sulphur dioxide, nitrogen oxides and volatile organic compounds) from nuclear power stations are extremely low compared to other regulated industries. The Environment Agency's 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.

Biodiversity and Ecosystems

- 4.10 The biodiversity interest around the nominated site is high and includes a number of nationally and European designated sites, which are primarily designated for their valuable coastal habitats and important bird assemblages. Further information on the European designated sites and their current condition is given in the separate HRA Report for Heysham.
- 4.11 The Morecambe Bay estuarine system is of particular note. It has numerous international designations associated with it, including the Morecambe Bay

¹⁸ UK Air Quality Archive (online) available: <http://www.airquality.co.uk/archive/laqm/laqm.php> [accessed 03 March 2009]

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

Special Area of Conservation (SAC), the Morecambe Bay Special Protection Area (SPA) and the Morecambe Bay Ramsar²⁰ wetland site.

- 4.12 The nominated site boundary includes approximately 5.5ha of land that falls within the boundary of the Lune Estuary SSSI, Morecambe Bay Ramsar, SPA and SAC, within the vicinity of Ocean Edge Caravan Park. Several Sites of Special Scientific Interest (SSSIs) form component parts of the SAC, SPA and Ramsar sites, including Morecambe Bay SSSI (approximately 400m north of the nominated site) and Lune Estuary SSSI (adjacent to the nominated site). The Lune Estuary is also a designated SPA and Ramsar site within the Morecambe Bay SAC. Within the wider landscape are additional important habitats, such as the lowland raised bog of Heysham Moss SSSI, Leighton Moss SPA and Ramsar, reed beds and coastal floodplain and grazing marsh. The Shell Flats and Lune Deep pSACs at the entrance of Morecambe Bay and Liverpool Bay SPA form part of the offshore habitat.
- 4.13 There are 19 Sites of Special Scientific Interest (SSSI) within 16km of the Heysham nomination; Lune Estuary, Morecambe Bay, Heysham Moss, Cockerham Marsh, Winmarleigh Moss, Wyre Estuary, Calf Hill and Crag Woods, Thwaite House Moss, Crag Bank, Artle Dales, Burton Wood, Bowland Fells, Warton Crag, Jack Scout, Leighton Moss, Far Arnside, Humphrey Head, Wart Barrow, South Walney and Piel Channel Flats.
- 4.14 Legally protected species within the area include Great Crested Newts (one of the primary reasons for designation of the Morecambe Bay SAC) with records of otters, water voles, numerous bat species and common species of reptile falling within 10km. The Natterjack toad, a European Protected Species is a notified feature of the Cockerham Marsh which lies 8km to the south east. Nationally important invertebrate species and rare and uncommon plants are also known to occur.
- 4.15 A local nature reserve is indicated on the 1:10,000 map of the area, located within the boundary of the nominated site, at the northern end.

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 The UK's 2008 Climate Change Act²¹ set a legally binding target of at least an 80 percent cut in greenhouse gas emissions by 2050, to be achieved through action in the UK and abroad. The Act also sets a target to reduce emissions by at least 34 percent by 2020. Both targets are against a 1990 baseline.

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 water birds within the UK, and consequently many Ramsar sites are also SPAs; however non-bird features have been increasingly taken into account.

²¹ http://www.decc.gov.uk/en/content/cms/legislation/cc_act_08/cc_act_08.aspx

- 4.18 The North West is the second largest emitter of carbon dioxide in the UK. The Cumbria Strategic Partnership has signed up to the Local Area Agreement indicator NI 186 to reduce per capita CO₂ emissions across Cumbria as a whole by 11.5% by 2010/11, which equates to savings of 619,000 tonnes CO₂ per year.
- 4.19 There are currently four power stations within a 80km radius of the nominated site, with a combined capacity of 350 MW. These are primarily coal and gas systems, with the exception of the Scout Moor Wind Farm (65 MW). The current two nuclear power stations Heysham 1 and Heysham 2 have a total capacity of 3.4 GW, with Heysham 1 operating to 2014 and Heysham 2 expected to operate until 2023.

Communities: Population, Employment and Viability

- 4.20 Population in the North West of England has decreased slightly over the past 25 years and there are now more than 7 million residents, the third most populated English Government Office region behind the South East and London²². According to the Office for National Statistics, the region's population fell between 1981 and 2006 by 1.3%.
- 4.21 There are a number of caravan and mobile home sites used as residences within the Morecambe area, despite requirements to vacate them for two months a year.
- 4.22 The region's population is also ageing, with only three districts in the North West forecast to see a reduction in the population aged 65 years and over (Liverpool, Manchester and Salford), with an increase of over 30% forecast in many districts between 1996 and 2021.²³ The proportion of the population in the Lancaster District aged 65 years and over is only slightly above that of the North West and England and Wales.
- 4.23 Lancaster District has a population density of 249 persons per km², which is below the average for England and Wales of 358 persons per km² and is significantly lower than the North West density of 487 persons per km².²⁴
- 4.24 Employment rates for people of working age in the North West are lower than in the rest of the UK; 68 % (2009) compared to the overall rate of 71%. However, full time employment levels at ward and district level for the Lancaster District (73%) are higher than the regional and national averages.²⁵

Communities: Supporting Infrastructure

- 4.25 Transport: Strategic transport routes in the North West are dominated by the M6 (north-south) and the M61, which provides links to Manchester and the

²² http://ec.europa.eu/budget/reform/library/contributions/pgs/20080415_PGS_65.pdf

²³ An Aging Population: Impacts for the North West (Summary Document) (www.ageconcern.org.uk)

²⁴ Source ONS: Mid-Year Population Estimates; ONS: Census of Population 2001

(www.lancashire.gov.uk/office_of_the_chief_executive/lancashireprofile/areas/population.asp?ar=la)

²⁵ Official Labour Market Statistics. <https://www.nomisweb.co.uk/reports/lmp/la/2038432057/report.aspx>

east. Heysham is served by the A589 and A683, which are identified as routes of regional importance.

- 4.26 The main west coast rail line also serves the area, providing recently upgraded services to the south and to Scotland. However the railway to Heysham is a single track and only for transport of passengers and nuclear waste, it may be unsuitable for regular industrial traffic
- 4.27 The nominated site is adjacent to the Port of Heysham. This is a major port, and is identified in the Regional Spatial Strategy (RSS) as a target for improvement and investment. The port includes a rail link, which runs along the northern boundary of the nominated site. The RSS also refers to the North European Transport Axis (NETA), a transnational spatial planning proposition across Ireland, Northern England, the Netherlands and Germany, in which the Port of Heysham could feature.
- 4.28 Conventional waste²⁶ : Lancashire County Council was ranked 73rd for the highest residual waste per head among the 394 disposal or unitary authorities. In 2006/2007 Lancashire County Council attained a recycling and compost rate of 41.2%, which is higher than the average (34.5%) for England.
- 4.29 Landfill remains the principal method of waste disposal in Lancashire. In total, 396,527 tonnes (59%) of municipal waste was sent to landfill in the region in 2006/2007, which is just above the English average of 58%.²⁷
- 4.30 Lancashire County Council has contracts with several landfill operators and currently utilises 8 landfill sites and 5 waste transfer stations that are strategically located across the county. Two Mechanical Biological Treatment (MBT) units, capable of treating 600,000 tonnes p.a. and an In-Vessel Composting unit are operated by a private waste management contracting authority and serve the region.²⁸

Human Health and Well-Being

- 4.31 The nominated site at Heysham is within the Super Output Area (SOA) known as Lancaster 016G²⁹. Indices of deprivation show that is a deprived area although crime is less than the English average. The age profile for this SOA shows that there are fewer children under sixteen and significantly more senior citizens (males over 65 and females over 60) than the English average. The profile also shows that there are fewer working age people in the area than average.
- 4.32 The most recent census (2001) found that people within the Lancaster 016G area generally reported good or fairly good health. The number reporting poor

²⁶ Conventional waste means “controlled waste” i.e. waste controlled under Part II of the Environment Act 1990

²⁷ Department for Environment, Food and Rural Affairs. Municipal Waste Management Statistics <http://www.defra.gov.uk/environment/statistics/wastats/bulletin07.htm> [accessed 03 March 2009]

²⁸ Urban Mines Municipal Waste Procurement webpage:

<http://www.urbanmines.org.uk/?i=1459&s=1111> [accessed 11 March 09]

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

health was slightly higher than the English average. Overall, health statistics show a mixed picture within the area as life expectancy for males and females is approximately equal to the English average but infant mortality is higher than the regional and national averages.

- 4.33 With regard to mental health, the Health Profile 2008³⁰ for Lancaster shows that estimates of the number of people claiming incapacity benefit for mental illness in the area (34.1 per 1000 population) are somewhat higher than the English average (27.5 per 1000 population).
- 4.34 Despite the deprivation referred to above, pupils in the Lancaster 016G area perform better in their GCSE equivalent examinations than their peers in the rest of England.
- 4.35 Housing stock within Lancaster City Council's area is reasonable with a smaller percentage of unfit housing³¹ than in the north west of England region but a higher percentage than the average for England.
- 4.36 With regard to crime levels in Lancaster City Council's area, figures from the Audit Commission for 2005³² suggest that the crime rate is generally lower than the national average, although the rate for some classes of crime is above the national average.
- 4.37 The economic well-being of the area is slightly negative as can be seen from the local employment figures³³ (see 'Communities: Population, Employment and Viability' above - noted here as a measure of economic well-being). From July 2007 to June 2008, 71.9% of the population of the Lancaster City Council area were employed. However, this number compares unfavourably with figures for the North-west of England region (72.1%) and England as a whole (74.5%).
- 4.38 Local access to medical services is reasonably good with two general practitioner (GP) practices within 5km of the nominated site. There are also twelve GP practices within 10km of the nominated site and a local hospital (Queen Victoria Hospital), though without an accident and emergency department, some 6.3 kilometres distant. The nearest accident and emergency department is the Royal Lancaster in Ashton Road, Lancaster (8.0km), whilst the nearest mental health hospital is Parkwood (24.3km).
- 4.39 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 at least six leisure centres within 20km of the nominated site. In addition, the countryside and coastal areas around Heysham offers good potential for outdoor recreational activities, such as walking, cycling, sailing and water

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>

sports as the area includes a number of local nature reserves and popular beaches.

- 4.40 There has been a nuclear power station in operation at Heysham since 1983. Therefore the necessary data exists 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.
- 4.41 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.
- 4.42 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.
- 4.43 COMARE's tenth report considered the incidence of childhood cancer around nuclear installations. These were divided into nuclear power generating stations and other nuclear sites. The results for the power generating stations supported the conclusion that *'there is no evidence from this very large study that living within 25 km of a nuclear generating site in Britain is associated with an increased risk of childhood cancer'*.
- 4.44 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.'*
- 4.45 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.
- 4.46 The KiKK study gave the results on childhood cancer in the vicinity of 16 German nuclear power plants from a dataset established by the German Childhood Cancer Registry, which included over 1500 childhood cancer cases from 1980 to 2003. In comparison, the dataset used for COMARE's tenth report and the subsequent Bithell paper contained over 32,000 cases of childhood cancer from 1969 to 1993. This is a verified national database and is believed to be the largest national database on childhood cancer in the world. The size of the database used by COMARE therefore gives considerable confidence in the results of the tenth report.

- 4.47 COMARE is currently undertaking a further review of the incidence of childhood cancer around nuclear power stations, with particular reference to the KiKK study and COMARE's 10th and 11th reports. This will be published as COMARE's 14th report later this year.
- 4.48 Radioactive monitoring carried out in 2008³⁴ found generally low concentrations of artificial radionuclides in water, sediment and beach samples and in meat and seafood samples taken around the existing Heysham nuclear power stations. From this sampling, the estimated total dosage levels to the public from all sources within the Heysham area were assessed as being less than 5% of the dose limit for members of the public of 1mSv per year as specified in The Ionising Radiations Regulations 1999.

Cultural Heritage

- 4.49 There are no amenity, cultural heritage, or landscape designations identified inside the nominated site boundary. There are 3 scheduled monuments, 6 Conservation Areas and 89 listed buildings within approximately 5km of the nominated site.
- 4.50 Settlements at Heysham date back to the Stone Age. A Neolithic flint axe has been found within the existing power station site, indicating that there may be potential for other items of archaeological significance to be located in the vicinity.

Landscape

- 4.51 Heysham is situated within the Morecambe Coast and Lune Estuary National Landscape Character Area No31. Heysham is situated on the western side of Morecambe Bay, with the town of Morecambe and the Lake District National Park to the north and the city of Lancaster to the north west.
- 4.52 The landscape of this area is characterised by an undulating coastal strip adjoining a flat lowlands before ascending into wooded escarpments to the east. There are panoramic vistas across the valley and estuary from the surrounding high ground. On the Heysham Peninsula towards the mouth of the estuary, landscape features include marshland, sand and shingle beaches and low sandstone cliffs. The existing Heysham nuclear power stations, caravan parks, the port and suburban development spreading out from Morecambe dominate the shoreline scenery. This developed area is favourably interspersed by some valued countryside wedges.
- 4.53 The nominated site is located within an area that is predominantly developed for industrial purposes, including the existing power station and port facilities. As such there is likely to be existing contamination from industry already active in the vicinity of the proposed development. The nominated site is not located within a designated landscape area. The nominator acknowledges that new nuclear development would be a significant feature within the

³⁴ Food Standards Agency (2008). Radioactivity In Food and the Environment (RIFE 14) report.

landscape as it is likely to be visible from surrounding Areas of Outstanding Natural Beauty. This will need to be considered carefully at the design stage.

- 4.54 Saltmarshes are a valued landscape character feature on the Morecambe Coast and Lune Estuary and are one of the distinguishing characteristics of the national landscape character area (See Appendix 4).

Soils, Geology and Land Use

- 4.55 The Heysham site is located on non agricultural land. The soils and geology comprise Made Ground over tidal flat deposits, underlain by the Sherwood Sandstone Group and Eldroth Grit. Soils within the area are likely to be associated with land reclamation during the construction of the existing power station.
- 4.56 In addition to the existing power station, there are a number of other industrial uses currently being undertaken around the Heysham Harbour area, including mineral importation.
- 4.57 Two historical landfill sites are located at the central and eastern sections of the nominated site. Respectively. Waste received by these landfills included inert and industrial waste, and contaminated water. Two historical landfills are also located to the northeast of the nominated site. These closed landfills were regulated under the Waste Management Licensing Regulations (now Environmental Permitting Regulations). An active Registered Waste Transfer site operated by British Gas is located to the north of the nominated site. Further information regarding the identified waste sites, including extent, nature and quantities of waste will be obtained and assessed as part of a site specific EIA.
- 4.58 One active mineral abstraction site is present locally at Fish Quay in Heysham Harbour to the north of the nominated site. Marine sands and gravel are being abstracted at this location.
- 4.59 British Geological Society (BGS) has assessed geological risks in the local area, which include:
- Potential for Shrinking or Swelling Clay Ground Stability Hazard –low risk
 - Potential for Landslide Ground Stability Hazards - very low to low risk
 - Potential for Running Sand Ground Stability Hazards – very low to moderate risk
 - Potential for Compressible Ground Stability Hazards – very low to moderate risk

Water Quality and Resources

- 4.60 The nominated site at Heysham is located in the north west (NW) River Basin District (RBD). Within this RBD, only 20% of rivers (by length) meet the requirements for good ecological status (GES) or good ecological potential

(GEP). In total, 2% of all surface waters are designated as artificial and 41% of all surface waters are designated as heavily modified.

- 4.61 44% of groundwater bodies in the RBD meet the requirements for good status. The status of estuaries, transitional and coastal waters and the status of lakes are not listed in the NW draft River Basin Management Plan (RBMP)³⁵. 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.
- 4.62 The nominated site is located within the Lune catchment of the NW RBD. Within this catchment, 51% of surface water bodies achieve GES. The nearest watercourse to the nominated site is the Overton Dyke which has moderate ecological quality and high chemical quality.
- 4.63 Bathing waters in the area are of good quality, and the coast immediately bordering the nominated site is a Designated Shellfish Water.
- 4.64 The ground water aquifer under the nominated site is known as the Lune & Wyre Carboniferous Aquifer. The status of this aquifer is classified by the Environment Agency as being of good quantitative quality. Part of the existing nuclear power stations lies over the Fylde Permo-Triassic Aquifer, which is classified as being of poor quantitative quality, however, this classification is based on the whole aquifer and does not determine whether the quality is a direct result of the industrial uses around Heysham Harbour.
- 4.65 There are no groundwater source protection zones in the vicinity of the site.
- 4.66 The nominated site is located within the Lune Catchment Abstraction Management Strategy (CAMS) area and lies on the coast near the bottom of the catchment area. As a result of this location and because the Environment Agency's resource assessment³⁶ is restricted to main rivers and sandstone aquifers, the area containing the site is not classed as a Water Resource Management Unit (WRMU). However, it will be supplied from one or more of the adjacent units. Of the five WRMUs in the Lune catchment area that have been assessed, the unit nearest to Heysham is assessed as being over licensed, while three of the other units are classed as having water available. Hence any additional requirements for freshwater resources would need to be managed within the constraints set by the CAMS.
- 4.67 The Morecambe Bay marine and estuarine system contains several coastal and offshore sites with European status as Special Areas of Conservation (SACs) and Special Protection Areas (SPAs). The Lune Estuary which is adjacent to the nominated site is an area of SSSIs for its lowland raised bog at Heysham Moss, its reed beds and its coastal flood plain and grazing marsh.

³⁵ The data used in this assessment is taken from the Draft River Basin Management Plan, which was the most up to date plan available at the time. Draft plans were presented to the Government for approval in September 2009 and were subsequently published in December 2009

³⁶ Environment Agency (2004). The Lune Catchment Area Management Strategy

- 4.68 The nominated site is located within United Utilities' Integrated Resource Zone. Yield and demand forecasts show the zone will be in a water deficit of 88.8 MI/d by 2024/25. Efficiency measures, the increased uptake of metering and a significant reduction in water-intensive industry in the north west of England are expected to reduce demand. However, a predicted increase in population within the zone of 0.5 million people between 2006/07 and a 2034/35 means that the overall demand will increase.
- 4.69 The exact water requirements for the nominated site are not yet finalised. The nomination indicates that direct cooling, using sea water, is the preferred option for the nominated site.
- 4.70 Tidal currents dominate Morecambe Bay sediment transport with net direction being controlled by an asymmetry between flood and ebb tides. Sediment is transported into the Bay along the coastline and then outwards in the Centre of the Bay. Sediment is reworked towards the shore by the action of the waves and deposited onto the shallow sand banks. Morecambe Bay is currently a sink for sediment.

Flood Risk

- 4.71 The Environment Agency flood map indicates that the majority of the site is not located within a Flood Zone 2 or 3, suggesting that the nominated site has a low risk of flooding (less than 1 in 1,000). A small area at the southern end of the nominated site lies within a Flood Zone 2. The Lancashire coast however, is susceptible to the effects of climate change.
- 4.72 A number of flood defences already exist in the area surrounding the nominated site to offset the risk of flooding for the existing nuclear power stations. Land to the east of the nominated site would potentially be at risk of flooding from the River Lune at the 1/100 year event, but the area is protected by formal defences. Similarly the coastline to the west of the nominated site (beyond the existing nuclear power station) is protected by coastal defences which offer a standard of protection of 1/200 years.
- 4.73 The River Wyre to Walney Island Shoreline Management Plan intends to "hold the line" at Heysham as part of Defra's 'Making Space for Water' strategy which aims to manage the risks from flooding and coastal erosion by employing an integrated portfolio of approaches which reflect both national and local priorities.
- 4.74 Despite the presence of sea and river defences, the nominated site is low lying and may be vulnerable to flooding and coastal erosion towards decommissioning.

5 Appraisal of Sustainability

Introduction

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

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

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 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 Site 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,

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.

relative to some other forms of power generation, nuclear power plants do not 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, heavy goods vehicles (HGVs), and traffic movements generated by the construction workforce. This has the potential to affect residential properties along local access/haul routes in the immediate surrounding area. 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 has the potential to create longer-term adverse effects on air quality, including in the nearby town of Heysham. Traffic and air quality assessments will need to 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 the existing rail and port facilities where possible.
- 5.7 The AQMA in the centre of Lancaster is on a route that heavy traffic would be expected to take to the Heysham site, as no other routes are suitable for heavy traffic. The main arterial route to the area, the M6, to the south of the nominated site, is near to capacity. A marginal increase in traffic would adversely impact air quality, particularly during peak hours.
- 5.8 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.
- 5.9 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 Environmental Permitting (England and Wales) Regulations 2010 and subject to monitoring and reporting. Further consideration of the control of radioactive discharges to air is given in Section 7 of the Main AoS Report.
- 5.10 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 permitting 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.

- 5.11 **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 Heysham 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

- 5.12 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 and quantity, 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.
- 5.13 Of greatest concern are activities which might lead to detrimental effects on coastal, intertidal and marine habitats within the Morecambe Bay SAC, part of which overlaps with the nominated site, and species which utilise these habitats, such as Great Crested Newts. Activities which could have an adverse impact on important assemblages of birds within the Morecambe Bay SPA and Ramsar sites would be of additional concern. Indirect impacts may also result at Lune Estuary SSSI. An Appropriate Assessment will be required to determine level of mitigation and/or compensation for land take/ loss of habitat.
- 5.14 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.
- 5.15 The discharge of cooling waters from the nominated Heysham site could potentially be significant to the biodiversity of the Morecambe Bay area, as it would have the potential to alter the temperature and salinity structure of the water column. The existing nuclear power stations will continue to operate in parallel with the proposed new facilities and therefore the impact of the cooling water being discharged into the Bay should be examined in terms of

cumulative impacts arising from the interaction of several plumes. Dispersion and dilution modelling would be required to determine the optimum location for discharging the cooling water, preferably in an area of fast flowing current and away from the estuary channels.

- 5.16 In addition, the intake of water poses impacts on the local fish/marine populations through the risk of impingement or entrainment. There are a number of potential mitigations to avoid the impacts of impingement and entrainment, including restocking strategies to offset impacts, and avoidance mechanisms to reduce impingement and entrainment. Acoustic screens, for example, have been used to deter fish from entering the zone of entrainment near an intake. It is understood that such a system has been employed at the existing Hartlepool power station, with good levels of avoidance (50-60% exclusion).
- 5.17 Consideration needs to be given to cumulative impacts as a result of other high profile projects. For example, the continued operation and eventual decommissioning of the two existing nuclear power stations at Heysham, in combination with development of the nominated site, could result in adverse impacts on biodiversity.
- 5.18 Further studies by the nominator 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, including the local Heysham Nature Reserve. Design and mitigation measures should in the first instance seek to avoid and minimise loss of habitat (particularly SAC/SPA habitats and species) and avoid disturbance of legally protected species. Once defined, mitigation measures could be implemented through an ecological mitigation and management plan or similar document.
- 5.19 A separate report, documenting the Habitats Regulation Assessment (HRA) for Heysham³⁸ has been undertaken. This report should be referred to for further information relating to the effects of a new nuclear power station at Heysham on European-designated habitat sites.
- 5.20 **Strategic Effects on Biodiversity and Ecosystems: The potential for adverse effects on sites and species that are considered to be of UK-wide and European nature conservation importance (the Morecambe Bay SAC/SPA/Ramsar site, Leighton Moss SPA/Ramsar and the Lune Estuary SSSI, Morecombe Bay SSSI and Heysham Moss SSSI) means that significant strategic effects on the biodiversity cannot be ruled out at this stage of the appraisal. There is, however, potential for the mitigation or compensation of biodiversity effects, including the creation of replacement habitat for UK designation sites³⁹. Detailed baseline studies will form part of the project-level EIA. The HRA for**

³⁸ Habitat Regulations Assessment Pilot Heysham: HRA Screening and Appropriate Assessment Report

³⁹ For European Sites, compensation measures, such as creation of replacement habitat, may only be considered if it has been established that there are no alternative solutions and the plan or project is necessary for imperative reasons of overriding public interest

Heysham should be referred to for further details and advice for internationally designated sites.

Climate Change

- 5.21 The establishment of a new nuclear power station will contribute positively to the North West region's climate change objectives, as well as contributing to national targets. 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 A new nuclear power station at Heysham 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 North West's climate change objectives.**

Communities: Population, Employment and Viability

- 5.25 Construction of a new nuclear power station is likely to bring significant benefits in terms of employment, the economy and communities at the local level. The significance of these effects is reduced at the national level.
- 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 stations 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 region as a whole when considered with nominations for further nuclear power stations in the North West. This could contribute to the regional economy and employment, with potential for a specialist nuclear industry hub where local specialist skills are 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 America⁴⁰ found that property values were actually increased in the vicinity of nuclear facilities, although the authors caution that this finding is subject to several caveats including being based on a small sample and may be unrepresentative. It is suggested that in relatively poor areas, or where the local economy is depressed, the income generated by employment at a new nuclear facility may have a positive effect on local property values. For the present appraisal, any effect on property values is not considered to be strategically significant because it is limited to the local area.
- 5.32 **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 North 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 on the local scale are likely to occur due to increased pressure on basic services and infrastructure. This could include waste management facilities and local transport networks. These effects could be increased at Heysham if the construction phase of the new nuclear power station were to overlap with the decommissioning phase of the existing Heysham 1 and/or 2 reactors. However, overall, it should be possible to mitigate these effects through detailed assessment and logistics planning, and the effects are therefore not considered of strategic significance.
- 5.34 The North West region has considerable expertise in industry and embryonic plans already exist for a 'specialist nuclear energy hub' given the diversity and number of nuclear establishments in the North West.
- 5.35 There is the potential for significant effects on national road infrastructure through increased congestion/disruption of traffic on the M6 motorway and on the A589 and A683. In isolation, this is not likely to be significant, although

⁴⁰ 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

the cumulative effect of development in the region may lead to increased congestion. However, the effect of a nuclear power station at the nominated site on this strategic network can likely be mitigated through transportation management plans, green travel plans and consideration of alternatives to road for the transport of large loads. Considering the availability of a large and active port nearby, sea transport may well be an easy way to mitigate transport impacts. In addition, road traffic accidents may increase, both between vehicles and involving pedestrians, giving rise to measurable health effects to local communities which cannot be completely resolved by mitigation. However, the potential for an adverse effect from transport on local communities is low.

- 5.36 Waste material is generated during the construction, operation and decommissioning phases of a nuclear power station. Impacts may be expected upon local regional facilities, however the scale of operation is not considered to be significant in the long/medium term. Construction traffic would also be a short-term factor. Waste management facilities should 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. Many impacts may be positive such as the generation of significant quantities of secondary aggregate during demolition (for example crushed demolition rubble that can be reused). There is a solvent recycling site adjacent to the nominated site boundary. It operates by batch processing and the interaction of the emergency plans for the solvent recycling site and the nominated site would need careful consideration.
- 5.37 Radioactive waste⁴¹: 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.
- 5.38 Electricity transmission: The development of a nuclear power station at Heysham 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).

⁴¹ Radioactive waste is waste regulated under Environmental Permitting (England and Wales) Regulations 2010.

- 5.39 **Strategic Effects on Communities: Supporting Infrastructure:** There is the potential for adverse effects on supporting infrastructure, including transport, waste and basic services. These effects are of local significance. However, there is some potential for wider significant effects on national road infrastructure when considered cumulatively with the decommissioning of the existing Heysham power station, and/or other major developments in the region. A range of mitigation options are potentially available, subject to further detailed study.

Human Health and Well-Being

Radiological Health Issues

- 5.40 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.⁴²
- 5.41 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.⁴³ 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.
- 5.42 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.⁴⁴ In England and Wales, the main regulatory bodies are the Nuclear

⁴² Ionising Radiation Exposure of the UK Population: 2005 Review HPA-RPD-001

⁴³ 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>

⁴⁴ 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).

Installations Inspectorate (NII), a division of the Health and Safety Executive and the EA. These agencies regulate radioactive discharges from nuclear power stations and have responsibilities for ensuring that workers, the general public and the environment are protected against exposure to radioactivity. Regulation of all disposals, including discharges to air, water and land, of radioactive waste off or on nuclear sites is regulated under the Environmental Permitting (England and Wales) Regulations 2010. This regulatory system will apply to a potential new nuclear power station at Heysham and should ensure that permitted radioactive discharges do not cause unacceptable risk to health.

Regulatory Justification

- 5.43 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 has decided, after public consultation, that two nuclear reactor designs, Westinghouse's AP-1000 and Areva's EPR, should be Justified⁴⁶.
- 5.44 The Government believes that the regulatory regime will effectively limit and minimise the radiation dose and release of radioactivity from new nuclear power stations, until they have been fully decommissioned, to very low levels, and that the health detriments associated with the operation of new nuclear power stations will be very low

Construction and Operational Effects

- 5.45 During the operation of a nuclear power station, there is a risk of unplanned radioactive discharges into the environment which could potentially lead to adverse health impacts. However, the risk of such an accident is judged to be very small because of the strict regulatory regime in the UK. 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.
- 5.46 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

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 www.decc.gov.uk

Transport Event Database (RAMTED) for the period 1958 to 2008 showed that of the recorded 913 events associated with the transport of radioactive materials no 'significant dose events' were associated with the nuclear power industry⁴⁷.

- 5.47 The scale of construction work associated with a potential new nuclear power station at Heysham 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.
- 5.48 During the operation of a potential nuclear power plant at Heysham, 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.
- 5.49 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 advice⁴⁸, a precautionary approach is adopted to the routing of any required power lines.
- 5.50 The presence of, and more particularly the construction of, a new nuclear power station at the Heysham site will increase community disturbance to some degree. Such disturbance may include noise and vibration, dust in the construction phase and increased traffic in all phases. To mitigate construction phase disturbances an environmental management plan should be developed, implemented and monitored for effectiveness throughout the construction period. Potential traffic issues in all the project's phases can be mitigated through the adoption of a transport plan aimed at minimising community disturbance whilst also promoting 'green' travel.
- 5.51 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

⁴⁷ <http://www.hpa.org.uk/HPA/Publications/Radiation/HPARPDSeriesReports/>

⁴⁸ http://www.hpa.org.uk/web/HPAweb&HPAwebStandard/HPAweb_C/1195733817602

plant and equipment and noise and vibration monitoring. These would be strategically managed through the construction management plan procedures.

- 5.52 Noise emissions from nuclear power stations are relatively low. Minimisation of operational noise emissions would require consideration at the design/layout stage of the scheme. In particular, significant benefits would result if potential sources of noise emissions could be reduced through a combination of engineering design solutions. These could include the careful siting of noise emitting plant within the overall facility (at high or low level and in relation to local noise sensitive locations) and careful selection of trafficking routes and access points. Particular emphasis would need to be taken of any low frequency and constant emission sources. Overall, background noise and noise prediction assessment following relevant international (ISO) and British (BS) standards would need to be applied so that the noise impact of the proposals could be determined for planning purposes. Given the relatively lightly populated locality, it is considered that noise and vibration impacts would not be a significant issue and pose a constraint to development at Heysham.

Local Health and Recreation

- 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 possible that the presence of a nuclear power plant may lead to increased stress levels in certain individuals, due to potential perception of risk associated with living or working near a power station. However, there is little literature available on this potential impact which suggests that it has not been a significant problem in the past. In any event, in the case of the nominated site, people living and working nearby have had a long time to get used to there being an adjacent nuclear plant so this is unlikely to be a problem at this location.
- 5.55 It is probable that building, operating and decommissioning a new nuclear power station at Heysham will lead to an increase in employment, community wealth, housing stock and other associated neighbourhood infrastructure. These positive effects on the community are likely to be much more significant than any potential negative consequences of the project assuming there are no adverse effects on the health of the local population.
- 5.56 **Strategic Effects on Human Health and Well-Being: The rigorous system of regulation of routine discharges from the proposed nuclear power**

station at Heysham 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. 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 nominated 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

- 5.57 The main effects of the development of a new nuclear power station at Heysham would be local and within the facility itself. However, a new nuclear power station could detrimentally impact the setting of the scheduled monuments, conservation areas, and listed buildings that are identified in the region. Depending on distance and sight lines, this could be of regional or national importance. However, this could be mitigated by placement of the new station adjacent to existing nuclear facilities and through appropriate planning and design of construction activities and operational facilities, including adherence to the principles of good design⁴⁹.
- 5.58 In addition, there may be potential off-site effects on cultural heritage assets caused by an increase in traffic and the development of new infrastructure. Detailed assessment will be required at the project level EIA stage.
- 5.59 A prehistoric artefact has been found within the site of the existing nuclear power stations. If it is identified that further items of archaeological importance may be located at the nominated site, 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).
- 5.60 **Strategic Effects on Cultural Heritage:** The AoS has not identified any amenity, cultural heritage, or landscape designations within the nominated site boundary, though a prehistoric artefact was found in the area. There is the potential for adverse effects on local designations, but these are unlikely to be considered as being of national strategic significance. Further detailed assessment at project level will be required.

⁴⁹ Adherence to good design is outlined in Planning Policy Statement 1: Delivering Sustainable Development

Landscape

- 5.61 The existing power stations are already a prominent feature from local viewpoints and are visible from some long-distance viewpoints, including the Lake District. There are likely to be distant indirect landscape and visual impacts on the Arnside and Silverdale and the Forest of Bowland Areas of Outstanding Natural Beauty. The area around the nominated site on the Heysham Peninsula is already characterised by existing industrial estate development, numerous electricity pylons, a substation and a busy port. The local area would benefit from landscape and visual enhancement associated with strategic new build in the area.
- 5.62 The proposed development will replace a golf course leading to some loss of leisure facilities. This will need to be taken into account during detailed design of the project.
- 5.63 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
- 5.64 It appears that there would be potential for the use of brownfield land to limit adverse landscape impacts that could arise from the creation of a new power station and from associated construction lay down areas. However, potential changes arising from the installation of new cooling culverts through the low sandstone cliffs on the shoreline could give rise to a long lasting adverse impact on this feature. Attempts should be made to avoid this. The addition of associated new lighting, with incorporated mitigation measures to limit light spill and glare, is unlikely to have an adverse effect on an area that already is characterised by low levels of tranquillity.
- 5.65 Given the scale of the nominated site, fully effective mitigation of adverse impacts is unlikely during the construction and operational phases. However, there appears to be some potential to mitigate most local landscape impacts. There is also potential for safeguarding and enhancing the local landscape, including countryside wedges, in what is currently a rundown area. The decommissioning of the existing facilities may allow some landscape restoration/enhancement of previously developed areas in the long term, however, long-term land uses for the restored areas are difficult to predict.
- 5.66 **Strategic Effects on Landscape: The AoS has identified potential, adverse visual effects on Landscape. These include lasting adverse indirect landscape and visual impacts on the surrounding area, the Lake District and two AONB designations, which are of national significance. There is also the potential for long term adverse effects on the sandstone cliffs adjacent to the nominated site. Given the scale of the nominated site it is unlikely that these effects could be mitigated entirely. However, further detailed assessment at project level will be**

required to ensure that attempts be made to minimise any adverse effects.

Soils, Geology and Land Use

- 5.67 The construction of a power station at Heysham and associated infrastructure (including transmission lines/towers) could lead to the direct loss of soil structure. This may include impacts on soils that maintain terrestrial habitats, including designated nature conservation sites; the Lune Estuary and Morecambe Bay SSSI, Morecambe Bay SPA, SAC and Ramsar sites. This is considered further in the Biodiversity and Ecosystems sections. Further loss of coastal habitat or changes to soil structure may have significant impacts on natural coastal processes unless suitable mitigation is applied.
- 5.68 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.
- 5.69 Blight of land is a likely effect of the development of a new nuclear power station on the nominated site, but is considered of local or district significance. Likewise, effects on existing land uses including surrounding tourist areas, are considered to be of local impact.
- 5.70 **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

- 5.71 The development of a new nuclear power station at Heysham may necessitate upgraded coastal flood defence works over the lifetime of the power station. Certain parts of the nominated site are at risk of flooding in a 1 in 100 or 1 in 200 year flood event, although they are protected by formal sea defences. However, climate change-driven rises in sea-level may increase flood risk over the coming decades. Upgraded defences may be required to mitigate this increase in flood risk, which may modify existing estuarine hydrodynamics and associated movement of sediment. This could have secondary effects on estuary and marine ecosystem structure and functioning. However, the use of an appropriate design and a full understanding of the hydrodynamics and sediment transport within the estuary could minimise the potential effects.
- 5.72 If cooling water is returned to the sea at elevated temperatures, this could have significant adverse effects on both sediment transport and water quality in coastal waters. Although there are currently discharges from the existing Heysham power stations, the return of cooling water from a new power station to the coastal waters at Morecambe Bay at elevated temperatures could

cause failures to meet existing water quality standards. Any future thermal discharge will be subject to environmental permits⁵⁰ from the Environment Agency and will need to meet existing regulatory standards and the requirements of the Water Framework Directive, including the objective of no deterioration in ecological status (whichever is the most stringent). In addition to the thermal effects from direct cooling, there are other potential water quality issues, for example from discharge of radioactive or non-radioactive materials, such as anti-fouling agents, associated with the cooling water process. These discharges will also be subject to permitting by the EA.

- 5.73 The Marine and Coastal Access Act 2009 makes provision for the production of Marine Policy Statements. It is intended to produce a Marine Policy Statement (MPS) that, for the first time, brings together the policies for all UK administrations. The second stage in the new planning system will consist of a series of Marine Plans. The Marine Management Organisation (MMO) set up under the Marine and Coastal Access Act, is responsible for preparing marine plans for the English inshore and offshore regions according to the policies and objectives set out by the Government. Similar plans will be produced for Welsh marine waters. The MPS will interact with National Policy Statements and, in reaching its decisions, the IPC must have regard to the MPS but, subject to certain exceptions, must decide in accordance with the relevant National Policy Statements.
- 5.74 Morecambe Bay hosts several important fisheries. The discharge of cooling water and any accidental (or planned) release of pollutants from the Heysham site have the potential to have an impact on local fisheries. To maintain water quality standards, any future discharges from the power station will need to be considered as part of the EIA for the proposed development. This process will include an assessment of the impacts of any discharges to the aquatic environment, including impacts on specific designated sites under both the Habitats and Shellfish Directives.
- 5.75 To maintain water quality standards, a more detailed appraisal is required at the project EIA level to assess the implications of any future discharges, including thermal discharges. This process will include an assessment of the impacts of any discharges to the aquatic environment, including impacts on specific designated sites under both the Habitats and Shellfish Directives. Any future thermal discharge will require an Environmental Permit⁵¹ from the Environment Agency and will need to meet existing regulatory standards and the requirements of the Water Framework Directive, including the objective of no deterioration in ecological status (whichever is the most stringent). In addition to the thermal effects from direct cooling, there are other potential water quality issues, for example from discharge of radioactive or non-radioactive materials, such as anti-fouling agents, associated with the cooling water process. These discharges will also be subject to permitting by the EA.

⁵⁰ The Environmental Permitting (England and Wales) Regulations 2010 came into force on 6 April 2010 and cover all water discharge activities. Water discharge consents will become Environmental Permits, and applications for new discharges will fall under the new regulations.

⁵¹ The Environmental Permitting (England and Wales) Regulations 2010 came into force on 6 April 2010 and cover all water discharge activities. Water discharge consents will become Environmental Permits, and applications for new discharges will fall under the new regulations

- 5.76 The development of a new nuclear power station on the nominated site may have the short-term effect of increasing water demand during the construction phase, due to an increased population. The potential magnitude and duration is dependent on the timing of new development in relation to the activities (operation or decommissioning) of the existing nuclear facilities. It is anticipated that, as the operation of a new nuclear power station on the nominated site is likely to have a similar or lower demand for water to the existing power station, no adverse long-term impacts are expected on water resources, although this will need to be confirmed as part of the planning for this site. Similar comments apply to wastewater production from the nominated site, although there is likely to be a short-term effect of increasing wastewater production due to an increased population during the construction phase.
- 5.77 An assessment of the water supply/demand network efficiency of current and proposed development should be undertaken at the detailed EIA stage with a view to ensuring that water demand and usage is minimised as far as possible. Effective use should be made of all sources of supply available to the nominated site, including existing licensed private sources of supply. The assessment should be undertaken as part of a site specific study, to be completed once the exact water requirements for the nominated site are finalised.
- 5.78 The nominated site appears to be situated on a minor aquifer, which is not used for significant water supply. This minor aquifer could be used locally for private water supplies, and discharges from these groundwater bodies may support local groundwater-dependent surface water aquatic ecosystems. Localised groundwater pathways are likely to exist, hence accidental discharges or construction disturbance at the nominated site could cause deterioration in groundwater quality and flow quantity in local minor aquifers. Further studies would be required by the nominator to ensure that local groundwater bodies are investigated and a suitable design is adopted to mitigate potential impacts.
- 5.79 **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 from the thermal impact of cooling water discharges, have also been identified. This is of potential wider significance because of indirect effects on national and European designated habitat sites, for example. In addition, there are potential cumulative effects with existing discharges from Sellafield and Heysham sites and with other new nominated sites.**

Flood Risk

- 5.80 Flood risk is not likely to increase as a direct result of the development itself. However, as a result of sea level rise over the lifetime of the development, flood risk is likely to increase.
- 5.81 To mitigate the risk to the nominated site it is likely that either improvement to the existing coastal defences will need to be made or new coastal defences will need to be constructed. This construction/improvement of coastal defences could impact upon coastal processes. This may be mitigated by appropriate design and construction of defences and sustainable management. Any residual flood risks to the nominated site could be mitigated through the siting of the most vulnerable infrastructure at the lowest levels of flood risk. Further investigation during the detailed design stage of the project will be required to inform the requirement for, and impacts of mitigation from new or upgraded coastal defences. The Environment Agency's permit will be required for any works to the existing flood defences.
- 5.82 One of the major potential impacts of sea-level rise along the Lancashire coast will be coastal erosion, the amount of which largely depends on the wave climate, sediment type and beach profile. A rise in sea level will also render low lying areas increasingly prone to risk of coastal flooding.
- 5.83 Implementing measures of coastal protection through hard engineering solutions along the south side of the proposed Heysham site will alter the hydrodynamics and sediment transport mechanisms. The Morecambe Bay shoreline, inter-tidal sand flats and mud flats and salt marshes are in delicate balance with the prevailing current, wave and tide regime, and any alteration to the dynamics will change the configuration of the current coastal form. It is recommended that the nominator ensures hydrodynamic and sediment transport surveying and modelling is conducted as part of the detailed appraisal to determine baseline conditions. This data can then be used to determine an appropriate management strategy.
- 5.84 **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. There are existing flood defences, but these may need improvement/upgrading. This is considered a wider national issue, because of the potential impact on national energy supply and infrastructure. Possible impacts on coastal processes, hydrodynamics and sediment transport from any necessary new or upgraded coastal defences have also been identified. Mitigation may be possible through appropriate design and construction of defences.**

Key Interactions between Sustainable Development Themes

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

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

- 5.87 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 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 plans that might lead to cumulative effects when combined with the development at the nominated Heysham were identified as follows:
- Lancashire Biodiversity Action Plan, Lancashire Biodiversity Partnership (2008)
 - River Wyre to Walney Island Shoreline Management Plan, Wyre Borough Council (2008) and Shoreline Management Plan 2 (SMP2), River Wyre to Walney Island (2009).
 - A greener strategy for a greener future - Lancashire's Municipal Waste Management Strategy 2001-2020, Lancashire Waste Management Strategy Steering Group (2001)
 - River Basin Management Plan for the North West, Environment Agency (2009)
 - Water Resources Management Plan, United Utilities (2009)
- 5.88 Other relevant key projects that might have significant interactions with the proposals for a new nuclear power station at Heysham include:
- Operation and decommissioning of the existing nuclear power stations at Heysham
 - Nomination for new nuclear power station at Sellafield
 - Construction of the Heysham – M6 link road that is planned to start in 2010
- 5.89 The appraisal of cumulative sustainability effects arising through interactions between the nominated site at Heysham and other key plans, programmes and projects 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"> • Although no common sites of European nature conservation importance are assessed as being potentially affected by both power stations, there may be significant adverse effects on wider biodiversity if both Heysham and Sellafield nuclear power stations are developed. • Potential for interaction with the Lancashire Biodiversity Action Plan target to maintain natural habitats and allow re-establishment of salt marshes to compensate for past loss
Climate Change	<ul style="list-style-type: none"> • Low carbon economy promoted by nuclear power proposals and reducing unsustainable travel patterns all seek to minimise the effects of climate change.
Communities: Supporting Infrastructure	<ul style="list-style-type: none"> • Potential cumulative effects of congestion with the proposed M6-Heysham link and increased traffic during construction. • Potential interaction with Regional Transport Strategy, which aims to reduce private car use and increase use of public transport. • Decommissioning of existing nuclear facilities at Heysham 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 secure, long-term employment are likely to have synergistic positive effects on health and well-being.
Landscape	<ul style="list-style-type: none"> • Potential in-combination effects associated with further electricity pylon infrastructure improvements by the National Grid. • Potential in-combination effects associated with the proposed M6 link, new housing and industrial development in the vicinity. • Potential positive effects if the power station scheme is sensitively integrated with emerging Local Area Action Plan proposals for Heysham and a local bid to designate the area a Regional Park.
Water Quality and Resources	<ul style="list-style-type: none"> • Potential for interaction with the objectives for the ecological status of coastal and estuarine waters set in the River Basin Management Plan for the North West • In combination with other projects that may impact on the coast within the Lune estuary and Morecambe Bay European Marine Sites, there may be a cumulative adverse impact on coastal process, hydrodynamics and sediment transport, and potential indirect effects on nationally and internationally designated habitats.

AoS Sustainable Development Theme	Interactions and Cumulative Effects
Flood Risk	<ul style="list-style-type: none"> • Potential positive impact on the River Wyre to Walney Island Shoreline Management Plan policy to “hold the line” for sea defences at Heysham, as sea defences may need to be upgraded or constructed as part of the development of the nominated site.

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

- 6.1 This Section summarises the key findings of the AoS assessment and explores possible mitigation which could be undertaken to reduce impacts. Table 6.1 presents a summary of significance of potential effects and Table 6.2 provides a more detailed breakdown of the potential effects and possible mitigation,
- 6.2 The AoS has explored both adverse and beneficial potential effects of building a new nuclear power station at Heysham. 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 revised draft Nuclear NPS. This site report for Heysham 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 Heysham, 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 There are potential negative effects on three national and internationally protected conservation sites, namely Morecambe Bay, Lune Estuary and Leighton Moss; and effects on water quality in the region due to the abstraction and release of sea water for cooling. Although no common sites of European nature conservation importance are assessed as being potentially affected by both power stations, there may be significant adverse effects on wider biodiversity if both Heysham and Sellafield nuclear power stations are developed.
- 6.5 River and coastal flood defence schemes already exist in the area of the nominated site, but these may need to be upgraded to protect against sea level rise and coastal erosion during the lifetime of the facility, depending on on-going research and revisions to the SMP by the EA. These effects are significant, but mitigation opportunities may be available following further study.
- 6.6 The development of a new nuclear power station will have a negative visual impact on the landscape and could potentially be seen from parts of the Lake District National Park. This impact could not be fully mitigated, however, the nominated site is adjacent to an existing nuclear power station, in an area that is already heavily industrialised, and so the additional impact on the landscape would be less significant at a regional level.

- 6.7 There will be significant positive effects associated with long term employment and enhanced prosperity for communities locally. These benefits are likely to be significant at the sub-regional level if two power stations (Heysham and Sellafield) are built in the North West. Benefits may be further enhanced if other proposals for regeneration in the region go ahead. The Heysham site is adjacent to an existing rail link and sea port, which presents opportunities for sustainable transport, particularly during construction.
- 6.8 There remains some uncertainty relating to the significance of some effects and the most appropriate mitigation. It is expected that the mitigation measures will be refined iteratively as part of the development of the proposals for the nominated site, and will be assessed further in the project level EIA.
- 6.9 The table on the following page provides an overall summary of the significance of the environmental and sustainability effects for the Heysham site. Each sustainable development theme and each development stage has been considered. The symbols and colours used are explained in the key.

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

Sustainable Development Themes:	Significance of potential Strategic effect at each Development stage:		
	Construction	Operation	Decommissioning
Air Quality	-	- ?	- ?
Biodiversity and Ecosystems	-- ?	-- ?	-- ?
Climate Change	-	++	- ?
Communities: Population, Employment and Viability	+ ?	+ ?	0
Communities: Supporting Infrastructure	-	-	-
Human Health and Well-Being	+	+	+
Cultural Heritage	-	-	-
Landscape	-	-	0?
Soils, Geology and Land Use	- ?	-?	-?
Water Quality and Resources	-	-	-
Flood Risk	-	-	-
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 '?'

- 6.10 Potential environmental and sustainability effects considered to be of a wider strategic significance were also identified. These are summarised in Table 6.2. This table includes a summary of how the potential adverse effects may be mitigated and includes possible feasible suggestions for mitigation to be considered at the project level. Some of these mitigation options could be addressed by the HSE, EA, HPA and others when they consider the development consent application stage. Other mitigation options could be proposed by the developer as part of the project design process and through EIA. However, mitigation measures can in themselves produce impacts and these would need to be assessed at the project level.
- 6.11 At this strategic level of appraisal, there are some uncertainties on the significance of some impacts and the effectiveness of suggested mitigation measures. Further detailed studies should therefore be carried out by the developer and the regulators at the project level stage.
- 6.12 Mitigation measures should be considered in all stages of the project with the aim to develop a strategy that avoids impacts, and if they cannot be avoided, to reduce them. The suggested mitigation measures shown in Table 6.2 include examples from all levels of the mitigation hierarchy that comprises:
- Enhance
 - Avoid
 - Reduce
 - Repair
 - Compensate
- 6.13 Options for mitigating through project design or management should firstly consider avoidance, addressing impacts at source before considering impacts at the receptor, and ensuring that a commitment is made to implementing and monitoring the effectiveness of the proposed mitigation. For European Sites, compensatory measures to offset damage to biodiversity and ecosystems and ensure coherence of the Natura 2000 network may only be considered if it has been established that there are no alternative solutions and the plan or project is necessary for imperative reasons of overriding public interest.

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

Potential Strategic Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear 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"> • Disturbance to fauna (in particular bird species in Morecambe Bay SAC) from construction activities, including long-term displacement of waterfowl and waders which could adversely impact the integrity of marine protected areas. 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Seek to avoidance the need to disturb sensitive areas where possible • Developer should ensure further hydrological surveys to assess the effects of water abstraction on valuable or vulnerable habitats

<p>Potential Strategic Significant Effects (adverse and beneficial effects)</p>	<p>Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC</p>
<ul style="list-style-type: none"> • Loss, damage or fragmentation of internationally designated sites (terrestrial and marine) such as SSSI, RAMSAR and SPAs • Loss of priority species (such as the Sandwich Tern) using protected habitats • New drainage systems resulting in physical loss of habitats as well as possibility of increased sediment loading in waterways 	<ul style="list-style-type: none"> • Construction Environmental Management Plan to avoid/minimise disturbance to wildlife, to minimise habitat loss and to prevent water pollution • Habitat retention and species protection measures on the nominated site • Habitat creation on the nominated site and wider estate to maintain ecological networks: Ecological Mitigation and Management Plan / Integrated Land Management Plan
<ul style="list-style-type: none"> • During construction, risk of accidental pollution of local environment (for example, spillage of oil or other fuels) 	<ul style="list-style-type: none"> • Careful construction site planning and management. • Regular monitoring of suite condition during construction. • Emergency spill response plans in place
<ul style="list-style-type: none"> • Coastal defences could have an adverse impact especially if these are required at the nominated site 	<ul style="list-style-type: none"> • Avoid the effects of coastal squeeze where possible. • Require environmentally sensitive designs for all coastal defence structures and marine landing facilities. • Soft engineering, managed realignment and foreshore recharge should be considered as possible flood defence techniques.
<ul style="list-style-type: none"> • Harm to migratory fish (cSAC) from cooling water abstraction 	<ul style="list-style-type: none"> • Ensure fish protection in cooling water intake system design
<ul style="list-style-type: none"> • Groundwater abstraction may affect water supply to valuable areas (Heysham Moss SSSI) 	<ul style="list-style-type: none"> • Require studies to ensure that local groundwater bodies are investigated and suitable design is adopted to avoid or mitigate potential impacts on sensitive habitats/species

Potential Strategic Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
<ul style="list-style-type: none"> • Discharge of heated water, routine discharge of radioactive liquids leading to bioaccumulation of these toxins • Routine releases of radioactive discharges, abstraction of water and discharges of heated water could impact on nationally and internationally designated sites as well as non-designated aquatic systems. 	<ul style="list-style-type: none"> • Use of modern techniques to minimise routine radioactive discharges • Monitoring programme to identify and manage effects on priority species and habitats, as well as wider area
Climate Change	
<p>Adverse Effects:</p> <ul style="list-style-type: none"> • Potential short term increases in 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"> • 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"> • Possible detrimental effect on the ability of other industries/projects to source labour 	<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"> • Pressure on basic services from likely large scale in-migration of construction workers 	<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 (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear 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 new population of workers in construction phase will help support existing services and create some new ones • Potential for property values to increase within vicinity of nominated site, based on previous studies 	
<p>Communities: Supporting Infrastructure</p>	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Potential for disruption to local and regional transport routes, including M6 motorway, A589 and A683. • Potential for adverse impacts from both radioactive waste and upgraded grid connectivity. 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Transport Management Plans and Green Travel Plans to minimise effects • Physical improvements to road network • Good potential for use of existing port and rail transport infrastructure to reduce pressure on road network
<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 storage and management

Potential Strategic Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
Human Health and Well-Being	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Possibility of local and regional health risks from authorised discharges 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Adherence to the UK’s strict regulatory framework, to restrict both routine discharges from nuclear power stations and direct radiation exposures to workers and the general public, should reduce potential health impacts to acceptable levels and ensure that radiation doses are well within internationally agreed limits.
<ul style="list-style-type: none"> • Possibility of local and regional health risks from accidental discharges 	<ul style="list-style-type: none"> • Adherence to the Nuclear Installations Inspectorate (NII)’s regulatory regime for the safe operation of nuclear power stations, including the Nuclear Site licensing Safety Assessment Principles and the continual monitoring by NII of safety risks throughout the lifetime of the station.
<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 	

Potential Strategic Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
Cultural Heritage	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • A prehistoric artefact has been discovered within the existing facility • An unknown archaeological (buried) resource is potentially present, which could be detrimentally affected by the decommissioning processes, as excavation will be required 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Further detailed investigations may be required prior to construction, with a watching brief • Application of principles of good design in accordance with PPS1
Landscape	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Potential for long-term adverse landscape character and visual impacts during operation on the surrounding area, including distant viewpoints within the National Park to the north and two areas of Outstanding Natural Beauty 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Some landscape mitigation and enhancement may be possible at a local level. Opportunities to further the objectives of the Landscape Strategy for Lancashire 2002 and the emerging Area Action Plan for Heysham 2008 • It may be possible to mitigate through appropriate landscaping/planting schemes • Some potential for visual impact mitigation through detailed design, including application of principles of good design in accordance with PPS1. This is, however, limited given the building scale
Soils, Geology and Land Use	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Construction combined with new infrastructure could lead to the direct loss of soil structure 	<p>Mitigation Possibilities:</p> <ul style="list-style-type: none"> • Limitation of the footprint of the development, reducing the area of soils affected

Potential Strategic Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
<ul style="list-style-type: none"> • Further loss of coastal habitat or changes to soil structure may have significant impacts on natural coastal processes • This may include impacts on soils, which maintain terrestrial habitats, including designated nature conservation sites; Lune Estuary and Morecambe Bay SSSI, Morecambe Bay SPA, SAC and RAMSAR 	<ul style="list-style-type: none"> • Avoidance of any soils within designated sites of ecological importance
Water Quality and Resources	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Effects of potential new flood defence works on fluvial and coastal processes, hydrodynamics and sediment transport, and any indirect effects on internationally designated habitats • Potential negative effects of works to provide and discharge cooling water on coastal processes, 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 • Sediment transport modelling • Suitable design, which may include use of SUDS • Selection of appropriate construction methods • Appropriate management of the defences
<ul style="list-style-type: none"> • Thermal impact of cooling water discharges (if this mode of cooling were to be adopted). This effect is of local and regional significance 	<ul style="list-style-type: none"> • Further investigation required • Modelling impact of thermal plume on shellfisheries • Thermal discharges will need to be permitted by the EA. The discharge quality will need to comply with existing standards or meet the no deterioration standard

Potential Strategic Significant Effects (adverse and beneficial effects)	Suggested Mitigation for Adverse Effects and Recommendations for the revised draft Nuclear NPS and IPC
<ul style="list-style-type: none"> • Increased demand for water during construction stage and potentially during operation phase. Magnitude and duration dependent on source of cooling waters and timing of activities at the existing and other nominated nuclear sites • Similar comments apply to wastewater production 	<ul style="list-style-type: none"> • Further investigations required • Studies to ensure that capacity of water and wastewater infrastructure in WRZ is sufficient
<ul style="list-style-type: none"> • Potential impacts of accidental discharges or construction disturbance could cause deterioration in quality and flow of local groundwater bodies 	<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 impact on groundwater bodies
Flood Risk	
<p>Adverse effects:</p> <ul style="list-style-type: none"> • Main effects are through the continued management and improvement of existing defences which may affect coastal processes 	<p>Mitigation possibilities:</p> <ul style="list-style-type: none"> • It may be possible to mitigate these effects by suitable design and selection of appropriate construction methods and also appropriate management of the defences • Mitigation should be designed with due consideration of modelling results and further research and will need to be viewed in the wider context of revisions to the SMP for the area.

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 of Energy and Climate Change
Defra	Department for the Environment, Food and Rural Affairs
EA	Environment Agency
EfW	Energy from Waste
EIA	Environmental Impact Assessment
EMF	Electromagnetic fields
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
LBAP	Lancashire Biodiversity Action Plan
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
NWCCAP	North West Regional Development Agency
NWRDA	North West Regional Development Agency
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
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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