

BERR

Department for Business
Enterprise & Regulatory Reform

**TOWARDS A NUCLEAR NATIONAL
POLICY STATEMENT**

Applying the proposed
Strategic Siting Assessment
Criteria: a study of the potential
environmental and
sustainability effects

JULY 2008

the 1990s, the number of people with a mental health problem has increased in the UK, and the number of people with a mental health problem who are in contact with mental health services has also increased (Mental Health Act 1983, 1990, 1994, 1997, 2003, 2007, 2010, 2013, 2017, 2020).

There is a growing awareness of the need to improve the lives of people with a mental health problem, and to reduce the stigma and discrimination that they experience. This has led to a focus on the development of self-help resources, which can help people to manage their condition and improve their quality of life. Self-help resources can be used in a variety of ways, and can be tailored to meet the needs of individual people.

Self-help resources can be used to help people to understand their condition, to learn about the symptoms and signs of their condition, and to learn how to manage their condition. Self-help resources can also be used to help people to develop coping strategies, to improve their self-esteem, and to build a support network. Self-help resources can be used in a variety of ways, and can be tailored to meet the needs of individual people.

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This environmental study has been prepared with expert input from specialist planning and environmental consultancy Hyder Consulting (UK) Limited.

0 NON-TECHNICAL SUMMARY

A Introduction

- 0.1. This is a non-technical summary of a study into the environmental and sustainability effects of constructing new nuclear power stations on sites which will be identified through the application of the proposed Strategic Siting Assessment (SSA) criteria. The title of this document is 'Towards a Nuclear National Policy Statement - Applying the proposed Strategic Assessment criteria: a study of the potential environmental and sustainability effects'. For ease of reference, this is referred to as 'the environmental study' or 'the study' throughout the document.
- 0.2. The Government is currently consulting on the Strategic Siting Assessment process and criteria¹. The SSA is a process for identifying and assessing sites which are strategically suitable for the deployment of new nuclear power stations by the end of 2025. As part of the SSA, the Government proposes to invite third parties to nominate sites which they think are suitable for the construction of new nuclear power stations. The Government will then assess those sites against a set of siting criteria ('the Proposed SSA criteria') and will produce a list of sites which it considers to be strategically suitable for the deployment of new nuclear power stations by the end of 2025. That list will be a key part of the proposed National Policy Statement for Nuclear Power ('the Nuclear NPS') which the Government intends to produce under the new planning regime to be established under the Planning Bill; the Government will consult on the Nuclear NPS next year.
- 0.3. **As part of the consultation on the SSA process, the Government is specifically seeking views on the proposed SSA criteria. This study assesses the environmental and sustainability impacts of siting new nuclear power stations on sites identified through the application of the proposed SSA criteria. It has been produced during the process of developing the criteria. It is being published alongside the SSA consultation to provide respondents to the SSA consultation with further information about the environmental and sustainability impacts applying to the proposed SSA criteria. We are also seeking views on this study itself. Copies of the SSA consultation document are available at the Department for Business, Enterprise and Regulatory Reform website.**

¹ <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

- 0.4. The Government is conducting a Strategic Environmental Assessment ('SEA') in relation to the Nuclear NPS. SEA is a process for identifying and assessing the environmental effects of proposed plans or programmes and ensuring that a consideration of those effects is taken into account in the development of the plan or programme. This study is an important step in the development of that SEA.
- 0.5. This section of the document is a non-technical summary of the study. It sets out the following:
- The purpose and key conclusion of this environmental study
 - The background to the environmental study
 - A description of the assessment methodology
 - A summary of the main findings
 - An examination of other issues covered in this environmental study
 - An explanation of next steps and consultation question

B Purpose and key conclusion of this environmental study

- 0.6. As part of the consultation on the SSA, we are consulting on the proposed SSA criteria which will be used for assessing the suitability of sites nominated through the SSA process. This environmental study has been produced alongside the development of the proposed SSA criteria. It assesses the environmental and sustainability effects of siting potential new nuclear power stations in accordance with the proposed criteria during the stages of construction, operation and decommissioning (throughout this document, we sometimes refer to these for short-hand: 'as the effects or impacts of the proposed SSA criteria'). This study also considers broader sustainability issues in relation to the criteria. The study is being published alongside the SSA consultation to provide consultees with information about the environmental and sustainability impacts of the proposed SSA criteria which consultees may wish to consider in forming their responses to the SSA consultation. This study summarises and describes the key elements of the SSA process and sets out the proposed SSA criteria. The SSA consultation describes the process and criteria in greater detail.
- 0.7. This non-technical summary provides an overview of the assessments undertaken for the purposes of the study and a summary of the main findings. It is only intended to be a summary of the study. This summary

and the full study are being published alongside the SSA consultation.²

Key conclusion of the environmental study

- 0.8. This study finds that while factors (including the discretionary nature of some of the criteria), mean that adverse impacts cannot be wholly ruled out, using the proposed SSA criteria to identify suitable sites for new nuclear power stations is likely to lead to outcomes which are, on balance, broadly in line with the principles of sustainability and environmental protection. In particular, some of the criteria seek to provide direct protection to people by influencing those aspects of siting which affect safety. Other criteria seek to protect sensitive habitats, such as those areas which are designated for environmental protection at a national or international level.
- 0.9. The findings are set out in greater detail in the main study itself. In particular, Section 2 sets out an assessment of the alternative and additional proposals we considered, and an assessment of the alternative classifications of the criteria. Sections 3-10 set out a detailed assessment of the criteria in relation a range of environmental and sustainability issues. The key findings are summarised in section E of this non-technical summary.

C Background to the environmental study

The White Paper on Nuclear Power

- 0.10. The 2008 White Paper on Nuclear Power³ states the Government's belief that new nuclear power stations should have a role to play in this country's future energy mix alongside other low-carbon sources; that it would be in the public interest to allow energy companies the option of investing in new nuclear power stations; and that the Government should take active steps to facilitate this.
- 0.11. These facilitative steps include:
 - Improving the planning system for major electricity generating stations in England and Wales, including nuclear power stations, by

² BERR Towards a Nuclear National Policy Statement *A Consultation on the Strategic Siting Assessment Process and Siting Criteria for New Nuclear Power Stations in the UK* July 2008
<http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

³ BERR *Meeting the Energy Challenge: A White Paper on Nuclear Power* January 2008
<http://www.berr.gov.uk/files/file43006.pdf>

ensuring it sets a framework for development consents that gives weight to policy and regulatory issues that have already been subject to debate and consultation at a national level, and does not reopen these issues in relation to individual applications.

- Running a SSA process to develop criteria for determining the suitability of sites for new nuclear power stations that would enable the planning process to focus on the applications it receives rather than on whether there are other more suitable sites for development.
- In conjunction with the SSA, considering the likely environmental effects in accordance with the SEA Directive.⁴ This would limit the need to consider such high-level environmental impacts of nuclear power stations during the planning process.

0.12. The Planning Bill 2007, currently before Parliament, is intended to improve the planning system for nationally significant infrastructure proposals in England and Wales. It would establish an independent Infrastructure Planning Commission (IPC) to take decisions on applications for development consent in accordance with relevant National Policy Statements (NPS). The Government would designate NPSs following appraisal of sustainability, public consultation and Parliamentary scrutiny to establish the national case for infrastructure development and set the primary policy framework for IPC decisions.

Proposed Nuclear NPS, Strategic Environmental Assessment and this study

0.13. The Government proposes to produce a National Policy Statement for Nuclear Power (“the Nuclear NPS”). The SSA is part of the process for developing that Nuclear NPS. In particular, the list of sites which have been assessed through the SSA process and which are considered to be strategically suitable for new nuclear power stations will be a key component of the Nuclear NPS. We plan to consult on the draft list of sites as part of the consultation on the draft Nuclear NPS in 2009.

0.14. The Government is conducting a Strategic Environmental Assessment (“SEA”) in relation to the proposed Nuclear NPS which will incorporate an appraisal of sustainability which would be required by the Planning Bill. This study is an important step in the development of that SEA.

⁴ Directive 2001/42/EC of the European Parliament and of the Council “on the assessment of the effects of certain plans and programmes on the environment”, transposed by the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004 no 1633)

- 0.15. The Government consulted on the scope of the proposed SEA earlier this year.⁵ As part of that Scoping Report consultation, we proposed to publish two Environmental Reports in relation to the Nuclear NPS: a First Environmental Report alongside the SSA consultation and a Second Environmental Report at the time of consulting on the draft Nuclear NPS in 2009. The consultation stated that the First Environmental Report would be issued alongside the consultation on the proposed SSA criteria and would document the consideration of the alternatives considered as well as an assessment of the draft SSA Exclusionary and Discretionary Criteria. The consultation also explained that a Second Environmental Report would be issued alongside a final draft of the NPS which would document the assessment of all relevant elements of the NPS including the nominated sites.
- 0.16. This study sets out an assessment of the potential environmental and sustainability effects of building new nuclear power stations on sites that have been screened through the use of the proposed SSA criteria. It also considers alternative criteria and alternative ways of applying the criteria. It does not assess the impacts of the proposed Nuclear NPS as a whole since the Nuclear NPS is still at an early stage in its development and we do not now think it would be possible to undertake a meaningful assessment of the impacts of applying the Nuclear NPS at this time and to set this out in a First Environmental Report.
- 0.17. We refer to this study as an “environmental study” rather than a “First Environmental Report” to make clear that it is not intended to assess the Nuclear NPS as a whole, but rather focuses on the proposed SSA criteria. We expect to produce an Environmental Report for the Nuclear NPS next year as work on the NPS progresses. We also expect to publish that Environmental Report alongside the consultation on the draft Nuclear NPS. That Environmental Report will continue our assessment of the high-level impacts of siting new nuclear power stations in accordance with the proposed SSA criteria. The assessment study reported in this document, and any comments received on it in the course of the consultation on the proposed SSA criteria, will thus be an important step in the development of the Environmental Report to be published alongside the draft National Policy Statement on nuclear power.
- 0.18. This assessment study constitutes the Government’s formal response to

⁵ BERR (March 2008) Consultation on Strategic Environmental Assessment Scoping Report for Proposed National Policy Statement for New Nuclear Power
<http://www.berr.gov.uk/files/file45240.pdf>

the Scoping Report consultation. A summary of the responses to the Scoping Report consultation and the Government's response to these is at Annex C. The responses are reproduced in full on the BERR website.⁶

Geographical Scope of the SSA and the SEA

0.19. This study assesses impacts throughout the UK. This is to ensure that the environmental and sustainability impacts of the proposed SSA criteria are properly assessed. However, it is important to note that the applicability of the SSA in Scotland and Northern Ireland will be limited. In particular, not all of the siting criteria will be expressed as applying to Scotland and Northern Ireland. Tables 0-1 and 0-2 set out which criteria are applicable to the whole of the UK and which apply only in England and Wales. The process for nominating sites will not extend to Scotland and Northern Ireland as the legal power to consent to the construction of power stations in excess of 50MW capacity has been executivevely devolved to Scottish Ministers and is also devolved in Northern Ireland.

The Proposed SSA process and criteria

0.20. The purpose of the SSA is to identify those sites which are strategically suitable for deployment of new nuclear power stations by the end of 2025. The list of sites identified through the SSA will be included in an NPS for nuclear power to be published under the new planning regime (to be established under the Planning Bill). The process will comprise four key stages:

Stage 0

- Views on the SEA Scoping Report sought from statutory SEA consultation bodies and other bodies with a role in regulating nuclear facilities (completed).

Stage 1

- The Government will consult on the SSA process and on the exclusionary and discretionary criteria for assessing the suitability of sites.⁷

Stage 2

- The Government will publish the final SSA criteria.

⁶<http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

⁷ This is the purpose of the SSA consultation and the current document.

- The Government will invite third parties to nominate sites.
- The Government will assess nominated sites against the exclusionary and discretionary criteria.

Stage 3

- The Government will consult on a draft list of sites, as part of a consultation on a draft Nuclear NPS.
- The Government will publish the final list of suitable sites as part of the Nuclear NPS.

0.21. The Government has currently reached Stage 1 in the process above and is consulting on the proposed SSA process and SSA criteria. Two types of criteria for assessing sites as part of the SSA are proposed: exclusionary and discretionary criteria.

0.22. Exclusionary criteria are those criteria that for safety, regulatory or other reasons will categorically exclude a site from further consideration in the SSA, as being a strategically suitable site for a new nuclear power station.

0.23. Discretionary criteria are those criteria that the Government considers, for various reasons, could, either singly or in combination, make a site unsuitable for a new nuclear power station, but which need to be considered in order to come to a conclusion as to the site's strategic suitability. These criteria will address issues such as flood risk, proximity to protected sites or suitable cooling. The Government will assess these issues at a strategic level through the SSA.

0.24. In addition to the above exclusionary and discretionary criteria, a number of local criteria have been identified which cannot be appropriately assessed at a strategic level, largely due to the need for detailed site-specific investigations and data. The Nuclear NPS will highlight these issues as important factors for the IPC as 'Flags for local consideration'.

0.25. Table 0-1 presents the proposed SSA criteria and Table 0-2 presents the list of issues which we believe should be flagged for local consideration. The numbering of the SSA criteria as set out in Table 0-1 is referred to throughout the study. Further details can be found in the SSA consultation document.⁸

⁸ BERR (July 2008) *A Consultation on the Strategic Siting Assessment Process and Siting Criteria for New Nuclear Power Stations in the UK* <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

Table 0-1 Proposed criteria for the Strategic Siting Assessment

Criteria related to nuclear safety		Status	Geographic Scope
1.1	Seismic risk (vibratory ground motion)	Exclusionary	UK
1.2	Capable faulting	Exclusionary	UK
1.4	Flooding	Discretionary	UK
1.5	Tsunami, storm surge and coastal processes	Discretionary	UK
1.7	Proximity to hazardous industrial facilities and operations	Discretionary	UK
1.8	Proximity to civil aircraft movements	Discretionary	UK
1.10	Demographics	Exclusionary	UK
1.12	Proximity to military activities	Exclusionary and Discretionary	UK
Criteria related to environmental protection			
2.1	Internationally designated sites of ecological importance	Discretionary	England and Wales only
2.2	Nationally designated sites of ecological importance	Discretionary	England and Wales only
Criteria related to societal issues			
3.1	Areas of amenity, cultural heritage and landscape value	Discretionary	England and Wales only
Criteria related to operational requirements			
4.1	Size of site to accommodate construction, operation and decommissioning	Discretionary	UK
4.2	Access to suitable sources of cooling	Discretionary	UK

Table 0-2 Proposed local criteria for the Strategic Siting Assessment

Issues related to nuclear safety		Status	
1.3	Non-seismic ground conditions	Flag for local consideration	UK
1.6	Meteorological conditions	Flag for local consideration	UK
1.8	Proximity to civil aircraft movements	Flag for local consideration	UK
1.9	Proximity to mining, drilling and other underground operations	Flag for local consideration	UK
1.11	Emergency planning	Flag for local consideration	UK
Societal issues			
3.2	Significant infrastructure / resources	Flag for local consideration	England and Wales only
Issues related to operational requirements			
4.3	Access to transmission infrastructure	Flag for local consideration	UK

D Description of assessment methodology

Approach

0.26. The SEA is an iterative process which includes assessing policy proposals against a series of environmental topics and objectives (the SEA objectives which are described below). If likely significant⁹ adverse effects are identified then recommendations for improvements to avoid, limit or offset these effects (mitigation measures) are then incorporated where appropriate through refinements to the proposals. Where opportunities for enhancing the benefits of proposals are identified, then further recommendations for refinement can also be made. This process has been undertaken throughout the environmental study which assesses the proposed SSA criteria. The ongoing assessment of the proposed SSA

⁹ Significant effects are not trivial or inconsequential effects. Only those effects deemed as significant have been identified in this report. Annex 2 of the SEA Directive presents criteria for determining the likely significance of effects.

criteria has therefore been an integral part of their development. The results of this assessment are presented in this study.

Topics covered in the study

0.27. This study assesses the effects of the proposed SSA criteria in a number of specific topics (listed below). In conducting the assessment we have used “strategic environmental assessment (SEA) objectives” as a means of identifying and assessing environmental impacts on those topics. Those objectives are described further below.

0.28. The SEA Directive requires coverage of the likely significant effects of a plan or programme on the environmental topics listed below:

- biodiversity
- population
- human health
- flora
- fauna
- soil
- water
- air
- climatic factors
- material assets
- cultural heritage including architectural and archaeological heritage
- landscape
- the interrelationship between the above factors

0.29. The Scoping Report consultation¹⁰ confirmed that it will be necessary for all of the above topics to be considered in the SEA for new nuclear power stations. Accordingly, relevant assessments will be included in the Environmental Report which will be published alongside the draft Nuclear NPS. In order to incorporate the appraisal of sustainability, the topics of population, human health and material assets will be extended to include a wide range of socio-economic factors such as employment, demographics,

¹⁰ BERR (March 2008) Consultation on Strategic Environmental Assessment Scoping Report for Proposed National Policy Statement for New Nuclear Power
<http://www.berr.gov.uk/files/file45240.pdf>

life expectancy, vulnerability to illness, locations of settlements and infrastructure, property values and access to services.

- 0.30. Although the environmental study presented in this document is not a formal Environmental Report which assesses the impacts of the entire Nuclear NPS, we believe the topics set out are relevant to the assessment of the criteria, and we have followed this structure in presenting the assessment. This is because the study is an important step in the development of the SEA for the draft Nuclear NPS. Accordingly, in this study, assessments are presented against the same SEA topic areas.

Existing Environmental Conditions

- 0.31. It is important that there should be a “baseline” against which this assessment can be set. The baseline for the purposes of this study is taken to be “current conditions”. These are summarised in Annex D and full details of baseline conditions are documented in Appendix C1 of this study. The baseline review highlighted a number of issues to be taken into account and which are reflected at the appropriate points in the assessment.
- 0.32. It is also important that existing national and international environmental protection and sustainability objectives are considered. Appendix B of this study documents a review of the relevant national and international plans and strategies including the environmental protection and sustainability objectives within them and suggests how they should be considered when preparing this environmental study and the SSA.

The SEA Objectives

- 0.33. While not specifically required by the Directive, SEA objectives are a recognised way of considering the environmental effects of a plan or programme and comparing the effects of alternatives. In particular, they provide a mechanism for assessing environmental impacts in relation to the SEA topics referred to above. The study is an important step in the development of the SEA for the Nuclear NPS and we have therefore decided to use SEA objectives for the purposes of the assessment of the SSA criteria. Accordingly, SEA objectives have been developed in relation to each of the SEA topics. The SSA criteria have been assessed against those SEA objectives. This has been done by identifying to what extent the SEA objectives can be met through applying the suite of SSA criteria. Those objectives have been developed and consulted on as part of the Scoping Report consultation for the Nuclear NPS. The SEA objectives themselves were drawn up in accordance with Government guidance in

relation to SEAs. The SEA objectives set out aspirational outcomes, in terms of environmental and sustainability impacts on a number of areas related to the environment or to sustainability. In Sections 3-10 of the main part of this study, an assessment is made, for each of the SEA objectives, of the likely outcomes of constructing new nuclear power stations on sites identified through the application of the proposed SSA criteria. A detailed description of the assessment methodology is at Annex E of this study.

0.34. Twenty-five SEA objectives relevant to the construction of new nuclear power stations have been developed. These are set out in Table 0-3 and have been used for the assessment in this study. Sections 3-9 of the main part of this study assess the impact of constructing new nuclear power stations on sites identified through the application of the proposed SSA criteria, on the achievement of each of these 25 objectives. This set of objectives was based on the following:

- The Scoping Report consultation;
- A review of existing national and international environmental protection objectives, strategies and plans; and
- Identification of specific key features of the UK environment which could be affected.

0.35. The SEA objectives were consulted on through the SEA Scoping Report consultation.¹¹ The version set out in Table 0-3 reflects comments received from Statutory Consultees during that consultation. These SEA objectives are clearly aspirational. They do however include the aspiration to avoid, or to mitigate, such impacts, where feasible at a strategic level and where appropriate in the context of the specific objectives of the plan or programme itself. Each SEA objective is supported by a series of guide questions. The guide questions are intended to provide more direction and focus to the SEA objectives as the latter are more high-level. The guide questions have been used to assist the overall assessment process and have helped to ensure that all the necessary impacts have been addressed.

0.36. The SEA objectives used in this assessment study may change as work on the SEA for the Nuclear NPS progresses.

¹¹ BERR (March 2008) Consultation on Strategic Environmental Assessment Scoping Report for Proposed National Policy Statement for New Nuclear Power
<http://www.berr.gov.uk/files/file45240.pdf>

Table 0-3 The aspirational SEA objectives selected for use in the context of siting new nuclear power stations

SEA objective number	The SEA objective
1.	To avoid adverse impacts on the integrity of wildlife sites of international and national importance
2.	To avoid adverse impacts on valuable ecological networks and ecosystem functionality
3.	To avoid adverse impacts on Priority Habitats and Species including European Protected Species
4.	To create employment opportunities
5.	To encourage the development of sustainable communities
6.	To avoid adverse impacts on physical health
7.	To avoid adverse impacts on mental health
8.	To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure
9.	To avoid disruption to basic services and infrastructure
10.	To avoid adverse impacts on property and land values and to avoid planning blight
11.	To avoid the loss of access and recreational opportunities, their quality and user convenience
12.	To avoid adverse impacts upon air quality
13.	To minimise greenhouse gas emissions
14.	To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible
15.	To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology)
16.	To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives
17.	To avoid adverse impacts on the supply of water resources
18.	To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives
19.	To avoid damage to geological resources

Table 0-3 The aspirational SEA objectives selected for use in the context of siting new nuclear power stations	
SEA objective number	The SEA objective
20.	To avoid the use of greenfield land and encourage the re-use of brownfield sites
21.	To avoid the contamination of soils and adverse impacts on soil functions
22.	To avoid adverse impacts on the internationally and nationally important features of the historic environment
23.	To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes
24.	To avoid adverse impacts on nationally important landscapes
25.	To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness

Challenges Encountered During This Study

0.37. This study has focused upon the assessment of the SSA criteria and of the extent to which they enable the SEA objectives to be achieved. At this stage we do not know where new nuclear power stations will be developed and do not know specific site design details or operational characteristics. Consequently, the assessment has been high-level and uncertainty in the assessment has been acknowledged. A further level of assessment detail will be possible once sites have been nominated. This more detailed, yet still strategic, assessment will be reported in the Environmental Report.

E Summary of main findings

0.38. We are reporting the main findings of the study in two different ways in this non-technical summary.

0.39. Firstly, a summary of the environmental and sustainability assessment, in each of the SEA objective areas, of the effect of constructing new nuclear power stations on sites identified through the application of the draft SSA criteria. These findings are taken from summaries at the beginning of each of the detailed assessments, set out in Sections 3-10 of this study. We have summarised the effects of the collective set of SSA criteria against the SEA objectives, and we have grouped the SEA objectives where possible under nine SEA topic headings. This is called “Assessment of the collective SSA criteria against the SEA objectives”.

- 0.40. Secondly, we have summarised the effects of the SSA criteria individually. This is intended to give an indication of the likely impacts on the environmental and sustainability aspects of each criterion in turn. This is called “Assessment of the effects of the individual SSA criteria”.
- 0.41. It is important to note that throughout the assessment of the SSA criteria, measures to mitigate, offset, avoid or minimise adverse effects have been proposed. This has taken the form of suggested amendments to the criteria wording, proposals to remove or add new criteria, and the identification of the types of mitigation measures that should be considered once further details of individual new nuclear power station sites are available when sites have been nominated. The process of identifying mitigation and considering what measures may be appropriate has been ongoing throughout the environmental study and this is documented within the main report.
- 0.42. To assist in interpreting this study, the box below sets out a high level summary of the impacts of building nuclear power stations on sites identified through the application of the proposed criteria. There is a more detailed description of the findings later in this Non-Technical Summary, and is the main body of the study.

Box 1 – Summary of environmental and sustainability assessment

Assessment of the collective SSA criteria against the SEA objectives

The environmental study uses SEA objectives assembled in 12 topic areas as its basis for assessment. It sets out the extent to which the application of the proposed suite of SSA criteria contributes to the achievement of the aspirational SEA objectives and topics. This non-technical summary of the environmental study also identifies the potential environmental and sustainability impacts of applying each of the SSA criteria in turn. For convenience, some of the most closely related topic areas have been grouped together here.

Effects on Biodiversity, Flora and Fauna - The discretionary criteria relating to nationally and internationally designated sites of ecological importance contribute to the protection of Biodiversity, Flora and Fauna within these designated sites. However, the discretionary nature of the criteria means that adverse impacts cannot be ruled out. The protection of valuable ecological networks, Priority Habitats and Species including European Protected Species, which lie outside these sites, are not specifically considered in the criteria.

Effects on Population and Human Health - The SSA process, by facilitating the development of new nuclear power stations, is likely to lead to the creation of employment opportunities and may offer indirect benefits to communities. The SSA criteria also give specific consideration to those aspects of nuclear safety which can be influenced by national-level siting decisions. This includes reducing accident risk as a result of external hazards and an established approach to identifying safe distances between new nuclear power stations and existing populations. This helps to avoid risks to human health.

Effects on Material Assets - Criteria relating to safety issues are found to provide an indirect contribution to the protection of material assets by reducing the potential accident risk. However, SSA criterion 3.2 which relates to significant resources and infrastructure, and specifically the need to protect sites and structures such as transport links, gas and electricity networks and water sources is classed as being for local consideration only. The environmental study therefore notes that the SSA will not influence the potential impact upon important national infrastructure. Discretionary criteria also work towards avoiding impacts upon important recreational and amenity assets. The SSA criteria do not directly address the issues of planning blight and property values.

Effects on Air and Climate - By seeking to limit the risk of nuclear accidents, SSA criteria relating to nuclear safety indirectly contribute to the achievement of SEA objectives related to air quality – specifically radioactive emissions to air. In addition, the SSA process, by facilitating the development of new nuclear power stations, will make a contribution to the UK's ability to meet its commitments to the reduction of carbon emissions. However, the study also finds that the development of new nuclear power stations may have adverse impacts on air quality particularly arising from dusts and increased vehicle activity during the construction phase. Vehicle activity would also result in greenhouse gas emissions. The SSA criteria do not address these issues. The criteria also seek to avoid flood risk at new nuclear power stations and reduce risk of the new development causing increased flood risk in neighbouring areas. The relevant criteria to flooding are discretionary.

Effects on Water - The environmental study finds that the SSA criteria have little impact on the ability to achieve SEA objectives related to water other than through the reduction of accident risk, flood risk or where sensitive water features coincide with nationally and internationally designated nature conservation sites. In particular, the proposed criteria do not seek to address issues associated with radioactive discharges to the water environment. The water environment includes surface, coastal and groundwater, water supply and geomorphology. The criteria also require that new nuclear power stations have access to a suitable supply of cooling – this may result in adverse environmental effects as a result of, for example, abstraction and warm discharges, so it is important that effects on the water environment are considered as early as possible in the process. Dependent on the choice of cooling technology, there are potential adverse environmental and visual

impacts related to the abstraction and discharge of cooling water and the construction of large cooling towers.

Effects on Soils and Geology - The SSA criterion relating to nationally designated areas of ecological importance contributes to the protection of soils and geology where those features are designated for protection at a national level (for example as a SSSI). These resources may also be afforded some protection indirectly by the criteria relating to reducing accident risk. However, the SSA criteria do not directly assess all aspects of the soil and geological resource and the study concludes that there could be a risk of contamination and potential adverse effects on soil functions, particularly during the construction phase. The criteria do not specify a preference for brownfield or greenfield land to be used.

Effects on Cultural Heritage including Architectural and Archaeological Heritage - A specific SSA criterion (criterion 3.1 covering areas of amenity, cultural heritage and landscape value) seeks to avoid adverse impacts on areas of amenity, cultural heritage and landscape value and therefore directly contributes to the achievement of this SEA objective. However, the discretionary nature of this criterion means that adverse impacts cannot be wholly ruled out and the focus is on nationally designated features only.

Effects on Landscape - A specific SSA criterion (criterion 3.1 covering areas of amenity, cultural heritage and landscape value) seeks to avoid adverse impacts on areas of amenity, cultural heritage and landscape value and therefore directly contributes to the achievement of this SEA objective. However, the discretionary nature of this criterion means that adverse impacts cannot be wholly ruled out.

Assessment of the effects of the individual SSA criterion:

Criterion 1.1 – Seismic risk (Exclusionary) - Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to Human health. By reducing safety risks through the siting process, this criterion also works indirectly towards avoiding risks to other features of the built and natural environment.

Criterion 1.2 – Capable faulting (Exclusionary) - Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to Human health. Through reducing safety risks through the siting process, this criterion also works indirectly towards avoiding risks to other features of the built and natural environment.

Criterion 1.4 – Flooding (Discretionary) - Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to Human health. This criterion also requires Government and nominators to consider the off-site impacts of flooding which may be caused by a development. Indirectly it works towards protecting other features of the natural and built environment. However, the discretionary nature of

the criterion means that potential adverse impacts cannot be completely ruled out.

Criterion 1.5 – Tsunami, storm surge and coastal processes (Discretionary) -

Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to human health. By reducing safety risks through the siting process, this criterion also works indirectly towards avoiding risks to other features of the built and natural environment. However, the discretionary nature of the criterion means that potential adverse impacts cannot be completely ruled out.

Criterion 1.7 – Proximity to hazardous industrial facilities (Discretionary) -

Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to human health. However, the discretionary nature of the criterion means that potential adverse impacts cannot be completely ruled out. By reducing safety risks through the siting process, this criterion also works indirectly towards avoiding risks to other features of the built and natural environment.

Criterion 1.8 – Proximity to civil aircraft movements (Discretionary and Local) -

Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to human health. However, the discretionary nature of the criterion means that potential adverse impacts cannot be completely ruled out. This criterion also provides some protection against the disruption to airport operations which may result from the development of new nuclear power stations. By reducing safety risks through the siting process, this criterion also works indirectly towards avoiding risks to other features of the built and natural environment.

Criterion 1.10 – Demographics (Exclusionary) - Contributes directly to the reduction of risks to the public relating to nuclear accidents and is therefore consistent with SEA objectives relating to human health.

Criterion 1.12 – Proximity to military activities (Exclusionary and Discretionary) -

Contributes directly to the reduction of safety risks and is therefore consistent with SEA objectives relating to human health. However, the discretionary nature of certain aspects of this criterion means that potential adverse impacts cannot be completely ruled out. This criterion also provides protection against the disruption to military activities which may result from the development of new nuclear power stations. By reducing safety risks through the siting process, this criterion also works indirectly towards avoiding risks to other features of the built and natural environment.

Criterion 2.1 – Internationally designated sites of ecological importance

(Discretionary) - Contributes directly to the protection of sensitive habitats and should therefore lead to more informed judgements about the siting of nuclear power stations in relation to these sites. However, habitats and species which are not covered by international designations are not considered in this criterion and there may therefore be a

potential for adverse environmental impacts with respect to these habitats and species. In addition, the discretionary nature of the criterion means that wider potential adverse impacts cannot be completely ruled out.

Criterion 2.2. – Nationally designated sites of ecological importance (Discretionary)

- Contributes directly to the protection of sensitive habitats and should therefore lead to more informed judgements about the siting of nuclear power stations in relation to these sites. However, habitats and species which are not covered by national-level designations are not considered in this criterion and there may therefore be a potential for adverse environmental impacts with respect to these habitats and species. In addition, the discretionary nature of the criterion means that potential wider adverse impacts cannot be completely ruled out.

Criterion 3.1 – Areas of amenity, cultural heritage and landscape value.

(Discretionary) - Contributes directly to the protection of areas of amenity value and should therefore lead to more informed judgements about the siting of nuclear power stations in relation to these sites, which have a direct bearing on SEA objectives relating to amenity, landscape, and cultural heritage. However, the discretionary nature of the criterion means that potential adverse impacts cannot be completely ruled out.

Criterion 4.1 – Size of site (Discretionary) - The study finds that there are no significant potential environmental impacts associated with this criterion.

Criterion 4.2 – Cooling (Discretionary) - This criterion requires that suitable access to cooling technologies is available. This may involve abstractions or discharges to water features or the creation of cooling towers, both of which may result in adverse environmental effects. However, the criterion does not, in its own right, seek to reduce the environmental impacts of developments. Rather, it relies on criteria relating to the protection of environmentally sensitive sites to influence these aspects of nuclear power station siting.

Criterion 1.3 – Non seismic ground conditions (Local) - The study finds that there are no significant potential environmental impacts associated with this criterion at the strategic level as it is for local consideration only.

Criterion 1.6 – Meteorological (Local) - The study finds that there are no significant potential environmental impacts associated with this criterion at the strategic level as it is for local consideration only.

Criterion 1.9 – Proximity to mining, drilling and other underground operations (Local) - The study finds that there are no significant potential environmental impacts associated with this criterion at the strategic level as it is for local consideration only.

Criterion 1.11 – Emergency planning (Local) - This criterion directly relates to SEA objectives related to human health. However, the fact that this issue is classed as “flag for local consideration” means that it will not be used by the SSA to influence the siting of nuclear stations. Rather, this issue is expected to be addressed by regulators as part of a nuclear site licence application.

Criterion 3.2 – Significant infrastructure / resources (Local) - This relates to significant resources and infrastructure and specifically the need to protect sites and structures such as transport links, gas and electricity networks and water sources. It is classed as being for local consideration only and is therefore not considered to directly contribute to the achievement of the SEA objectives.

Criterion 4.3 – Access to transmission infrastructure – (Local) - The SSA classes this issue as being for local consideration. This means that the potential environmental, landscape and cultural heritage impacts of developing new electricity transmission lines will not be considered at a national level by the SSA. There could therefore be a potential for some adverse environmental impacts.

It should also be noted that the development of a number of new nuclear power stations may result in cumulative environmental effects which may not be significant for each site but may become significant when assessed as a whole. These issues will be discussed further in the Environmental Report which we propose to be issued alongside the draft NPS.

The sections below provide a more detailed summary of the assessment of the impacts of the SSA criteria. The full assessment is set out in the main body of the Study.

Assessment of the collective SSA criteria against the SEA objectives

Effects of SSA criteria on Biodiversity, Flora and Fauna (SEA objectives 1-3, Section 3 of this study)

0.43. This section considers how the SSA criteria will impact on those SEA objectives which cover Biodiversity, Flora and Fauna. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:

1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance.
2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality.
3. To avoid adverse impacts on Priority Habitats and Species

including European Protected Species.

- 0.44. The SSA criteria seek to avoid, minimise or mitigate adverse impacts (whether direct or indirect) on national and international sites that have been designated as being important for nature conservation. However, the SSA criterion covering internationally designated sites (criterion 2.1) is a discretionary criterion only and so there remains a risk that adverse effects on these nature conservation sites could occur. It is not possible to predict at this stage whether any effects will be significant. In order to ensure they are properly taken into account, the Government has carried out a Habitats Regulations Assessment to assess whether the proposed SSA Criteria (as part of the development of the Nuclear NPS) could have significant impacts on those nature conservation areas protected under the Habitats Directive for the purpose of deciding whether it is necessary to conduct an Appropriate Assessment under the Habitats Directive. The Habitats Regulations Assessment will be updated once sites have been nominated through the SSA process. Depending on the outcome of the updated Assessment, an Appropriate Assessment may need to be carried out in accordance with the Habitats Directive to assess the impacts on sites protected under the Directive. Further information is set out in Annex B of this study and in the accompanying Habitats Regulations Assessment report.¹² For these reasons, this environmental study has also found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objective 1.
- 0.45. Sites that have been designated as having national or international ecological importance (addressed in SSA criteria 2.1 and 2.2) will usually contain a high proportion of locally important ecological networks and protected habitats and species. However, the SSA criteria do not, specifically seek to minimise adverse impacts on valuable ecological networks, ecosystem functionality and priority habitats and species, at the local level as the criteria only relate to sites with national or international designations. For these reasons, this environmental study has found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objectives 2 and 3.

Effects of SSA criteria on Population and Human Health (SEA objectives 4-7, Section 4 of this study)

- 0.46. This section considers how the SSA criteria will impact on those SEA

¹² BERR, July 2008, Towards a Nuclear National Policy Statement – Habitats Regulations Assessment Screening Report 08/928

objectives which cover population and human health. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:

4. To create employment opportunities.
5. To encourage the development of sustainable communities.
6. To avoid adverse impacts on physical health.
7. To avoid adverse impacts on mental health.

- 0.47. The SSA process is one of the Government's facilitative actions, which will reduce regulatory and planning risks associated with investing in new nuclear power stations. If private sector operators ultimately decide to invest in new nuclear power stations, this could potentially lead to a wide range of new job opportunities in the nuclear sector. Therefore, the process of conducting the SSA is likely to have major positive effects on the ability to achieve SEA objective 4. This is likely to be the case in all phases of a nuclear power station's life, although it is expected that fewer jobs will be provided once a power station ceases to operate and decommissioning has begun.
- 0.48. Many of the SSA criteria will impact on the ability to encourage the development of sustainable communities (SEA objective 5). The relevant criteria are those addressing nuclear safety (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12); those addressing environmental protection (criteria 2.1 and 2.2); and those addressing societal issues (criteria 3.1 and 3.2). Following assessment, this environmental study has found that because of their discretionary nature, the SSA criteria could have both positive and negative effects on the ability to achieve SEA objective 5. The benefits outlined above in terms of creating employment opportunities as a result of the Government's facilitative actions are also relevant to SEA Objective 5.
- 0.49. The SSA criteria seek to avoid, minimise or mitigate adverse impacts on nuclear safety, environmental protection and societal issues. For this reason, the SSA criteria will have a positive effect on the ability to meet SEA objectives 6 and 7. However, there is still a risk that adverse health effects may occur as a result of new nuclear power stations which are not directly linked to the siting process. We are confident that the UK has an effective regulatory framework that will ensure that risks to health are minimised and managed by industry consistent with 'as low as reasonably practicable' (ALARP) principles.

Effects of SSA criteria on Material Assets (SEA objectives 8-11, Section 5 of this study)

- 0.50. This section considers how the SSA criteria will impact on those SEA objectives which cover Material Assets. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
8. To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure.
 9. To avoid disruption to basic services and infrastructure.
 10. To avoid adverse impacts on property and land values and to avoid planning blight.
 11. To avoid the loss of access and recreational opportunities, their quality and user convenience.
- 0.51. Many of the SSA criteria will impact on the ability to achieve SEA objectives 8 and 9. The criteria addressing nuclear safety (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) would provide some benefits to infrastructure and services by reducing the risk of accidents. Following assessment, this environmental study has found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objectives 8 and 9. There is a criterion relating to significant infrastructure and resources (criterion 3.2) although, given that this criterion is for local consideration only, it would not have an impact on the achievement of SEA objectives at a strategic level.
- 0.52. The environmental study has concluded that the likelihood of new nuclear power stations causing negative effects on strategic infrastructure could be reduced by making criterion 3.2 discretionary, rather than leaving it for local consideration, and thus giving it prominence at a strategic level. The Government's reasons for not adopting this approach are set out in Chapter 2 of the SSA consultation.
- 0.53. The SSA criteria do not directly address the issues of planning blight and property values. As the location of new nuclear power stations could have an impact on these issues, the environmental study has not been able to draw firm conclusions at this stage on the impact of the SSA criteria on the ability to achieve SEA objective 10. However, the Planning Bill requires the IPC to give consideration to issues such as planning blight.

- 0.54. The SSA criteria seek to avoid, minimise or mitigate adverse impacts on societal issues, including areas of amenity, cultural heritage and landscape value (criterion 3.1). For this reason, we expect that the SSA criteria will have positive effects on the ability to achieve SEA objective 11. However, since criterion 3.1 is a discretionary criterion only, there is a risk of possible negative effects.

Effects of SSA criteria on Air and Climate (SEA Objectives 12-14, Section 6 of this study)

- 0.55. This section considers how the proposed SSA criteria will impact on those SEA objectives which cover air and climate. It considers whether the use of the proposed SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
- 12. To avoid adverse impacts upon air quality.
 - 13. To minimise greenhouse gas emissions.
 - 14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible.
- 0.56. The environmental study has found that the construction of new nuclear power stations could have a negative effect on air quality affecting distances up to 100 km from the site. This is because the construction of new nuclear power stations would be likely to cause dust to be generated, as well as increased vehicle emissions. This would be relevant to SEA objective 12. The SSA criteria do not seek specifically to address these impacts. During the other phases of the power station's life, the environmental study found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objective 12. It should be noted that those SSA criteria that seek to reduce the risk of accidents (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) will help to reduce the likelihood of unplanned gaseous radioactive emissions and will therefore have positive air quality impacts.
- 0.57. The environmental study found that the increase in transport movements that would result from new nuclear power stations could have adverse impacts on the air quality of the local area. These effects could be managed through the careful siting of the power stations in relation to key materials sources and also through the use of alternatives to road transport where practicable. This issue is not addressed through the proposed SSA criteria.
- 0.58. The SSA process is one of the Government's facilitative actions, which will

reduce regulatory and planning risks associated with investing in new nuclear power stations. If private sector operators ultimately decide to invest in new nuclear power stations, there would be a positive impact on the ability to reduce local CO₂ emissions from the energy sector and thus to achieve SEA objective 13.

- 0.59. The proposed SSA criteria seek to avoid or mitigate flood risk at the sites of new nuclear power stations (criteria 1.4 and 1.5). For this reason, the environmental study has found that the proposed SSA criteria will have positive effects on the ability to achieve SEA objective 14. However, these criteria are discretionary only and the environmental study has noted that the SSA could place a greater emphasis upon the need for holistic approaches to flood risk issues. Whilst the criteria relating to flooding and coastal processes are discretionary, they do require nominators of sites to give consideration to the potential off-site impacts of their flood protection proposals.

Effects of SSA criteria on Water (SEA objectives 15-18, Section 7 of this study)

- 0.60. This section considers how the SSA criteria will impact on those SEA objectives which cover water. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
- 15. To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology).
 - 16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives.
 - 17. To avoid adverse impacts upon the supply of water resources.
 - 18. To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives.
- 0.61. The environmental study found that the SSA criteria have little impact on the ability to achieve the SEA objectives relating to water or the coastal environment. Those criteria that seek to minimise the risk of accidents (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) and the minimisation of flood risk (criteria 1.4 and 1.5) could have some indirect positive impact. Some background text has been included in the SSA consultation document which identifies that the protection of surface water

quality, hydrology and hydrogeology¹³ should be important considerations when developing new nuclear power stations and that developers should take appropriate measures to avoid, minimise or mitigate adverse effects on these resources. However, due to the lack of specific criteria addressing this issue, the environmental study has found that the SSA criteria could have some negative effects on addressing water quality, water supply and groundwater.

- 0.62. Criterion 4.2 requires nominators of sites to identify the likely cooling technology for each site. Whilst the application of this criterion, in itself, will not contribute to achieving SEA objectives 15-18, it will facilitate further consideration of the potential water-related impacts of power station development during the development of the Environmental Report on the Nuclear NPS.

Effects of SSA criteria on Soils and Geology (objectives 19-21, Section 8 of this study)

- 0.63. This section considers how the proposed SSA criteria will impact on those SEA objectives which cover soils and geology. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
- 19. To avoid damage to geological resources.
 - 20. To avoid the use of Greenfield land and encourage the re-use of brownfield sites.
 - 21. To avoid the contamination of soils and adverse impacts on soil functions.
- 0.64. The SSA criteria provide some degree of protection to geological resources through criterion 2.2, regarding nationally designated sites of ecological importance. A number of other criteria, including those which aim to reduce accident and flood risk (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) could have an indirect positive impact on the ability to achieve the SEA objectives on soils and geology. However, the SSA criteria do not directly assess all aspects of the soil and geological resource and there would continue to be a potential risk of soil contamination, particularly during the construction of new nuclear power stations.
- 0.65. The environmental study also reports that since the SSA criteria do not

¹³ Hydrogeology considers the occurrence, distribution and quality of groundwater.

directly encourage the use of brownfield rather than greenfield sites for the construction of new nuclear power stations, the consequential potential to build on greenfield sites could, as a result of development, have an adverse impact on soil resources. The extraction of mineral resources could also be compromised in the future depending upon where the sites are located. For this reason, the environmental study has found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objectives 19-21.

Effects of SSA criteria on Cultural Heritage (SEA objectives 22-23, Section 9 of this study)

- 0.66. This section considers how the SSA criteria will impact on those SEA objectives which cover cultural heritage. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
- 22. To avoid adverse impacts on the internationally and nationally important features of the historic environment.
 - 23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes.
- 0.67. SSA criterion 3.1 seeks to avoid, minimise or mitigate negative impacts on areas of amenity, cultural heritage and landscape value and would thus have a positive impact on the ability to achieve SEA objective 22. The environmental study has noted that, since this is a discretionary criterion only, the risk of adverse effects remains.
- 0.68. SSA criterion 3.1 should also help to avoid, minimise or mitigate adverse effects on the setting and quality of built heritage and archaeology and historic landscapes. It thus should have a positive impact on the ability to achieve SEA objective 23. A number of other criteria, including those which aim to minimise accident and flood risk (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) could have an indirect positive impact on the ability to achieve the SEA objectives in respect of cultural heritage. However, the SSA criteria do not directly address the issue of local level resources that contribute to the overall quality of the UK's cultural heritage. For these reasons, the environmental study has found that the SSA criteria could have both positive and negative effects on the ability achieve SEA objective 23.
- 0.69. The findings of the environmental study could lead to the conclusion that it would be beneficial for a local level criterion to be developed that identified

the importance of protecting the wider cultural heritage resource and historic landscapes. The Government's reason for not adopting this approach (in the proposed SSA criteria set out for consultation) is set out in Section 2 of the SSA consultation document.

Effects of SSA criteria on Landscape (SEA objectives 24-25, Section 10 of this study)

- 0.70. This section considers how the proposed SSA criteria will impact on those SEA objectives which cover landscape. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
- 24. To avoid adverse impacts on nationally important landscapes.
 - 25. To avoid adverse impacts on landscape character, quality and tranquility, diversity and distinctiveness.
- 0.71. SSA criterion 3.1 specifically seeks to minimise impacts upon areas of amenity and landscape value and would thus have a positive impact on the ability to achieve SEA objective 24. The development of new nuclear power stations would be likely to require the construction of new transmission infrastructure, which could have a negative impact on the SEA objectives related to landscape. There is an SSA criterion which addresses transmission infrastructure (criterion 4.3), although it is identified for local consideration. Whilst an NPS for Electricity Networks is being developed to consider the transmission lines that will be needed for new generation capacity, the effects of the transmission infrastructure will not be known when decisions are made about which sites to include in the Nuclear NPS. For this reason, the environmental study has concluded that some risk of negative effects could still exist. The implementation of cooling technologies, for example the use of cooling towers, could also have adverse landscape effects. Criterion 4.2 regarding cooling technologies states that operators should identify suitable countermeasures to avoid, minimise or mitigate the potential impacts of cooling.
- 0.72. SSA criterion 3.1 establishes that those nominating sites for inclusion in the Nuclear NPS need to consider the effects upon local landscape character, quality and tranquil areas. It would thus have a positive impact on the ability to achieve SEA objective 25. However, due to the potential for changes to the electricity network to have adverse effects on the ability to achieve this SEA objective (as outlined above), the SSA criteria could also have a negative impact in this area.

Assessment of the effects of the individual SSA criteria

- 0.73. The proposed SSA criteria set out below are numbered in the order in which they appear in Tables 0-1 and 0-2. The assessments have been derived from the assessments of the criteria as a whole and are included here to assist in interpreting the key findings of the study.

Criterion 1.1 Seismic Risk (vibratory ground motion) - Exclusionary

- 0.74. The seismic risk criterion seeks to limit the potential risk to new nuclear power stations as a result of seismic activity (earthquakes). Seismic risk is a key consideration in maintaining the safety of the UK's nuclear facilities. Whilst human health is the principal driver of safety regulation, this criterion could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives, e.g. the criterion reduces the likelihood of unplanned releases of radioactive materials which could indirectly have adverse effects on different components of the natural and human environment. These components include: biodiversity (including protected habitats and species, valuable ecological networks and designated nature conservation sites); air quality; water resources; soils and soil functions; the historic environment (including designated sites and the wider heritage resource); the functionality of basic services and transport infrastructure; and human health (including the development of sustainable communities). However, the effects of this criterion are likely to only be significant when considered cumulatively with other measures to reduce accident risk. Separate siting criteria have been developed specifically to consider certain aspects of the wider environment.
- 0.75. Further information about the potential environmental effects of applying this criterion is set out in Chapters 3-10 and Appendix D. In particular, Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk; and Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment.

Criterion 1.2 Capable Faulting - Exclusionary

- 0.76. Similar to seismic risk, the capable faulting criterion seeks to limit the potential risk to new nuclear power stations as a result of geological faulting. Capable faulting is a key consideration in maintaining the safety of the UK's nuclear facilities. Whilst human health is the principal driver of safety regulation, this criterion could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives.

- 0.77. For example, the criterion contributes to reducing the risk of accidents and hence could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives in the same way as described above for criterion 1.1 on seismic risk.
- 0.78. Further information about the potential environmental effects of applying this criterion is set out in Chapters 3-9 and Appendix D. In particular, Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk, and Sections 3 and 5-9 explains the indirect linkage between this criterion and the wider environment.

Criterion 1.4 Flooding – Discretionary

- 0.79. The flooding criterion seeks to consider the risk of flooding from two perspectives. Firstly, the possible threats to the safety of siting in an area exposed to flood risk, and secondly, the wider impacts of flood protection countermeasures on areas surrounding potential new nuclear power station sites.
- 0.80. The criterion works specifically towards reducing the risk of flooding as a result of developing new power stations. This has direct benefits for human health and the maintenance of sustainable communities, through avoidance of increased flood risk to: people and property, basic infrastructure, services (including the transport network), recreational and amenity land. It would also contribute to avoiding flood risk to other features of the wider environment such as the historic environment, landscape, water quality and soils.
- 0.81. The criterion also contributes to reducing the risk of accidents. It could hence make a minor, indirect contribution to the achievement of some of the wider natural and human environmental objectives in the same way as described above for criterion 1.1 on seismic risk. Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk and Sections 3 and 5-9 explains the indirect linkage between this criterion and the wider environment.
- 0.82. This criterion is discretionary and, therefore, effects of flooding in the context of each new nuclear power station would be dealt with on a case-by-case basis. Adverse effects can therefore not be completely ruled out at this stage and detailed design and mitigation proposals would need to be considered by the IPC before consents are granted.
- 0.83. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10. In particular Sections 3 and 5-10 detail how this criterion would affect the different components of the natural

and human environment in the context of the other criteria.

Criterion 1.5 Tsunami, storm surge and coastal processes – Discretionary

- 0.84. This criterion seeks to limit the potential risk to new nuclear power stations as a result of tsunami, storm surge and coastal erosive processes over a timeframe of at least 100 years taking into account the effects of climate change. These processes are a key consideration in maintaining the safety of the UK's nuclear stations.
- 0.85. The criterion works specifically towards reducing the risk of tsunami, storm surge and the impacts of coastal erosion on new nuclear power stations and towards avoiding the risk of increased coastal flooding elsewhere as a result of developing new nuclear power stations. This has direct benefits for human health and the maintenance of sustainable communities through avoidance of increased risk to people and property and features such as basic infrastructure and services, the transport network and recreational and amenity land. It would also contribute to avoiding coastal flooding of other features of the wider environment such as the historic environment, landscape, water quality and soils. Reference is made in the SSA to the cross-Government programme: Making Space for Water (MSW), which covers a range of topics including coastal erosion in England and the criterion states that nominators should take into account the potential wider impacts of coastal protection measures on areas surrounding nuclear power station sites.
- 0.86. The criterion contributes to reducing the risk of accidents and hence could also make a minor, indirect contribution to the achievement of some of the wider natural and human environmental objectives in the same way as described above for criterion 1.1 on seismic risk. Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk. Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment.
- 0.87. This criterion is discretionary and, therefore, the effects from each new nuclear power station would be dealt with on a case-by-case basis. Adverse effects can therefore not be completely ruled out at this stage and detailed design and mitigation proposals would need to be considered by the IPC before consents are granted.
- 0.88. The study considered the possibility of using criteria 1.4 and 1.5 to place greater emphasis on the need for holistic approaches to flood risk issues. The reasons for not adopting this approach are explained in Table 2.1 in chapter 2.

- 0.89. Further information about the potential environmental effects of applying this criterion is set out in Section 10. In particular, Sections 3 and 5-10 detail how this criterion would affect the different components of the natural and human environment in the context of the other criteria.

Criterion 1.7 Proximity to hazardous industrial facilities and operations – Discretionary

- 0.90. This criterion seeks to limit the potential risk to new nuclear power stations as a result of locating them in the proximity of other hazardous industrial facilities and operations. The safety regulation of nuclear power stations requires that the risks posed by external hazards are minimised, and these considerations extend beyond natural hazard issues to man-made external hazards to the power plant safety.
- 0.91. Human health is the principal driver of safety regulation, but this criterion could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives in the same way as described above for criterion 1.1 on seismic risk by reducing the risk of accidents.
- 0.92. This criterion is discretionary and, therefore, the effects from each new nuclear power station would be dealt with on a case-by-case basis depending upon the locations and nature of other hazardous industrial facilities and operations. This is consistent with the relevant safety regulation guiding development near to such facilities.
- 0.93. Further information about the potential environmental effects of applying this criterion is set out in Chapters 3-9 and Appendix D. In particular paragraphs 4.28 and 4.34 explain how the criterion seeks to protect human health through the reduction of accident risk and paragraphs 3.37, 5.23, 6.22, 7.33, 8.24 and 9.26 explain the indirect linkage between this criterion and the wider environment.

Criterion 1.10 Demographics - Exclusionary

- 0.94. Public safety is paramount when locating new nuclear power stations. This criterion provides guidelines based upon established research and provides further protection over and above the stringent regulatory requirements imposed on nuclear operators to prevent accidents. This is supported by the exclusionary nature of the criterion.
- 0.95. The primary benefit of this criterion relates to the avoidance of risk to human health as a result of an accident and seeks to ensure that the level of risk posed by new nuclear power stations is acceptably low.
- 0.96. Further information about the potential environmental effects of applying

this criterion is set out in Chapters 3-10 and Appendix D. In particular, Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk and Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment.

Criterion 1.12 Proximity to military activities – Exclusionary and Discretionary

- 0.97. This criterion seeks to minimise the risk of accidents occurring as a result of military activities and also reduces the risk of disruption to the regular operations of the armed forces. The minimisation of accident risk is a key consideration in maintaining the safety of the UK's nuclear power stations and, whilst human health is the principal driver of safety regulation, this criterion could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives.
- 0.98. For example, the criterion contributes to reducing the risk of accidents and hence could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives in the same way as described above for criterion 1.1 on seismic risk.
- 0.99. This criterion is both exclusionary and discretionary with the exclusionary criterion applying to low-flying Tactical Training Areas or Aerodrome Safeguarding Plan areas around military aerodromes and discretion being allowed via consultation with the Ministry of Defence where no such plans exist as a reference point.
- 0.100. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. In particular, Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk and Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment.

Criterion 2.1 Internationally designated sites of ecological importance – Discretionary

- 0.101. This criterion seeks to limit the risk of potential adverse effects of new nuclear power stations on internationally designated sites of ecological importance including Ramsar Sites, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), potential SPAs, candidate SACs, draft SACs and possible SACs. The inclusion of this criterion within the SSA should lead to more informed judgements about the siting of new nuclear power stations in relation to these sites, thereby helping to reduce the likelihood of adverse effects. This is explained further in paragraph 3.33. It may also contribute to maintaining valuable ecological networks and

protected habitats and species within internationally designated sites.

- 0.102. This criterion could also provide indirect benefits to areas of landscape and amenity value as internationally designated sites may be areas of landscape and recreational importance (refer to paragraph 10.26 and Appendix D). The integrity of internationally designated sites may be directly linked to the water environment and so there could be indirect benefits for surface and groundwater quality if effects on internationally designated sites are minimised. This criterion, in conjunction with other environmental, safety and societal SSA criteria should work towards minimising adverse effects on the natural environment which is a factor that contributes to the establishment and maintenance of a sustainable community which is explored in paragraphs 4.33 to 4.36 and in Appendix D.
- 0.103. This criterion is discretionary and, therefore, effects on each site would be dealt with on a case-by-case basis. Adverse effects can therefore not be completely ruled out at this stage. As discussed in paragraph 3.34 a Habitats Regulations Assessment (HRA) has been undertaken and this has identified that whilst the criterion is designed to minimise impacts on internationally designated sites, as it is a discretionary criterion only, the risk of adverse effects occurring cannot be ruled out. Further HRAs may also be required as appropriate once sites have been nominated and before sites are granted consent.

Criterion 2.2 Nationally designated sites of ecological importance – Discretionary

- 0.104. This criterion seeks to limit potential adverse effects of new nuclear power stations on nationally designated sites of ecological importance. The inclusion of this criterion in the SSA should lead to more informed judgements about the siting of new nuclear power stations in relation to these sites, thereby helping to reduce the likelihood of adverse effects.
- 0.105. This criterion could also provide benefits to areas of landscape and amenity value as nationally designated sites may be areas of landscape and recreational importance (refer to paragraph 10.26 and Appendix D). The integrity of nationally designated sites may be directly linked to the quality of the water environment and so there could be indirect benefits for surface and groundwater quality if effects on nationally designated sites are minimised. Paragraph 7.31 explains how the criterion could provide some protection to Shellfish Waters which are designated for their importance for commercial fishing and paragraph 8.20 explains how nationally important sites for earth science interest may also benefit. This criterion, in conjunction with other environmental, safety and societal SSA criteria

should work towards minimising adverse effects on the natural environment. This is a factor that contributes to the establishment and maintenance of a sustainable community, and is explored in paragraphs 4.33 to 4.36 and in Appendix D.

- 0.106. This criterion is discretionary only, and, therefore adverse effects on nationally designated sites cannot be ruled out and so there remains a risk of negative environmental effects. The criterion is also focussed solely upon designated sites and does not offer protection to the wider biodiversity resource including wildlife corridors and connectivity, Protected Habitats and Species that also lie outside these designated sites.

Criterion 3.1 Areas of amenity, cultural heritage and landscape value – Discretionary

- 0.107. The criterion seeks to limit the risk of adverse effects on sites of amenity, cultural heritage and landscape value, for example National Parks and Scheduled Monuments. The inclusion of this criterion in the SSA should lead to more informed judgements about the siting of new nuclear power stations in relation to these sites, thereby helping to reduce the likelihood of adverse effects. These potential benefits are explained further in Sections 5, 9 and 10.
- 0.108. This criterion is discretionary only and so effects would be dealt with on a case by case basis and so the risk of adverse effects on areas of amenity, landscape and heritage value cannot be ruled out.
- 0.109. The criterion, by seeking to reduce the likelihood of adverse effects on areas of amenity and recreational value, could have indirect benefits for physical health, as these are areas where individuals might participate in physical exercise and maintain healthy lifestyles. The study also suggested the addition of explanatory text supporting criterion 3.1 highlighting the need to consider effects on landscape resources when thinking about the potential upgrades to the electricity transmission infrastructure. The SSA considered that this was too specific to individual projects to be included in the SSA and is more appropriately addressed through the Transmission Networks NPS.

Criterion 4.1 Size of site to accommodate construction, operation and decommissioning – Discretionary

- 0.110. This criterion addresses the need for nominators to confirm that the sites proposed are large enough to meet the land requirements during construction, operation and decommissioning

0.111. There are no significant environmental strengths or weaknesses identified for this criterion.

Criterion 4.2 Access to suitable sources of cooling – Discretionary

0.112. This criterion requests that site nominators provide information about the cooling technologies feasible for the site. The use of water for cooling new nuclear power stations could have adverse hydrological and geomorphological effects which could have indirect effects for biodiversity resources, for example Protected Habitats and Species and potentially water supply if aquifers are affected. Sections 3 and 7 explain these potential linkages and effects. There could also be adverse landscape and visual effects generated by the use of cooling towers and any associated steam clouds created

0.113. The criterion does not address these issues specifically, although it indicates that sites may be ruled out on a discretionary basis unless nominators can identify suitable mitigation measures for adverse effects that could occur. However, the potential for negative effects cannot be ruled out. The study suggested using this criterion to seek to avoid adverse impacts on the water environment which may result from the abstraction or discharge of cooling water. The reasons for not adopting this approach are explained in Table 2-1 in chapter 2.

0.114. Whilst it could have been beneficial for the criterion to be more explicit in the need for environmental effects of cooling technologies to be considered by nominators, the criteria will be applied as a suite, rather than individually and there are other criteria providing protection and guidance in relation to some environmental attributes and sites that could be affected by cooling technologies.

Criterion 1.3 Non-seismic ground conditions – Flag for local consideration

0.115. This criterion highlights the varied geology and earth surface processes in the UK that can create some particular non-seismic hazards. The SSA considers that this issue is most appropriately addressed once sites for new nuclear power stations have been identified and specific reactor designs for those sites selected. For this reason, the criterion is identified for local consideration and so would not be used in the SSA but rather by the Infrastructure Planning Commission (IPC) when making decisions about individual sites.

0.116. The principal driver for this criterion is safety regulation, although it could have minor, indirect environmental benefits locally. Further information about the potential environmental effects of applying this criterion is set out

in Sections 3-10 and Appendix D. In particular, Sections 4 explains how this criterion could benefit human health and population and Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment. However, any such minor, incidental benefits would not be realised at a strategic level.

Criterion 1.6 Meteorological conditions – Flag for local consideration

- 0.117. This criterion highlights the extreme meteorological conditions which could pose a threat to the safety of a new nuclear power station. The SSA considers that it is not practicable to distinguish meaningfully between different areas of the UK on the ground of meteorological risk and for this reason, it is not proposed that this criterion is used to inform decisions about which sites to include in the NPS. It will, therefore, only be used by the IPC in the context of a specific planning application to build at a site included on the list in the Nuclear NPS.
- 0.118. The principal driver for this criterion is safety regulation, although it could have minor, indirect environmental benefits locally. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. In particular, Section 4 explains how this criterion could benefit human health and population and Sections 3 and 5-19 explain the indirect linkage between this criterion and the wider environment. However, any such minor, incidental benefits would only be realised at the local level.

Criterion 1.8 Proximity to civil aircraft movements – Discretionary and Flag for local consideration

- 0.119. This criterion seeks to limit the potential risk to nuclear facilities as a result of locating in proximity to civil aircraft movements. This is a key consideration in maintaining the safety of the UK's nuclear facilities and, whilst human health is the principal driver of safety regulation, this criterion could also make a minor, indirect contribution to the achievement of some of the wider environmental objectives as described above for criterion 1.1 on seismic risk.
- 0.120. The criterion also serves to limit the potential impact of the siting of new nuclear power stations on the operations of airports and makes a positive contribution towards SEA objective 8 which seeks to avoid adverse impacts on the function and efficiency of the strategic transport infrastructure.
- 0.121. This criterion is discretionary and, therefore, the effects from each new nuclear power station would be dealt with on a case-by-case basis depending upon the locations and nature of other hazardous industrial

facilities and operations. However, there is an element of the criterion that is only identified for local consideration relating to unlicensed aerodromes.

- 0.122. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. In particular, Section 4 explains how the criterion seeks to protect human health through the reduction of accident risk and Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment.

**Criterion 1.9 Proximity to mining, drilling and other underground operations
– Flag for local consideration**

- 0.123. This criterion highlights the risks posed by mining, drilling and other underground activities to new nuclear power stations. The SSA identifies that these risks must be fully evaluated at the local level and will not be considered at a strategic level in the SSA.
- 0.124. The principal driver for this criterion is safety regulation, although it could have minor, indirect environmental benefits locally. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. In particular, Section 4 explains how this criterion could benefit human health and population and Sections 3 and 5-9 explain the indirect linkage between this criterion and the wider environment. However, any such minor, incidental benefits would only be realised at the local level.

Criterion 1.11 Emergency planning – Flag for local consideration

- 0.125. This criterion highlights the importance of emergency planning and the need for all nuclear operators to make and implement adequate arrangements for dealing with an incident or emergency and its effects. The Government believes that at a national level, the suitability of a site to meet emergency planning obligations cannot be determined. However, a high level description should be provided of the practicality of developing appropriate emergency planning arrangements at any site nominated through the SSA process.
- 0.126. Safety is the principal driver for the development of this criterion, although it could have minor, indirect environmental benefits locally. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. Section 4 explains the potential benefits to human health and population and Sections 5-7 explain the indirect linkage between this criterion and the wider environment. However, the emergency planning proposals of nuclear operators would only be reviewed at the local level by regulators and the IPC and as such

the benefits of this criterion would only be realised at the local level.

Criterion 3.2 Significant infrastructure/resources – Flag for local consideration

- 0.127. This criterion seeks to protect infrastructure and resources from inappropriate siting of new nuclear power stations. This includes motorways, the strategic rail network, the gas transmission network, the electricity transmission network, airports and Source Protection Zones which protect the supply of drinking water.
- 0.128. This contributes directly towards the avoidance of adverse effects upon some aspects of basic infrastructure and services, the function and efficiency of elements of the strategic transport infrastructure, parts of the water supply resource and collectively the development of sustainable communities. However, the criterion is flagged for local consideration only by the IPC as it is considered that site specific details would be required in order to assess these issues robustly. Such effects would not be considered at the strategic level and therefore such issues would not be considered when choosing which sites should be listed within the Nuclear NPS. For this to be the case, the criterion would need to be made discretionary and the study concluded that this criterion should be discretionary. The Government has set out its reasons for not making this a discretionary criterion in the SSA consultation document. A further conclusion of this environmental study is that this criterion should also make reference to A-Roads (as well as motorways) and to port infrastructure. These have now been included in the relevant text in the SSA consultation document.
- 0.129. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. In particular, Sections 4, 5 and 7 explain how the criterion works towards avoiding adverse effects upon sustainable communities, basic services and infrastructure, the strategic transport infrastructure and water resources.

Criterion 4.3 Access to transmission infrastructure – Flag for local consideration

- 0.130. This criterion seeks to ensure that new nuclear power stations will have access to electricity transmission infrastructure via the National Grid. The development of new transmission lines can create environmental and planning blight issues, for example as a result of landscape and visual intrusion or direct land take. They may also require transmission network upgrades some considerable distance away from the new nuclear power station site which could result in environmental effects.

- 0.131. Further information about the potential environmental effects of applying this criterion is set out in Sections 3-10 and Appendix D. In particular, Sections 4 and 10 explain how the criterion may adversely affect biodiversity and landscape.
- 0.132. The study concluded that this criterion 4.3 could also be classified as a discretionary criterion (as opposed to “flag for local consideration”) to ensure that potential transmission routes are considered when identifying sites for new nuclear power stations. However, it was considered that it would be difficult to apply this criterion at national level because it is considered that specific details of individual power stations, along with applications to National Grid, would be required before the locations of and hence the environmental and other impacts of new transmission infrastructure could be accurately determined. A separate Electricity Networks NPS is proposed for the installation of electric lines above ground, which would consider the impacts of new electric lines for electricity generation stations such as new nuclear power stations. This would need to be considered by the IPC when granting consent to new power stations.

F Other issues covered in this environmental study

Assessment of Alternatives

- 0.133. The SEA Directive requires consideration of the significant environmental effects of a plan or programme, and of reasonable alternatives that take into account the objectives and the geographical scope of that plan or programme. The purpose of the assessment of strategic alternatives is to consider different ways of fulfilling the objectives of the plan or programme, and enable a testing of these alternatives against the SEA objectives to consider positive and negative effects, with a view to enhancing positive effects of the programme and reducing negative ones.
- 0.134. We have decided to undertake an assessment of reasonable alternatives for the purposes of this study. As this study focuses on the SSA criteria, the reasonable alternatives have been assessed in relation to the development of the set of proposed criteria which are set out in the SSA consultation document. This helps underpin Government’s choice of this particular set of draft criteria, and of the way we have chosen to implement them. In summary, the following types of alternative have been considered at this stage:
- Proposed additional criteria (see Table 2-1).
 - Alternative classifications of the draft criteria to those that we are

currently consulting upon (see Table 2-2) for example exclusionary or discretionary.

- Alternative wording of the draft criteria which has been incorporated or rejected throughout the development of the criteria (the key points of which are also identified in Table 2-1).

0.135. The details are set out in the relevant tables (identified above) in Section 2.

0.136. These assessments show how the SSA criteria have developed and taken account of environmental and sustainability considerations.

0.137. The assessment of alternative criteria has been undertaken throughout the development of the SSA rather than at defined stages. As part of this iterative process, certain alternative criteria have not been included within the set of draft criteria which we are currently consulting upon.

0.138. In summary, our conclusions are that:

- The selected set of proposed SSA criteria are broadly in line with environmental and sustainability objectives and, in particular, certain criteria seek to give direct consideration to issues of environmental and amenity importance.
- The discretionary nature of some of the criteria means that adverse environmental effects cannot be ruled out at the strategic level. However, the SSA criteria which directly relate to environmental protection are consistent with UK and European legislation.
- The strategic, national level, nature of the SSA process and criteria means that certain local level considerations and impacts are not directly addressed by the SSA. However, the SSA makes clear that these are important considerations and recognises that these would be addressed through Environmental Impact Assessments in relation to specific planning proposals.

Monitoring

0.139. The SEA Directive includes a requirement to monitor the significant environmental effects of implementing plans and programmes, in order to enable adverse environmental effects to be identified and action taken to deal with them. In this study, an outline monitoring framework for the Nuclear NPS is set out in Section 11. This will be developed in more detail in the Environmental Report once the sites have been nominated and assessed through the SEA.

0.140. In this study it is not appropriate or practical to identify detailed local level

monitoring indicators, so the focus has been upon those indicators that can be readily collated at the strategic level. It is intended to refine the indicators identified further following the site nominations process, as a better understanding will be obtained of the likely significant effects of each nominated site.

0.141. The outline monitoring framework is based around the SEA objectives and includes the following elements:

- Potentially significant effects that may be monitored.
- Potential monitoring indicators.

0.142. The final monitoring framework in the Environmental Report may also include:

- Potential environmental targets.
- Potential data sources.
- The frequency of the monitoring.

Waste

0.143. The Government considers that radioactive waste relating to new build is an important issue and the Environmental Report for the Nuclear NPS will take the relevant aspects of new build radioactive waste management into account at the strategic level.

0.144. Each of Sections 3-10 on the effects of the SSA criteria considers the potential high-level effects of waste during the operation and decommissioning stages of new nuclear power stations. We have included background information on radioactive waste management at Annex F in this study.

G Next steps and consultation question

Transboundary Consultation

0.145. The SEA Directive requires that other European Union (EU) Member States are to be consulted if the plan or programme is likely to have significant effects on the environment in their territories. The study has not identified any such effects, but these countries and others in the European Economic Area will be informed of the consultation exercise and invited to respond if they wish. Further consideration will be given to potential effects on other Member States when preparing the Environmental Report on the draft Nuclear NPS.

Consultation Question

0.146. Public consultation is being undertaken on the proposed SSA criteria. This environmental study is being made available to the public alongside the SSA criteria to enable its findings to be considered. Comments and opinions on this study are also invited. Specifically we are seeking views on the following question:

Do you agree with the findings of the study of the potential environmental and sustainability effects of applying the proposed SSA criteria? If not, what additional environmental and sustainability effects, if any, should be considered and how should these issues be reflected in the SSA criteria?

About this consultation

- 1 The Government has produced this study during the process of developing the SSA criteria and it is publishing this study alongside the consultation on the SSA criteria. As well as seeking views in response to the SSA consultation, the Government now wishes to hear the views of interested parties. The purpose is to help inform and enhance the environmental study which will then contribute to the Environmental Report for the Nuclear NPS and to inform our assessment of the SSA criteria.
- 2 In addition to the study, the following documents are available:
 - A Consultation on the SSA process and siting criteria for new nuclear power stations;¹⁴
 - Habitats Regulations Assessment Screening Report;¹⁵ and
 - Environmental study appendices.¹⁶
- 3 While the Habitats Regulations Assessment Screening Report is not subject to public consultation, the Government will consider any comments from interested parties or members of the public.

¹⁴ BERR (July 2008) *Towards the draft Nuclear National Policy Statement: Applying the draft Strategic Siting Assessment criteria: A study of the potential environmental and sustainability effects* <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

¹⁵ BERR (July 2008), *Towards the draft Nuclear National Policy Statement: Habitats Regulations Assessment*, <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

¹⁶ BERR (July 2008) *Towards the draft Nuclear National Policy Statement: Applying the draft Strategic Siting Assessment criteria: A study of the potential environmental and sustainability effects Appendices* <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

- 4 A summary of responses to the consultation on this study will be published on the BERR website. Based on the responses and evidence gathered during the consultation on the SSA process and criteria, the Government will:
- later this year publish the exclusionary and discretionary criteria to be used in the SSA and invite initial nominations for potential sites, which may be strategically suitable for new nuclear power stations; and
 - assess nominations against exclusionary and discretionary criteria and publish a list of sites strategically suitable for new nuclear power stations in a Nuclear National Policy Statement.
- 5 In addition, the Government will prepare an Environmental Report for the Nuclear NPS.

Additional points about this consultation

0.147. When responding please state whether you are responding as an individual or representing the views of an organisation. If you are responding on behalf of an organisation, please make it clear who the organisation represents and, where applicable, how you assembled the views of members.

0.148. The deadline for responses is 11 November 2008.

Confidentiality and data protection

0.149. Your response may be made public by the Government. If you do not want all or part of your response or name made public, please state this clearly in the response. Any confidentiality disclaimer that may be generated by your organisation's IT system or included as a general statement in your fax cover sheet will be taken to apply only to information in your response for which confidentiality has been specifically requested.

0.150. Information provided in response to this consultation, including personal information, may be subject to publication or disclosure in accordance with the access to information regimes. These are primarily the Freedom of Information Act 2000 (FOIA), the Data Protection Act 1998 (DPA) and the Environmental Information Regulations 2004 (EIR).

0.151. If you want other information that you provide to be treated as confidential, please be aware that, under the FOIA, there is a statutory Code of Practice with which public authorities must comply and which deals, amongst other things, with obligations of confidence.

0.152. In view of this it would be helpful if you could explain to us why you regard the information you have provided as confidential. If we receive a request

for disclosure of the information we will take full account of your explanation, but we cannot give an assurance that confidentiality can be maintained in all circumstances. An automatic confidentiality disclaimer generated by your IT system will not, of itself, be regarded as binding on the Department.

- 0.153. The Department will process your personal data in accordance with the DPA and in the majority of circumstances this will mean that your personal data will not be disclosed to third parties.

Additional copies

- 0.154. You may make copies of this document without seeking permission. An electronic version can be found at <http://www.berr.gsi.gov.uk/nuclear-whitepaper/consultations/page44523.html>

Help with queries

- 0.155. Please email SSACriteria@berr.gsi.gov.uk or call 020 7215 3331.
- 0.156. If you have comments or complaints about the way this consultation has been conducted, these should be sent to:

Vanessa Singhateh, Consultation Co-ordinator
Department for Business, Enterprise and Regulatory Reform
Better Regulation Team
1 Victoria Street
London SW1H 0ET
E-mail: vanessa.singhateh@berr.gsi.gov.uk

Tel: 020 7215 2293

Fax: 020 7215 2235

- 0.157. A copy of the consultation code of practice criteria is set out at Appendix 2 to the Strategic Siting Assessment Consultation Document.

1 INTRODUCTION

Background

- 1.1. As part of the SSA, the Government proposes to invite third parties to nominate sites which they think are suitable for the construction of new nuclear power stations. The Government will then assess those sites against a set of proposed siting criteria (“the SSA criteria”) and will produce a list of sites which it considers to be strategically suitable for the construction of new nuclear power stations. That list will be a key part of the proposed National Policy Statement for Nuclear Power (“the Nuclear NPS”) which the Government intends to produce under the new planning regime to be established under the Planning Bill, and on which the Government will consult next year.
- 1.2. The Government is conducting a Strategic Environmental Assessment (“SEA”) in relation to the Nuclear NPS. SEA is a process for identifying and assessing the environmental effects of proposed plans or programmes, and ensuring that a consideration of those effects is taken into account in the development of the plan or programme.

Purpose of the Study

- 1.3. The Government is currently consulting on the SSA process and the proposed SSA criteria. The proposed SSA criteria will be used to assess the suitability of nominated sites. This environmental study has been produced alongside the development of the SSA criteria. It assesses the environmental effects of siting potential new nuclear power stations in accordance with the proposed criteria, during the stages of construction, operation and decommissioning. Throughout this document, and as noted above, we sometimes refer to these for short-hand as the effects of the SSA criteria. The study also considers broader sustainability issues in relation to the criteria. The study is being published alongside the SSA consultation to provide consultees with information about the environmental and sustainability effects of the proposed SSA criteria. It is therefore an integral part of the SSA consultation, and provides relevant background material which consultees may wish to consider in forming their responses to the SSA consultation.
- 1.4. The Government’s White Paper on Nuclear Power, Meeting the Energy Challenge¹⁷, published in January 2008, stated that:

¹⁷ BERR (January 2008), *Meeting the Energy Challenge: a White Paper on nuclear power*, URN 08/525 <http://www.berr.gov.uk/file43006.pdf>

“The Government believes that it is in the public interest that new nuclear power stations should have a role to play in this country’s future energy mix alongside other low-carbon sources; that it would be in the public interest to allow energy companies the option of investing in new nuclear power stations; and that the Government should take active steps to open up the way to the construction of new nuclear power stations”.

- 1.5. The White Paper committed the Government to undertaking a number of facilitative actions to reduce regulatory and planning risks associated with investment in new nuclear power stations. These included:
- Improving the planning system for major electricity generating stations in England and Wales, including nuclear power stations, by ensuring that it sets a framework for development consents that gives weight to policy and regulatory issues that have already been subject to debate and consultation at a national level, and does not re-open these issues in relation to individual applications.
 - Running a Strategic Siting Assessment process (SSA) to develop criteria for determining the suitability of sites for new nuclear power stations. This would enable consideration of individual proposals to focus on issues specific to the locations concerned.
 - In conjunction with the SSA, considering the likely high-level environmental effects in accordance with the SEA Directive¹⁸. This would limit the need to consider such high-level environmental impacts of nuclear power stations during the planning process.
- 1.6. The Government’s proposals on improvements to the planning system are set out in the White Paper Planning for a Sustainable Future¹⁹ and in the SSA consultation document, and are incorporated in the Planning Bill currently being considered by Parliament. The Planning Bill would improve the planning system for nationally significant infrastructure proposals such as major electricity generating stations in England and Wales, including new nuclear power stations. It would establish an independent Infrastructure Planning Commission (IPC) to take decisions on applications for development consent in accordance with relevant National Policy Statements (NPS) except in certain circumstances, for instance where this would involve a breach of international obligations or

¹⁸ Directive 2001/42/EC of the European Parliament and of the Council “on the assessment of the effects of certain plans and programmes on the environment”, transposed by the Environmental Assessment of Plans and Programmes Regulations 2004 (SI 2004 no 1633)

¹⁹ Communities and Local Government (May 2007), Planning for a Sustainable Future: White Paper

[http://www.communities.gov.uk/publications/planningand building/planningsustainablefuture](http://www.communities.gov.uk/publications/planningand%20building/planningsustainablefuture)

domestic law. The Government would designate NPSs following an appraisal of sustainability, public consultation and Parliamentary scrutiny to establish the national case for infrastructure development and set the primary policy framework for IPC decisions.

- 1.7. In accordance with these proposals, it has been decided to produce a Nuclear NPS, and the development of SSA criteria is a critical step towards this. The Government is proposing to conduct a Strategic Environmental Assessment in relation to the proposed Nuclear NPS.
- 1.8. The Government's proposals for the SSA criteria are set out in: *A consultation on the Strategic Siting Assessment Process and Siting Criteria for New Nuclear Power Stations in the UK.*²⁰ However, it was considered desirable to carry out a full study of the potential effects of these criteria to inform their development and that of the SEA and appraisal of sustainability of the Nuclear NPS. This study has therefore been prepared to accompany the SSA consultation document and should be read in conjunction with it.
- 1.9. The Government consulted on the scope of the proposed SEA for the Nuclear NPS earlier this year. As part of that consultation, we proposed to publish two Environmental Reports in relation to the Nuclear NPS: a First Environmental Report alongside the SSA consultation and a Second Environmental Report at the time of consulting on the draft Nuclear NPS in 2009. The Scoping Consultation stated that the First Environmental Report would be issued alongside the consultation on the SSA criteria and would document the consideration of the alternatives considered as well as an assessment of the draft SSA Exclusionary and Discretionary criteria. The Scoping Report also explained that a Second Environmental Report would be issued alongside a final draft of the NPS which would document the assessment of all relevant elements of the NPS including the nominated sites.
- 1.10. This study sets out an assessment of the potential environmental and sustainability effects of building new nuclear power stations on sites that have been screened through the use of the SSA criteria. It also considers alternatives to those criteria. It does not assess the impacts of the proposed Nuclear NPS as a whole, since the Nuclear NPS is still at an early stage in its development and we do not now think it would be possible to undertake a meaningful assessment of the impacts of applying the Nuclear NPS at this time and to set this out in a First Environmental Report.
- 1.11. We refer to this study as an "environmental study" rather than a "First

²⁰ <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

Environmental Report” to make clear that it is not intended to assess the Nuclear NPS as a whole, but rather focuses on the SSA criteria. We expect to produce an Environmental Report for the Nuclear NPS next year as work on the NPS progresses. We also expect to publish that Environmental Report alongside the consultation on the draft Nuclear NPS. That Environmental Report will continue our assessment of the high level impacts of siting new nuclear power stations in accordance with the SSA criteria. This assessment study, reported in this document, and any comments received on it in the course of the consultation on the SSA criteria, will thus be an important step in the development of the Environmental Report to be published alongside the draft National Policy Statement on nuclear power.

- 1.12. This assessment study constitutes the Government’s formal response to the Scoping Report consultation. A summary of the responses to the Scoping Report consultation and the Government’s response to these is at Annex C.
- 1.13. The study reflects the results of the formal SEA scoping proposals and therefore refers throughout to SEA processes and methods, including “SEA objectives” which are used to test the effects of the criteria.
- 1.14. The Directive defines the objective of SEA as “to provide for a high level of protection of the environment and to contribute to the integration of environmental considerations into the preparation and adoption of plans and programmes, with a view to promoting sustainable development”. SEA is an iterative process of gathering information on the existing situation and trends, assessing the effects of the proposed plan or programme, developing mitigation measures, presenting the findings in a report, consulting the public, and monitoring the actual significant effects when the plan or programme is put into effect. Details of the scope of the SEA and the methodology used are provided in Annexes C to E of this environmental study.

The SSA criteria

- 1.15. The purpose of the SSA is to identify sites which are strategically suitable for deployment of new nuclear power stations by the end of 2025. The list of sites identified through the SSA will be included in an NPS for nuclear power to be published under the new planning regime (to be established under the Planning Bill).

The process will comprise four key stages:

Stage 0

- Views on the SEA Scoping Report sought from statutory SEA consultation bodies and other bodies with a role in regulating nuclear facilities (completed).

Stage 1

- The Government will consult on the SSA process and on the exclusionary and discretionary criteria for assessing the suitability of sites.²¹

Stage 2

- The Government will publish the final SSA criteria.
- The Government will invite third parties to nominate sites.
- The Government will assess nominated sites against the exclusionary and discretionary criteria.

Stage 3

- The Government will consult on a draft list of sites, as part of a consultation on a draft Nuclear NPS.
- The Government will publish the final list of suitable sites as part of the Nuclear NPS.

- 1.16. We are conducting a Strategic Environmental Assessment for the proposed Nuclear NPS which will include an assessment of the list of strategically suitable sites.
- 1.17. We have currently reached Stage 1 in the process above and we are consulting on the proposed SSA process and SSA criteria. We are proposing two types of criteria for assessing sites as part of the SSA: exclusionary and discretionary criteria.
- 1.18. Exclusionary criteria are those criteria that, for safety, regulatory, environmental or other reasons will categorically exclude a site from further consideration in the SSA as being strategically suitable site for a new nuclear power station.
- 1.19. Discretionary criteria are those criteria that the Government considers, for various reasons, could, either singly or in combination, make a site unsuitable for a new nuclear power station and which need to be considered in order to come to a conclusion as to the site's strategic suitability. These criteria will address issues such as flood risk, proximity to protected sites or suitable cooling. The Government will assess these issues at a strategic level through the SSA. It is important to note that at this stage of the SSA process, BERR will be conducting a high-level assessment that will not involve site-specific investigations or detailed site-specific data. In reaching a decision on whether to

²¹ This is the purpose of the current document.

include a site that appears to engage one or more discretionary criteria in the list in the Nuclear NPS, the following factors will be considered:

- Whether the nominator has demonstrated that there is a reasonable prospect of appropriately mitigating (wholly or in part) any potential adverse impacts in relation to the relevant discretionary criterion or criteria.
- Where a potential adverse impact or impacts cannot be appropriately mitigated, whether the potential adverse impact should prevent the site from being considered suitable at a strategic level taking account of the Government's objectives on energy policy.

- 1.20. Government does not expect to form a view as to the viability of detailed proposals for mitigation or the precise extent of any potential adverse impact. This will be a matter for the IPC to assess when it receives a specific planning application to build on a site listed in the Nuclear NPS. However, we would expect the Nuclear NPS to make clear that the IPC, when examining an application, would need to consider the mitigation measures above in more detail before making its decision in relation to the granting of development consent for a specific application to build on a site included in the list in the Nuclear NPS.
- 1.21. Government will also consider the cumulative impact of the discretionary criteria in relation to a nominated site. Where a site breaches a significant number of discretionary criteria, it may be appropriate to exclude it from the Nuclear NPS.
- 1.22. In developing the SSA criteria, Government has identified a number of issues which cannot be appropriately assessed at a strategic level, largely due to the need for detailed site-specific investigations and data. Nonetheless, the Nuclear NPS will highlight these local issues as important considerations for the IPC. The local issues in the SSA are not intended to be an exhaustive list of issues for consideration at a local level by the IPC or by the safety, security or environmental regulators.
- 1.23. Table 1-1 presents the SSA criteria and their status, i.e. whether they are exclusionary, discretionary or a local issue, and Table 1-2 presents issues which would be flagged for consideration by the IPC. Further details can be found in the SSA Consultation document²². The numbering of the SSA criteria is referred to throughout this environmental study

²² BERR (2008) The Future of Nuclear Power, The Role of Nuclear Power in a Low Carbon Economy, Consultation on the Strategic Siting Assessment for New Nuclear Power Stations in the UK

Table 1-1 Proposed Criteria for the Strategic Siting Assessment		
Criteria related to nuclear safety		Status
1.1	Seismic risk (vibratory ground motion)	Exclusionary
1.2	Capable faulting	Exclusionary
1.4	Flooding	Discretionary
1.5	Tsunami, storm surge and coastal processes	Discretionary
1.7	Proximity to hazardous industrial facilities and operations	Discretionary
1.8	Proximity to civil aircraft movements	Discretionary
1.10	Demographics	Exclusionary
1.12	Proximity to military activities	Exclusionary and Discretionary
Criteria related to environmental protection		
2.1	Internationally designated sites of ecological importance	Discretionary
2.2	Nationally designated sites of ecological importance	Discretionary
Criteria related to societal issues		
3.1	Areas of amenity, cultural heritage and landscape value	Discretionary
Criteria related to operational requirements		
4.1	Size of site to accommodate construction, operation and decommissioning	Discretionary
4.2	Access to suitable sources of cooling	Discretionary

Table 1-2 Strategic Siting Assessment Local Issues		
Issues related to nuclear safety		Status
1.3	Non-seismic ground conditions	Flag for local consideration
1.6	Meteorological conditions	Flag for local consideration
1.8	Proximity to civil aircraft movements	Flag for local consideration
1.9	Proximity to mining, drilling and other underground operations.	Flag for local consideration
1.11	Emergency planning	Flag for local consideration

Table 1-2 Strategic Siting Assessment Local Issues		
Issues related to societal issues		
3.2	Significant infrastructure / resources	Flag for local consideration
Issues related to operational requirements		
4.3	Access to transmission infrastructure	Flag for local consideration

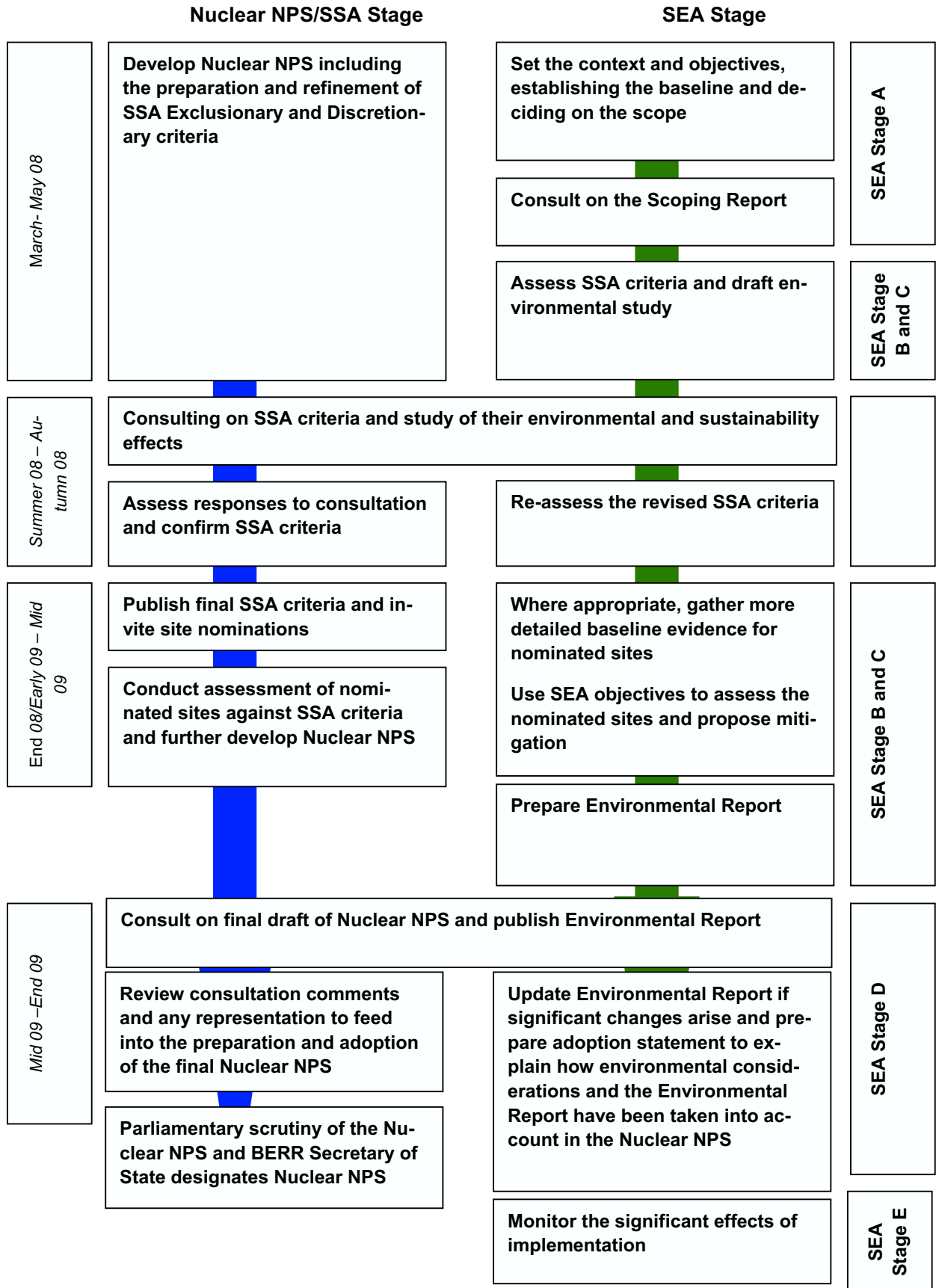
Development of the Nuclear NPS and the SEA

1.24. Explanation of Diagram 1-1:

- The SEA and the NPS/SSA processes are intended to be integrated, running in parallel to each other.
- Diagram 1-1 demonstrates how the SEA and the NPS/SSA have proceeded to date and how they will develop in the future. The approximate timescales associated with the delivery of each phase of the NPS are presented in italics in Diagram 1-1.
- The stages of the SEA process, as defined in the Practical Guide, are presented at the side of the diagram. We are currently at SEA stage B, defined in the Practical Guide as “assessing and refining alternatives and assessing effects”.

1.25. This environmental study presents the findings of this assessment to date and these findings have been presented in this document to assist the consultation on the draft SSA criteria. Further assessment, including assessment of the revised SSA criteria (following consultation), the nominated sites and other elements of the draft NPS including its strategic alternatives, will be undertaken following this consultation. The results of this assessment will be consulted upon in the Environmental Report - SEA Stage C - which is expected to be completed in mid 2009.

Diagram 1-1 Integrating the Nuclear NPS/SSA and the SEA



The Rest of this Study and Associated Documents

1.26. This Study contains:

- Sections 3-10: Environmental Effects

These sections present the potential significant effects of new nuclear power stations if they were developed on the basis of the proposed SSA criteria. Mitigation measures are suggested for significant effects identified.

- Section 3: Biodiversity, Flora and Fauna
- Section 4: Population and Human Health (these topics also comprise information for the appraisal of sustainability)
- Section 5: Material Assets (this topic also comprises information for the appraisal of sustainability)
- Section 6: Air and Climate
- Section 7: Water
- Section 8: Soils and Geology
- Section 9: Cultural Heritage
- Section 10: Landscape

- Section 11: Monitoring Framework

This section explains the purpose of monitoring in the SEA process and defines an indicative monitoring framework which should be refined and updated in the Second Environmental Report.

1.27. The Annexes to this study contain:

- Annex A: Abbreviations
- Annex B: Habitats Regulations Assessment (HRA)

This is a short background on the HRA with a link to the HRA Screening Report

- Annex C: The Response to the Consultation on the Scope of the SEA

This annex outlines the main themes of the responses to the consultation on the Scope of the SEA and the Government's response.

- Annex D: The SEA Baseline and Context

This summarises the review of the other relevant plans, programmes and environmental protection objectives, the collation of baseline data for the First Environmental Report and presents some of the key strategic problems and opportunities that have been identified as a result of these reviews.

- Annex E: The Assessment Methodology

This annex explains the purpose of SEA objectives and how they were developed, explains the assessment methodology and the limitations/main areas of uncertainty in the assessment.

- Annex F: Background information on Management and Disposal of Radioactive Waste

This Annex covers the following elements associated with the management and disposal of radioactive waste. It provides context for the assessment of the environmental impacts of creating new waste by explaining the background to waste management and UK policy. It also explains how the impacts of creating new waste will be assessed through the SEA. Finally, it explains what assessments of the impacts of waste storage, transport and disposal have been undertaken to-date.

Consultation

Consultation question

- 1.28. Public consultation is being undertaken on the proposed SSA criteria. In accordance with Article 6 of the SEA Directive and SEA Regulation 13, this environmental study is being made available to the public alongside the SSA criteria to enable its findings to be considered. Comments and opinions on this study are also invited. Specifically we are seeking views on the following question:

Do you agree with the findings of the study of the potential environmental and sustainability effects of applying the proposed SSA criteria? If not, what additional environmental and sustainability effects, if any, should be considered and how should these issues be reflected in the SSA criteria?

Responding to consultation

- 1.29. The consultation began on 22 July 2008 and the deadline for responses is 11 November 2008.

A response can be submitted by letter, fax or email to:

SSA Criteria Consultation
Nuclear Unit
Bay 129
Department for Business, Enterprise and Regulatory Reform
1 Victoria Street
London
SW1H 0ET

Tel. 020 7215 3331
Fax. 020 7215 2842
Email:SSACriteria@berr.gsi.gov.uk

General matters related to responding to Government consultations are set out in the SSA consultation document (paragraph 61 onwards)

Transboundary Consultation

- 1.30. The SEA Directive requires other European Union (EU) Member States to be consulted if the plan or programme is likely to have significant effects on the environment in their territories. The study has not identified any such effects, but

these countries and others in the European Economic Area will be informed of the consultation exercise and invited to respond if they wish. Further consideration will be given to potential effects on other Member States when preparing the environmental study.

2 ASSESSMENT OF ALTERNATIVES

Purpose of the Assessment of Alternatives

- 2.1 The SEA Directive requires consideration of the significant environmental effects of the plan or programme, and of reasonable alternatives that take into account the objectives and the geographical scope of the plan or programme. The purpose of the assessment of strategic alternatives is to consider different ways of fulfilling the objectives of the plan or programme, and enabling a testing of these alternatives against the SEA objectives to consider positive and negative effects, with a view to enhancing positive effects of the programme and reducing negative ones. Reasonable strategic alternatives will be developed and set out in the Environmental Report of the draft Nuclear NPS.
- 2.2 In the SEA Scoping Report²³, a number of strategic alternatives were identified for assessment including strategic alternatives to producing the Nuclear NPS. However, this study does not assess the impacts of the proposed Nuclear NPS as a whole, since the Nuclear NPS is still at an early stage in its development and the Government does not now think it would be possible to undertake a meaningful assessment of applying the Nuclear NPS at this time, or to assess strategic alternatives to producing the NPS. These will instead be reported in the Environmental Report.
- 2.3 As this study focuses on the SSA criteria, the reasonable alternatives at this stage have been assessed in relation to the development of these criteria to highlight how the SSA criteria have taken the environmental perspective into account. Two separate assessments are set out in this Section. The first is a consideration of early draft SSA criteria, as set out in Table 2.1, and the second assessment is on the classification of the SSA criteria as “exclusionary”, “discretionary” and “flags for local consideration”, which is set out in Table 2.2. The assessment of alternative criteria has been an ongoing and iterative process, undertaken throughout the development of the SSA rather than at defined stages. This ongoing assessment is demonstrated in Tables 2.1 and 2.2.
- 2.4 The process of developing the draft set of SSA criteria has resulted in some criteria being modified or deleted and some criteria have been added (see Diagram E-1). Some criteria have been changed from discretionary criteria to exclusionary criteria and vice versa. These represent alternatives to the criteria that will eventually be adopted in the Nuclear NPS. Furthermore, the consultation on the SSA criteria may result in further modifications to the criteria which will require further assessment through the SEA.
- 2.5 The significant environmental effects of those alternative criteria identified to date

²³ BERR (March 2008) Consultation on Strategic Environmental Assessment Scoping Report for Proposed National Policy Statement for New Nuclear Power <http://www.berr.gov.uk/files/file45240.pdf>

are identified in this study in paragraph 2.3.4. Any further modifications to the criteria that occur as a result of the consultation will be assessed and reported in the Environmental Report.

Assessment of the Early SSA criteria

- 2.6 An assessment of an early draft of the SSA criteria was undertaken to identify potential omissions from an environmental perspective in view of the SEA objectives developed and to suggest improvements for new or alternative criteria.
- 2.7 Table 2-1 presents the main results of the assessment of the early draft of the SSA criteria, the recommendations that were made regarding the SSA and how the recommendations were incorporated into the SSA criteria. It also reports those changes that have been ongoing throughout the preparation of the study, as a result of recommendations of the SEA.

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
Assessment of the Early Draft of the proposed SSA criteria		
<p>Through the assessment of the early draft of the proposed SSA criteria it was identified that there were no specific criteria relating to the protection of biodiversity resources. This was identified as an area that needed to be addressed through the SSA as the development of new nuclear power stations has the potential to significantly affect biodiversity resources including internationally and nationally designated sites.</p>	<p>The inclusion of specific criteria that seek to protect internationally and nationally designated sites would ensure greater compatibility and improved performance against the SEA objectives. This amendment would also reflect European and UK goals to ensure that adverse effects on sites including SPAs etc are avoided and mitigated as necessary.</p>	<p>On the basis of the SEA recommendations Criteria 2.1 and 2.2 were added to ensure that protection is afforded to ecological sites of international and national importance through the SSA and the NPS.</p>
<p>Through the SEA a criterion was developed that addressed the need to avoid adverse impacts on areas of landscape and heritage value, in particular nationally important sites like National Parks, AONBs and Scheduled Monuments.</p>	<p>Inclusion of a criterion protecting these areas and sites would ensure greater compatibility with the SEA objectives and would ensure that these important aspects of the environmental resource are protected.</p> <p>It is important to acknowledge the broad range of effects that can impact upon an environmental resource, for example direct, indirect, cumulative effects, to prevent a narrow interpretation being undertaken.</p>	<p>On the basis of the SEA recommendations Criterion 3.1 was added.</p>
<p>Whilst there was a criterion that identified the need to minimise significant impact on infrastructure and</p>	<p>Public water supply, A roads and ports could all be affected by the development of new nuclear power stations as well as railways, motorways, the strategic</p>	<p>On the basis of the SEA recommendations the explanatory text supporting Criterion 3.2</p>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
resources (3.2), the SEA recommended that it made specific reference to the protection of public water supply, A roads and ports as these were not referenced.	rail network, airports, gas and electricity supply networks and Source Protection Zones (SPZs) which were already cited in the criterion. Increasing the coverage of the criterion would make it more comprehensive and improve its performance against the SEA objective that addresses the need to avoid adverse impacts on basic services and infrastructure.	was strengthened.
The SEA identified the need for the development of a new criterion which encourages developers to use of brownfield rather than greenfield sites	There are a number of environmental reasons for seeking to reduce the loss of greenfield land, for example, avoiding the loss of recreational areas, reducing biodiversity losses (although it is acknowledged that many brownfield sites are highly biodiverse), avoiding a reduction in infiltration capacity and the loss of soil functions.	The use of brownfield sites in preference to greenfield sites is an important issue to be considered in taking planning decisions for all developments. However, we have not included a specific criterion related to this issue in the SSA because we believe that the identification of, and decision making in relation to, these sites is more appropriately carried out at the time of site specific planning applications.
Ongoing Feedback on the SSA throughout the Preparation of the Study		
To support criteria 2.1 and 2.2 in relation to internationally and nationally designated ecological sites, the SEA recommended that supporting text be developed that made reference to other statutory ecological	To ensure that all relevant nationally and internationally important sites are cited in the proposed SSA criteria and to ensure that nominators understand the different designations that they need to consider when nominating sites.	These amendments have been incorporated in the SSA criteria.

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
designations of national and international importance including Limestone Pavement Orders and Areas of Special Protection.		
The SEA identified that criterion 2.1 which seeks to protect internationally designated sites needed to include wording which reflected the need for HRA at the strategic level and also highlighted the importance to potential site nominators of the sites within the Natura 2000 network, in particular the need to mitigate adverse effects on such sites where it is considered that they could occur.	To ensure that all potential site nominators are aware of the rigorous procedures that will have to be followed, as required by the Habitats Directive and in determining whether significant effects could occur on sites within the Natura 2000 network.	The relevant text has been inserted in the SSA criteria.
The SEA identified the need for supporting text to be added to the SSA criteria consultation document highlighting the value of all biodiversity, flora and fauna and the need for effects upon biodiversity resources, for example valuable ecological networks, to be considered in the planning process.	To demonstrate that the valuable biodiversity resource is not just limited to areas that fall within internationally and nationally designated sites.	The relevant text has been inserted in the introductory text to the environmental SSA criteria

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
<p>The SEA identified that supporting text should be added into the SSA document, particularly criterion 1.5 to ensure that issues relating to downstream effects are identified and also the need for operators to be aware of and the need for integrated/holistic coastal zone planning.</p>	<p>The coast is a highly dynamic environment and it is important for this to be identified in the SSA criteria such that site nominators are aware of the need to consider both risks at the site and also at other locations downstream. Modifications to the coast or the introduction of new defences to protect a new nuclear power station site could affect coastal geomorphology and potentially biodiversity and so an holistic approach is needed.</p>	<p>Reference to Making Space for Water²⁴ was inserted into the SSA criteria consultation document and the criterion has been strengthened to encourage nominators to take account of the wider impacts of coastal protection measures on areas surrounding potential nuclear power station sites.</p>
<p>The SEA identified that reference to listed buildings and Areas of Archaeological Importance should be included in order to highlight the national importance of these features.</p>	<p>Listed buildings and Areas of Archaeological Importance are of national importance and this should be highlighted through the SSA criteria.</p>	<p>Supporting text relating to Listed Buildings and Areas of Archaeological Importance has been included within the supporting text to SSA criteria 3.1.</p>
<p>The SEA identified that supporting text should be added to the SSA criteria consultation document that highlights the value of all cultural heritage resources and not just designated sites and the need for such effects to be considered in the planning process.</p>	<p>To demonstrate that cultural heritage resources are not just limited to areas that fall within statutory designations.</p>	<p>Reference to the consideration of locally- and non-designated cultural heritage has been inserted into the supporting text for criterion 3.1</p>
<p>The SEA identified that for criterion 4.2 supporting text should identify the need for</p>	<p>Different types of cooling technology could have a range of effects on the environment, for example a deterioration in visual</p>	<p>The relevant text has been inserted in the SSA criteria.</p>

²⁴ Defra (2008), Making Space for Water homepage <http://www.defra.gov.uk/environ/fcd/policy/strategy.htm>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account In the proposed SSA at this stage
nominators to provide high-level information on the types of cooling technology that might be viable or appropriate at nominated sites.	amenity or the water environment. By obtaining more information at the nominated sites stage about the types of cooling that could be viable a more informed assessment can be undertaken in the Environmental Report.	
The SEA identified that criterion 3.1 could be developed further to make reference to the value of locally designated or non-designated areas of landscape value, landscape character, tranquillity and distinctiveness.	Whilst there are parts of the landscape that are considered to be of a higher quality and are protected by specific designations, the overall value and importance of the landscape outside of these designated areas should also be highlighted to nominators.	Relevant supporting text has been added into the SSA criterion 3.1.
The SEA identified that in criterion 2.2, the supporting text could also include reference to a wider range of statutory wildlife sites designated at the national scale.	To demonstrate that there are a wide range of nationally designated sites in the UK that are afforded high levels of protection.	Additional supporting text has been inserted under criterion 2.2 to cover a wider range of sites including those that may be designated under the Marine Bill.
The SEA recommended that explanatory text supporting criterion 3.1 highlights to nominators the need for effects on landscape resources to be considered when thinking about the potential upgrades that might be needed to provide electricity transmission upgrades.	To ensure that the potential landscape effects are considered by nominators.	The SSA considered that this was too specific to individual projects to be included in the SSA and is more appropriately addressed through the Electricity Networks NPS.
The SEA identified that	To ensure that the value of all	The SSA did not

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account In the proposed SSA at this stage
<p>a criterion for local consideration should be developed which addresses the need to protect Priority Habitats and Species and ecological features outside of designated sites.</p>	<p>ecology is clearly identified to nominators and that the wider ecological resource and not just designated sites are identified as important to nominators.</p>	<p>consider it appropriate to include specific SSA criteria to deal with issues that are more effectively dealt with at the local level both once sites have been nominated and once individual applications have been submitted. However, as a result of the SEA process so far, supporting text has been added to the SSA document to encourage developers to consider the value of all ecology (terrestrial and freshwater). Impacts upon Priority Habitats and Species will also be addressed as far as is appropriate at the strategic level once sites have been nominated via the Environmental Report. The SSA does not intend to be exhaustive in its coverage of local issues given the role of EIA.</p>
<p>The SEA identified that greater enhancement opportunities could be promoted through the SSA, for example the establishment of community funds or the provision of training schemes to enable local labour to benefit from the potential job</p>	<p>To maximise the potential benefits of the process, particularly from a health and well-being perspective.</p>	<p>The SSA considers that the promotion of enhancement opportunities can be better undertaken once site-specific planning applications are considered by the IPC.</p>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account In the proposed SSA at this stage
opportunities created.		
The SEA identified that a criterion or criteria for local consideration could be developed highlighting the need to consider and assess impacts upon hydrology, hydrogeology, geomorphology, soils, water quality and drainage.	To ensure that all appropriate environmental issues are addressed in the SSA and are highlighted to potential nominators.	The SSA did not consider it appropriate to include specific proposed SSA criteria to deal with issues that are more effectively dealt with at the local level both once sites have been nominated and once individual applications have been submitted. However, as a result of the SEA process so far, supporting text has been added to the SSA document to encourage developers to consider hydrology and geomorphology. It does not intend to be exhaustive in its coverage of local issues given the role of EIA.
The SEA identified that a criterion for local consideration could be developed highlighting the need to consider and assess impacts upon geology and mineral resources that are not covered by designated sites.	To ensure that all appropriate environmental issues are addressed in the SSA and are highlighted to potential nominators.	The SSA did not consider it appropriate to include specific proposed SSA criteria to deal with issues that are more effectively dealt with at the local level both once sites have been nominated and once individual applications have been submitted. However, as a result of the SEA process so far, supporting text has been added to the SSA document to encourage

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account In the proposed SSA at this stage
		developers to consider geology. It does not intend to be exhaustive in its coverage of local issues given the role of EIA.
A criterion for local consideration could be developed which highlights the importance of protecting the wider cultural heritage resource.	To demonstrate that the valuable cultural heritage resource is not just limited to areas that fall within designated sites.	The SSA did not consider it appropriate to include specific proposed SSA criteria to deal with issues that are more effectively dealt with at the local level both once sites have been nominated and once individual applications have been submitted. It does not intend to be exhaustive in its coverage of local issues given the role of EIA.
Criterion 3.2, which relates to significant infrastructure / resources, should be changed from an issue for local consideration to a discretionary criterion	To increase the role of significant infrastructure in the strategic decision-making process.	We recognise that transport issues, particularly during the construction phase of a nuclear power station development, may have significant impacts on both strategic and local infrastructure. We believe that these issues should be given detailed consideration by developers as site- and design- specific plans are being prepared for submission to the IPC. For this reason, we have not proposed an SSA criterion in relation to these issues as they are

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
		more appropriately considered in the context of planning applications for specific development proposals.
<p>The development of a criterion which seeks to limit the increase in transport movements resulting from a new power station development and to encourage the use of alternatives to road transport where practicable.</p>	<p>To encourage new nuclear power stations to be developed in locations that would minimise the need for transport movements by road. This would reduce the impacts of road traffic congestion and vehicular emissions.</p>	<p>The main transport issues associated with new nuclear power stations are likely to be the transport of major components during the construction phase; fuel and personnel transport during the operational phase; and the transport of spent fuel and waste materials during the operational and decommissioning phases. At this point in time, it is not known where the likely manufacturing locations for major components will be and decisions around the location of higher-activity waste management facilities have not yet been made. For this reason, we do not believe it will be possible for the SSA to draw any meaningful conclusions about the likely environmental impacts of transport movements resulting from power station siting decisions, and so have decided not to develop an SSA criterion covering these matters.</p>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
<p>Use criteria 1.4 and 1.5 to place greater emphasis on the need for holistic approaches to flood risk issues.</p>	<p>Flooding is a significant issue both in terms of safety risk to new nuclear power stations and to surrounding populations and the environment. It is important that a holistic approach to planning with regard to flooding is taken to help avoid such risks.</p>	<p>Both criteria 1.4 and 1.5 require nominators to give consideration to the wider impacts of flood protection countermeasures on areas surrounding nominated sites.</p> <p>We have not included further reference to holistic approaches to flood risk management because we believe that this issue is more appropriately assessed by the IPC and relevant regulators at the time of site specific planning applications. We expect that these assessments will give consideration to the recommendations of relevant frameworks and water management strategies such as Planning Policy Statement 25 and the Making Space for Water programme.</p>
<p>Consider changing the criterion relating to electricity transmission infrastructure to discretionary.</p>	<p>To ensure that the potential landscape and environmental issues associated with the development of new transmission lines is given full consideration in the development of the Nuclear NPS.</p>	<p>Early proposals for the SSA criteria did consider the development of a discretionary criterion relating to the proximity of a site to suitable electricity transmission infrastructure. However, these drafts were rejected for the following</p>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account In the proposed SSA at this stage
		<p>reasons:</p> <p>Firstly, the relationship between the location of a power station and its required transmission infrastructure is not straightforward. In addition to the more obvious requirements for connections between power stations and the transmission infrastructure, the development of new power stations often requires upgrades to transmission infrastructure (including the construction of new power lines) elsewhere in the transmission network. In order to understand the requirements for these “deep system upgrades”, it is necessary to conduct extensive technical assessments. These assessments require details of the capacity of the power stations and other technical operating parameters to be known.</p> <p>Secondly, the Planning Bill sets out that a separate National Policy Statement will be</p>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
		<p>prepared relating to developments of electricity transmission infrastructure. The requirement for connection to the electricity transmission infrastructure is not specific to nuclear power stations and this NPS will need to be applicable to all power station developments. It is important that the Nuclear NPS is consistent with this NPS for transmission infrastructure and therefore the SSA will not include specific recommendations or criteria about issues related to transmission infrastructure. When specific proposals are brought forward for development consent, we anticipate that the IPC will consider the NPS for transmission infrastructure alongside the Nuclear NPS in taking decisions about the appropriateness of the proposals.</p>
<p>Use the criterion related to identification of cooling technologies to seek to avoid adverse impacts on the water environment which may result from the</p>	<p>To encourage a greater consideration of adverse effects upon the water environment as a result of cooling water abstraction and discharge when identifying sites for new nuclear power stations. Some water sources may be more</p>	<p>This criterion seeks to identify the likely cooling technologies which nominators believe will be appropriate for each nominated site. This will allow consideration in</p>

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria

Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account in the proposed SSA at this stage
abstraction or discharge of cooling water.	sensitive than others in terms of water supply, quality or ecological function, consideration of these issues at the strategic level may help avoid potential adverse effects.	the SSA and SEA assessment of the potential adverse environmental impacts of development on a particular site. Where there is a potential for impact on nationally or internationally designated sites of ecological importance, the SSA assessment will address these issues in consideration of criteria 2.1 and 2.2. It is clear from the environmental study that additional adverse environmental impacts may arise related to the abstraction and discharge of cooling water. However, it will be possible to avoid, minimise or mitigate a number of these issues through careful selection of cooling technology and design of outfalls. Since we do not expect that developers will have made reactor technology choices by the time of the SSA assessment, we do not believe it will be possible to make meaningful decisions on the basis of these issues in the SSA in the absence of detailed information about site specific cooling system designs. For these reasons, we believe the

Table 2-1 SEA Recommendations from the assessment of the early proposals for the SSA criteria		
Main SEA Recommendation	Basis for SEA Recommendation	Explanation of how SEA recommendations have been taken into account In the proposed SSA at this stage
		issue is better considered at the local level when site-specific planning applications are considered by the IPC.

Alternative Classification of the SSA criteria

2.8 Following the drafting of the SSA criteria it was necessary to consider how they should be classified i.e. whether they should be exclusionary, discretionary or if they are only issues that can be realistically addressed at the local level and hence should be highlighted for local consideration only. Table 2-2 presents the factors that were taken into consideration when deciding which classification would be most appropriate for each criterion.

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Seismic risk (vibratory ground motion)	Exclusionary	<p>Seismic risk is a fundamental safety issue that is referenced in international and national safety regulation. It can be mapped at a high-level in the UK.</p> <p>This is an essential consideration for the protection of human health and the environment.</p> <p>The highest level of protection will therefore be given through the criteria being exclusionary.</p>	Exclusionary
	Discretionary	<p>It would not be appropriate for the Government to make discretionary judgements about safety issues, as this is the NII's responsibility.</p> <p>If this were discretionary there would be a risk of sites being located in seismic zones that could present safety risks.</p>	
	Local Consideration	<p>Certain aspects of seismic risk will still be considered at a local level as part of the site licensing process. It would not be appropriate for this to be solely an issue for consideration at the local level, as it has important strategic impacts for health, well-being and the environment.</p> <p>This would decrease its effectiveness in avoiding safety risks.</p>	
Capable faulting	Exclusionary	<p>At a national level, there is no evidence of capable faulting across the UK. However, this is a fundamental safety consideration and so would not be appropriate as a discretionary criterion.</p> <p>This is an essential consideration for the protection of human health and the environment.</p> <p>The highest level of protection will therefore be given through this criterion being exclusionary.</p>	Exclusionary

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	<p>As an element of seismic risk, capable faulting is a fundamental safety issue that is referenced in international and national safety regulation. It can be mapped at a high-level in the UK.</p> <p>It would not be appropriate for the Government to make discretionary judgements about safety issues, as this is the NII's responsibility.</p> <p>There would be a risk that such safety considerations would not be given sufficient attention and the effectiveness in avoiding safety risks would be reduced.</p>	
	Local Consideration	<p>Certain aspects of seismic risk (including local faulting) will still be considered at a local level as part of the site licensing process. It would not be appropriate for this to be solely an issue for consideration at the local level, as it has important strategic impacts for health, well-being and the environment.</p> <p>This would decrease its effectiveness in avoiding safety risks.</p>	
Non-seismic ground conditions	Exclusionary	It would be impossible to make meaningful judgements about this issue at a national level and hence safety risks could not be addressed robustly potentially leading to adverse effects.	Local Consideration
	Discretionary	It would be impossible to make meaningful judgements about this issue at a national level and hence safety risks could not be addressed robustly potentially leading to adverse effects.	
	Local Consideration	<p>Meaningful judgements can only be made at the local level as this is a detailed issue.</p> <p>This level of classification would give the most robust level of effectiveness in reducing safety risks.</p>	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Flooding	Exclusionary	<p>Flooding can pose significant risks to life and property and by making the criterion exclusionary there would be significant environmental benefits, for example reduced risks to mental and physical health, benefits to water quality, benefits to channel hydrology and geomorphology.</p> <p>This would be the most precautionary classification for this criterion.</p> <p>However, by setting this as an exclusionary criterion at a national-level it would be more stringent than existing planning policy. PPS 25 states that <i>'The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development, is exceptionally necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall'</i>²⁵.</p>	Discretionary

²⁵ DCLG (2006) Planning Policy Statement 25: Development and Flood Risk

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	<p>Government planning policy establishes discretionary judgement in this area. At a local level, this would have to be backed up by appropriate safety consideration.</p> <p>This would be less precautionary than if it were exclusionary. However, the discretionary nature allows for decisions to be made on a site-by-site basis and conforms to PPS25 principles.</p> <p>By making this a discretionary criterion it would still be possible to avoid increasing flood risk and associated environmental effects. However, when considering each site nomination it would also be essential to determine whether there would be effects on other locations e.g. downstream as a result of the implementation of new flood defences to protect a new nuclear power station site from increased flood risk.</p>	
	Local Consideration	<p>Certain aspects of this issue would still have to be considered at a local scale, for example in EIAs for specific new nuclear power station development. However, it is essential, from an environmental perspective that flooding is considered at a strategic level as the development of multiple sites across the UK could lead to the cumulative loss of floodplain and this would not be desirable from an environmental perspective.</p> <p>The effectiveness of this criterion to reduce flood risk would be greatly diminished if it were classified in this way.</p>	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Tsunami, storm surge and coastal processes	Exclusionary	<p>Classifying this criterion as exclusionary would be the most precautionary approach to avoiding coastal erosion and safety risks associated with tsunami, storm surge and coastal processes. However, coastal protection and management plans can be developed to provide adequate protection against coastal processes and thereby ensure suitable protection to new nuclear power station sites from these risks.</p> <p>As an aspect of flood-risk (see criterion above), it would be inappropriate for an exclusionary criterion to be established for coastal flood risk. However, as an issue that is particularly relevant to nuclear stations, which may be located in coastal areas, it is appropriate for the Government to be able to exercise strategic control over this issue.</p>	Discretionary

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	<p>By making the criterion discretionary it would be possible for the Government to rule out power stations nominated in higher risk areas if suitable coastal protection countermeasures are considered unlikely. Consideration of coastal protection measures could be considered on a case-by-case basis rather than having blanket exclusion of the coastal zone.</p> <p>By making this criterion discretionary there would continue to be potential environmental benefits, and risks could be assessed on a site-by-site basis (this would not be as precautionary an approach as if it were exclusionary). However, it will be important to ensure that risks to coastal processes are considered holistically, as part of the SEA. Changes to coastal processes and geomorphology have the potential to have knock-on adverse effects on coastal habitats. Consideration should be given to existing Shoreline Management Plans, future sea-level rises and Coastal Habitat Management Plans when determining the effects on coastal areas and the management regimes that are already in existence.</p>	
	Local Consideration	<p>Certain aspects of this issue would still have to be considered at a local scale, for example in EIAs for specific new nuclear power station developments. However, solely considering this issue at the local level would be inappropriate from a strategic environmental perspective as the effectiveness of the criterion to reduce such risks through the site nominations process would be greatly diminished.</p>	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Meteorological conditions	Exclusionary	UK weather patterns are relatively benign when compared against international power plant locations and so it would not be appropriate from a UK perspective to make this criterion exclusionary. It is considered that for these reasons, making this criterion exclusionary would not provide significant safety benefits.	Local Consideration
	Discretionary	Whilst different parts of the UK do experience different weather patterns, the differences across the country are not so extreme as to allow any particular area to be reasonably ruled out. It is considered that for these reasons, making this criterion discretionary would not provide significant safety benefits.	
	Local Consideration	It is considered that this is an issue that would to be best addressed at the local level by the IPC to enable local meteorological conditions to be assessed with respect to safety risks.	
Proximity to hazardous industrial facilities and operations	Exclusionary	Making this criterion exclusionary could have benefits to physical and mental health in that it could help to reduce the likelihood of accidents and incidents occurring which could have wide-ranging effects on the environment and society. This would provide the most precautionary approach to addressing this issue. All regulatory decision-making in this area is non-prescriptive, thereby allowing proximal development considerations to be made on a case-by-case basis.	Discretionary

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	By making the criterion discretionary there would still be the opportunity for the Government to rule out a site if the risks posed were believed to be disproportionate. The risks associated with each site could be determined on a case-by-case basis. There would be benefits to physical and mental health and the environment, as the potential risk of accidents and incidents would still be assessed and potentially reduced through consideration at the strategic level. However, this approach would be less precautionary than if it were an exclusionary criterion.	
	Local Consideration	As with all other safety criteria, detailed consideration of this issue will be required at a local level as part of the site licensing and planning process but its effectiveness at reducing safety risks through the nominations process would be greatly diminished if it were classified in this way.	
Proximity to civil aircraft movements	Exclusionary	Determination of safety issues associated with siting of nuclear stations near to civil aircraft operations requires detailed understanding of the exact nature of the operations. Furthermore, regulations are in place to limit aircraft operations around/above nuclear sites. It would therefore be inappropriate to have a blanket exclusion on sites near to airports/airfields since it is feasible for nuclear sites and aerodromes to operate safely in relatively close proximity to each other. Whilst this would be a very precautionary approach, it may not provide any additional safety benefits over and above a thorough assessment on a case-by-case basis.	Discretionary and Local Consideration

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	The restriction of aircraft operating near to nuclear sites has an impact on the effectiveness of airport/aircraft operations. For certain large airports it may be important to avoid these impacts at a strategic level. Whilst not as precautionary as if it were exclusionary, a detailed consideration of safety issues on a case-by-case basis should present a significant avoidance of safety risks at nominations stage.	
	Local Issue	Information on unlicensed airfields is not held at a national level and local investigations will be needed to understand the exact nature of operations in the area surrounding the proposed site. It is important that local level information is considered to robustly assess the safety risks. However if the criterion were solely assessed as a local issue it would greatly diminish its effectiveness.	
Proximity to civil and military activities	Exclusionary	The airspace around military airbases is protected in a similar manner to civilian aerodromes and therefore could alternatively be classed as discretionary. However, the Ministry of Defence is a statutory planning consultee and has powers to safeguard defence assets in order to protect the capability of defence organisations to carry out essential training and operations. Therefore an exclusionary status is appropriate for licensed military airbases, low fly areas and ranges. It is feasible that this precautionary approach can be taken and should help to provide the highest levels of safety.	Exclusionary and Discretionary

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	Certain military activities are more appropriate to class as discretionary, such as technical sites and transmitters, explosive storage facilities, and offshore danger areas. These will need considering on an individual basis and should not automatically exclude a site from consideration. This approach would not be as precautionary as if it were exclusionary in terms of reducing safety risks. However, it may be impractical to place a blanket exclusion without addressing issues on a case-by-case basis.	
	Local Issue	Military operations could pose a risk to nuclear facilities and for this reason it would be inappropriate for this to be a local issue. If it were classified in this way the safety benefits would be greatly reduced.	
Proximity to mining, drilling and other underground operations	Exclusionary	For this criterion to be applied effectively at a national level detailed geotechnical surveys of the whole UK would be required and this is not appropriate or practicable. This approach would represent the most precautionary approach to reducing safety risks through the siting process but it may not be practicable.	Local Consideration
	Discretionary	For this criterion to be applied effectively at a discretionary level detailed geotechnical surveys would need to be undertaken by all site nominators. This is not considered practicable at a strategic level. This would be less precautionary than if it were classified as exclusionary (with regard to safety risks).	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Local Issue	This issue is highly detailed and is only appropriate for site-specific consideration after extensive on-site studies have been carried out. It is considered that benefits to safety would still be achievable if classified in this way but it would not form part of the SSA process.	
Demographics	Exclusionary	<p>Current demographic criteria are a matter of government policy and are determined at national level.</p> <p>By making the criterion exclusionary it would allow the SSA to rule out sites that are in areas more populous than is allowed for the existing fleet of Advanced Gas-Cooled Reactor (AGR).</p> <p>There would be positive impacts for human health if this criterion were exclusionary as it would ensure that risks to populations are sufficiently reduced.</p> <p>This classification would provide the most effective means of reducing risk to population through the siting process.</p>	Exclusionary
	Discretionary	<p>Policy on demographic criteria has historically reserved some discretion for the regulator to make detailed alterations to the application of policy as required on a case by case basis, and the SSA criteria seeks to retain this right. Whilst there would still be positive impacts for human health as a result of the inclusion of this criterion in the SSA, the likelihood of the benefits being realised would be reduced as the criterion would be discretionary.</p> <p>However, there is a strict regulatory regime in the UK that would ensure that risks to populations are reduced to acceptable levels.</p>	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Local Issue	If this were classified as a local consideration only, the benefits of reducing risks to human safety would be greatly diminished and would not represent sound decision-making.	
Emergency Planning	Exclusionary	<p>The ability to put in place robust emergency planning arrangements is an important condition of a nuclear power station's license to operate. However, an assessment of this capability requires a detailed understanding of the nature and location of local populations, the adequacy of local transport infrastructure and the capabilities of local emergency services. At this early stage, it will not be able to make suitable assessments and this issue should therefore be left for detailed consideration by the NII in carrying out their assessment of site licence applications.</p> <p>Without this information the safety benefits of classifying it as exclusionary or discretionary would not be significantly greater than if it were a local issue. It is considered that emergency planning would need to be implemented effectively at all sites wherever they are located.</p>	Local Consideration
	Discretionary		
	Local		

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Internationally designated sites of ecological importance	Exclusionary	<p>This criterion relates specifically to sites listed within the Natura 2000 network. Protection of these sites is of international importance. However, a stringent procedure is required (Appropriate Assessment under the Habitats Directive 92/43/EEC) which enables effects on these sites to be evaluated. Under exceptional circumstances, a development that causes significant impacts may still be allowed to proceed under this Directive. It is considered that making these areas exclusionary would therefore go beyond what the law requires.</p> <p>However, if it were exclusionary, this criterion would apply the highest levels of protection to these sites.</p>	Discretionary
	Discretionary	<p>For the reasons described above the criterion would be most appropriately classified as discretionary. However, adverse environmental effects on sites within the Natura 2000 network are more likely under this alternative (since it does not impose an outright bar on development on such sites). From an environmental perspective, adverse effects on such sites would not be desirable.</p>	
	Local Consideration	<p>This would be inappropriate as these sites should be considered at the strategic level in order to give early and effective consideration to opportunities to protect them. Purely addressing effects on these sites at the local level would not allow for an effective consideration of strategic alternatives and may result in significant adverse effects on such sites.</p>	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Nationally designated sites of ecological importance	Exclusionary	The criterion relates to nationally designated nature conservation sites such as sites of Special Scientific Interest. Whilst avoiding impacts on these sites entirely would provide the highest levels of protection, there may be ways to mitigate adverse effects should they arise. Classifying this criterion as exclusionary would be the most precautionary approach to avoiding such impacts.	Discretionary
	Discretionary	For the reasons described above the criterion would be most appropriately classified as discretionary and impacts and mitigation would be assessed on a case-by-case basis. However, adverse environmental effects on nationally designated sites of ecological importance would be more likely under this alternative.	
	Local Consideration	This would be inappropriate, as these sites should be considered at the strategic level in order to give early and effective consideration to opportunities to protect them. Purely addressing effects on these sites at the local level would not allow for an effective consideration of strategic alternatives and would be more likely to result in significant adverse effects on these sites, both individually and on a cumulative basis. However, further consideration will have to be given to effects on these sites at the local level e.g. in EIAs and when developing site specific mitigation.	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Areas of amenity, cultural heritage and landscape value	Exclusionary	By making the criterion exclusionary there could be significant benefits to landscape, heritage and amenity resources at a national level including National Parks, AONBs and Scheduled Monuments. Whilst avoiding impacts on these sites entirely would provide the highest level of protection, there may be ways to mitigate adverse effects should they arise after reviewing nominations on a case-by-case basis. However, development of this scale in National Parks and AONBs is undesirable as it could adversely affect the landscape and heritage resource. This could have wider indirect effects for tourism and other recreational pursuits.	Discretionary
	Discretionary	For the reasons described above the criterion has been classified as discretionary. However, adverse environmental effects on areas of amenity, cultural heritage and landscape value could be more likely under this scenario as such areas would not be covered by a blanket exclusionary zone. It would still be possible for cumulative effects, alternatives and strategic mitigation measures to be considered before sites were listed in the NPS although this approach provides protection for these resources.	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Local Issue	This would be inappropriate, as these sites should be considered at the strategic level in order to give early and effective consideration to opportunities to protect them. Purely addressing effects on these sites at the local level would not allow for an effective consideration of strategic alternatives and would be more likely to result in significant adverse effects both on an individual and cumulative basis. However, further consideration will have to be given to effects on these sites at the local level e.g. in EIAs and when developing site specific mitigation.	
Significant infrastructure / resources	Exclusionary	This would require Government to impose a blanket restriction on any development which impacts on any infrastructure and would not allow any mitigating measures to be taken into account. A blanket restriction would be very precautionary and would avoid negative impacts upon nationally important infrastructure and resources but it is recognised that this could constrain the development of new nuclear power stations unnecessarily. These could lead to adverse effects on electricity supply in the future which could have wider socio economic effects.	Local Consideration
	Discretionary	Government would be able to consider a site on its merits and broadly determine whether the potential impact on infrastructure is reasonable at the strategic level. It would also be able to consider whether mitigation is feasible and could consider cumulative impacts more effectively. However, without project-specific information it would not be possible to make an accurate assessment of impact.	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Local Issue	Detailed consideration of this issue will be factored in to the IPC decision-making process as it looks at local site-specific issues. However, impacts on significant infrastructure and resources would not be considered either cumulatively or when assessing site nominations. Adverse effects may therefore be more likely.	
Size of site to accommodate construction, operation and decommissioning	Exclusionary	There is a need for sufficient land to be available to construct, operate and decommission new nuclear power stations. Making the criterion exclusionary would restrict sites to a particular size, not allowing developers to optimise plant layout to meet land availability. This may result in a greater land-take than is necessary which may have adverse environmental effects.	Discretionary
	Discretionary	This option would allow Government to ensure that nominated sites are suitably sized to accommodate the necessary facilities and allow suitable perimeter security arrangements to be put in place. Further advice from regulators would need to be sought when considering site nominations. This would ensure the most robust and effective consideration of land-take.	
	Local Issue	From an environmental perspective this is something which could be considered in more detail at the local level. However, consideration at the strategic level is important because it will enable knock-on environmental effects associated with the land-take to be determined e.g. whether brownfield or greenfield land would be lost. Adverse effects would be more likely under this option.	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
Access to suitable sources of cooling	Exclusionary	<p>Access to suitable sources of cooling is necessary for all types of power station. However, different types of cooling may be more visually intrusive than others, such as through the use of cooling towers and can also have wider adverse environmental effects e.g. as a result of the need to abstract water. However, if the Government made certain types of cooling exclusionary e.g. the use of cooling towers then there would be long-term visual and landscape benefits. However, there would be no technical justification for making this decision and in certain locations, cooling towers might be acceptable.</p> <p>This option would be the most precautionary approach to protecting landscape and water resources.</p>	Discretionary
	Discretionary	<p>By making this criterion discretionary it would be possible for future nuclear power station operators to identify the most appropriate cooling methodology. However, there is a risk with this option that there could be adverse environmental effects. These would have to be assessed before any development could occur on certain sites and appropriate mitigation measures developed.</p> <p>Adverse effects would be more likely under this classification but it would allow for possible mitigation measures to be considered on a site-by-site basis.</p>	

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Local Issue	<p>Detailed consideration of effects of cooling infrastructure would have to be thoroughly reviewed by the IPC. However, leaving this decision until the local site level would not be appropriate from an environmental perspective as it would not be possible to consider cumulative effects.</p> <p>It would be more likely that a site would be chosen that could result in adverse effects under this option.</p>	
Access to transmission infrastructure	Exclusionary	<p>The existing mechanism for securing access to the grid is via grid connection applications to National Grid. Making this criterion exclusionary would override this existing arrangement.</p> <p>There is uncertainty over how this criterion could be applied in practice if it were exclusionary.</p>	Local Consideration

Table 2-2 Alternative Classifications of the SSA criteria			
Criteria	Types of Classification	Potential effects and basis of classification choice	Classification for draft SSA Consultation
	Discretionary	<p>The joint permitting of grid and generation under the planning reforms will require the Government to retain discretion over grid connection planning issues and hence this criterion is most appropriately classified as discretionary.</p> <p>The development of multiple electricity transmission lines across the UK has the potential to lead to wide-ranging cumulative environmental effects, for example visual impacts and the loss of archaeological and ecological resources. Some understanding of the potential scale of these effects is important at the strategic level in order to minimise them through the siting process. Similarly, the pressures this may put on the grid may be of national significance. A National Policy Statement on the installation of above ground electricity transmission infrastructure (the electricity networks NPS) is also proposed. This could provide the framework for decisions on transmission infrastructure proposals by the IPC.</p> <p>However, the potential effects of new transmission lines could not be taken into account through the SSA when assessing nominated sites. This may lead to sites being chosen for the Nuclear NPS which may result in significant adverse effects both as a result of individual and cumulative development.</p>	
	Local Issue	<p>A separate NPS is being prepared for transmission developments. This will provide the relevant strategic guidance to the IPC in considering any development (nuclear or otherwise) which requires grid changes. Therefore, the SEA will rely on this NPS to deal with the environmental impacts of infrastructure proposals.</p>	

3 EFFECTS ON BIODIVERSITY, FLORA AND FAUNA

Summary

- 3.1 This section considers how the SSA criteria will impact on those SEA objectives which cover Biodiversity, Flora and Fauna. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance.
 2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality.
 3. To avoid adverse impacts on Priority Habitats and Species including European Protected Species.
- 3.2 The SSA criteria seek to avoid, minimise or mitigate adverse impacts (whether direct or indirect) on national and international sites that have been designated as being important for nature conservation. However, the SSA criterion covering internationally designated sites (criterion 2.1) is a discretionary criterion only and so there remains a risk that adverse effects on these nature conservation sites could occur. It is not possible to predict at this stage whether any effects will be significant, so to ensure they are properly taken into account we have produced a Habitats Regulations Assessment in relation to the proposed SSA criteria which will be updated once sites have been nominated through the SSA process. Depending on the outcome of that Assessment, an Appropriate Assessment will be carried out in accordance with the Habitats Directive to assess the impacts on sites protected under the Directive. Further information is set out in Annex B of this study and in the accompanying Habitats Regulations Assessment report.²⁶ For these reasons, this environmental study has found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objective 1.
- 3.3 Sites that have been designated as having national or international ecological importance (addressed in SSA criteria 2.1 and 2.2) will usually contain a high proportion of locally important ecological networks and protected habitats and species. However, the SSA criteria do not specifically seek to minimise adverse

²⁶ BERR, July 2008, Towards a Nuclear National Policy Statement – Habitats Regulations Assessment Screening Report 08/928

impacts on valuable ecological networks, ecosystem functionality and priority habitats and species at a local level as the criteria only relate to sites with national or international designations. For these reasons, this environmental study has found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objectives 2 and 3.

3.4 Table 3-1 sets out the results of the assessment²⁷

Table 3-1 Effects of the SSA criteria on Biodiversity, Flora and Fauna												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	⊖	⊖	⊖
	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct	Direct			
	+	+	+	+	+	+	+	+	+			
2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	⊖	⊖	⊖
	Direct	Direct	Direct	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect			
3. To avoid adverse impacts on Priority Habitats and Species including European Protected Species	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	+/-	⊖	⊖	⊖
	Direct	Direct	Direct	Indirect	Indirect	Indirect	Indirect	Indirect	Indirect			
<p>C = Construction; O = Operation; D = Decommissioning</p> <p>Note that the symbol “⊖” means that "There would be no significant contribution towards the achievement of the SEA Objective". It appears in each of the assessment matrices and the symbols used are set out in Annex E.</p>												

²⁷ These symbols are explained in the table at Annex E

Introduction and Background

- 3.5 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to biodiversity, fauna and flora.
- 3.6 Biodiversity means the variety of living organisms on earth, including all flora and fauna. It comprises species of plants and animals but also the complex habitats and ecosystems of which they are part, and the genetic variations between them. Biodiversity is not confined to rare, endangered or protected species, although these are afforded the highest levels of protection. Biodiversity includes all species, however commonplace, and the valuable ecological networks that help to sustain them.
- 3.7 Biodiversity is a cornerstone of sustainable development, as it is essential to the economic, social and physical wellbeing of this and future generations. The benefits of biodiversity can be considered in three groups: ecosystem services, biological (including genetic) resources and social benefits. Ecosystem services relate to the protection of water resources, soils formation and protection, nutrient storage and cycling, pollution breakdown and absorption, climate stability, maintenance of ecosystems and recovery from unpredictable events such as floods. Biological resources have direct value as food, wood products, ornamental plants, tourism and as population and genetic reservoirs. Given the paucity of knowledge we currently have about the total number of species in the world, there is a clear relationship between the conservation of biological diversity and the discovery of new resources. Potential products that may be derived from biological resources include adhesives, pharmaceuticals, and agrochemicals. Social benefits include opportunities for education, recreation, improved health, and cultural identity²⁸.
- 3.8 The world is losing biodiversity at an ever-increasing rate as a result of human activity. The UK has lost over 100 species during the last century²⁹, with many more species and habitats in danger of disappearing, especially at the local level. On a world scale, the rate of loss is now recognised to be a cause for serious concern, requiring concerted international action to prevent continued loss of biodiversity.
- 3.9 Key problems and issues faced by biodiversity, flora and fauna in the UK are described in Appendix C3. Strategic level baseline data for the UK are presented in Appendix C1.

²⁸ www.sustainable-development.gov.uk

²⁹ www.defra.gov.uk

- 3.10 A wide range of environmental legislation, including EU Directives (e.g. related to wildlife and nature conservation, water quality, air quality, waste) has a direct impact on biodiversity. These are described in the review of plans and programmes in Appendix B, Table B1.
- 3.11 Table 3-2 presents details of the key biodiversity, flora and fauna designations, including the level at which they operate (e.g. national or local level) and whether they are statutory or non-statutory designations. It is important to note that some of the designations listed in Table 3-2 may be consistent with landscape designations including National Parks and Areas of Outstanding Natural Beauty (AONB) – in other words an area designated as one may also be designated as another. Landscape designations are discussed in Section 10.

Table 3-2 Status of Biodiversity, Flora and Fauna Designations in the UK		
Nature Conservation Feature	Level of the Designation	Statutory or Non-Statutory?
SPA	International	Statutory
SAC	International	Statutory
Ramsar	International	Statutory
Biosphere Reserves	International	Non-statutory
Marine Conservation Zones	National	Statutory
SSSI/Areas of Special Scientific Interest (ASSI) (Northern Ireland)	National	Statutory
National Nature Reserve (NNR)	National	Statutory
Marine Nature Reserve (MNR)	National	Statutory
Marine Consultation Areas (MCA)	National	Non-statutory
Areas of Special Protection (AoSP) / Wildlife Refuges (Northern Ireland)	National	Statutory
Limestone Pavement Orders	National	Statutory

Table 3-2 Status of Biodiversity, Flora and Fauna Designations in the UK		
Nature Conservation Feature	Level of the Designation	Statutory or Non-Statutory?
Sensitive Marine Areas	National	Non-statutory
Ancient Woodland	Local	Non-statutory
Local Nature Reserves (LNRs)/ Local Authority Nature Reserves (LANRs) (Northern Ireland)	Local	Statutory
Local Wildlife Sites	Local	Non-statutory
Note that the “Natura 2000” feature does not appear on this list because Natura 2000 is the name for a network of sites, not an particular designation. Natura 2000 comprises SACs, SPAs and Ramsar sites which are listed individually in this table		

3.12 There are many internationally and nationally designated sites situated across the UK which should be afforded high levels of protection. Further details of these features are presented in Appendix C.

Assessment of Environmental Effects of the SSA criteria on Biodiversity, Flora and Fauna

3.13 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. It: outlines the potential generic impacts of a new nuclear power station in the absence of location specific information; assesses the performance of the SSA criteria against the SEA objectives; and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the NPS are developed further.

Relevant SEA Objectives and Guide Questions

3.14 Table 3-3 identifies the SEA objectives and guide questions relevant to this topic.

Table 3-3 Relevant SEA objectives and Guide Questions to Biodiversity, Flora and Fauna

Relevant SEA Objectives	Guide Questions
<p>1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance</p> <p>2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality</p> <p>3. To avoid adverse impacts on Priority Habitats and Species including European Protected Species</p>	<p>Will it result in the loss of habitats of international/national importance?</p> <p>Will it affect other statutory or non-statutory wildlife sites?</p> <p>Will it result in harm³⁰ to internationally or nationally important or protected species?</p> <p>Will it adversely affect the achievement of favourable conservation status for internationally and nationally important wildlife sites?</p> <p>Will it affect the structure and function/ecosystem processes that are essential to restoring, securing and/or maintaining favourable condition of a feature or a site?</p> <p>Will the proposal enable the BAP targets for maintenance, restoration and expansion to be met?</p> <p>Will the proposal result in changes to coastal evolution that is otherwise needed to sustain coastal habitats?</p> <p>Will it result in the release of harmful substances e.g. oil, fuel and other pollution into waterbodies which could affect aquatic ecosystems?</p> <p>Will it result in the accidental migration of radionuclides which could harm aquatic or terrestrial ecosystems?</p>

³⁰ Harm includes: killing, disturbing, obstructing access to a breeding site or resting place, damaging or destroying a breeding site or resting place.

Relevant SEA Objectives	Guide Questions
	<p>Will it result in changes to stream hydrology³¹ and morphology that could affect aquatic or terrestrial ecosystems?</p> <p>Will it result in thermal discharges that could adversely affect aquatic ecosystems?</p> <p>Will it result in soil contamination that could damage aquatic or terrestrial ecosystems?</p>

3.15 SEA objectives 1-3 apply to three slightly different elements of biodiversity, flora and fauna that are deemed applicable at the strategic level.

- Objective 1 (To avoid adverse impacts on the integrity of wildlife sites of international and national importance), applies specifically to the avoidance of adverse impacts on designated sites of international and national importance only.
- Objective 2 (To avoid adverse impacts on valuable ecological networks and ecosystem functionality), applies to the avoidance of adverse impacts on all valuable ecological networks and not just sites designated at the national and international level. This may include sites designated at the local or regional level, and also considers the potential for ecological severance and impacts upon wildlife connectivity. This thereby provides a means of considering the underpinning ecosystem functionality that is important for designated sites, but which may be physically situated outside of these sites.
- Objective 3 (To avoid adverse impacts on Priority Habitats and Species including European Protected Species), applies not only to designated sites but also covers wider impacts upon protected habitats and species in particular Priority Habitats and Species including those identified by European law; this may include migratory species. It is recognised that there is an overlap between

³¹ Hydrology includes the consideration of variations in the storage and flow of water and also water quality. Hydrology is strongly influenced and influences local climate, soils, geomorphology, geology and ecology.

these objectives.

- 3.16 Objectives 2 and 3 may also include consideration of national and international designated sites, as these sites will often form part of important ecological networks as well as including protected habitats and species.

Overview of Potential Impacts

- 3.17 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. Such facilities have the potential to result in adverse effects upon biodiversity, flora and fauna. Some such effects may be specific to nuclear power generation, but many will be common to all major infrastructure projects.
- 3.18 Many such effects will only arise if there is valuable biodiversity, flora and fauna present in or around the locations of the proposed power stations, the supporting infrastructure and grid connection. Without knowing the proposed locations at this stage, there is uncertainty about whether the development of new nuclear power stations would result in significant effects on biodiversity. However, given that many SACs, SPAs and other important sites tend to be located in similar locations to existing nuclear power stations (e.g. coastal areas), it is considered highly likely that the potential exists for significant impacts. It is also not known at this stage to what extent effects could be mitigated through detailed design. It is also important to consider the indirect effects of induced development as a result of new nuclear power stations being built. This may include, for example, new housing or community facilities as well as supporting infrastructure such as roads that could all result in adverse environmental impacts if developed inappropriately. These potential effects will be assessed further in the Environmental Report.
- 3.19 In many ways, the impacts on biodiversity of developing new nuclear power stations would be similar to other major infrastructure developments, such as other types of power station. The principal issues relate to water abstraction and discharge and the removal of native vegetation and its replacement with large concrete structures. These can cause direct damage to, or loss of, terrestrial and aquatic habitats. Some of these habitats may be protected by national or international designations.
- 3.20 New nuclear power stations will also produce radioactive waste. This waste would be stored on site in safe and secure interim storage throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear

power stations. The interim storage, transport and disposal of the waste could have effects on biodiversity, flora and fauna as outlined in Table 3-4. The effects of waste management in relation to new build waste will also be considered in the Environmental Report.

- 3.21 Table 3-4 provides a summary of the potential effects associated with new nuclear power development in the absence of information about exact locations and detailed design.

Table 3-4 Potential Impacts of Nuclear Facilities on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Drainage works and use of vehicles</p> <p>The use of machinery, vehicles and new drainage systems may mobilise soil particles in surface run-off, which can result in adverse impacts on aquatic flora and fauna due to increased sediment loading of streams. The mobilisation of dust particles can also have an adverse effect on sensitive habitats nearby, especially if the dust is of a different acidity to the surrounding habitats.</p> <p>General construction site activities</p> <p>The potential exists for noise and visual disturbance from the construction site to have an adverse impact on species, in particular sensitive bird species associated with neighbouring SPAs.</p> <p>Materials management</p> <p>The management of materials may result in accidental contamination of watercourses and soils from oil, fuel, cement or other substances. This may result in harm to flora and fauna although good site environmental management practices should minimise these risks.</p> <p>Earthworks and excavations</p> <p>Earthworks and excavations may result in direct habitat removal, fragmentation or severance. Similarly, disturbance may occur to individual species (including rare and sensitive species and those which are specifically protected from disturbance under European Law), and the mobilisation of sediment may have adverse impacts on aquatic flora and fauna due to increased sediment loading of streams.</p> <p>New electricity transmission infrastructure</p> <p>Construction of new over/or underground transmission lines could</p>

Table 3-4 Potential Impacts of Nuclear Facilities on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation
	cause direct disturbance and physical loss of terrestrial habitats.
Operation (40 years)	<p>Routine release of radioactive discharges to water</p> <p>The operation of the nuclear reactor would result in the emission of routine radioactive discharges to the aquatic environment which may adversely affect both aquatic and terrestrial ecology. These discharges are identified in Section 7 – the Water Environment. Prior to undertaking the preliminary GDA assessment, vendors were requested to supply information about how radioactive wastes will arise, be managed and disposed of, to provide design basis estimates for monthly discharges of liquid wastes and proposed annual limits with derivation for radioactive discharges³². The preliminary findings indicated that all discharges would be within established dose limits. The outputs of the detailed assessment will also be used to set indicative limits for authorisations. Any new nuclear power stations would require authorisation from the relevant environment agency under the Radioactive Substances Act 1993 before making any discharges of radioactivity.</p> <p>Release of radioactive materials as a result of accidents</p> <p>During the operation of the nuclear power station there would be a very small risk of accident or other incident which could result in the unplanned release of radiation into the environment, which could affect aquatic or terrestrial flora and fauna. The overall safety of nuclear installations is dependent upon good design and operation and is driven by a system of regulatory control. The work undertaken to date by the nuclear regulators, as part of the GDA, has provided an overview of the fundamental acceptability of the proposed reactor design within the overall UK regulatory regime. For all reactors being considered, the key preliminary conclusion from the GDA was that there are no safety or security shortfalls that would be so serious as to rule out, at this stage, the eventual construction of the reactors in UK licensed sites. The next stage of the GDA will be to review, in more detail, the submissions of each of the vendors in respect of safety, security and environmental issues. Before granting a nuclear site licence, the HSE will also have to be satisfied that the nuclear facility is designed and operated so that: several levels of protection and defence are provided against significant faults or failures; accident management and emergency preparedness strategies are prepared; and all reasonably</p>

³² Environment Agency (2007) Process and Information Document for Generic Assessment of Candidate Nuclear Power Plant Designs

Table 3-4 Potential Impacts of Nuclear Facilities on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation
	<p>practicable steps have been taken to minimise the radiological consequences of an accident³³.</p> <p>Water treatment plant</p> <p>There is potential for accidental pollution of watercourses by leaks or spillages from water treatment plants. This may in turn affect aquatic and/or terrestrial ecology.</p> <p>Non-radioactive discharges</p> <p>The reactor designs assessed through the GDA require cooling water to be abstracted and then discharged into a suitable water body. Discharge may be to the sea, rivers or lakes. The temperature of the discharge will often be above that of the receiving water body (it may be up to 10°C warmer³⁴) and may result in changes to the aquatic ecology in that area. This may be negative, as oxygen is less soluble at higher temperatures. Reductions in dissolved oxygen can put aquatic life under stress if levels become very low. In contrast, certain species (such as the worm <i>Sabellaria</i> which creates reefs that are designated under the Habitats Directive) thrive in warmer water.</p> <p>Water abstractions</p> <p>As for all thermal plants (whether coal, gas or nuclear powered), water is needed for cooling purposes and may be abstracted from groundwater, the sea, rivers or lakes. Water intake from surface</p>

³³ HSE (2006) Safety Assessment Principles for Nuclear Facilities

³⁴ Referenced in Sustainable Development Commission (2006) The role of nuclear power in a low carbon economy Paper 3: Landscape, environment and community impacts of nuclear power.

³⁵ Referenced in Sustainable Development Commission (2006) The role of nuclear power in a low carbon economy Paper 3: Landscape, environment and community impacts of nuclear power.

³⁶ IAEA (2002) Non-technical factors impacting on the decision-making process in environmental remediation, page 64

http://www-pub.iaea.org/MTCD/publications/PDF/te_1279_prn.pdf

³⁷ Security of radioactive waste storage and transport is quite under constant review by the regulators to ensure that facilities and practices remain robust (BERR, January 2008, Meeting the Energy Challenge, A White Paper on Nuclear Power)

Table 3-4 Potential Impacts of Nuclear Facilities on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation
	<p>water bodies can lead to the incidental mortality of fish and other aquatic species, particularly on the intake screens. Fish, larvae and eggs can be sucked into condenser circuits and subject to heat before being returned to the sea. New technologies are designed to eliminate these impacts³⁵. Groundwater abstractions may affect groundwater supply to other areas of valuable habitat including rivers and streams, resulting in habitat degradation.</p> <p>Site drainage</p> <p>The drainage of the site may result in altered run-off rates to watercourses which could in turn affect stream hydrology (especially flow rates) and morphology. This has the potential to adversely affect aquatic flora and fauna.</p> <p>Materials management and vehicle movements</p> <p>As during the construction phase, the use of vehicles, machinery and management of materials on site gives rise to the risk of accidental pollution to soils and water. This may include oil, fuel or other substances which could adversely affect aquatic and terrestrial ecology. Again, the potential exists for noise and visual disturbance from the site to have an adverse impact on species, in particular, sensitive bird species associated with neighbouring SPAs.</p> <p>Physical presence of site</p> <p>The physical presence of the site buildings may cause direct alteration, disturbance or direct physical loss of terrestrial habitats and species. This may include the severance of wildlife corridors and commuting routes for protected species.</p> <p>It is also feasible that the principle of restricting human access to the sites could be beneficial to flora and fauna by providing buffer zones in which an ecosystem could thrive³⁶.</p> <p>Interim Radioactive Waste Storage</p> <p>Radioactive waste including higher activity wastes (ILW and potentially spent fuel), will be stored on site in safe, secure, interim storage facilities prior to being transported for final disposal. The main risks to biodiversity, flora and fauna would be through unplanned releases of radioactive materials into the environment via air, water or soil contamination. However, these risks to biodiversity, flora and fauna are considered to be very low as the stores would be designed to the highest levels of containment and would be subject to strict regulatory controls³⁷. Safe storage in these facilities would be expected to be available until such time as final disposal facilities</p>

Table 3-4 Potential Impacts of Nuclear Facilities on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation
	become operational.
Decommissioning (including interim waste storage, transport and final disposal) (minimum of 30 years)	<p>Decommissioning activities</p> <p>During decommissioning activities there may be risks of continued soil, water and air contamination if radioactive and other hazardous materials are released. The risk of this is considered to be very low given the strict regulatory requirements that would need to be adhered to during decommissioning. A stringent decommissioning strategy would be required together with full EIA prior to decommissioning.</p> <p>Restoration design</p> <p>Following decommissioning, the site will be restored. This presents an opportunity for habitat creation and thus the enhancement of nature conservation value.</p> <p>Interim Radioactive Waste Storage</p> <p>Impacts during decommissioning would be the same as those identified during operation (above). However, once geological disposal facilities are constructed and operational, the waste store and its contents will be dismantled and removed. There is the potential for some degree of ground contamination to remain on site in the long-term, which could affect biodiversity, flora and fauna although this would be addressed on a site specific basis through the decommissioning strategy.</p> <p>Transport of Radioactive Waste for Final Disposal</p> <p>Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. Because the design of transportation packages is robust and meets international and European regulations, the main risks to biodiversity, flora and fauna, is likely to be through unplanned releases of radioactive materials into the environment as a result of accidents, which could lead to radioactive releases into the air, water or soil. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from RAMTED for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that</p>

Table 3-4 Potential Impacts of Nuclear Facilities on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Biodiversity, Flora and Fauna in the Absence of Details on Location, Design or Mitigation
	<p>were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s. None of these significant dose events involved the transportation of nuclear materials.³⁸ The majority of incidents that have occurred have resulted in trivial or no radiological consequences. During interim storage of several decades, the initial fission product activity of the waste would decline as more active compounds decay, and it may only require a single movement of lower activity material to the final disposal locations. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Final Disposal of Radioactive Waste</p> <p>The Government considers that it would be technically possible to dispose of higher activity waste from new nuclear power stations in a geological disposal facility. The risks to biodiversity, flora and fauna of disposal in a geological disposal facility relate to both the impacts of construction of the facility and waste emplacement and disposal within it. Such impacts may relate to direct habitat loss and disturbance during construction, and unplanned releases of radioactive materials into the environment. The containment of radioactivity would be central to any safety case presented to the regulators, who would have to be satisfied that such risks would be acceptably small before such a facility could be built and operated.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for biodiversity, flora and fauna.</p>

3.22 SSA criteria have been developed in order to provide greater direction towards those areas of the UK that would be more suitable for the development of new nuclear power stations. The following section describes the significant effects of

³⁸ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

applying the SSA criteria upon biodiversity, flora and fauna.

Significant Environmental Effects of the SSA criteria

- 3.23 The SSA criteria have been assessed against the relevant SEA objectives for effects on biodiversity, flora and fauna (refer to Table 3-3) using the matrices in Appendix D. The following presents a summary of these findings.
- 3.24 Criteria 2.1 and 2.2 are worded specifically to avoid, mitigate or minimise adverse impacts upon nationally and internationally designated sites of ecological importance. This should apply to the avoidance of adverse impacts during the construction, operation and decommissioning phases (including the interim storage of radioactive waste), and should lead to more informed judgements about siting in relation to these designated sites. Effects are most likely to be direct at the site level, and largely relate to habitat loss, although indirect effects may occur at a distance from the site in the form of impacts to designated sites as a result of, for example, changes in groundwater regimes, pollution and discharges, coastal processes or abstractions which could be realised over a wide area. However, both of these criteria are discretionary, and so the extent to which adverse effects would be minimised would be determined on a case-by-case basis. There is therefore a lower degree of certainty that the potential benefits of the criteria would be realised. For this reason, and in line with the precautionary principle, positive and negative effects have been assigned for SEA Objective 1. However, nominators will be expected to provide details of how potentially adverse effects in relation to a discretionary criterion could be mitigated.
- 3.25 Whilst criterion 2.1 is intended to facilitate the avoidance, minimisation or mitigation of adverse impacts on the integrity of wildlife sites of international importance, it is a discretionary criterion. Development could be permitted despite adverse impacts if: no effective mitigation is possible; no feasible alternatives exist, Imperative Reasons of Overriding Public Interest (IROPI) can be demonstrated; and compensation measures to ensure the overall coherence of the Natura 2000 network can be taken. A separate Habitats Regulations Assessment (HRA) screening exercise³⁹ (referred to as the “Screening Report”) has been undertaken in tandem with the SEA, and this has determined that the

³⁹ Under the Habitats Regulations, an assessment is required to determine whether or not any plan or project may have a significant adverse effect upon the integrity of a European Designated site. If significant effects are likely, an Appropriate Assessment would be required. See Annex B for further details on this process. The first stage of the process is to undertake a screening exercise and report to determine whether or not significant effects are likely and hence whether Appropriate Assessment is required.

SSA criteria, whilst being designed to minimise impacts on European designated sites, are not able to guarantee that there will be no adverse effects on the integrity of sites listed in the Natura 2000 network. The Screening Report has identified that adverse effects on integrity could not be ruled out at this stage. It is therefore intended that a further screening exercise be undertaken once sites have been nominated, to identify those sites which are likely to impact upon the Natura 2000 network and may require Appropriate Assessment. A strategic level Appropriate Assessment would then be conducted on the Nuclear NPS and will focus on those nominated sites for which the potential for significant effects cannot be ruled out. It is anticipated that further, more detailed, Appropriate Assessments of individual sites will probably be required by developers at the EIA stage for particular power stations, as part of the planning application process. Should any of these Appropriate Assessments identify that significant adverse effects on the integrity of designated sites are likely, consent could still be granted if the Competent Authority⁴⁰ determines that there are no feasible alternatives, IROPI exist and that effective compensation measures to ensure the overall coherence of the Natura 2000 network can be taken.

- 3.26 These criteria only seek to avoid, minimise or mitigate impacts on these designated sites, and do not consider the wider protection of biodiversity, such as wildlife corridors, connectivity outside of site boundaries and other protected and/or UK BAP habitats and species. Further protection of biodiversity could, however, be achieved indirectly through criterion 3.1, which seeks to avoid, minimise or mitigate impacts on areas of amenity, cultural heritage and landscape value. Many of these areas may also contain valuable ecological networks and other features of biodiversity value. Criterion 3.1 is also discretionary. Consequently, both positive and negative effects have been assigned to SEA objectives 2 and 3, as some avoidance can be inferred through certain criteria, although specific avoidance of adverse impacts to valuable biodiversity outside of national and international designated sites is not implicit in the criteria, and as such adverse impacts may still occur. Of particular importance are the potential cumulative impacts that may occur as a result of the deployment of numerous new power stations across the UK. It is intended that the Environmental Report looks in more detail at non-designated ecology where information is available at an appropriate level for SEA.
- 3.27 The issues raised in criteria 1.4 and 1.5 have the potential to adversely affect internationally and nationally designated sites if they cause changes to

⁴⁰ The Habitats Regulations uses the term “Competent Authority” whilst the SEA Regulations uses the term “Responsible Authority”.

hydrological regimes, coastal processes and geomorphology or require the need for suitable defensive infrastructure to protect against those risks. Similarly, criteria 4.2 and 4.3, requiring access to sources of cooling and transmission infrastructure, could pose risks to internationally and nationally designated sites, for example as a result of direct habitat loss caused by infrastructure development or ecosystem changes caused by modified hydrological regimes. However, the criteria should be applied as a whole; therefore, criteria 2.1 and 2.2 would need to be integral to nominators' considerations, and should help to ensure that effects on designated sites are considered and the necessary protection provided. Avoidance of adverse effects on designated sites should be a central consideration for nominators, including their consideration of supporting infrastructure (e.g. new transmission lines or flood and coastal defences).

- 3.28 Criteria 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12, by reducing risks of accidents involving nuclear power stations, could indirectly reduce the risk of unplanned radionuclide release which could adversely affect internationally and nationally designated wildlife sites. Some of these criteria are discretionary. Criteria 1.3, 1.6, 1.8 and 1.9, which are identified for local consideration, could also reduce the risk of accidents and incidents and highlight issues for consideration by the IPC. These criteria, therefore, also have the potential to contribute to the achievement of SEA objectives 1, 2 and 3, albeit at the local level.
- 3.29 The overall facilitative action of the Nuclear NPS, through increasing the likelihood of new nuclear power stations being built, will increase the need for radioactive waste to be transported and disposed of. The transportation and final disposal of radioactive waste are not addressed through the SSA criteria.

Cumulative Effects

- 3.30 All of the above effects on biodiversity, flora and fauna could occur at individual sites developed for new nuclear power stations. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites, or at other locations across the UK, then cumulative and synergistic effects could occur. At this stage of the SEA, it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. However, cumulative effects on the national biodiversity resource might include the loss of priority habitats and species, particularly in areas outside of designated sites, as this is an area not addressed by the SSA criteria. As part of the HRA process it is necessary for the cumulative effects of all plans or projects to be assessed.
- 3.31 Once sites are nominated, the cumulative effects could be identified with more certainty. This will enable the issue of cumulative effects to become a central

consideration in determining which and how many sites are brought forward. This will enable a more informed decision to be made on which sites are listed in the NPS.

Mitigation

- 3.32 Criteria 2.1 and 2.2 were added in response to the SEA process to provide greater protection to the most important wildlife sites in the UK.
- 3.33 Criterion 2.2 was improved further by adding reference to avoiding other statutory and non-statutory designations of national and international importance including: AoSP/Wildlife refuges (although most are within SSSI/ASSIs); Limestone Pavement Orders; and areas that may be designated under the Marine Bill such as Marine Conservation Zones.
- 3.34 Positive and negative effects have been identified for SEA Objective 1 and this is as a result of the application of the precautionary principle, as the potential for negative effects on internationally and nationally designated sites cannot be ruled out, despite the inclusion of criteria 2.1 and 2.2 in the SSA.
- 3.35 The negative impacts identified relate to the lack of provision of specific protection for valuable ecological networks and ecosystem functionality and priority habitats and species that are outside those sites designated at the national or international level. It would be beneficial for a criterion to be developed identifying the importance of protecting ecological resources outside of designated sites, including Priority Habitats and Species. The SSA did not consider it appropriate to include specific SSA criteria to deal with issues that are more effectively dealt with at the local level, both once sites have been nominated, and individual applications have been submitted. However, as a result of the SEA process so far, supporting text has been added to the SSA document to encourage developers to consider the value of all ecology, both terrestrial and aquatic. This issue will also be considered in more detail in the Environmental Report once sites have been nominated.
- 3.36 The Environmental Report will assess the potential cumulative effects to the biodiversity resource that could occur as a result of the development of multiple nuclear power station sites in England and Wales.

4 EFFECTS ON POPULATION AND HUMAN HEALTH

Summary

- 4.1 This section considers how the SSA criteria will impact on those SEA objectives which cover Population and Human Health. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
4. To create employment opportunities.
 5. To encourage the development of sustainable communities.
 6. To avoid adverse impacts on physical health.
 7. To avoid adverse impacts on mental health.
- 4.2 The SSA process is one of the Government's facilitative actions, which will reduce regulatory and planning risks associated with investing in new nuclear power stations. If private sector operators ultimately decide to invest in new nuclear power stations, this could potentially lead to a wide range of new job opportunities in the nuclear sector. Therefore, the process of conducting the SSA is likely to have major positive effects on the ability to achieve SEA Objective 4. This is likely to be the case in all phases of a nuclear power station's life, although it is expected that fewer jobs will be provided once a power station ceases to operate and decommissioning has begun.
- 4.3 Many of the SSA criteria will impact on the ability to encourage the development of sustainable communities (SEA Objective 5). The relevant criteria are those addressing nuclear safety (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12); those addressing environmental protection (criteria 2.1 and 2.2) and those addressing societal issues (criteria 3.1 and 3.2). Following assessment, this environmental study has found that because of their discretionary nature, the SSA criteria could have both positive and negative effects on the ability to achieve SEA Objective 5. The benefits outlined above in terms of creating employment opportunities as a result of the Government's facilitative actions are also relevant to SEA Objective 5.
- 4.4 The SSA criteria seek to avoid, minimise or mitigate adverse impacts on nuclear safety, environmental protection and societal issues. For this reason, the SSA criteria will have a positive effect on the ability to meet SEA objectives 6 and 7. There is still a risk that adverse health effects may occur as a result of new nuclear power stations which are not directly linked to the siting process. However, we are confident that the UK has an effective regulatory framework

that will ensure that risks to health are minimised and managed by industry consistent with ‘as low as reasonably practicable’ (ALARP) principles.

4.5 Table 4-1 presents a summary of the results.

Table 4-1 Effects of the SSA criteria on Population and Human Health												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
4. To create employment opportunities	++ Direct	++ Direct	+ Direct	++ Indirect	++ Indirect	+ Indirect	++ Indirect	++ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect
5. To encourage the development of sustainable communities	NA	NA	NA	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	NA	NA	NA
6. To avoid adverse impacts on physical health	NA	+ Direct	+ Direct	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect
7. To avoid adverse impacts on mental health	?	?	?	?	?	?	?	?	?	?	?	?
C = Construction; O = Operation; D = Decommissioning												

Introduction and Background

4.6 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to Population and Human Health.

4.7 The World Health Organisation states that “health is not only the absence of infirmity and disease but also a state of physical, mental and social well-being”.

Health is, therefore, affected by the complex interaction between social and economic factors, individual behaviour, the physical environment and hereditary factors. The determinants of health are often grouped into the following categories⁴¹:

- General socio-economic, cultural and environmental conditions
- Living and working conditions (physical environment)
- Social and community influences (socio-economic environment)
- Individual lifestyle factors
- Age, sex and hereditary factors

- 4.8 Some groups of people and individuals experience better or worse health than others and this is defined as health inequalities. Health disparities and inequalities occur across the UK and there is a need to raise quality of life in areas of poor health and reduce these inequalities. Good health plays a major role in long-term economic growth and sustainable development. The cost of ill-health places a significant burden on the economy, as a result of lower productivity and increased healthcare costs. There is a link between health, employment, productivity and poverty, and being in work can play a very important role in contributing to good levels health and well-being. The recent review "*Is work good for your health and well-being?*" concluded that work generally benefits physical and mental health⁴².
- 4.9 The European Environment and Health Action Plan 2004 – 2010 has been developed to give Member States the information and support needed to help them reduce the adverse health effects that can be created by poor environmental conditions, e.g. poor air quality and ground contamination. The European Commission has also adopted a new health strategy "*Together for Health: A Strategic Approach for the EU 2008 – 2013*" which seeks to provide an overall strategic framework spanning core issues in health, as well as health in all policies and global issues.
- 4.10 The need to raise quality of life and promote good health is also a central theme of many national policy documents. A central principle of the UK Sustainable Development Strategy is "ensuring a strong, healthy and just society and a key priority is the need to establish sustainable communities where people want to live and work now and in the future".

⁴¹ European Policy Health Impact Assessment A Guide, May 2004

⁴² Waddell, G. and Burton A.K. (2006), *Is work good for your health and well-being?*, London: TSO (The Stationery Office)

- 4.11 The Department for Communities and Local Government (CLG) is working towards creating sustainable communities across the UK that are thriving and vibrant places that will improve quality of life. Sustainable communities should be: active, inclusive and safe; well-run; environmentally sensitive; well-designed and built; well-connected; thriving; well served; and fair for everyone⁴³. A new development can have a range of effects on population, communities and human health, for example as a result of the effect it has upon the built and natural environment, the effect on the local economy and also upon local facilities and services.
- 4.12 Any new large infrastructure development that could create employment opportunities has the potential to modify local population dynamics, as a result of in-migration by potential new employees. This could lead to changes in the sizes of settlements and also population density. This could have secondary effects in relation to demands on service structure and capacity.
- 4.13 Key problems and issues that face the population and human health in the UK are described in Appendix C3 and strategic level baseline data for the UK is presented in Appendix D.
- 4.14 There are a number of regulatory bodies involved in protecting people and society from the risks (both safety and environmental) associated with the operation of nuclear power stations. The key regulators are:
- The NII as part of the HSE's Nuclear Directorate responsible for nuclear site licensing
 - The EA in England and Wales and SEPA in Scotland responsible for regulating discharges to the environment from nuclear power stations, and the Industrial Pollution and Radiochemical Inspectorate (IPRI) (part of the Department of the Environment Northern Ireland)
 - OCNS as part of the HSE's Nuclear Directorate which regulates the security of civil nuclear material and sites
 - The Dangerous Goods Division of the Department for Transport responsible for regulating the safety of transport of nuclear materials.
- 4.15 Any operator of a nuclear power station must comply with the health and safety requirements of the Health and Safety at Work etc Act 1974 and related regulations. Operators must also comply with the Nuclear Installations Act 1965 which requires the potential operator to have a licence from the NII before constructing the power station. Before a licence is issued, the NII must be

⁴³ www.communities.gov.uk

satisfied that the power station can be built, operated and decommissioned safely with risks being kept ‘as low as reasonably practicable’ at all times. The licence will have conditions attached to it that allow the NII to control the risks throughout the lifetime of the installation. Other key pieces of legislation that are particularly important to nuclear regulation include:

- The Ionising Radiation Regulations 1999
- The Radiation (Emergency Preparedness and Public Information) Regulations 2001
- The Radioactive Substances Act 1993

Assessment of Environmental Effects of the SSA criteria on Population and Human Health

4.16 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information, assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the NPS are developed further.

Relevant SEA Objectives and Guide Questions

4.17 Table 4-2 identifies the SEA objectives and guide questions relevant to population and human health topics.

Table 4-2 Relevant SEA Objectives and Guide Questions to Population and Human Health	
Relevant SEA Objectives	Guide Questions
4. To create employment opportunities	<p>Will it create both temporary and permanent jobs in areas of need?</p> <p>Will it result in in-migration of population?</p> <p>Will it result in out-migration of population?</p>
5. To encourage the development of sustainable communities	<p>Will it affect the population dynamics of nearby communities (age-structure)?</p>

Table 4-2 Relevant SEA Objectives and Guide Questions to Population and Human Health

Relevant SEA Objectives	Guide Questions
<p>6. To avoid adverse impacts on physical health</p> <p>7. To avoid adverse impacts on mental health</p>	<p>Will it result in changes to services and service capacity in population centres?</p> <p>Will it adversely affect the health of local communities through accidental radioactive discharges or exposure to radiation?</p> <p>Will the storage of radioactive waste result in adverse physical and mental health effects for local communities?</p> <p>Will exposure to noise and vibration as a result of plant activities lead to physical and mental health impacts on nearby communities?</p> <p>Will it adversely affect the health of the workforce?</p> <p>Will it impact upon different vulnerable communities locally?</p> <p>Will it help to reduce health inequalities?</p> <p>Will the perceptions of adverse risk as a result of activities lead to adverse impacts on mental health for nearby communities?</p> <p>Will it adversely affect the ability of an individual to enjoy and pursue a healthy lifestyle?</p>

4.18 All of these SEA objectives apply to slightly different elements of population and human health topics. SEA Objective 4 relates solely to the employment benefits that could be achieved by new nuclear power stations. SEA Objective 5 is a more holistic objective and is used to establish to what extent sustainable communities would be affected. When assessing against this objective, consideration was given to the factors which are recognised as being essential

to a sustainable community.

- 4.19 SEA objectives 6 and 7 solely relate to effects on human health, although it is recognised that employment opportunities and the establishment of a sustainable community do contribute to overall health and well-being. Furthermore, performance against many of the other SEA objectives developed for other topics are also closely linked to human health and well-being e.g. water, air quality, landscape.

Overview of Potential Impacts

- 4.20 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. These facilities have the potential to have wide-ranging effects on population and human health. Whilst some of these effects may be specific to nuclear power generation, many will be common to other major infrastructure projects, particularly during the construction phase.
- 4.21 New nuclear power stations will also produce radioactive waste. This waste would be stored on site in an interim safe store throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The interim storage, transport and disposal of the waste could have effects on population and human health as outlined in Table 4-3. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 4.22 Table 4-3 presents the potential impacts of a new nuclear power station. These potential impacts are generic, as no information is yet available regarding the location of the nuclear power stations, the type of reactor that would be used at the sites, nor the specific operating characteristics.

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Job creation and upskilling</p> <p>There is the potential for job opportunities to be created which could have benefits for incomes and quality of life. The effect of these benefits upon the local community would depend upon how many jobs are created and whether construction workers are sourced from the local area. This would also determine whether the upskilling benefits would be retained within the local area.</p> <p>Changes to local population dynamics</p> <p>The construction works could lead to an increase in the population if the workforce is not sourced from the local area. This could lead to changes to local population dynamics as a result of in-migration and may alter the demand for services and facilities in the settlements nearest to where the construction work occurs. There could also be effects on social cohesion depending upon how population dynamics change and service provision changes.</p> <p>Local economic multiplier effects</p> <p>The creation of job opportunities could have benefits for other local services in the area depending upon where the workforce lives and whether labour is sourced from the local area. The presence of the nuclear industry in Cumbria has had significant effects on the local economy and it is estimated that approximately one third of employment in West Cumbria is dependent upon Sellafield because of off-site multiplier effects⁴⁴.</p> <p>Release of dust</p> <p>All construction projects have the potential to generate dust. Fine particles of less than 10µm in diameter (PM₁₀) can cause local nuisance and result in effects on physical health⁴⁵, and can lead to individuals modifying their daily routines to avoid the nuisance created. These effects could be mitigated through the use of careful</p>

⁴⁴ IDM and ERM (2006) Potential New Build in Cumbria, An Assessment of Implications for the County, Final Report.

⁴⁵ 'Both short-term and long-term exposure to ambient levels of PM₁₀ are consistently associated with respiratory and cardiovascular illness and mortality as well as ill health effects. The associations are believed to be causal' (Department for the Environment, Food and Rural Affairs (2005) Air Quality Expert Group on Particulate Matter).

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>working practices and the use of construction environmental management plans.</p> <p>Local services</p> <p>A construction project, by leading to changes to local access routes and increased traffic, has the potential to cause disruption to local services.</p> <p>Local nuisance</p> <p>Light pollution, increased noise, dust generation and localised loss of environmental resources can have effects on physical and mental well-being. However, these impacts could be mitigated through the use of construction environmental management plans.</p> <p>Loss of Recreational and Amenity Land</p> <p>Depending upon where new nuclear power stations are sited, there could be losses of open space and recreational land which could have knock-on adverse effects on human health, including adverse effects on mental health and also decreased levels of physical fitness for those living in the vicinity of the site. There is, therefore, a link with the landscape topic.</p> <p>Increased noise and vibration</p> <p>The delivery of construction materials and equipment to the site could increase noise and vibration for properties living adjacent to roads used for the deliveries. These effects would be temporary.</p> <p>Presence of new infrastructure</p> <p>New roads and infrastructure may need to be constructed as part of the new nuclear power station and this could have health effects, as a result of severance effects, direct loss of land which might be used for recreational purposes, or pollution.</p> <p>Demand on local health services</p> <p>Depending upon where the construction workforce is sourced from, and the effects of the construction works on the local population, there could be increased pressure and demand on local health services.</p>

⁴⁶ www.hse.gov.uk

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>Occupational health risks</p> <p>People working in the construction industry are exposed to occupational health risks on a daily basis. Key ill-health complaints associated with the construction industry are: back pain; skin problems; breathing problems; noise and vibration; and stress⁴⁶. However, there are appropriate means of mitigating such impacts.</p> <p>Construction accidents</p> <p>There is the potential for construction accidents to occur which could have a range of physical health effects, depending upon the incident that occurs e.g. slips and trips or falls from height.</p> <p>Perception of risks and accidents</p> <p>The perception of risks and accidents, as well as concerns about the environmental effects of the construction works or effects on property values, could have adverse effects on mental health and well-being. For example, local residents could be concerned about how the development of a new nuclear power station and the associated construction works could affect their quality of life. Whilst there is no current literature available about the effects of the construction of a new nuclear power station on mental health and well-being, Health Impact Assessments (HIAs) for other major infrastructure projects suggest that local populations may experience anxiety associated with the introduction or extension of industrial plants.</p> <p>Pollution</p> <p>Pollution of watercourses through the release of fuels, oils and sediment could have adverse effects on human health if ingested by humans, as a result of the contamination of water supply or contaminants entering the food chain. These impacts could be controlled through the use of construction environmental management plans and would also be monitored by the relevant environmental protection agency.</p>
Operation (40 years)	<p>Job creation and upskilling</p> <p>During the operational phase job, opportunities would be created which could have benefits for incomes and quality of life. The effect of this job creation on the local community will depend upon how many jobs are created and whether workers are sourced from the local area i.e. there may be significant in-migration to service the new facility with the appropriate staff with the correct skills. The levels of in-migration and the origin of the workers would also</p>

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>determine the benefits to the local communities in terms of upskilling. There could also be increased health benefits if there is increased aspiration amongst the local population owing to the improved range and quality of employment opportunities.</p> <p>Effects for other industries</p> <p>Depending upon the levels of employment provided by a new nuclear power station, there could be positive and/or negative effects. For example, there could be positive multiplier effects for the local economy and businesses if there is increased spending or an increase in the population in the area. This is evident in West Cumbria, as a result of the presence of Sellafield. Conversely, there could be negative effects on businesses, if there is increased competition for labour.</p> <p>Risk of accidents</p> <p>During the operation of the nuclear power station there would be a very small risk of accident which could result in the unplanned release of radiation into the environment leading to adverse health effects. Adverse health effects could result from direct exposure to high levels of ionising radiation or from increased contamination of the air, land and water environment (which could lead in turn to ingestion via water supply or the food production chain), potentially over a wide area. Some potential health consequences of an accident could include a range of cancers, burns, and sensory impairment. This would depend upon the scale of incident that occurred and which part of the plant it occurred in. There would also be the adverse economic effects of the costs associated with cleaning-up following an accident and the potential effects of an accident on businesses and other industries e.g. the tourism industry. The overall safety of nuclear installations is dependent upon good design and operation and is driven by a system of regulatory control. Prior to being able to construct, a site licence has to be granted. The work undertaken to date by the nuclear regulators as part of the GDA has provided an overview of the fundamental acceptability of the proposed reactor design within the overall, UK regulatory regime. For all reactors being considered, the key preliminary conclusion of the GDA was that there are no safety or security shortfalls that would be so serious as to rule out, at this stage, the eventual construction of the reactors in UK licensed sites. The next stage of the GDA will be to review in more detail the submissions of each of the vendors in respect of safety issues.</p> <p>Before granting a nuclear site licence, the HSE will also have to be satisfied that the nuclear facility is designed and operated so that</p>

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>several levels of protection and defence are provided against significant faults or failures, that accident management and emergency preparedness strategies are prepared and that all reasonably practicable steps have been taken⁴⁷ to minimise the radiological consequences of an accident.</p> <p>Perception of accident risks</p> <p>The perception of accident risks could have effects on the mental health and well-being of the local population and over a wider area. However, there is very little literature available in relation to this potential impact and we are not aware of any evidence of an adverse impact.</p> <p>Occupational health risks</p> <p>People working at the nuclear power station sites would be exposed to occupational health risks associated with their daily work that would be typical of a non-nuclear facility, including back pain, skin problems, breathing problems etc. However, the risk of such ill effects occurring could be effectively managed through the development of appropriate working practices.</p> <p>Exposure to low-level radiation for the workforce</p> <p>During the operation of the power station there would be risks of exposure to radiation for the staff employed. Exposure could occur as a result of the storage of radioactive materials including waste and fuel on the site. However, the UK has strict, independent, safety and environmental protection regimes for nuclear power which fulfil the requirements of the Euratom Treaty with regard to radiation protection. Radiation doses to workers in the nuclear power industry continue to fall and the average dose to workers from emissions from nuclear power stations are below those experienced by other workers⁴⁸ prone to radiation exposure in their workplaces e.g. aircraft crew. The site licensing process will require consideration of whether there is adequate protection against exposure to ionising radiation and radioactive contamination both in normal and accident conditions to protect both workers and members of the public.</p> <p>Vehicle movements</p> <p>Vehicle movements to and from the site associated with deliveries</p>

⁴⁷ HSE (2006) Safety Assessment Principles for Nuclear Facilities

⁴⁸ BERR (January, 2008) Meeting the Energy Challenge: A White Paper on Nuclear Power

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>and the daily flow of workers could have very localised effects on the transport network and there could be associated noise and vibration effects and a deterioration in local air quality. Effects would depend upon where the nuclear power station sites are situated and would not be dissimilar to the operation of any other industrial facility.</p> <p>Accident risk associated with the transportation of radioactive materials</p> <p>The transportation of radioactive materials would increase the risk of accidents and incidents which could lead to radiological consequences for workers and members of the public. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from RAMTED for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period</p>

⁴⁹ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

⁵⁰ Bezdek, R.H and Wendling, R. M, (2006) The Impacts of Nuclear Facilities on Property Values and Other Factors in the Surrounding Communities, International Journal of Nuclear Governance, Economy and Ecology, Vol 1, No. 1.

⁵¹ EA, SEPA, Food Standards Agency, Environment and Heritage Service (2007) Radioactivity in Food and the Environment 2006.

⁵² COMARE (2006) the distribution of childhood leukaemia and other childhood cancers in Great Britain 1969-1993

⁵³ Intergovernmental Panel on Climate Change, Working Group III Report, Mitigation of Climate Change.

⁵⁴ Department of Health and Health Protection Agency (2008) Health Effects of Climate Change in the UK 2008: An Update of the Department of Health Report 2001/2002.

⁵⁵ Security of radioactive waste storage and transport is quite under constant review by the regulators to ensure that facilities and practices remain robust (BERR, January 2008, Meeting the Energy Challenge, A White Paper on Nuclear Power)

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s. None of these significant dose events involved the transport of nuclear materials.⁴⁹ The majority of incidents that have occurred have resulted in trivial or no radiological consequences.</p> <p>Recreational/amenity land</p> <p>Depending upon where it is located, the presence of a new nuclear power station could lead to the loss of recreational and amenity land or might deter the use of adjacent areas for such purposes. This could have effects on levels of physical fitness and quality of life.</p> <p>Flood risk</p> <p>The siting of a new nuclear power station, depending upon its location could cause an increase in flood risk. Floods could have both physical and mental health consequences for the local population by disrupting access to services, potentially inundating homes, causing loss of life and increasing anxiety. There would also be an increased financial burden if flood risk increased e.g. higher insurance premiums and associated clean-up costs. Effects would depend upon where new nuclear power station sites are situated with respect to floodplain and how the sites are designed and potential flood defences implemented.</p> <p>Property values</p> <p>There may be a perception amongst individuals living in the vicinity of a new nuclear power station that there could be decreases in property values. Research in this field is very limited⁵⁰, particularly in the UK. Research undertaken in the United States⁵⁰ suggests that nuclear facilities are very important economic elements of local communities, as they provide large numbers of skilled jobs, pay above average wages and contribute to the social infrastructure of an area. The study explored housing and real estate values in seven regions and identified that total property values, assessed valuations and median housing prices increased at rates above the national and state averages. Housing prices in each local area were several times higher than prior to the opening of the nuclear facilities. Whilst the research does not claim to be definitive, it calls into question the perception that nuclear facilities have a detrimental effect on adjacent communities and property owners.</p>

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>Release of radiation during normal operating conditions</p> <p>Liquid and gaseous radioactive wastes would be released into the environment during operation. As part of the GDA, the EA stated it was important to have an assessment of the annual doses from the gaseous and liquid discharges for a generic site. Vendors were expected to provide <i>‘dose assessments addressing annual doses from gaseous and liquid radioactive discharges and direct radiation, potential short-term doses from the maximum anticipated short-term discharges for normal operation and collective dose’</i>. Using the data that has been supplied to date by each of the vendors, the EA used its initial radiological assessment methodology to determine a total annual dose. The purpose of this was to provide early assurance that dose constraints could be complied with. For all designs it was concluded that the annual dose constraints and limits would be met for a coastal site. However, much more detailed assessment will be undertaken as part of the second phase of the GDA.</p> <p>Whilst detailed results cannot be reported at this stage without information from later in the GDA process, nor information about the receiving environment at the site of a new nuclear power station, it is recognised that there is a risk to human health from the release of radiation. However, consent has to be sought from the relevant environment agency prior to the discharge of any radioactive wastes under the Radioactive Substances Act 1993 and discharges are monitored in accordance with such consents and limits. The Radioactivity in Food and the Environment Reports (RIFE) give results of a UK wide monitoring programme for radioactivity levels in food and the environment. The 2007 report⁵¹ documents the levels of radioactivity and the amount of radiation that the public is exposed to near 39 nuclear sites in the UK. The results to date indicate that discharges from nuclear sites do not compromise environmental or public health and all doses are within legal limits. There are public concerns about links between radioactive discharges and incidences of cancer. The 11th Report of the Committee on Medical Aspects of Radiation in the Environment (COMARE) has not identified any evidence of increased incidents of childhood cancer in areas within a 25km radius of existing nuclear power stations⁵².</p> <p>CO₂ reduction emissions</p> <p>Nuclear power is a low-carbon form of electricity generation. The CO₂ emissions from the whole life-cycle of nuclear power stations are significantly lower than fossil fuelled generation and are similar to those for renewable energy sources⁵³. The CO₂ emission reductions that could be achieved during the operation of new</p>

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>nuclear power stations could have health benefits. If no action is taken to reduce climate change then there could be very significant effects on human health and well being⁵⁴.</p> <p>Energy availability</p> <p>The operation of new nuclear power stations could increase the security of energy supply, as nuclear fuel supply is a stable and mature industry, and could help to prevent decreases or fluctuations in energy supply. This should prevent any adverse health effects that could be created by a decrease in energy availability.</p> <p>Pollution</p> <p>Pollution of watercourses through the release of fuels, oils and sediment could have adverse effects on human health if ingested by humans. These impacts could be controlled through the use of appropriate site management plans and would also be monitored by the relevant environmental protection agency.</p> <p>Interim Radioactive Waste Storage</p> <p>Radioactive waste including higher activity wastes (ILW and potentially spent fuel) will be stored on site in safe, secure, interim storage facilities prior to being transport for final disposal. The main risks to population and human health would be through unplanned releases of radioactive materials into the environment via air, water or soil contamination. However, these risks are considered to be very low, as the stores would be designed to the highest levels of containment and would be subject to strict regulatory and health and safety controls⁵⁵. Safe storage in these facilities would be expected to be available until such time as final disposal facilities become operational.</p>
Decommissioning (including interim waste storage, transport and final disposal) (minimum of 30 years)	<p>Exposure to radiation for the workforce</p> <p>During decommissioning there would be risks of exposure to radiation for the staff employed. Exposure could occur as a result of the storage of radioactive materials including waste and fuel on the site. The risk would remain for as long as the waste materials are stored on site prior to final disposal in a geological disposal facility.</p> <p>Job creation and upskilling</p> <p>The decommissioning process would provide employment, which could have benefits for incomes and quality of life. However, the end of the operational phase would lead to the loss of jobs which could adversely affect local communities and the local economy.</p>

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>Vehicle movements during decommissioning</p> <p>Vehicle movements to and from the site could have very localised effects on the transport network and there could be associated noise and vibration effects together with a deterioration in local air quality.</p> <p>Accident risk associated with the transportation of radioactive materials</p> <p>The transportation of radioactive materials during the decommissioning which might include radioactive waste would present an accident or incident risk which could expose workers and members of the public to radiation. However, the safety record for the transport of nuclear materials suggests that the risks are very low.</p> <p>Perception of accident risks</p> <p>The perception of accident risks could have effects on the mental health and well-being of the local population, for example by creating anxiety, though we are not aware of any evidence of an adverse impact.</p> <p>Pollution effects</p> <p>Pollution of watercourses through the release of fuels, oils and sediment could have adverse effects on human health if ingested by humans.</p> <p>Release of radiation during decommissioning</p> <p>Radioactive wastes could be released into the environment during decommissioning, comprising gaseous emissions to air and liquid radioactive discharges to water. This could result in adverse health effects in the long-term, as a result of accumulation through the food-chain, the contamination of water supply or as a result of direct contact with radioactive emissions. A decommissioning strategy would be required together with a full EIA prior to decommissioning.</p> <p>Occupational health risks</p> <p>Workers involved in the decommissioning process at the nuclear power station sites would be exposed to occupational health risks associated with their daily work that would be typical of a non-nuclear facility.</p> <p>Interim Radioactive Waste Storage</p> <p>Radioactive waste will be stored on site in safe, secure, interim storage facilities prior to being transport for final disposal. The main</p>

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>risks to population and human health are described above during the operational phase. It would need to be demonstrated that risks to population and human health would be insignificant before the decommissioned site could be used by the public.</p> <p>Transport of Radioactive Waste for Final Disposal</p> <p>Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. The main risks to population and human health would be through unplanned releases of radioactive materials into the environment as a result of accidents which could lead to radioactive releases into the air, water or soil or as a result of direct exposure to workers involved in transportation and storage. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from RAMTED for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred⁵⁶ mainly in the 1970s, only two have occurred since the mid - 1980s. The majority of incidents that have occurred have resulted in trivial or no radiological consequences. During interim storage of several decades the initial fission product activity of the waste would decline as more active compounds decay and it may only require a single movement of lower activity material to the final disposal locations. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Final Disposal of Radioactive Waste</p> <p>The Government considers that it would be technically possible to dispose of higher activity waste from new nuclear power stations in a</p>

⁵⁶ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

Table 4-3 Potential Impacts of Nuclear Facilities on Population and Human Health in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Population and Human Health in the Absence of Details on Location, Design or Mitigation
	<p>geological disposal facility. The risks to population and human health of disposal in a geological disposal facility relate to both the impacts of construction of the facility and the depositing and long-term storage of waste and waste emplacement disposal within it. The containment of radioactivity would be central to any safety case presented to the regulators, who would have to be satisfied that the risks to human health would be acceptably small before such a facility could be built and operated.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for human health and employment characteristics in the local area depending upon where it is located.</p>

Significant Effects of the SSA criteria

- 4.23 The SSA criteria have been assessed against the relevant SEA objectives for effects on population and human health (refer to Table 4-2) using the matrices in Appendix D.
- 4.24 The SSA process is one facilitative action being undertaken by the Government to reduce the regulatory uncertainty and risk associated with investing in new nuclear power stations. Whilst none of the SSA criteria relate directly to creating job opportunities, it is expected the employment market will respond to the development of new nuclear power stations with jobs being created both on the sites and as a result of wider multiplier effects (including support industries).
- 4.25 Major positive effects have been recorded against Objective 4 because of the job opportunities that would be provided. During construction, a large number of jobs would be created which would have the potential to benefit local residents. For example, during the most intensive elements of the construction of Sizewell B approximately 4,385 people were employed, of which 50% were from East Anglia. During operation there would also be job opportunities and US experience estimates that around 500 jobs would be needed during the operational phase for each reactor. Over the long-term, it is expected that job opportunities would increase at times of major overhaul, then decrease when the sites cease to operate and decommissioning commences. For new nuclear power stations this might not be until the 2080s. It should also be recognised

that different skills and expertise are needed throughout all of the phases (construction, operation, overhaul and decommissioning).

- 4.26 None of the SSA criteria are specifically focused upon protecting human health, both physical and mental, but it is evident that a number of the criteria seek to avoid adverse impacts on human health in some way by ensuring that particular safety, societal or environmental issues are considered through the siting process.
- 4.27 Criteria 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12 seek, directly or indirectly, to reduce the likelihood of accidents and incidents occurring at new nuclear power stations, for example: by excluding areas at seismic risk or areas of capable faulting; and by highlighting the need for sites not to be at risk of flooding nor to adversely affect flood risk in other locations. These criteria are a combination of exclusionary and discretionary but are all strengths from a human health perspective. Criteria 1.3, 1.6, 1.8 and 1.9 are identified for consideration by the IPC at the local level and so could provide some human health benefits by addressing certain safety issues.
- 4.28 Criterion 1.11 which is identified for local consideration highlights the need for operators to prepare, in consultation with local authorities, the police, health authorities and other bodies, emergency plans for the protection of the public and their workforce including those for dealing with accidental releases of radioactivity. The development of such plans would also offer help to avoid adverse effects on physical health.
- 4.29 Criterion 3.1 seeks to avoid, minimise or mitigate adverse effects on areas of amenity, cultural heritage and landscape value. The avoidance of adverse impacts upon such areas is of importance to human health as they are locations where local communities are able to participate in physical exercise and can maintain healthy lifestyles. The quality of the physical environment is another determinant of health and well-being. However, this criterion is discretionary only and so there remains a risk that adverse effects on areas of amenity, cultural heritage and landscape value could occur.
- 4.30 Whilst the criteria offer some avoidance of health impacts, they do not address specific health issues relating to the construction, operation and decommissioning of the new nuclear power stations, for example risks associated with construction accidents or radiation releases during operation and decommissioning. The role of the regulators in managing and assessing these risks must also be recognised. Such risks, with the exception of risks of accidental radioactive releases, are also associated with the alternatives to nuclear power. The production and use of fossil fuels involves major project construction risks and (admittedly small) radiation risks.

- 4.31 Whilst the siting of a new nuclear power station in itself would not lead directly to the creation of a sustainable community, there is the potential for their development to have both beneficial and adverse effects on some of the factors that are critical to the establishment of a sustainable community, or which could affect the sustainability of an existing community. Criterion 3.1, by avoiding, minimising or mitigating adverse effects on areas of amenity, cultural heritage and landscape value, would be of benefit to the recreational amenity of areas which is also important to creating or maintaining a sustainable community.
- 4.32 The criteria also work towards reducing the risk of accidents and incidents. There are multiple SSA criteria (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) which would help to ensure that a safe environment is maintained by seeking to reduce the risk of accidents occurring which could have adverse effects on human health.
- 4.33 The employment opportunities potentially created by facilitating the development of new nuclear power stations would also benefit communities. However, there could be the potential for this to lead to in-migration if individuals move to an area to take the jobs created. This could lead to changes to population dynamics in the settlements affected which could affect demand for services, for example, education and health services. For example, an increase in population could help to maintain the viability of existing services and stimulate the establishment of new facilities which could benefit communities. Impacts could be positive or negative depending upon the size of the community, the settlement and the capacity of the services to accommodate such a change.
- 4.34 Positive and negative effects have been recorded against SEA Objective 5. A number of other issues, outside the scope of siting criteria, would need to be addressed to ensure that benefits to local communities are maximised and potential detriments avoided.
- 4.35 Table 4-3 identified that at various stages of a new nuclear power station's life, there could be various perceptions by the population which could affect its mental health and well-being. Impacts upon mental health and well-being are very difficult to define and assess and for this reason, performance against SEA Objective 7 was recorded as uncertain, though we are not aware of any evidence of an adverse impact.
- 4.36 It could be argued that the SSA process and all of the other facilitative actions that are being undertaken represent a robust process that is seeking to reduce risks to human health and the environment and so should help to reduce concerns and fears. The development of the SSA and the Nuclear NPS will be very transparent, with public consultation occurring throughout, and this should

help to ensure that the public are able to scrutinise and query areas that they feel need greater accountability.

- 4.37 The overall facilitative action of the Nuclear NPS, through increasing the likelihood of new nuclear power stations being built, will increase the need for radioactive waste to be transported and disposed of. The transportation and final disposal of radioactive waste are not addressed through the SSA criteria

Cumulative Effects

- 4.38 All of the above effects on human health could occur at individual sites developed for new nuclear power stations. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites or at other locations across the UK then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. There could be a range of positive and negative cumulative effects including cumulative benefits for health and well-being as a result of job creation and regeneration. These specific cumulative effects would depend upon precisely where the development occurs, the number of jobs created and who would benefit from the opportunities. There could also be adverse cumulative effects on health associated with emissions from multiple nuclear power stations including new and existing facilities. However, such emissions would be controlled and regulated. The Department of Health and the Health Protection Agency will be consulted on the suitable methods that could be used to assess cumulative effects for the subsequent Environmental Report.
- 4.39 Whilst a number of the SSA criteria are discretionary, and therefore would not entirely rule out the potential for adverse effects to occur which could subsequently impact upon population and health and well-being, they would ensure that such issues are considered as part of the decision-making process and should help to reduce the number of adverse cumulative effects that occur. However, a degree of uncertainty remains at this stage in the assessment as the likelihood of such benefits being realised depends upon how the discretionary criteria are applied, although we are aware of an adverse impact.
- 4.40 Once sites are nominated, the cumulative effects could be identified with more certainty. This will enable the issue of cumulative effects to become a central consideration in determining which sites and how many are brought forward. This will enable a more informed decision to be made on which sites are listed in the Nuclear NPS.

Mitigation

- 4.41 At this stage in the assessment, there are no details about where the sites might be located and so it is not possible for the assessment to differentiate between how different populations or communities might be affected. It is also not possible to determine at this stage exactly how social cohesion and the provision of services will be affected. These types of effects will be considered in the Environmental Report once sites have been nominated and further information can be collated about the communities that might be affected. Criterion 3.2 is a local level criterion that seeks to minimise disruption to the strategic transport infrastructure. As this criterion also covers A-roads it could also be seen to contribute towards the protection of sustainable communities which depend upon the function and efficiency of their local road infrastructure.
- 4.42 It will also be possible in the Environmental Report to better identify the key risks to communities and also to determine what risks they are already exposed to in a particular area, for example: whether there are there already industrial facilities operating in the area; whether it is an area of significant deprivation; and health inequalities.
- 4.43 The other facilitative actions including Justification and the Generic Design Assessment have a very important role to play in determining the potential effects of developing new nuclear power stations on human health. Furthermore, before the construction of a nuclear power station can commence a site license has to be issued by the HSE which will also consider risks to human health.
- 4.44 It is considered beneficial if the SSA could also recommend enhancements to be provided, for example, the creation of community funds or the provision of training. It was considered that such measures would be better undertaken once site-specific applications are considered by the IPC.

5 EFFECTS ON MATERIAL ASSETS

Summary

- 5.1. This section considers how the SSA Criteria will impact on those SEA objectives which cover Material Assets. It considers whether the use of the SSA Criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
8. To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure.
 9. To avoid disruption to basic services and infrastructure.
 10. To avoid adverse impacts on property and land values and to avoid planning blight.
 11. To avoid the loss of access and recreational opportunities, their quality and user convenience.
- 5.2. Many of the SSA criteria will impact on the ability to achieve SEA objectives 8 and 9. The criteria addressing nuclear safety (1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) would provide some benefits to infrastructure and services by reducing the risk of accidents. Following assessment, this environmental study has found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA objectives 8 and 9. There is a criterion relating to significant infrastructure and resources (criterion 3.2), although given that this criterion is for local consideration only, it would not have an impact on the achievement of SEA objectives at a strategic level.
- 5.3. The environmental study has concluded that the likelihood of new nuclear power stations causing negative effects on strategic infrastructure could be reduced by making criterion 3.2 discretionary, rather than leaving it for local consideration, and thus giving it prominence at a strategic level. The Government's reasons for not adopting this approach are set out in Chapter 2 of the SSA consultation.
- 5.4. The SSA criteria do not directly address the issues of planning blight and property values. As the location of new nuclear power stations could have an impact on these issues, the environmental study has not been able to draw firm conclusions at this stage on the impact of the SSA criteria on the ability to achieve SEA objective 10. However, the Planning Bill requires the IPC to consider a 'local impact report' (which may cover blight) when making a decision.

5.5. The SSA criteria seek to avoid, minimise or mitigate adverse impacts on societal issues, including areas of amenity, cultural heritage and landscape value (criterion 3.1). For this reason, we expect that the SSA criteria will have positive effects on the ability to achieve SEA Objective 11. However, since criterion 3.1 is a discretionary criterion only, there is a risk of possible negative effects.

5.6 Table 5-1 summarises the assessment results.

Table 5-1 Effects of the SSA criteria on Material Assets												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
8.To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure	NA	NA	NA	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	⓪	⓪	⓪
9. To avoid disruption to basic services and infrastructure	+/- Direct	+/- Direct	+/- Direct	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	⓪	⓪	⓪
10.To avoid adverse impacts on property and land values and to avoid planning blight	NA	NA	NA	?	?	?	?	?	?	NA	NA	NA
11. To avoid the loss of access and recreational opportunities, their quality and user convenience	+ Direct	+ Direct	+ Direct	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	⓪	⓪	⓪
C = Construction; O = Operation; D = Decommissioning Note that the symbol "⓪" means that "There would be no significant contribution towards the achievement of the SEA Objective". It appears in each of the assessment matrices and the symbols used are set out in Annex E.												

Introduction and Background

5.7 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to material assets.

5.8 Material assets are identified as a topic for consideration in Annex 1 of the SEA Directive. The term, ‘material assets’ is not defined in the Directive, Regulations

or the Practical Guide although it is often interpreted as including those features of the built environment that are of value to the community. It is potentially a very broad topic and there is a clear overlap with the topics of cultural heritage, water (through effects on, for example, flood defences and water infrastructure), landscape (through effects upon the built environment – townscape) and population and human health (through effects on, for example, community facilities, housing provision etc.). These topics are dealt with separately within this environmental study and the assessment of effects upon material assets is undertaken within them.

5.9 However, for the purposes of this environmental study, the following additional material assets have been considered as requiring assessment:

- strategic transport infrastructure (including strategic rail links, strategic road links (including motorways, trunk roads and A-roads), airports and ports)
- property values and planning blight
- basic services and infrastructure (including General Practitioners (GPs), post offices, schools, electricity, gas and water transmission infrastructure)
- recreational and amenity land

5.10 There is a comprehensive transport network across the UK comprising principally roads, railways, airports and ports. The effectiveness of the transport infrastructure is a key component of our economic and social well-being. Nonetheless, traffic congestion and associated adverse air quality and climatic impacts are rising, notably in major urban areas. There are still many more remote, rural areas of the UK which are less well served by the transport network.

5.11 Property and land values throughout the UK have changed significantly over the last seven years, for a wide variety of reasons. The changing value of property plays an important role in the economy and in personal wealth and wellbeing.

Assessment of Environmental Effects of the SSA criteria on Material Assets

5.12 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information, and assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the Nuclear NPS are developed further.

Relevant SEA Objectives and Guide Questions

5.13 Table 5-2 identifies the SEA objectives and guide questions relevant to this topic.

Table 5-2 Relevant SEA Objectives and Guide Questions for Material Assets	
Relevant SEA Objectives	Guide Questions
8.To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure	Will it result in the direct loss of strategic road/rail/air/port infrastructure? Will it result in increased congestion/pressure on key transport infrastructure?
9. To avoid disruption to basic services and infrastructure	Will it result in loss or disruption to basic services and infrastructure?
10.To avoid adverse impacts on property and land values and to avoid planning blight	Will it result in a decrease in property and land values as a result of a change in perceptions or blight?
11. To avoid the loss of access and recreational opportunities, their quality and user convenience	Will it result in the loss of recreational and amenity land?

Overview of Potential Impacts

5.14 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. Such facilities have the potential to result in adverse effects upon material assets. Some such effects may be specific to nuclear power generation but many will be common to all major infrastructure and power generation projects. Some impacts may be negative but benefits are also possible.

5.15 Many such effects will depend upon the presence of, for example, a transport network, basic services and infrastructure, properties or recreational land in or around the locations of the proposed power stations, the supporting infrastructure and grid connection. Without knowing the proposed locations at this stage, there is uncertainty about whether or not the development of new

nuclear power stations would result in significant effects on material assets. It is also not known at this stage to what extent effects could be mitigated through detailed design.

- 5.16 New nuclear power stations will also produce radioactive waste. This waste would be stored on site in safe and secure interim storage facilities throughout operation and decommissioning, prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The transport and disposal of the waste could have effects on material assets which are presented in Table 5-3. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 5.17 Table 5-3 represents a summary of the potential effects associated with new nuclear power development in the absence of information about exact locations and detailed design.

Table 5-3 Potential Impacts of Nuclear Facilities on Material Assets in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Material Assets in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Earthworks and excavations</p> <p>Earthworks and excavations can result in disruption to services such as electricity, gas, water, or telecommunications due to the laying of underground cables, pipes and foundations.</p> <p>Physical presence of site</p> <p>The development of buildings and other structures may result in the loss of amenity or recreational land during construction. This could be temporary or permanent depending upon whether land is lost beneath the footprint of the site or whether it is located nearby and needs to be closed temporarily or permanently for safety reasons.</p> <p>Construction Traffic</p> <p>An increase in construction traffic on local roads has potential to put pressure on the strategic transport network depending upon its location. Construction waste may need to be transported away from the site to a suitable disposal facility.</p> <p>Increased traffic through deep water ports and via railways may also occur in order to transport construction materials.</p> <p>Construction employment and/or negative publicity</p> <p>Major infrastructure projects can affect property values both</p>

Table 5-3 Potential Impacts of Nuclear Facilities on Material Assets in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Material Assets in the Absence of Details on Location, Design or Mitigation
	<p>positively and negatively whether this is through planning blight as a result of adverse environmental effects, negative publicity, or the regeneration of a settlement and its facilities through job creation and multiplier effects. However, there is insufficient evidence from the UK regarding property values and nuclear power stations to form strong conclusions regarding this. Research undertaken in the United States suggests that nuclear facilities are very important economic elements of local communities, as they provide large numbers of skilled jobs, pay above average wages and contribute to the social infrastructure of an area. The study explored housing and real estate values in seven regions and identified that total property values, assessed valuations and median housing prices increased at rates above the national and state averages. Housing prices in each local area were several times higher than prior to the opening of the nuclear facilities. Whilst the research does not claim to be definitive, it calls into question the perception that nuclear facilities have a detrimental effect on adjacent communities and property owners.</p> <p>It is possible that populations and local communities may increase to service the power stations. This could help to make basic services and infrastructure more viable. It is assumed that the construction of new power stations would not result in the direct physical loss of essential local services such as schools, GPs and post offices as development would be located at a safe distance from areas of local population.</p>
<p>Operation (40 years)</p>	<p>Physical presence of site</p> <p>The presence of the site itself may cause loss of amenity or recreational land. This could be temporary or permanent depending upon whether land is lost beneath the footprint of the site or whether it is located nearby and needs to be closed temporarily or permanently for safety reasons. Rights of way may need to be altered for security reasons or access reduced.</p> <p>Grid Connection</p> <p>New power stations would need to be connected to the national grid and operators will be required to submit a Grid Connection Application. Depending upon the power output of the reactor chosen, this may or may not result in a need for grid strengthening and upgrades.</p> <p>Vehicle movements</p> <p>An increase in operational traffic particularly due to employees on local roads has potential to put pressure on the strategic transport network depending upon its location.</p>

Table 5-3 Potential Impacts of Nuclear Facilities on Material Assets in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Material Assets in the Absence of Details on Location, Design or Mitigation
	<p>Operational employment and/or negative publicity</p> <p>Major infrastructure projects can affect property values in different ways whether this is through planning blight as a result of adverse environmental effects or negative publicity. It is expected that the operational life of each reactor would be at least 40 years. See comments above during construction phase.</p> <p>It is possible that the populations of local communities may increase to service the power stations. This could help to make basic services and infrastructure more viable.</p> <p>Risk of accidents</p> <p>During the operation of the nuclear power station there would be a very small risk of accident which could result in the unplanned release of radiation into the environment leading to adverse effects upon recreational amenity and infrastructure. The overall safety of nuclear installations is dependent upon good design and operation and is driven by a system of regulatory control. Prior to being able to construct a site licence has to be granted. The work undertaken to date by the nuclear regulators as part of the GDA has provided an overview of the fundamental acceptability of the proposed reactor design within the overall, UK regulatory regime. For all reactor types being considered the key preliminary conclusion was that there are no safety or security shortfalls that would be so serious as to rule out at this stage the eventual construction of the reactors in UK licensed sites. The next stage of the GDA will be to review in more detail the submissions of each of the vendors in respect of safety, security and environmental issues.</p> <p>Before granting a nuclear site licence the HSE will also have to be satisfied that the nuclear facility is designed and operated such that several levels of protection and defence are provided against significant faults or failures, 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 accident⁵⁷.</p> <p>Accident risk associated with the transportation of radioactive materials</p> <p>The transportation of radioactive materials would increase the risk of accidents and incidents which could disrupt the transport network.</p>

⁵⁷ HSE (2006) Safety Assessment Principles for Nuclear Facilities
<http://www.hse.gov.uk/nuclear/saps/saps2006.pdf>

Table 5-3 Potential Impacts of Nuclear Facilities on Material Assets in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Material Assets in the Absence of Details on Location, Design or Mitigation
	<p>However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from RAMTED for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid - 1980s.⁵⁸ The majority of incidents that have occurred have resulted in trivial or no radiological consequences</p> <p>Property values</p> <p>There may be a perception amongst individuals living in the vicinity of a new nuclear power station that there could be decreases in property values. Research in this field is very limited⁵⁹, particularly in the UK. Research undertaken in the United States⁵⁹ suggests that nuclear facilities are very important economic elements of local communities, as they provide large numbers of skilled jobs, pay above average wages and contribute to the social infrastructure of an area. The study explored housing and real estate values in seven regions and identified that total property values, assessed valuations and median housing prices increased at rates above the national and state averages. Housing prices in each local area were several times higher than prior to the opening of the nuclear facilities. Whilst the research does not claim to be definitive, it calls into question the perception that nuclear facilities have a detrimental effect on adjacent communities and property owners.</p>

⁵⁸ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

⁵⁹ Bezdek, R.H and Wendling, R. M, (2006) The Impacts of Nuclear Facilities on Property Values and Other Factors in the Surrounding Communities, International Journal of Nuclear Governance, Economy and Ecology, Vol 1, No. 1.

Table 5-3 Potential Impacts of Nuclear Facilities on Material Assets in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Material Assets in the Absence of Details on Location, Design or Mitigation
Decommissioning (including interim waste storage, transport and final disposal) (minimum of 30 years)	<p>Post-closure land-use</p> <p>There is no evidence to suggest that property values, planning blight or viability of essential services will be affected differently throughout the decommissioning phase. This phase will continue to provide jobs although they will require different skills than during operation. There may be an increased demand for housing and healthcare resulting from the periodic employment of a greater number of contractors. However, jobs that existed during operation would decline and as many sites are in remote areas where power stations are dominant employers, this can have significant effects upon the socio-economic well-being of an area. This has proven to be the case in areas such as West Cumbria, North Sutherland and Caithness, Anglesey and Merionnydd and the Lockerbie-Annan-Gretna corridor in Dumfries and Galloway⁶⁰. These issues may have an impact upon population dynamics of local communities and levels of investment in an area which could in turn affect property values and the viability of local settlements.</p> <p>Decommissioning would take a minimum of 30 years and there may be a reluctance to re-use the site, perhaps due to remaining licensed sites nearby or to public perception of the risks involved.</p> <p>Restoration design</p> <p>Once decommissioned, there could be opportunities for enhancement of recreational and amenity value in and around the sites.</p> <p>Transport of Radioactive Waste for Final Disposal</p> <p>Whilst it is expected that the necessary transport infrastructure would have been implemented by this stage of the power station's lifecycle, an increase in decommissioning plant and traffic has potential to put pressure on the strategic transport network depending upon its location. Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. The safety record for the transport of nuclear materials suggests that the risks are very low. Data from the RAMTED for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period</p>

⁶⁰ NDA (2008) NDA Socio-Economic Policy

Table 5-3 Potential Impacts of Nuclear Facilities on Material Assets in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Material Assets in the Absence of Details on Location, Design or Mitigation
	<p>had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s.⁶¹ The majority of incidents that have occurred have resulted in trivial or no radiological consequences. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Final Disposal of Radioactive Waste</p> <p>The Government considers that it would be technically possible to dispose of higher activity waste from new nuclear power stations in a geological disposal facility. The risks to material assets of disposal in a geological disposal facility relate to both the impacts of construction of the facility and the depositing and long-term storage of waste, waste emplacement and disposal within it. Such impacts, may relate to loss of recreational and amenity land, disruption to services and infrastructure, disruption to the strategic transport network and the potential for planning blight and change in property values.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for material assets in the locations chosen for the development of new facilities.</p>

5.18 SSA criteria have been developed to provide greater direction towards those areas of the UK that would be more suitable for the development of new nuclear power stations. The following section describes the significant effects upon material assets of applying the SSA criteria.

⁶¹ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

Significant Effects of the SSA criteria

- 5.19 The SSA criteria have been assessed against the relevant SEA objectives for effects on material assets (refer to Table 5-2) using the matrices in Appendix D.
- 5.20 It is assumed that sites would not be nominated where strategic transport infrastructure is present on site. Criterion 3.2 highlights the importance of significant infrastructure which includes motorways, airports and the strategic rail network. This criterion would work towards achieving SEA Objective 8 and it is flagged for local consideration only and so would not contribute to the strategic decision-making process when deciding which sites should be listed on the NPS, rather it is identified for consideration by the IPC when determining individual site applications. There is a risk that there could be negative strategic effects caused by some of the nominated sites and that these effects might not be considered when deciding which sites to include in the Nuclear NPS. The transportation of nuclear raw materials and waste to and from the nuclear power station sites could lead to accidents which could disrupt the transport network. Whilst the criteria do not specifically address this issue, the UK operates a strict safety and security regulatory framework for the transport of nuclear materials. In light of the past safety record, the likelihood of an incident is considered very low⁶².
- 5.21 Criterion 1.11 which is flagged for local consideration identifies the need for all nuclear power station operators to prepare emergency plans which would also help to avoid adverse impacts on basic services and infrastructure at the local level.
- 5.22 It is assumed that sites would not be nominated where essential basic services (schools, GPs, post offices etc) exist, as these are likely to be within existing areas of population. This may not always be the case, but any such proposals would need to satisfy both the demographic siting criteria (1.10) as well as additional regulatory requirements (e.g. 1.11 emergency planning).
- 5.23 It is expected that in response to the development of new nuclear power stations, jobs will be created both on the sites and as a result of wider multiplier effects (including support industries). It is possible that the populations of local communities may increase to service the power stations depending upon their location, which could help to make basic services and infrastructure more viable, hence contributing to SEA Objective 9.

⁶² Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014).

- 5.24 Major infrastructure projects can affect property values in different ways whether this is through planning blight as a result of adverse environmental effects, due to adverse public perceptions or by the regeneration of a settlement and its facilities through job creation and multiplier effects. However, there is insufficient evidence from the UK regarding property values and nuclear power stations to form strong conclusions regarding this. See Table 5-3 for further details. There are no criteria directly addressing either planning blight or property and land values.
- 5.25 Criterion 3.1 seeks to avoid, minimise or mitigate impacts upon areas of amenity, cultural heritage and landscape value. This could help to avoid the loss of recreational facilities and would contribute towards achieving SEA Objective 11. However, the criterion is discretionary only. Criteria 2.1 and 2.2 also seek to avoid, minimise or mitigate adverse impacts upon internationally and nationally designated wildlife sites which are often used for informal recreation.
- 5.26 An accident at a nuclear power station could affect the function and efficiency of transport infrastructure, basic services and infrastructure, recreational and amenity land. It could also have an effect on loss of property and land values. As described earlier, due to the stringent licensing and safety regimes operated for the nuclear sector in the UK, the risk of such an accident occurring is extremely low and either directly or indirectly criteria 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12 work towards reducing the risk of accidents and incidents occurring, although some are discretionary. Criteria 1.3, 1.6, 1.8, 1.9 and 1.11 identified for consideration at the local level also address safety issues.
- 5.27 Criteria 1.4 and 1.5 seek to avoid or mitigate flood risk and risks caused by tsunami, storm surge and coastal processes. These criteria also state there should be no adverse effects on neighbouring areas, as a result of implementing mitigation at the sites to protect against these risks e.g. new defences. This could have indirect effects to material assets, particularly in coastal areas, as a change to coastal processes could have knock on effects further along the coast on material assets including ports, properties or recreational land. However, these criteria are only discretionary.
- 5.28 The overall facilitative action of the NPS, through increasing the likelihood of new nuclear power stations being built, will increase the need for radioactive waste to be transported and disposed of. The transportation and final disposal of radioactive waste are not addressed through the SSA criteria.

Cumulative Effects

- 5.29 All of the above effects on material assets could occur as a result of the development of an individual power station. Additionally, if multiple new nuclear

power station sites are developed, either in close proximity to each other or existing nuclear power station sites or at other locations across the UK then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. There could be a range of positive and negative effects, including the loss of amenity land or planning blight at multiple locations across the UK. However, the process of developing the NPS, using the SSA criteria to identify sites and also the assessment that will be undertaken through the SEA, will enable the cumulative effects of developing the sites to be considered and this information will be used to inform the decision-making process about which sites should be included in the NPS.

- 5.30 A number of the SSA criteria are discretionary so this would not entirely rule out the potential for adverse effects to occur. However, they would ensure that such issues are considered as part of the decision-making process and this could help to reduce the number of adverse cumulative effects that occur.

Mitigation

- 5.31 Criteria relating to avoidance of adverse impacts upon infrastructure, and amenity land have been added to the SSA criteria as a result of the SEA. Mitigations could include addressing, as far as possible, effects on strategic transport infrastructure through the SSA process and a discretionary, rather than a local criterion could be used to address these issues. However, the SSA considered that it would not be practicable given the level of information available at this stage and that it was more appropriately addressed at the local level.
- 5.32 Whilst new nuclear power stations are anticipated to increase the likelihood of adverse impacts occurring upon material assets, the SSA criteria work towards avoiding these impacts, where it is appropriate at the strategic level and it is not considered that further mitigation is necessary at this stage. Once sites have been nominated it will be possible in the Environmental Report to provide further clarity about which types of, and also how, material assets will be affected.
- 5.33 As a consequence of the SEA, we will consider issues such as the efficiency of the transport infrastructure etc. at the local level as part of individual planning applications for new nuclear power station sites.

6 EFFECTS ON AIR AND CLIMATE

Summary

- 6.1. This section considers how the SSA Criteria will impact on those SEA objectives which cover Air and Climate. It considers whether the use of the SSA Criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
 12. To avoid adverse impacts upon air quality.
 13. To minimise greenhouse gas emissions.
 14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible.
- 6.2. The environmental study has found that the construction of new nuclear power stations could have a negative effect on air quality affecting distances up to 100 km from the site. This is because the construction of new nuclear power stations would be likely to cause dust to be generated, as well as increased vehicle emissions. This would be relevant to SEA Objective 12. The SSA criteria do not seek specifically to address these impacts. During the other phases of the power station's life, the environmental study found that the SSA criteria could have both positive and negative effects on the ability to achieve SEA Objective 12. It should be noted that those SSA criteria that seek to reduce the risk of accidents (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12), will help to reduce the likelihood of unplanned gaseous radioactive emissions and will therefore have positive air quality impacts.
- 6.3. The environmental study found that the increase in transport movements that would result from new nuclear power stations could have adverse impacts on the air quality of the local area. These effects could be managed through the careful siting of the power stations in relation to key materials sources and also through the use of alternatives to road transport where practicable. This issue is not addressed through the SSA criteria.
- 6.4. The SSA process is one of the Government's facilitative actions, which will reduce regulatory and planning risks associated with investing in new nuclear power stations. If private sector operators ultimately decide to invest in new nuclear power stations, there would be a positive impact on the ability to reduce CO₂ emissions from the energy sector and thus to achieve SEA Objective 13.
- 6.5. The SSA criteria seek to avoid or mitigate flood risk at the sites of new nuclear power stations (criteria 1.4 and 1.5). For this reason, the environmental study

has found that the SSA criteria will have positive effects on the ability to achieve SEA Objective 14. However, these criteria are discretionary only and the SSA could place a greater emphasis upon the need for holistic approaches to flood risk issues. Whilst the criteria relating to flooding are discretionary, they do require nominators of sites to give consideration to the potential off-site impacts of their flood protection proposals.

- 6.6. Positive effects have also been recorded for SEA Objective 14 as Criteria 1.4 and 1.5 both seek to avoid or mitigate flood risk. However, the criteria are discretionary only and the confidence in the assessment is low. A greater emphasis could be placed upon the role of holistic and integrated coastal zone management in the SSA. However, criterion 1.5 does identify the need for nominators to take into account the wider impacts of any coastal protection countermeasures on areas surrounding potential nuclear power station sites.

6.7 Table 6-1 presents the results of the assessment

Table 6-1 Effects of the SSA criteria on Air and Climate												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
12. To avoid adverse impacts upon air quality	- Direct	+/- Direct	+/- Direct	- Direct	+/- Direct	+/- Direct	- Direct	+/- Direct	+/- Direct	⓪	+ Direct	+ Direct
13. To minimise green-house gas emissions	- Direct	+ Direct	- Direct	- Direct	+ Direct	- Direct	- Direct	+ Direct	- Direct	⓪	+ Direct	+ Direct
14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible	+ Direct	+ Direct	+ Direct	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	+ Indirect	⓪	⓪	⓪
<p>C = Construction; O = Operation; D = Decommissioning</p> <p>Note that the symbol “⓪” means that "There would be no significant contribution towards the achievement of the SEA Objective". It appears in each of the assessment matrices and the symbols used are set out in Annex E.</p>												

Introduction and Background

- 6.8 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to air and climate.
- 6.9 Clean air is essential for a good quality of life. Exposure to air pollution can have both short-term and long-term effects on human health leading to increased hospital admissions and in some cases premature death. Whilst the UK's air is cleaner in overall terms since the industrial revolution, it still causes adverse health effects and it is estimated that the life expectancy of every person in the UK is reduced by an average of 7-8 months because of air pollution⁶³. Air pollution can have wider adverse environmental effects by directly affecting vegetation and indirectly affecting the acid and nutrient status of soils and waters. The introduction of the Environmental Protection Act 1990 and the Environment Act 1995 led to significant changes in the way air quality is managed and controlled in the UK.
- 6.10 The Environmental Protection Act 1990 established the main mechanisms for minimising pollution from industrial sources including power stations and this has led to improved air quality and reduced emissions from these types of installations. However, these mechanisms have gradually been replaced by the Integrated Pollution Prevention and Control regime⁶⁴ which applies an integrated approach to the regulation of certain industrial activities and, therefore considers emissions to air, land and water and discharges to sewers together.
- 6.11 The Environment Act 1995 introduced a requirement for the UK Government to establish a strategy to improve ambient air quality. The UK Air Quality Strategy 2007 sets air quality objectives and policy options for delivering further improvements in the UK's air quality in the long-term. The air quality objectives defined in the strategy are a statement of intent and are not legally binding, except in cases where they mirror the legally binding limit values established for certain pollutants by EU legislation. Air quality objectives have been developed for: particulate matter; ozone; oxides of nitrogen; sulphur dioxide; polycyclic aromatic hydrocarbons; benzene; 1,3-butadiene; carbon monoxide; lead; and ammonia.

⁶³ Defra in partnership with the Scottish Executive, Welsh Assembly Government and the Department of the Environment Northern Ireland (2007) the Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1.

⁶⁴ Implemented in the UK by the Pollution Prevention and Control (England and Wales) Regulations which employ an approach to control the environmental impacts of certain industrial activities.

- 6.12 Part IV of the Environment Act 1995 requires that local authorities review and assess current and likely future air quality in their area against national air quality objectives. Where it is identified that air quality objectives are unlikely to be met by the relevant deadline, an Air Quality Management Area (AQMA) must be designated and action taken to try and achieve the objective.
- 6.13 Road transport is a very significant source of air pollution in the UK which is evident from the number of AQMAs⁶⁵ that are designated for nitrogen dioxide and particulate matter of less than 10µm in diameter (PM10)⁶⁶. There are also some AQMAs that have been designated for sulphur dioxide as a result of emissions from nearby industrial plants.
- 6.14 The Radioactive Substances Act 1993 provides for controls to be exercised over the keeping and use of radioactive materials, particularly the accumulation and disposal of radioactive wastes. Discharges of radioactivity into the environment including gaseous emissions are strictly controlled through authorisations granted to operators. Before a new nuclear power station can be operated, the operator will need to obtain consent from the relevant environmental protection agency⁶⁷ to discharge radioactive emissions to the air.
- 6.15 Climate change represents a significant risk to ecosystems, the economy and human populations and could lead to a number of changes to the baseline environmental conditions across the UK. Reports by the Intergovernmental Panel on Climate Change provide scientific evidence that the emission of greenhouse gas emissions including carbon dioxide (CO₂) is changing the world's climate. The Government is committed under the Kyoto Protocol to reduce emissions of greenhouse gases by 12.5% below 1990 levels by 2012. There are also more challenging domestic targets which are to achieve a 20% reduction in CO₂ emissions below 1990 levels by 2010 and to reduce CO₂ emissions by 60% by 2050. The UK Climate Change Programme 2006⁶⁸ established a set of policies and priorities for action in the UK and

⁶⁵ Part IV of the Environment Act 1995 requires local authorities to review and assess the current and future air quality within an area against objectives for air pollutants. Where objectives are unlikely to be achieved by the required date, the authority concerned must designate an AQMA.

⁶⁶ Defra in partnership with the Scottish Executive, Welsh Assembly Government and the Department of the Environment Northern Ireland (2007) The Air Quality Strategy for England, Scotland, Wales and Northern Ireland, Volume 1

⁶⁷ The Environment Agency in England and Wales; SEPA in Scotland and the Environment and Heritage Service in Northern Ireland.

⁶⁸ Department for the Environment, Food and Rural Affairs (2006) Climate Change The UK Programme 2006, Tomorrow's Climate, Today's Challenge

internationally, highlighting the roles that all sectors and also individuals play in tackling climate change in the long-term. The commitment of the Government to this issue is further reflected by the Climate Change Bill which will create a new approach managing and responding to climate change in the UK. It will set ambitious targets, strengthen institutional frameworks and enhance the UK's ability to adapt to the impact of climate change. The target to reduce CO₂ emissions by at least 60% from 1990 levels by 2050 will become a statutory duty under the Climate Change Bill.

- 6.16 Flooding is a natural process which has been important in shaping our natural environment. Flooding can arise from rivers and the sea, as a result of rainfall on the ground surface, from rising groundwater and from sewers and drainage systems. Climate change could lead to an increased risk of flooding across the UK, for example increases in sea level are likely to increase the risk of coastal flooding and the incidence of storm surges may also increase. When flooding occurs, it can be a significant threat to both life and property. It is, therefore, essential to ensure that new developments are appropriately planned and managed. When implementing new coastal or fluvial defences it is essential to understand how such defences might affect adjacent areas as a result of changes to coastal or fluvial processes, particularly geomorphology.
- 6.17 Policy in relation to flood risk is established in Planning Policy Statement (PPS) 25 for England, Planning Policy Statement 15 for Northern Ireland, Scottish Policy Statement 15 and in Technical Advice Note 15 for Wales. All seek to avoid inappropriate development in areas at risk of flooding and to direct development away from the areas at highest risk. Exceptionally, where development does occur in high flood risk areas, it should not increase flood risk in other locations. A risk-based approach to flooding should be adopted and flood risk assessments undertaken at all levels of planning to assess the risks of all forms of flooding. The location of floodplains across the UK is shown on Figure 4.

Assessment of the Environmental Effects of the SSA criteria on Air Quality and Climate

- 6.18 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information, assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the NPS are developed further.

Relevant SEA Objectives and Guide Questions

6.19 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. Each of the SEA objectives addresses a different element. Table 6-2 presents the SEA objectives and guide questions for air quality and climate.

Table 6-2 Relevant SEA Objectives and Guide Questions for Air Quality and Climate	
Relevant SEA Objectives	Guide Questions
12. To avoid adverse impacts on air quality	Will it result in the release of low level radionuclides that may adversely affect human health or biodiversity?
13. To minimise greenhouse gas emissions	Will it result in increased vehicular emissions (particularly CO ₂)?
14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible	<p>Will it contribute to an increase in the number of, or expansion of, AQMAs?</p> <p>Will it result in the loss of floodplain?</p> <p>Will it increase surface water runoff and therefore increase flood risk?</p> <p>Will it take account of future effects and risks of climate change e.g. sea level rise?</p> <p>Will future changes in weather patterns be considered?</p> <p>Are there alternatives to reduce risk of flooding through secondary defences or design of the station?</p>

Overview of Potential Impacts

6.20 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. These facilities have the potential to have effects on air quality and climate. Whilst some of these effects may be specific to nuclear power generation, many will be common to other major infrastructure projects, particularly during the construction phase.

- 6.21 New nuclear power stations will produce radioactive waste. This waste would be stored on site in safe and secure interim storage throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The interim storage, transport and disposal of the waste could have effects on air quality and flood risk which are presented in Table 6-3. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 6.22 Table 6-3 presents the potential impacts of a new nuclear power station. These potential impacts are generic only, as no information is yet available regarding the location of the nuclear power stations, the type of reactor which would be used at the sites nor the specific operating characteristics.

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Air pollution from transport</p> <p>The delivery of construction materials to the site and the daily movement of site personnel would result in increased vehicular movements which could result in emissions of pollutants into the air including: nitrogen dioxide; oxides of nitrogen; PM₁₀; carbon monoxide; benzene; and 1,3-butadiene. The air quality effect would depend upon the number of vehicle movements to and from the site, the types of vehicles used and the existing air quality in the vicinity of the site. There would be a greater risk of adverse effects to populations and communities that lie adjacent to roads that would be used to access the sites.</p> <p>Release of dust and deterioration in local air quality</p> <p>All construction projects have the potential to generate dust. PM₁₀⁶⁹ can cause local nuisance and result in affects on physical health and lead to modifications to daily routines to avoid the nuisance created. However, the extent of such effects would depend upon the processes used on site and also whether there is a population</p>

⁶⁹ *Both short-term and long-term exposure to ambient levels of PM₁₀ are consistently associated with respiratory and cardiovascular illness and mortality as well as ill health effects. The associations are believed to be causal'* (Department for the Environment, Food and Rural Affairs (2005) Air Quality Expert Group on Particulate Matter).

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
	<p>present that could be adversely affected. Furthermore, if sites are developed in rural areas where air quality is good, then there is less likely to be an adverse effect on air quality as a result of the construction activities.</p> <p>Loss of floodplain or increased flood risk</p> <p>The construction of a new nuclear power station could lead to the loss of floodplain which could have adverse effects both up and downstream depending upon how the floodplain is altered. The realisation of such impacts would depend upon where new nuclear power stations are constructed. However, the Safety Assessment Principles (SAPs)⁷⁰ which are used to assess the safety of cases for nuclear facilities and are used as a framework for making regulatory judgments clearly identify the need for external hazards which could include flooding to be considered in the siting decision. Furthermore, the International Atomic Energy Agency (IAEA) indicate that the effects of flooding may have a major bearing on the safety of a nuclear plant and the presence of water may be a common cause of failure for safety-related systems⁷¹. However, there are other ways in which the development could increase flood risk which could include the development of flood or coastal defences to protect a site from flood risk which could lead to modified hydrological patterns and increased flood risk in other locations and in the development of hardstanding which could increase runoff rates. Such issues would have to be carefully considered once a site is selected and during the detailed design stage. This would also depend upon the type of site that is developed, for example whether it is a greenfield site.</p> <p>Any discharges to the ground or increased rate of discharge to the sewerage network could also pose a flooding risk that would need to be managed.</p>
Operation (40 years)	<p>Air pollution from transport</p> <p>The delivery of raw materials to the site e.g. fuel and the daily movement of site personnel would result in increased vehicular movements which could result in emissions of pollutants to air including: nitrogen dioxide; oxides of nitrogen; PM₁₀; carbon monoxide; benzene; and 1,3-butadiene. The effect on air quality</p>

⁷⁰ Health and Safety Executive (2006) Safety Assessment Principles for Nuclear Facilities

⁷¹ IAEA (2003) Flood Hazard for Nuclear Power Plants on Coastal and River Sites

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
	<p>would depend upon the number of movements, the composition of the traffic flows and how existing traffic flows were affected.</p> <p>Gaseous radioactive emissions during operation</p> <p>The operation of the nuclear reactor would result in gaseous radioactive emissions to the atmosphere which would be emitted via a stack. As part of the Generic Design Assessment (GDA), vendors were requested to supply information about how radioactive wastes will arise, be managed and disposed of, to provide design basis estimates for monthly discharges of gaseous wastes and proposed annual limits with derivation for radioactive gases⁷². Gaseous wastes for all the three reactors going forward in the GDA process would be mainly produced from degassing water in the primary circuit and would include: noble gases (xenon-133, xenon-135); carbon-14; tritium; and iodines. However, specific emissions including the gases emitted and the rate and volume of discharge would vary for each reactor. The preliminary assessment results for all reactors indicate that the predicted discharges to air are similar to discharges for comparable reactors but these will be explored further through the detailed assessment. For all of the reactors, more detailed information is needed for the next stage of the GDA to support the assessment of the impact of gaseous discharges, an analysis of Best Available Techniques (BAT) and the setting of indicative limits. The outputs of the detailed assessment will also be used to set indicative limits for authorisations. More information about discharges to air will become available as the detailed assessment progresses. Any new nuclear power stations would require authorisation from the relevant environmental protection agency under the Radioactive Substances Act 1993 before making any discharges of radioactivity, including gaseous. Statutory obligations require that radiation exposures not only comply with dose limits but are As Low As Reasonably Achievable (ALARA).</p>

⁷² Environment Agency (2007) Process and Information Document for Generic Assessment of Candidate Nuclear Power Plant Designs

⁷³ Intergovernmental Panel on Climate Change, Working Group III Report, Mitigation of Climate Change.

⁷⁴ Security of radioactive waste storage and transport is quite under constant review by the regulators to ensure that facilities and practices remain robust (BERR, January 2008, Meeting the Energy Challenge, A White Paper on Nuclear Power)

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
	<p>Non-radioactive gaseous emissions</p> <p>Diesel generators and boilers are likely to be used during the operation of the site and this would result in the release of combustion gases.. Rates of emission would depend upon specific operational characteristics.</p> <p>Radioactive emissions as a result of an accident</p> <p>An accident or incident could result in unplanned releases of gaseous emissions to the atmosphere. Potential accidents in a reactor could occur as a result of failures of equipment or from hazards like fires and floods. The overall safety of nuclear installations is dependent upon good design and operation and is driven by a system of regulatory control.</p> <p>Prior to being able to construct a site licence has to be granted. The work undertaken to date by the nuclear regulators as part of the GDA has provided an overview of the fundamental acceptability of the proposed reactor design within the overall UK regulatory regime. For all reactors being considered the key conclusion was that there are no safety or security shortfalls that would be so serious as to rule out at this stage the eventual construction of the reactors at UK licensed sites. The next stage of the process will be to review in more detail the submissions of each of the vendors in respect of safety, security and environmental issues.</p> <p>CO₂ reduction emissions</p> <p>Nuclear power is a low-carbon form of electricity generation. The CO₂ emissions from the whole life-cycle of nuclear power stations are significantly lower than fossil fuelled generation and similar to those for renewable energy sources⁷³. The CO₂ emission reductions that could be achieved during the operation of new nuclear power stations would contribute positively towards the UK government targets.</p> <p>Interim Radioactive Waste Storage</p> <p>Radioactive waste including higher-activity wastes (ILW and potentially spent fuel) will be stored on site in safe, secure, interim storage facilities prior to being transported for final disposal. The main risks to air quality would be through unplanned releases of radioactive materials directly to the atmosphere. However, these risks are considered to be very low as the stores would be designed to the highest levels of containment and would be subject to strict regulatory and health and safety controls⁷⁴. Safe storage in these facilities would be expected to be available until such time as final</p>

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
	disposal facilities become operational. The design of the interim storage facility would need to be fully protected against the risk of flooding both now and in the future as a result of climate change.
Decommissioning (including interim waste storage, transport and final disposal) (minimum of 30 years)	<p>Air pollution from transport</p> <p>The delivery of infrastructure to facilitate the decommissioning process, the removal of infrastructure from the site and the daily movement of site personnel would result in increased vehicular movements which could result in emissions of pollutants to air including: nitrogen dioxide; oxides of nitrogen; fine particles (PM₁₀); carbon monoxide; benzene; and 1,3-butadiene.</p> <p>Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. The main risks to air quality would be through unplanned releases of radioactive materials into the environment. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from the Radioactive Material Transport Event Database (RAMTED) for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid-1980s.⁷⁵ The majority of incidents that have occurred have resulted in trivial or no radiological consequences. During interim storage of several decades the initial fission product activity of the waste would decline as more active compounds decay and it may</p>

⁷⁵ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
	<p>only require a single movement of lower activity material to the final disposal locations⁷⁶. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Gaseous radioactive emissions during decommissioning</p> <p>During decommissioning gaseous radioactive discharges would continue to occur, although rates would depend upon how decommissioning is undertaken. For example, when Berkeley power station ceased generation, Magnox Electric requested a short-term increase in tritium gaseous discharges which would result from an accelerated decommissioning programme⁷⁷. Therefore, at this stage it is not possible to quantify the discharges, although they would be regulated by the relevant environmental protection agency. A stringent decommissioning strategy would be required together with full EIA prior to decommissioning which would assess in detail the impacts upon air quality and radioactive emissions as a result of the decommissioning proposals.</p> <p>Release of dust and deterioration in local air quality</p> <p>Decommissioning at any industrial facility has the potential to generate dust. PM₁₀ can cause local nuisance and result in affects on physical health⁷⁸.</p> <p>Interim Radioactive Waste Storage</p> <p>Risks to air quality would be the same as those identified for the operational phase above. It is considered unlikely, following dismantling and decommissioning of the store, that there would be long-term adverse air quality effects.</p> <p>Final Disposal of Radioactive Waste</p> <p>The Government considers that it would be technically possible to</p>

⁷⁶ BERR (May 2007) The Future of Nuclear Power, The Role of Nuclear Power in a Low Carbon UK Economy, Consultation Document.

⁷⁷ Environment Agency, Environment and Heritage Service, Food Standards Agency, Scottish Environment Protection Agency (2006) Radioactivity in Food and the Environment RIFE 12.

⁷⁸ 'Both short-term and long-term exposure to ambient levels of PM₁₀ are consistently associated with respiratory and cardiovascular illness and mortality as well as ill health effects. The associations are believed to be causal' (Department for the Environment, Food and Rural Affairs (2005) Air Quality Expert Group on Particulate Matter).

Table 6-3 Potential Impacts of Nuclear Facilities on Air Quality and Climate in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Air and Climate in the Absence of Details on Location, Design or Mitigation
	<p>dispose of higher activity waste from new nuclear power stations in a geological disposal facility. The risks to air quality and flood risk of disposal in a geological disposal facility relate to both the impacts of construction of the facility and the waste emplacement and disposal within it. Such impacts, may relate to unplanned releases of radioactive materials into the environment. The containment of radioactivity would be central to any safety case presented to the regulators, who would have to be satisfied that such risks would be acceptably small before such a facility could be built and operated.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR facility in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for air quality from radiological or non-radiological sources. The implications of each option will be addressed through the NDA Strategy.</p>

Significant Environmental Effects of the SSA criteria

- 6.23 There are no specific SSA criteria that address air quality and this is to be expected as gaseous emissions to the atmosphere resulting from the operation of a new nuclear power station are a factor that would be governed by the environmental regulator through the development of appropriate discharge limits, as part of the authorisation under the Radioactive Substances Act 1993. It is also a factor which is specific to the reactor type being used and not specifically siting, although it is recognised that the sensitivity of the receiving environment and the population would vary depending upon the siting of the new nuclear power station. However, the importance of air quality as a national level issue should not be underestimated and hence it is appropriate for it to be considered through the SEA.
- 6.24 There are a number of SSA criteria comprising 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12 which either directly or indirectly seek to minimise the risk of accidents or incidents. They offer indirect benefits for air quality at potentially very long distances beyond the site boundary, as they should help to avoid the uncontrolled or accidental release of radioactive gaseous emissions. Not all of the criteria are exclusionary and even with the use of these criteria a risk of accidents would remain. Criteria 1.3, 1.6, 1.8 and 1.9 also address nuclear safety issues but are identified for consideration by the IPC and, therefore will

not be considered at the strategic level, as they are more appropriately addressed at the local level. As part of the nuclear site license and authorisation process, consideration will be given to the risk of accidents and the measures that are proposed to reduce the likelihood of such occurrences and to reduce the adverse impacts of them. Criterion 1.11 is also identified as an issue for local consideration and highlights the emergency planning obligations that will have to be fulfilled by nuclear operators. These include the need to prepare emergency plans for the protection of the public and the workforce, including those for dealing with an accidental release of radioactivity. It is also possible that, during decommissioning activities, soil contaminated with radioactive material may be mobilised which could be carried over long distances as dust. This has potential to become a transboundary impact. However, it is considered that site environmental management procedures would control such a risk to within safe levels. This would need to be a requirement of site decommissioning plans and would be covered in EIAs undertaken for decommissioning.

- 6.25 There are other adverse air quality impacts that could arise which are not addressed by the SSA criteria. These are not necessarily siting issues and primarily relate to the execution of the construction, operation and decommissioning (including interim radioactive waste storage). For example, the generation of additional traffic movements throughout all phases could have local effects on air quality and would increase CO₂ emissions from vehicular sources. However, at this stage it is not known how materials would be transported to and from the site and it would be feasible to mitigate such adverse effects, for example by seeking to use alternative modes of transport and by avoiding particularly sensitive settlements, or locations where AQMAs are already designated.
- 6.26 The SSA process is considered a facilitative action by Government for reducing the regulatory uncertainty and the risks associated with investing in new nuclear power stations. Whilst there is no specific criterion addressing CO₂ emissions, the collective, facilitative action of the process could in the long-term reduce greenhouse gas emissions from the energy sector.
- 6.27 Both criteria 1.4 and 1.5 seek to avoid or mitigate risks caused by flooding, this would apply to the whole power station site including provisions for on-site interim waste storage. They also highlight the importance of avoiding a scenario whereby flood risk is increased at other locations, as a result of the implementation of suitable defences to protect a nominated site at flood risk. However, the effects of new defences upon river and coastal processes including geomorphology must be assessed in advance of their implementation to ensure that adverse effects would not occur at other locations. Whilst these

criteria are a significant strength of the SSA, they are discretionary criteria only and so would not preclude a potential site at flood risk from being considered for inclusion in the NPS assuming the requirements of planning policy can be met with regard to development in such areas. However, suitable mitigation measures would be needed to manage any adverse effects at the local level.

- 6.28 The overall facilitative action of the NPS, through increasing the likelihood of new nuclear power stations being built will increase the need for radioactive waste to be transported and disposed of. The transportation of such waste could have effects on air quality through accidental releases of radioactivity.

Cumulative Effects

- 6.29 All of the above effects on air and climate could occur as a result of the development of an individual power station. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites or at other locations across the UK then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. The cumulative air quality effects will also depend upon the types of reactors used at each site, their operational characteristics and also the means of transporting materials during each phase of the power station's operational life.
- 6.30 There is a risk of cumulative loss of floodplain and potentially an increased likelihood of new defences being constructed to protect new nuclear power stations from flood risk. This could have knock-on cumulative effects on coastal and riverine processes e.g. geomorphology which could have wider effects on biodiversity, flora and fauna. Once sites have been nominated, these cumulative effects can be assessed in more detail.
- 6.31 The process of developing the NPS, using the SSA criteria to identify sites and also the assessment that will be undertaken through the SEA will enable the cumulative effects of developing the sites to be considered and this information will be used to inform the decision about which sites should be included in the NPS.
- 6.32 A number of the SSA criteria are discretionary so this would not entirely rule out the potential for adverse effects to occur. However, they would ensure that such issues are considered as part of the decision-making process and this could help to reduce the number of adverse cumulative effects that occur.

Mitigation

- 6.33 Many of the adverse air quality effects that have been identified can only be

addressed and mitigated at the site specific level. The air quality effects of the vehicle movements during the construction, operation and decommissioning phases would need to be assessed as part of the detailed planning consent for the sites and included within the air quality chapters of the EIAs.

- 6.34 However, consideration should be given to the siting of new nuclear power stations in relation to transport infrastructure, such that opportunities to use alternatives to road transport, for example, deliveries, can be maximised, as this would help to reduce adverse local air quality impacts.
- 6.35 The detailed assessments undertaken by the HSE and the EA as part of the GDA will also be critical in developing an understanding of the safety of the proposed reactors and also their emissions to the atmosphere. These are not effects that can be robustly addressed at the strategic level, particularly when there is no information available about where sites would be located and how they would operate. For this reason, these effects can only be considered at the local level and as part of other processes being undertaken by the nuclear regulators.
- 6.36 Consideration should also be given at the individual site level to opportunities to incorporate Sustainable Drainage Systems into the design of the site to effectively manage site runoff and to reduce the adverse effects associated with an increase in hardstanding and impervious surfaces.
- 6.37 Once sites have been nominated further consideration should be given to flood risk issues at the sites. The ability of the sites to withstand future flood risks needs to be determined to ensure that development does not occur in unsuitable locations and an holistic approach to flood-risk management should be implemented through the SSA. Further data will be gathered for the Environmental Report with regards to flood and coastal defences to better understand the existing defences in a location and also potential future risks and liabilities. There are very close links with the biodiversity, flora and fauna topics, as any new defences implemented to protect new nuclear power stations could lead to changes to coastal processes and coastal evolution which could have knock-on effects on coastal habitats. Consideration of these issues will also require reference to Shoreline Management Plans and Coastal Habitat Management Plans to ensure that a holistic approach to coastal management is adopted. These considerations should also be reflected in the SSA process when deciding which sites should be included in the Nuclear NPS.

7 EFFECTS ON WATER

Summary

- 7.1. This section considers how the SSA Criteria will impact on those SEA objectives which cover Water. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
15. To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology).
 16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives.
 17. To avoid adverse impacts upon the supply of water resources.
 18. To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives.
- 7.2. The environmental study has found that the SSA criteria have little impact on the ability to achieve the SEA objectives relating to water or the coastal environment. Those criteria that seek to minimise the risk of accidents (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12), the protection of internationally and nationally designated sites (criteria 2.1 and 2.2) and the minimisation of flood risk (criteria 1.4 and 1.5) could have some indirect positive impact. Some background text has been included in the SSA Consultation document which identifies that the protection of surface water quality, hydrology and hydrogeology⁷⁹ should be important considerations when developing new nuclear power stations and that developers should take appropriate measures to avoid, minimise or mitigate adverse effects on these resources. However, due to the lack of specific criteria addressing this issue, the environmental study has found that the SSA criteria could have some negative effects on water quality, water supply and groundwater.
- 7.3. Criterion 4.2 requires nominators of sites to identify the likely cooling technology for each site. Whilst the application of this criterion, in itself, will not contribute to achieving SEA objectives 15-18, it will facilitate further consideration of the potential water-related impacts of power station development during the

⁷⁹ Hydrogeology considers the occurrence, distribution and quality of groundwater.

development of the Environmental Report on the Nuclear NPS.

7.4 Table 7-1 presents a summary of the assessment results.

Table 7-1 Effects of the SSA criteria on Water Resources													
SEA Objective	Geographical Scale of Effect												
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site			
	C	O	D	C	O	D	C	O	D	C	O	D	
15.To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology)	- Direct	- Direct	- Direct	- Direct	- Direct	- Direct	- Direct	- Direct	- Direct	- Direct	⓪	⓪	⓪
16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives	- Direct	+/- Indirect Direct	+/- Indirect Direct	- Direct	+/- Indirect Direct	+/- Indirect Direct	- Direct	+/- Indirect Direct	+/- Indirect Direct	⓪	⓪	⓪	
17.To avoid adverse impacts upon the supply of water resources	- Direct	+/- Direct	+/- Direct	- Indirect	+/- Indirect	+/- Indirect	- Indirect	+/- Indirect	+/- Indirect	+	+	+	
18. To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives	+/- Direct	+/- Direct	+/- Direct	+/- Direct	+/- Direct	+/- Direct	+/- Direct	+/- Direct	+/- Direct	⓪	⓪	⓪	
<p>C = Construction; O = Operation; D = Decommissioning</p> <p>Note that the symbol “⓪” means that "There would be no significant contribution towards the achievement of the SEA Objective". It appears in each of the assessment matrices and the symbols used are set out in Annex E.</p>													

Introduction and Background

7.5 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to the water environment.

7.6 Water is an essential part of life on earth. It is vital for all living plants and animals and for humans. It is not only important for life and health but also for industry, agriculture, waste disposal, transport and recreation. The water

environment is given significant protection in the UK. The Government is committed to protecting the quality and supply of drinking water and the quality of watercourses, groundwater, coastal and marine waters. Flooding is also a key element of the water environment. Flooding is addressed specifically in Section 6 of this report under Air and Climate although it also has direct implications for water quality.

- 7.7 Numerous standards are in place to provide protection to the water environment and a regulatory framework implemented respectively by the Environment Agency, SEPA and the Rivers Agency and the Environment and Heritage Service in Northern Ireland (EHSNI). The UK is currently implementing the Water Framework Directive⁸⁰. This established a framework for the management of water resources throughout the European Union and came into force in December 2000. It was transposed into law in each of the devolved territories in the UK via the following regulations:
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003
 - The Water Environment (Water Framework Directive) (Northern Ireland) Regulations 2003
 - The Water Environment and Water Services (Scotland) Act 2003 and The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR).
- 7.8 The Water Framework Directive will be effective by 2015 and will replace a number of other European Directives by this time, including: The Directive on the quality of water intended for human consumption (98/83/EC); The Groundwater Directive (80/68/EEC) which applies to groundwater protection; The Surface Water Abstraction Directives (75/440/EEC) which set quality objectives for the surface water sources from which drinking water is taken; Freshwater Fish Directive 78/659/EEC; Shellfish Waters Directive 79/923/EEC; and The Dangerous Substances Directives (76/464/EEC) which, together with the Water Resources Act 1991, requires control over inputs of dangerous substances into water.
- 7.9 The Water Act 2003 relates to water resources, regulation of the water industry and other provisions.
- 7.10 All radioactive discharges in the UK to the water environment are regulated under the Radioactive Substances Act 1993, to ensure that radioactivity

⁸⁰ The Water Framework Directive 2000/60/EC

discharged remains well within internationally agreed levels which are designed to protect both human health and the environment.

- 7.11 There are a number of strategies in place throughout the UK to guide the protection of the water environment. In February 2008, the Government launched its new water strategy, Future Water, which sets out a framework for water management in England. This includes: sustainable delivery of secure water supplies; an improved and protected water environment; fair, affordable and cost-reflective water charges; reduced water sector greenhouse gas emissions; and more sustainable and effective management of surface water. Making Space for Water⁸¹ is a 20 year strategy that seeks to implement a more holistic approach to the management of flood and coastal erosion risks in England. This is discussed further in Section 6 under climate change impacts.
- 7.12 The quality of water in the UK is under significant pressure from man-made sources such as discharges from industry, waste water treatment works and agriculture. However, due to concerted efforts by the regulators, chemical and biological water quality is improving although water quality varies significantly between locations.
- 7.13 Groundwater is also a natural resource that is integral to the overall water environment. It provides a reservoir for abstraction of drinking water and water for industrial and agricultural use. It is important for the maintenance of wetlands and river flows and as such has a direct impact upon the quality of surface waters. Whilst a large amount of baseline data is readily available in relation to the quality of surface waters, there is very limited information available about groundwater quality.
- 7.14 Significant areas of the UK coast are designated under the Shellfish Waters Directive⁸² for commercial fishing purposes. They are areas of coastal or brackish waters used for commercial fishing, and water quality standards are set for these areas. Coastal water is also used for recreational purposes in many areas, including for bathing. The protection of coastal bathing water quality is guided by the EU Bathing Waters Directive (76/160/EEC), although its principal objectives relate to faecal pollution.
- 7.15 Significant stretches of rivers and a number of additional areas of standing water are designated under the Freshwater Fish Directive, which is concerned

⁸¹ Making Space for Water: Taking Forward a New Government Strategy for Flood and Coastal Erosion Risk Management (2005)

⁸² This Directive has been transcribed into UK legislation under the Surface Waters (Shellfish) (Classification) Regulations 1997 and The Surface Waters (Shellfish) Directions 1997

with the protection and improvement of fresh waters to support fish life.

Assessment of Environmental Effects of the SSA criteria on Water

7.16 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information and assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the NPS are developed further.

Relevant SEA Objectives and Guide Questions

7.17 Table 7-2 identifies the SEA objectives and guide questions relevant to this topic.

Table 7-2 Relevant SEA Objectives and Guide Questions for the Water Environment	
Relevant SEA Objectives	Guide Questions
15.To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology)	Will it result in the increased sedimentation of watercourses? Will it adversely affect channel geomorphology?
16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives	Will it cause a deterioration in surface and groundwater quality as a result of accidental pollution, for example spillages, leaks? Will it cause a deterioration in surface and groundwater quality as a result of the disturbance of contaminated soil? Will it result in demand for higher defence standards that will impact on coastal processes? Can the higher defence standards be achieved without compromising habitat quality and sediment transport?
17.To avoid adverse impacts upon the supply of	Will it increase turbidity in watercourses?

water resources	Will it increase the temperature of watercourses?
18. To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives	Will it adversely affect water supply as a result of abstraction?
	Will hydrology and flow regimes be adversely affected by water abstraction?
	Will it affect designated Shellfish Waters?
	Will it affect Freshwater Fish Directive sites?

Overview of Potential Impacts

- 7.18 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. Such facilities have the potential to result in adverse effects upon the water environment. Some such effects may be specific to nuclear power generation, but many will be common to all major infrastructure and power generation projects.
- 7.19 Effects common to all major infrastructure and power generation projects include effects on surface water (including coastal waters) hydrology and quality as a result of construction activities; pollution from runoff; increased runoff rates as a result of the creation of impermeable surfaces; and polluted discharges from water treatment works, leaks and effluent spills. Atmospheric emissions may also indirectly contribute to the contamination of surface water.
- 7.20 Groundwater hydrology and quality can also be affected. A site may have to be drained or de-watered for construction, which may result in the water table being lowered. Cooling water abstractions can result in a reduction of groundwater flows if taken from nearby rivers. Land contamination can also lead to the contamination of water.
- 7.21 A principle concern specific to new nuclear power stations is pollution of the water environment as a result of routine radioactive discharges. This could occur via routine plant discharge to waters or the atmosphere.
- 7.22 An accident or incident could result in unplanned releases of liquid emissions to the water environment. The overall safety of nuclear installations is dependent upon good design and operation and is driven by a system of regulatory control. All radioactive discharges in the UK are regulated under the Radioactive

Substances Act 1993 to ensure that radioactivity discharged remains well within internationally agreed levels, which are designed to protect both human health and the environment. Defra have recently published a public consultation on the latest proposed revision to the UK Strategy for Radioactive Discharges 2006-2030⁸³ alongside a consultation on Statutory Guidance to the Environment Agency on the regulation of radioactive discharges into the environment⁸⁴.

- 7.23 Such regulation is carried out by the Environment Agency (EA) in England and Wales, SEPA in Scotland, and the Environment and Heritage Service in Northern Ireland.
- 7.24 Many such effects will depend upon the presence of sensitive water resources in or around the locations of the proposed power stations, the supporting infrastructure or grid connection. Without knowing the proposed locations at this stage, there is uncertainty about whether or not the development of new nuclear power stations would result in significant effects on the water environment. It is also not known at this stage to what extent effects could be mitigated through detailed design, although it is known that the strict regulatory regime imposed by the Radioactive Substances Act would be implemented for all licensed sites.
- 7.25 As part of the GDA process the EA is considering a detailed assessment of their environmental impacts, including their discharges to the water environment. Currently, a preliminary assessment has been undertaken although further more detailed assessment will be undertaken before any new power stations will be allowed in the UK.
- 7.26 New nuclear power stations will produce radioactive waste. This waste would be stored on site in safe and secure interim storage throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The interim storage, transport and disposal of the waste could have effects on the water environment. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 7.27 Table 7-3 presents a summary of the potential effects associated with new nuclear power development in the absence of information about exact locations and detailed design.

⁸³ <http://www.defra.gov.uk/corporate/consult/rad-discharges-ukstrategy/index.htm>

⁸⁴ <http://www.defra.gov.uk/corporate/consult/rad-discharges-eaguidance/index.htm>

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Use of vehicles and machinery</p> <p>During construction activities soils may be compacted or removed following vehicle movements and the use of heavy machinery. Impermeable or less permeable surfaces may be created. This can result in increased rates of surface runoff which can lead to soil erosion and flooding within the site, with subsequent changes to surface water hydrology and channel geomorphology in nearby watercourses. Flow velocities may be altered as a result and turbidity levels may increase, leading to further erosion and subsequent changes in bed and bank stability. Many of these issues may be able to be mitigated or controlled through good construction environmental management.</p> <p>Developing buildings near to watercourses may also increase the risk of localised flooding in these areas.</p> <p>Earthworks and site drainage</p> <p>Construction earthworks and new drainage schemes may result in sediments being mobilised which can enter watercourses, altering their sediment loads and sedimentation rates.</p> <p>Construction activities may also disturb and mobilise any contaminated soil in the site, which could subsequently pollute watercourses and groundwater.</p> <p>A site may have to be drained or de-watered for construction. De-watering and site drainage may result in lowering of the water table with potential knock-on effects on downstream flood storage and also subsidence. This may also cause effects upon the distribution and flow of groundwater, which can directly affect the flow of nearby watercourses. The abstraction of water will require a licence under the Water Resources Act 1991.</p> <p>Materials management</p> <p>Accidental spillage of fuels, lubricants and hydraulic fluids from construction plant may occur which could enter surface or groundwaters. Such impacts can be controlled through the implementation of construction environmental good practice.</p>
Operation (40 years)	<p>Abstraction of cooling water</p> <p>Power stations require abstraction for cooling water, and this may come from groundwater, nearby rivers or the sea. Abstractions can cause changes to flow regimes of watercourses downstream of the</p>

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
	<p>facility and consequent changes in sedimentation caused by these changes in flow and can result in a reduction of groundwater flows if taken from nearby rivers. If abstracted from groundwater, this can cause alteration of groundwater flow during low flow conditions which can indirectly also affect flow rates in rivers. This may have secondary effects upon aquatic ecology.</p> <p>In order to protect vulnerable groundwater resources it is the policy of the EA to encourage new developments to locate in areas of low vulnerability to groundwater pollution. However, this policy does not imply an automatic prohibition on nuclear facilities within source protection zones.</p> <p>The abstraction of water would require a licence under the Water Resources Act 1991.</p> <p>Materials management</p> <p>The quality of surface and coastal waters can also be affected during operation. Any ongoing ground workings may result in further soil erosion, which can lead to increased sediment loading of watercourses. Similarly accidental leaks or spills from plant and machinery, such as fuel, solvents, cleaning fluids or oil, can pollute surface waters.</p> <p>Radioactive discharges to water</p> <p>The operation of the nuclear reactor would result in the emission of routine radioactive discharges to the water environment. Prior to undertaking the preliminary GDA assessment, vendors were requested to supply information about how radioactive wastes will arise, be managed and disposed of, to provide design basis estimates for monthly discharges of liquid wastes and proposed annual limits with derivation for radioactive discharges⁸⁵. Liquid wastes for all reactors would be mainly produced from effluents associated with systems for collecting and treating the reactor cooling water. Other sources of effluent may include spent fuel storage ponds, washings from plant decontamination and drainage from change rooms. Radioactive substances within the discharges may include, Tritium, Carbon-14 and Iodines. The preliminary assessment results for all four reactors indicate that the predicted discharges to a coastal water environment are expected to meet annual dose constraints and limits, but these will need to be</p>

⁸⁵ Environment Agency (2007) Process and Information Document for Generic Assessment of Candidate Nuclear Power Plant Designs

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
	<p>explored further through the detailed assessment. The outputs of the detailed assessment will also be used to set indicative limits for authorisations. More information about liquid discharges will become available as the detailed assessment progresses. Any new nuclear power stations would require authorisation from the relevant environment agency under the Radioactive Substances Act 1993 before making any discharges of radioactivity.</p> <p>Radioactive emissions as a result of an accident</p> <p>An accident or incident could result in unplanned releases of liquid emissions to the water environment. Potential accidents in a reactor could occur as a result of failures of equipment or from hazards like fires and floods. The overall safety of nuclear installations is dependent upon good design and operation and is driven by a system of regulatory control.</p> <p>Prior to being able to construct, a site licence has to be granted. The work undertaken to date by the nuclear regulators as part of the GDA has provided an indication of the fundamental acceptability of the proposed reactor design within the overall UK regulatory regime. For all reactor designs being considered, the key conclusion was that there are no safety or security shortfalls that would be so serious as to rule out at this stage the eventual construction of the reactors in UK licensed sites. The next stage of the process will be to review in more detail the submissions of each of the vendors in respect of safety issues.</p> <p>Non-radioactive discharges to water</p> <p>Non-radioactive liquid discharges could include: water from the turbine-condenser cooling system and other non-active cooling systems; sludge lagoon water; water-glycol mixtures from the chilled water system; and drain water as part of the waste treatment and demineralization water systems containing water-treatment chemicals. These could be discharged to the sea or rivers depending upon the location and particular design. The discharge of</p>

⁸⁶ Referenced in Sustainable Development Commission (2006) The role of nuclear power in a low carbon economy Paper 3: Landscape, environment and community impacts of nuclear power.

⁸⁷ Security of radioactive waste storage and transport is quite under constant review by the regulators to ensure that facilities and practices remain robust (BERR, January 2008: Meeting the Energy Challenge, A White Paper on Nuclear Power)

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
	<p>aqueous effluents would require consent under the Water Resources Act 1991.</p> <p>All reactor designs assessed through the GDA require cooling water to be abstracted and then discharged into a suitable water body. Discharge may be to the sea, rivers or lakes. The temperature of the discharge will often be above that of the receiving water body (it may be up to 10°C warmer⁸⁶) and may result in changes to the aquatic ecology in that area. This may be negative as oxygen is less soluble at higher temperatures. Reductions in dissolved oxygen can put aquatic life under stress if levels become very low. In contrast, certain species thrive in warmer water.</p> <p>Coastal flood defences</p> <p>If power stations are located in coastal areas it may be necessary to construct coastal defences that will withstand predicted future coastal flooding events and storm surges. Different sea-level change scenarios will need to be reviewed when designing such defences to ensure that the site is protected. Such coastal defences have the potential to cause changes in coastal geomorphology and sedimentation rates, which may result in increased erosion further along the coastline. This in turn may directly affect valuable ecosystems or the human environment, including property or recreational areas. The relevant Shoreline Management Plans (SMPs) should be consulted once sites have been nominated. It is essential that development proposed at the coast is considered in a holistic manner and respects other coastal land uses in the area and the effect that coastal erosion may have on them. The Environment Agency's emerging coastal erosion risk maps should be consulted at this stage.</p> <p>Interim radioactive waste storage</p> <p>Radioactive waste, including higher activity wastes (ILW and potentially spent fuel) will be stored on site in safe, secure, interim storage facilities prior to being transport for final disposal. The main risks to the water environment would be through unplanned releases of radioactive materials into the environment via air, water or soil contamination. Coastal erosion and flooding may also pose a potential problem if interim storage facilities are located in areas of coastal erosion or flood risk. Erosion may result in a breach of the containment levels resulting in unplanned emissions of HLW, ILW or spent fuel. However, these risks are considered to be very low, as the stores would be designed to the highest levels of containment and would be subject to strict regulatory and health and safety controls⁸⁷. This includes the appropriate siting of such facilities (as</p>

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
	<p>part of the wider power station site) away from areas of risk, taking into account the long-term impacts of climate change and sea-level rise. Safe storage in these facilities would be expected to be available until such time as final disposal facilities become operational.</p>
<p>Decommissioning (including interim waste storage, transport and final disposal) (minimum of 30 years)</p>	<p>Site drainage</p> <p>During decommissioning the site drainage characteristics may be altered. This could result in the remobilisation of contaminants and suspended solids as identified during the construction phase above. At this stage, contaminants may also include radioactive materials remaining from the operational phase.</p> <p>Similarly, increased rates of surface runoff can lead to soil erosion and flooding with subsequent changes to surface water hydrology and channel geomorphology in nearby watercourses.</p> <p>Earthworks activities may also cause effects upon the distribution and flow of groundwater, which can directly affect the flow of nearby watercourses.</p> <p>Decommissioning plant movements</p> <p>Accidental spillage of fuels, lubricants and hydraulic fluids from decommissioning and cleaning plant may occur which could enter surface or groundwaters.</p> <p>Water treatment plant</p> <p>Potential for pollution of groundwater by accidental contamination during decommissioning.</p> <p>Release of radionuclides</p> <p>Accidental release of low levels of radiation may occur during plant dismantling and waste management. However, as during operation, the UK's strict, independent safety and environmental protection regimes would require high levels of surety that the likelihood of harmful releases would be extremely low. Routine discharges would also continue as plant is dismantled, although authorisation from the relevant environmental protection agency under the Radioactive Substances Act 1993 would still be required.</p> <p>Coastal flood defences</p> <p>Defences may have been constructed at coastal sites prior to operation and will need to withstand flood events and storm surges through the decommissioning period. This is particularly important</p>

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
	<p>as radioactive materials would be stored in interim storage on site for a considerable period of time prior to transfer to a final disposal facility.</p> <p>Interim radioactive waste storage</p> <p>Potential risks to the water environment as a result of interim waste storage would be consistent with those identified above during the operational phase. However, once the site is decommissioned and geological disposal facilities are operational, the interim waste store would be dismantled and removed from the site. There is the potential for contamination to remain on site following dismantling, dependent upon how the store is constructed, operated and removed. This could pose risks to the water environment e.g. groundwater in the long-term.</p> <p>Transport of radioactive waste for final disposal</p> <p>Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. The main risks to the water environment would be through unplanned releases of radioactive materials as a result of accidents, which could lead to radioactive releases into the air, water or soil. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from the Radioactive Material Transport Event Database (RAMTED) for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s.⁸⁸ The majority of incidents that have occurred have resulted in trivial or no radiological consequences. During interim storage of several decades the initial fission product</p>

⁸⁸ Hughes, J. S, Roberts, D, Watson S.J (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

Table 7-3 Potential Impacts of Nuclear Facilities upon the Water Environment in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Water in the Absence of Details on Location, Design or Mitigation
	<p>activity of the waste would decline as more active compounds decay and it may only require a single movement of lower activity material to the final disposal locations. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Final disposal of radioactive waste</p> <p>The Government considers that it would be technically possible to dispose of higher activity waste from new nuclear power stations in a geological disposal facility. The risks to the water environment of disposal in a geological disposal facility relate to both the impacts of construction of the facility and the waste emplacement and disposal within it. Such impacts may relate to pollution, changes to flow regimes and modified drainage patterns amongst others. As identified earlier, the containment of radioactivity would be central to any safety case presented to the regulators, who would have to be satisfied that such risks would be acceptably small before such a facility could be built and operated.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for water quality and resources in the areas chosen for developing such a facility or facilities.</p>

7.28 SSA criteria have been developed in order to provide greater direction towards those areas of the UK that would be more suitable for the development of new nuclear power stations. The following section describes the significant effects upon the water environment of applying the SSA criteria.

Significant Effects of the SSA criteria

7.29 The SSA criteria have been assessed against the relevant SEA objectives and guide questions for water resources (refer to Table 7-2) using the matrices in Appendix D. The following presents a summary of these findings.

7.30 All nuclear power station designs being assessed through the GDA require access to cooling water. This is reaffirmed by Criterion 4.2 which requires nominators to identify sites that would have suitable access to cooling water. The abstraction and return of this cooling water may potentially result in

hydrological and geomorphological changes by changing flow regimes, increasing sedimentation and channel and bank alterations which could also have biodiversity impacts. Similarly, the implementation of coastal flood defences to protect a coastal site may result in increased coastal erosion elsewhere along the coast. Criterion 1.5 states that nominators are expected to take account of the wider impacts of any coastal protection countermeasures that are implemented. These impacts can occur through a range of activities associated with site construction, operation and decommissioning (including interim storage of radioactive waste) as identified in Table 7-3. Depending upon the location of the abstraction and discharge points, these effects could be realised at a considerable distance from the site. Whilst such effects may be able to be mitigated to some extent locally, the effect of the criteria upon SEA Objective 15 has been assessed as negative as adverse effects are not avoided through the criteria.

- 7.31 Table 7-3 identifies a number of ways in which new nuclear power stations could affect surface water quality. The criteria do not provide direct protection to water quality and impacts could occur primarily through construction activity and through liquid discharges to waterbodies, although it is expected that, through good construction environmental management practice and the regulatory regimes in place to control polluted discharges, the impacts could be avoided locally.
- 7.32 However, criterion 2.2 seeks to avoid, minimise or mitigate impacts upon nationally designated features (this could include Shellfish Waters, which are designated for the quality of coastal waters and their importance for the fishing industry under the Shellfish Waters Directive (79/923/EEC)). Criterion 2.2 is a discretionary criterion, so the significance of the effects upon Shellfish Waters would be assessed on a case-by-case basis. For this reason, there is a lower degree of certainty that the potential benefits identified would be realised. The Water Framework Directive emphasises the link between water quality and aquatic ecology. Effects of the water environment should be considered in conjunction with effects upon biodiversity (see Section 3) and in particular effects upon designated sites of nature conservation interest such as those within the Natura 2000 network.
- 7.33 However, nominators will be expected to provide details of how potentially adverse effects in relation to a discretionary criterion could be mitigated.
- 7.34 Accidents could also result in the release of contaminated discharges to the water environment which could affect water quality. As identified above, the risk of accidental releases is considered very low due to the stringent regulatory and licensing regimes that will be in place. Either directly or indirectly, criteria 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12 work towards reducing the risk of accidents

and incidents occurring which could result in pollution to water bodies both above and below ground. However, some of these criteria are discretionary. Criteria 1.3, 1.6, 1.8, 1.9 and 1.11 identified for local consideration and could have some benefits for the water environment by reducing accident risk. Similarly, criteria 1.4 and 1.5 identify the need to avoid flood risk and risks caused by tsunami, storm surge and coastal processes. Flooding has the potential to cause a deterioration in water quality through the mobilisation of contaminants and these criteria could therefore indirectly help to protect water quality, although the scale at which such benefits might be realised could be highly localised.

- 7.35 The SSA criteria are a facilitative action to the development of new nuclear power stations which may result in localised water quality impacts. However, some criteria also reduce the likelihood of accidental impacts during operation and some protection is given to nationally designated sites which could include Shellfish Waters⁸⁹. Consequently, the criteria have both positive and negative impacts upon SEA Objective 16.
- 7.36 Criterion 3.2 highlights the importance of Source Protection Zones which protect wells and boreholes which are used for public water supply. However, this criterion is for local consideration only by the IPC and therefore would not be used in the SSA process to inform decisions about which sites should be included in the Nuclear NPS.
- 7.37 Criterion 3.2 makes reference to Source Protection Zones⁹⁰. Outside of these areas, no strategic protection of groundwater is given by the criteria and so risks of negative effects would remain, particularly associated with the need for cooling water abstraction and direct physical changes to the site as a result of construction activities. As with surface water, protection of groundwater will be implemented at the local level through the environmental protection agencies' regulatory responsibilities. SEA Objective 18 has been assigned both positive and negative effects. As identified above, the effects on the water environment are directly related to effects upon biodiversity and consideration of changes to groundwater should also include consideration to the secondary effects on, for example, Natura 2000 sites.

⁸⁹ Shellfish waters are coastal and brackish waters used for commercial fishing. They are designated under the Shellfish Waters Directive (79/923/EEC) which was repealed by the codified Shellfish Waters Directive (2006/113/EC) and will be repealed in 2013 by the Water Framework Directive through the issue of a notice and schedule. The Directive sets the standards for the quality of the waters where shellfish live in order to promote healthy shellfish growth.

⁹⁰ Source Protection Zones protect wells and boreholes which are used for public water supply from pollution effects.

Cumulative Effects

- 7.38 All of the above effects on the water environment could occur as a result of the development of an individual power station. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites or at other locations across the UK, then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. The cumulative effects on water quality, for example, will also depend upon the types of reactors used at each site, their operational characteristics and the likely discharge limits.
- 7.39 The process of developing the NPS, using the SSA criteria to identify sites and also the assessment that will be undertaken through the SEA, will enable the cumulative effects of developing the sites to be considered and this information will be used to inform the decision about which sites should be included in the NPS. There is no SSA criterion addressing water environment (outside of certain designated features) and this increases the likelihood that there could be adverse cumulative effects on the water environment. Many of the effects on the water environment are dependent upon the specific execution of each phase of the development, e.g. construction, and therefore the role of the regulators in guiding this process will be very important.

Mitigation

- 7.40 Some negative effects have been identified as the SSA criteria do not seek to protect all aspects of the water environment. Supporting text has been added as a result of the SEA process in the introduction to the criteria related to environmental protection in the SSA document. This relates to the importance that should be attached to hydrology, geomorphology, surface water quality and groundwater when assessing locations for new nuclear power stations. However, from an SEA perspective it would be beneficial for these issues to be addressed through the development of a criterion for local consideration to highlight the importance of such issues.
- 7.41 It is also recommended that if sites are nominated in the coastal zone, the decision as to whether or not to include them in the NPS should be made with consideration to the wider issues of holistic coastal zone management and planning. Within this, consideration should be given to coastal erosion, sea level rise and flooding effects along the coast and relevant Shoreline Management Plans and coastal studies should be consulted.
- 7.42 Further consideration will be given to the protection of water quality, hydrology, hydrogeology and geomorphology in the SEA once sites have been nominated.

Discussions will occur with the SEA statutory consultation bodies to discuss appropriate assessment techniques at the strategic level. The identification of negative effects through this assessment should serve to identify this as an important issue for local level consideration.

- 7.43 It is recommended that appropriate mitigation would need to be developed at the local level during detailed design once sites have been selected and the effects upon hydrology, geomorphology, water quality, water supply and groundwater should be addressed at the site planning application stage through the accompanying EIA.
- 7.44 It is important to remember that a stringent regulatory framework exists to monitor and protect the water environment which would be implemented for all new nuclear power stations.
- 7.45 The criterion related to cooling technologies (4.2) could also encourage greater consideration at the strategic level of the sensitivity of water bodies chosen for cooling water abstraction and discharge. This should help to avoid the most sensitive water bodies being selected through the siting process. It was considered that a number of measures to mitigate such effects could be employed once site designs were known, but it is too early at this stage to make meaningful judgements on this criterion. Criteria 2.1 and 2.2 provide protection for those features designated for national and international nature conservation purposes.

8 EFFECTS ON SOILS AND GEOLOGY

Summary

- 8.1. This section considers how the SSA criteria will impact on those SEA objectives which cover Soils and Geology. It considers whether the use of the SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
- 19. To avoid damage to geological resources.
 - 20. To avoid the use of greenfield land and encourage the re-use of brownfield sites.
 - 21. To avoid the contamination of soils and adverse impacts on soil functions.
- 8.2. The SSA criteria provide some degree of protection to geological resources through criterion 2.2, regarding nationally designated sites of ecological importance. A number of other criteria, including those which aim to reduce accident and flood risk (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) could have an indirect positive impact on the ability to achieve the SEA objectives on soils and geology. However, the SSA criteria do not directly assess all aspects of the soil and geological resource and there would continue to be a potential risk of soil contamination, particularly during the construction of new nuclear power stations.
- 8.3. The environmental study also reports that since the SSA criteria do not directly encourage the use of brownfield rather than greenfield sites for the construction of new nuclear power stations, the consequential potential to build on greenfield sites could, as a result of development, have an adverse impact on soil resources. The extraction of mineral resources could also be compromised in the future depending upon where the sites are located. For this reason, the environmental study has found that the SSA criteria will have both positive and negative effects on the ability to achieve SEA objectives 19-21.
- 8.4 Table 8-1 summarises the performance against the SEA objectives.

Table 8-1 Effects of the SSA criteria on Soils and Geology												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
19. To avoid damage to geological resources	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	⓪	⓪	⓪
20. To avoid the use of greenfield land and encourage the re-use of brownfield sites	- Direct	- Direct	- Direct	- Indirect	- Indirect	- Indirect	NA	NA	NA	NA	NA	NA
21. To avoid the contamination of soils and adverse impacts on soil functions	- Direct	+/- Direct	+/- Direct	⓪	+/- Indirect	+/- Indirect	⓪	+/- Indirect	+/- Indirect	⓪	+	+
C = Construction; O = Operation; D = Decommissioning Note that the symbol "⓪" means that "There would be no significant contribution towards the achievement of the SEA Objective". It appears in each of the assessment matrices and the symbols used are set out in Annex E.												

Introduction and Background

- 8.5 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to soil and geology.
- 8.6 The Earth's geology is a vital environmental resource, as it is central to the world's biogeochemical cycles, it forms the basis for all soils and plays a key role in determining the dynamics of ecosystems. For example, the alignment and type of rock influence the topography and landscapes of our world. The type of rock and its chemical composition affect the world's soils, and these in turn affect the natural distribution of vegetation.
- 8.7 Fossil fuels comprising coal, oil and natural gas are all part of the world's geological resource and are very valuable to society, owing to the reliance of human society upon them to generate energy. Geological resources are also essential for the long-term storage of water. Groundwater stored within geological formations is pumped to the surface to provide water supply. The

UK's geological resource is also used to store and dispose of waste through the construction of landfills.

- 8.8 Over time our geological resources have been modified by man, for example to extract mineral resources and to construct infrastructure. These modifications can leave behind a legacy of issues which must be addressed before new development can take place, for example the presence of mine shafts which can lead to land instability. Our geological resources are also finite and should be carefully used and appropriately restored.
- 8.9 Geological and geomorphological features considered to be of national importance are designated as SSSI. Areas designated might include particularly distinctive strata or rock formations. This is a statutory designation. Other sites of geological importance may be designated as Regionally Important Geological and Geomorphological Sites (RIGS) and are generally considered valuable for their educational, research, historic or aesthetic importance at the regional level. This is a non-statutory designation. Geoparks are an international, non-statutory designation comprising internationally recognised areas encompassing one or more sites of scientific importance in which the geological heritage is safeguarded and sustainably managed, with strong local involvement.
- 8.10 Soil is the top layer of the earth's crust. It is formed by mineral particles, organic matter, water, air and living organisms. Soils are a finite natural resource which perform a range of functions for society including:
- Storing carbon
 - Buffering pollution and transforming chemicals that could otherwise lead to air or water pollution and contaminate food sources
 - Supporting food production
 - Providing raw materials
 - Supporting natural habitats and biodiversity by decomposing organic matter, recycling nutrients and contributing to soil structure
 - Providing water and flood regulation by storing and transporting water
 - Protecting cultural heritage resources
 - Providing a platform for construction
- 8.11 Whilst policy measures have been implemented to protect the soil resource, degradation continues which has significant effects on the environment and

quality of life.⁹¹

- 8.12 The EU Thematic Strategy for Soil Protection published by the European Commission in 2006⁹² was intended to raise awareness of the potential threats to soil resources and to promote an improved and systematic response by Member States. A key part of this Strategy is a proposed Directive which includes provisions on preventing contamination. This Directive is still being negotiated and it is not clear that any Directive if adopted will cover soils contaminated by radioactive waste considering the Euratom competences. At a domestic level a draft Soil Strategy for England has been prepared. This is consistent with the aims of the proposed Directive. The strategy seeks to ensure that a sound framework for policy making is developed which will ensure the sustainable management of England's soils.
- 8.13 Across the UK, significant areas of the soil resource have been contaminated by previous uses. This is frequently associated with industrial uses that have now ceased but where waste products or residues continue to pose a hazard to the environment. There are environmental benefits associated with the reuse and remediation of brownfield sites.
- 8.14 All soils and rocks are radioactive due to the presence of naturally occurring radioactive substances including thorium, radium and radon gas. However, the operation and decommissioning of nuclear power station sites has the potential to increase the radioactivity of soils and lead to the land being 'contaminated with radioactivity'.⁹³

Assessment of the Environmental Effects of the SSA criteria on Soils and Geology

- 8.15 This section presents the SEA objectives on soils and geology (refer to Table 8-2) and guide questions that have been used to undertake the assessment of the SSA criteria. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information, assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the Nuclear NPS are developed further.

⁹¹ Defra (2008) Consultation on Draft Soil Strategy for England

⁹² www.defra.gov.uk/corporate/consult/soilstrategy/

⁹³ Environment Agency Radioactive Contaminated Land Briefing Note 2 An Overview of Land Contaminated with Radioactive Substances www.environment-agency.gov.uk

Relevant SEA Objectives and Guide Questions

8.16 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. Table 8-2 presents the SEA objectives that each address a slightly different element of the soil and geological resource.

Table 8-2 Relevant SEA Objectives and Guide Questions for Soils and Geology	
Relevant SEA Objectives	Guide Questions
19. To avoid damage to geological resources	Will it result in the compaction and erosion of soils?
20. To avoid the use of greenfield land and encourage the re-use of brownfield sites	
21. To avoid the contamination of soils and adverse impacts on soil functions	<p>Will it lead to the removal or alteration of soil structure and function?</p> <p>Will it lead to the contamination of soils which could adversely affect biodiversity and human health?</p> <p>Will it compromise the future extraction/use of geological/mineral reserves?</p> <p>Will it result in the loss of agricultural land?</p> <p>Will it lead to damage to geological SSSIs and other geological sites?</p> <p>Will it result in the loss of greenfield land?</p> <p>Will it adversely affect land under land management agreements?</p>

Overview of Potential Impacts

- 8.17 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. These facilities have the potential to have effects on geology and soils. Whilst some of these effects may be specific to nuclear power generation, many will be common to other major infrastructure projects, particularly during the construction phase.
- 8.18 New nuclear power stations will also produce radioactive waste. This waste would be stored on site in safe and secure interim storage throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The interim storage, transport and disposal of the waste could have effects on geology and soils as identified in Table 8-3. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 8.19 Table 8-3 presents the potential impacts of a new nuclear power station. These potential impacts are generic only, as no information is yet available regarding the location of the nuclear power stations, the type of reactor which would be used at the sites, nor the specific operating characteristics.

Table 8-3 Potential Impacts of Nuclear Facilities on Soils and Geology in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Soils and Geology in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Contamination of soils and underlying geological resource</p> <p>The presence of oils, fuels and lubricants on the construction site could lead to the contamination of soils on the site of the new nuclear power station and also in adjacent areas. There is also the potential for certain construction works, for example the establishment of foundations and piling to act as pathways for such contaminants to be transported into underlying aquifers. This could have knock on effects for human health as a result of the contamination of water supply.</p> <p>Loss of soil functions and the soil resource</p> <p>Depending upon where the new nuclear power stations are constructed there could be a loss of greenfield land and the associated soil functions including carbon storage and water regulation. However, the use of a previously developed site covered in hardstanding would not result in these losses. The loss of greenfield land could also lead to the loss of agricultural or</p>

Table 8-3 Potential Impacts of Nuclear Facilities on Soils and Geology in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Soils and Geology in the Absence of Details on Location, Design or Mitigation
	<p>recreational land uses.</p> <p>Waste generation</p> <p>Wastes generated during the construction phase would need to be disposed of and this could place an increased burden on landfills and hence the geological resource. However, such impacts could be managed through the development of site waste management plans.</p> <p>Damage to soil structure</p> <p>The machinery used on site and vehicular movements across the site could lead to the compaction and sealing of soils and a deterioration in soil structure. This could have knock-on effects for drainage if it leads to increased runoff rates. The construction works could also increase the vulnerability of the soils to erosion by removing vegetation.</p> <p>Removal of rock/geological resource</p> <p>The construction works could lead to the loss of the geological resource through the excavation of rock to construct the site. This could have particularly significant effects if a geological SSSI or a RIGS was affected.</p> <p>Mineral Resources</p> <p>Depending upon the sites that are developed for new nuclear power stations, there is the potential for development to compromise the future extraction or use of mineral/geological resources underlying the sites.</p>
Operation (40 years)	<p>Contamination of soils with radioactivity</p> <p>The presence of radioactive materials on site could lead to the contamination of soils underlying the site and also in the immediate vicinity, if accidents or leaks occur (it is assumed that under standard operating conditions all radioactive materials would be safely and securely stored).</p> <p>However, the radionuclides released into the atmosphere during normal operating conditions could be dispersed beyond the site boundary and deposited on adjacent soils which could have adverse effects on the food chain if the land is used for agricultural purposes. That said, all gaseous radioactive emissions to the atmosphere would be regulated by the relevant environmental protection agency.</p> <p>Contamination of soils</p> <p>Accidental spillages of oils and fuels could also lead to the</p>

Table 8-3 Potential Impacts of Nuclear Facilities on Soils and Geology in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Soils and Geology in the Absence of Details on Location, Design or Mitigation
	<p>contamination of soils.</p> <p>Damage to soil structure</p> <p>The machinery used on site and vehicular movements across the site could lead to the compaction and sealing of soils and a deterioration in soil structure. This could have knock-on effects for drainage if it leads to increased runoff rates. However, the likelihood of this happening is considered lower than during the construction phase, as site access roads would be established.</p> <p>Contamination from road runoff</p> <p>Runoff from roads across the site and providing access to it, could lead to contamination of adjacent soils.</p> <p>Interim Radioactive Waste Storage</p> <p>Radioactive waste, including higher activity wastes (ILW and potentially spent fuel) will be stored on site in safe, secure, interim storage facilities prior to being transport for final disposal. The main risks to geology and soils would be through unplanned releases of radioactive materials into the environment via air, water or directly to soil. Such releases may be transmitted via the soil or groundwater to other sensitive receptors such as flora and fauna or human populations. However, these risks are considered to be very low as the stores would be designed to the highest levels of containment and would be subject to strict regulatory and health and safety controls⁹⁴. Safe storage in these facilities would be expected to be available until such time as final disposal facilities become operational.</p> <p>There would also be non-radioactive waste generated on the site which would require suitable treatment and disposal to landfill could have adverse effects on soils and geology.</p>
Decommissioning (including interim waste storage, transport and final disposal) (minimum of 30	<p>Accumulation and need to dispose of radioactive or contaminated soils – increased disposal burden.</p> <p>When the site is decommissioned it would be necessary to confirm the presence of radioactive soils and undertake remediation as necessary and taking into consideration the end use. Any contaminated soils would need to be appropriately disposed of and there could be an increasing burden placed upon a geological</p>

⁹⁴ “Security of radioactive waste storage and transport is under constant review by the regulators to ensure that facilities and practices remain robust” (BERR, January 2008, Meeting the Energy Challenge, A White Paper on Nuclear Power, page 96)

Table 8-3 Potential Impacts of Nuclear Facilities on Soils and Geology in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Soils and Geology in the Absence of Details on Location, Design or Mitigation
years)	<p>disposal facility and other waste disposal sites. The remediation process itself could generate other environmental effects.</p> <p>Contamination of Soils with Radioactivity</p> <p>The decommissioning process could result in the release of contamination as a result of accidents or leaks which could contaminate underlying soils.</p> <p>Interim Radioactive Waste Storage</p> <p>Radioactive waste, including higher activity wastes (ILW and potentially spent fuel) will be stored on site in safe, secure, interim storage facilities prior to being transport for final disposal. The main risks to geology and soils are as identified above during the operational phase. However, following removal of the waste store and its contents, some ground contamination may remain, as a result of the presence of radioactive materials being present on the site. It is expected that such contamination would be removed or treated in an appropriate manner to ensure that risks to the environment and the public are effectively managed and reduced. Such issues would be addressed through the relevant regulatory regimes and Environmental Impact Assessments associated with decommissioning.</p> <p>Transport of Radioactive Waste for Final Disposal</p> <p>Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. The main risks to geology and soils would be through unplanned releases of radioactive materials into the environment as a result of accidents which could lead to radioactive releases into the air, water or directly to soil. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from the Radioactive Material Transport Event Database (RAMTED) for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not</p>

⁹⁵ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

Table 8-3 Potential Impacts of Nuclear Facilities on Soils and Geology in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Soils and Geology in the Absence of Details on Location, Design or Mitigation
	<p>resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s.⁹⁵ The majority of incidents that have occurred have resulted in trivial or no radiological consequences. During interim storage of several decades the initial fission product activity of the waste would decline as more active compounds decay and it may only require a single movement of lower activity material to the final disposal locations. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Final Disposal of Radioactive Waste</p> <p>The Government considers that it would be technically possible to dispose of higher activity waste from new nuclear power stations in a geological disposal facility. The risks to geology and soils of disposal in a geological disposal facility relate to both the impacts of construction of the facility and the depositing and long-term storage of waste emplacement and disposal within it. Such impacts, may relate to direct loss of the geological and soil resource during construction and unplanned releases of radioactive materials into the environment. The containment of radioactivity would be central to any safety case presented to the regulators, who would have to be satisfied that such risks would be acceptably small before such a facility could be built and operated.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for the underlying geology and soils.</p>

8.20 SSA criteria have been developed in order to provide greater direction towards those areas of the UK that would be more suitable for the development of new nuclear power stations. The following section describes the significant effects upon soils and geology of applying the SSA criteria.

Significant Environmental Effects of the SSA criteria

8.21 The SSA criteria have been assessed against the relevant SEA objectives for geology and soils (refer to Table 8-2) using the matrices in Appendix D.

- 8.22 Criterion 2.2 provides protection for ASSIs and SSSIs which include sites that are designated for their earth science interest and, therefore, positive effects have been recorded against SEA Objective 19. Under the SSA criteria in relation to geological resources only those sites of national importance are protected and, therefore, RIGS and also Geoparks would not be afforded such protection. However, it is likely that Geoparks which are an international designation would be protected in some way by the ASSI/SSSI designation. There are also no criteria which seek to avoid or reduce the risk of compromising the future extraction of mineral resources. Criterion 1.9 which is identified for local consideration by operators highlights the need to assess the risks associated with existing or historic mineral extraction but does not identify the need to avoid or compromise future known reserves. For this reason, effects have been recorded as positive and negative against SEA Objective 19.
- 8.23 There is a risk that Criterion 1.5 which seeks to avoid, minimise or mitigate risks caused by tsunami, storm surge and coastal processes would lead to the implementation of new coastal defences at some sites which could, themselves adversely affect the geological resource further along the coast through increased erosion risk. Criterion 1.5 states that nominators should take into account the wider impacts of any coastal protection countermeasures. Criterion 2.2 should also help to avoid this from occurring and nationally important geological sites being adversely affected.
- 8.24 None of the SSA criteria directly promote the use of brownfield or previously developed land rather than greenfield sites and so effects are assessed as negative against SEA Objective 20 although it is expected that applications for building new nuclear power stations will focus on areas in the vicinity of existing sites. Where possible, the loss of greenfield land should be avoided when undertaking any development. Criterion 3.1 seeks to avoid, minimise or mitigate adverse impacts on areas or amenity, cultural heritage and landscape value which could be perceived to include greenfield land, although the criterion is not intended to protect greenfield sites, nor does it actively encourage the re-use of brownfield land. Criteria 2.1 and 2.2 could also be perceived to be acting in a similar manner by protecting internationally and nationally designated sites.
- 8.25 Table 8-3 identifies a number of ways in which new nuclear power stations could affect geology and soils. The criteria do not provide direct protection to soil quality and functions and adverse impacts could occur during all phases of a power stations' life (including the interim storage of radioactive waste). However, it is expected that good planning, execution and control of all phases e.g. through the development of effective environmental management practices and the regulatory regimes would help to minimise the incident of these effects locally. Whilst none of the SSA criteria directly work towards avoiding soil

contamination, some indirect benefits are provided. Effects upon soil quality and function can be explored further in the Environmental Report once sites for new nuclear power stations have been nominated.

- 8.26 Accidents could result in the release of unplanned radioactive discharges to the air and water environments which could adversely affect soil quality at potentially very long distances from the site, depending upon the processes of dispersion and deposition. Criteria 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12 seek directly and indirectly to reduce the risk of accidents and incidents occurring at a new nuclear power station. Criterion 1.11 also highlights the need for emergency plans to be developed by nuclear operators to protect the public and the workforce, which should include measures for dealing with accidental releases of radioactivity. However, this is a local level criterion only and will not be considered through the SSA process. Similarly criteria 1.3, 1.6, 1.8 and 1.9 are identified for local consideration and also address nuclear safety issues.
- 8.27 Criteria 1.4 and 1.5 identify the need to avoid or mitigate flood risk and risks caused by tsunamis, storm surge and coastal processes. Flooding has the potential to cause a deterioration in soil quality, as a result of the mobilisation of contaminants, and these criteria could, therefore, indirectly help to protect soil quality. The scale at which such benefits might be realised would be very localised.
- 8.28 The overall facilitative action of the NPS, through increasing the likelihood of new nuclear power stations being built will increase the need for radioactive waste to be transported and disposed of. The transportation and final disposal of radioactive waste are not addressed through the SSA criteria.

Cumulative Effects

- 8.29 All of the above effects on geology and soils could occur as a result of the development of an individual power station. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites, or at other locations across the UK, then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects, as the locations and number of the sites to be developed is not known. Cumulative effects on geology and soil could include the loss of greenfield land which could have knock-on effects on infiltration, soil quality and functions and is not currently addressed by a specific SSA Criterion. There could also be cumulative adverse effects on geological resources as a result of direct loss.
- 8.30 The process of developing the Nuclear NPS, using the SSA criteria to identify

sites and also the assessment that will be undertaken through the SEA will enable the cumulative effects of developing the sites to be considered and this information will be used to inform the decision about which sites should be included in the Nuclear NPS. Whilst some of the SSA criteria would provide some protection to geology and soils, there are a number of aspects that would not be protected and this increases the risk of adverse cumulative effects.

Mitigation

- 8.31 Some negative effects have been identified, as the criteria do not seek to protect all aspects of soils and geology. The SEA recommended that a criterion be developed which promoted the use of brownfield land in preference to greenfield. The SSA considered that the issue was adequately addressed, indirectly through other criteria, for example criteria, 2.1 ,2.2 and 3.1.
- 8.32 Opportunities should be sought throughout the process to minimise the amount of greenfield land lost to development. Even when greenfield sites are brought forward for development, careful site design and landscaping can reduce the amount of land lost. The use of Sustainable Drainage Systems would also help to offset some of the adverse effects of reduced infiltration capacity and increased runoff rates associated with greenfield land losses.
- 8.33 Whilst the protection of soil resources is very important at a national level, suitable mitigation measures to protect soil quality and function during each phase of the power station's life could only be accurately developed once exact site locations and designs are known. The stringent regulatory, framework which seeks to protect the environment, would be implemented for all new nuclear power station developments and this would reduce the likelihood of adverse effects occurring. The role of construction environmental management plans would also be very important in mitigating potential adverse effects. However, the development of a criterion regarding soil resources and functions for local consideration would be beneficial and clearly highlight their importance to nominators.
- 8.34 When development consent is sought for new nuclear power stations, the EIAs must also consider effects on the entire geological resource and not just designated sites.
- 8.35 A further criterion for local consideration could be developed to consider adverse effects upon undesignated geology and mineral resources. This was considered too specific for the SSA and better placed for the IPC to consider in relation to site-specific planning applications.

9 EFFECTS ON CULTURAL HERITAGE

Summary

- 9.1. This section considers how the SSA Criteria will impact on those SEA objectives which cover Cultural Heritage. It considers whether the use of the SSA Criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
 22. To avoid adverse impacts on the internationally and nationally important features of the historic environment.
 23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes.
- 9.2. SSA criterion 3.1 seeks to avoid, minimise or mitigate negative impacts on areas of amenity, cultural heritage and landscape value and would thus have a positive impact on the ability to achieve SEA Objective 22. The environmental study has noted that since this is a discretionary criterion only, the risk of adverse effects remains.
- 9.3. SSA criterion 3.1 should also help to avoid, minimise or mitigate adverse effects on the setting and quality of built heritage and archaeology and historic landscapes and thus should have a positive impact on the ability to achieve SEA Objective 23. A number of other criteria, including those which aim to minimise accident and flood risk (criteria 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9, 1.10, 1.11 and 1.12) could have an indirect positive impact on the ability to achieve the SEA objectives in respect of cultural heritage. However, the SSA criteria do not directly address the issue of local level resources that contribute to the overall quality of the UK's cultural heritage. For these reasons, the environmental study has found that the SSA criteria will have both positive and negative effects on the ability to achieve SEA Objective 23.
- 9.4. The findings of the environmental study could lead to the conclusion that it would be beneficial for a local level criterion to be developed that identified the importance of protecting the wider cultural heritage resource and historic landscapes. The Government's reason for not adopting this approach in the proposed SSA criteria set out for consultation is that the SSA is intended only to cover strategic issues of national importance and that more local-level issues will be addressed by the IPC when it considers specific applications for planning consent.
- 9.5. Table 9-1 presents a summary of the assessment results.

Table 9-1 Effects of the SSA criteria on Cultural Heritage												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
22. To avoid adverse impacts on the internationally and nationally important features of the historic environment	+ Direct	+ Direct	+ Direct	+ Indirect	+ Indirect	+ Indirect	⓪	⓪	⓪	⓪	⓪	⓪
23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes	+/- Direct	+/- Direct	+/- Direct	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	+/- Indirect	⓪	⓪	⓪
	C = Construction; O = Operation; D = Decommissioning Note that the symbol “⓪” means that "There would be no significant contribution towards the achievement of the SEA Objective". It appears in each of the assessment matrices and the symbols used are set out in Annex E.											

Introduction and Background

- 9.6 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to cultural heritage.
- 9.7 Cultural heritage can be defined as ‘a group of resources inherited from the past which people identify, independently of ownership, as a reflection and expression of their constantly evolving values, beliefs, knowledge and traditions. It includes all aspects of the environment resulting from the interaction between people and places through time’⁹⁶. The historic environment and cultural heritage is an important national resource. It comprises archaeological remains, buildings and their settings and landscapes. Whilst it is possible to identify these three key elements, all of them interact and influence each other.

⁹⁶ Council of Europe (2005) Framework Convention on the Value of Cultural Heritage for Society

- 9.8 Archaeological remains contribute to our understanding of past human societies and are the materials created or modified by past human activities. They can include structures and artefacts and may be visible or buried below ground. Historic buildings are generally acknowledged to be ‘standing historic structures that are usually formally designed or have some architectural presence⁹⁷’. They may include churches and vernacular buildings, milestones or bridges.
- 9.9 All landscapes have been shaped by past human activities and so have historic character. However, some parts of the UK demonstrate and provide greater historical association than others and it is important to ensure that such landscapes are protected from inappropriate development. In Wales, a two volume Register of Landscapes of Outstanding Historic Interest in Wales has been developed and which includes landscapes ranging from industrial centres to ancient rural settlements.
- 9.10 Cultural heritage resources are protected by a wealth of legislation. Some key pieces of legislation include:
- The Ancient Monuments and Archaeological Areas Act 1979, which applies to England, Wales and Scotland
 - The Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995
 - The Planning (Listed Buildings and Conservation Areas) Act 1990
 - The Planning (Northern Ireland) Order 1991
 - The Planning (Listed Buildings and Conservation Areas (Scotland)) Act 1997 as amended.
- 9.11 A draft Heritage Bill was published in April 2008 and this seeks to streamline and improve the process by which decisions affecting heritage resources are made. The new system proposed in the Bill intends to close gaps in the protection process and see decisions made at a local level.
- 9.12 Table 9-2 presents details of the key cultural heritage designations, including the level at which they operate (e.g. international or national) and whether they are statutory or non-statutory designations.

⁹⁷ Highways Agency (2007) Design Manual for Roads and Bridges: Volume 11, Section 3 Environmental Topics, Part 2 HA208/07 Cultural Heritage
<http://www.standardsforhighways.co.uk/dmrb/vol11/section3/ha20807.pdf>

Table 9-2 Cultural Heritage Features and their Status in the UK		
Cultural Heritage Feature	Level of the Designation	Statutory or Non-Statutory?
World Heritage Site	International	Non-statutory, although they may be consistent with other features receiving statutory protection e.g. a Scheduled Monument.
Historic Battlefield	National	Non-statutory
Scheduled Monuments and Zones	National	Statutory
Protected Wrecks	National	Statutory
Parks and Gardens of Special Historic Interest (England) Inventory of Gardens and Designed Landscapes (Scotland) Register of Landscapes of Historic Interest – Part 1 comprises parks and gardens (Wales) Register of Historic Parks, Gardens and Demesnes of Special Interest (Northern Ireland)	National	Non-statutory
Areas of Archaeological Importance	National	Statutory
Listed Buildings	National	Statutory
Conservation Areas	Local	Statutory
Non-Designated Buildings and Sites (this includes historic landscapes, non-listed buildings, below ground archaeological remains)	Local	Non-statutory

9.13 All elements of the cultural heritage resource demonstrate how communities have been shaped through time and they can provide a sense of place and stability to a community. They are something which people can learn from, the economy can benefit from (for example through tourism revenue) and which a community can interact with. The underlying principle of government guidance is that features should be preserved in situ where possible, as they are a non-renewable resource.

9.14 The UK Government has ratified and adopted a number of international

Conventions and Charters that seek to protect and enhance heritage resources including the European Convention on the Protection of the Archaeological Heritage 1992 and the European Landscape Convention 2000.

- 9.15 The concept of setting is very important when determining effects on heritage resources and comprises the surroundings in which a particular location is experienced. The archaeological and historical context of a site, its visual appearance and the aesthetic qualities of the surroundings play a valuable role in understanding the value of heritage resources.
- 9.16 Strategic level baseline data for the UK is presented in Appendix C1 and Figure 2 presents details of locations of key features nationally across the UK.

Assessment of the Environmental Effects of the SSA criteria on Cultural Heritage

- 9.17 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria to determine effects on cultural heritage. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information and assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the Nuclear NPS are developed further.

Relevant SEA Objectives and Guide Questions

- 9.18 Table 9-3 presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria.

Table 9-3 Relevant SEA Objectives and Guide Questions for Cultural Heritage	
Relevant SEA Objectives	Guide Questions
22. To avoid adverse impacts on the internationally and nationally important features of the historic environment.	Will it adversely affect historic sites of international/national importance and their setting? Will it adversely affect other historic sites of known value?
23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes.	Will it adversely affect landscapes of historic importance?

Overview of Potential Impacts

- 9.19 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. These facilities have the potential to have effects on cultural heritage resources. Whilst some of these effects may be specific to nuclear power generation, many will be common to other major infrastructure projects.
- 9.20 New nuclear power stations will also produce radioactive waste. This waste would be stored on site in safe and secure interim storage throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The interim storage, transport and disposal of the waste could have effects on cultural heritage as identified in Table 9-4. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 9.21 Table 9-4 presents the potential impacts of a new nuclear power station. These potential impacts could occur if aspects of the new nuclear power station were developed in the absence of them being considered and of suitable mitigation measures being developed. Only once further details of each of the new nuclear power station sites are obtained would it be possible to determine the significant effects that could occur. Many of the potential impacts identified are not unique to the construction, operation and decommissioning of new nuclear power stations, but rather any large infrastructure project.

Table 9-4 Potential Impacts of Nuclear Facilities on Cultural Heritage in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Cultural Heritage in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Disturbance to or loss of below ground archaeological remains</p> <p>The construction works including the establishment of foundations, ground disturbance, the movement of heavy machinery and the potential construction of new grid connection infrastructure could lead to the direct loss or damage to below ground archaeology. These effects are not unique to a new nuclear power station but are an impact associated with any construction works depending upon where they are executed. Similarly, dewatering to construct foundations could lead to hydrological modifications which could disturb paleoenvironmental deposits.</p> <p>Disturbance or loss of maritime archaeology</p>

Table 9-4 Potential Impacts of Nuclear Facilities on Cultural Heritage in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Cultural Heritage in the Absence of Details on Location, Design or Mitigation
	<p>Depending upon the location of the new nuclear power stations there may be a need to construct new coastal infrastructure e.g. coastal defences or new ports to facilitate the delivery of raw materials which could lead to the loss of resources or their disturbance either directly or indirectly through modifications to coastal processes.</p> <p>Disturbance to historic landscapes</p> <p>The presence of the development site and construction works could lead to adverse impacts on historic landscapes. There could be the direct loss of an important area of land or there could be temporary effects which are reduced once a site has been landscaped or restored following construction.</p> <p>Direct loss of, or disturbance to, built heritage resources</p> <p>The construction works could lead to the direct loss of the fabric of built heritage resources like listed buildings. Such effects would be permanent.</p> <p>Increased noise and adverse air quality</p> <p>An increase in noise during the construction work associated with the machinery on site and also traffic movements to and from the site could adversely affect the setting of cultural heritage resources. Similarly, a localised deterioration in air quality caused by dust generation and emissions from vehicles could also cause adverse effects on setting. The significance of these effects would depend upon the number of traffic movements.</p> <p>Changes to the Setting of Cultural Heritage Resources</p> <p>The presence of construction works could adversely affect the setting of a heritage resource. For, example, the construction works could lead to the loss or removal of an important area of open space which is critical to the appreciation and original purpose of a building.</p>
Operation (40 years)	<p>Effects on Historic Landscapes</p> <p>Throughout the operation of the nuclear power station, owing to the presence of the reactor building and ancillary infrastructure there could be adverse effects on historic landscapes.</p> <p>Effects on the Setting of Heritage Resources</p> <p>The presence of the site and associated ancillary infrastructure, depending upon its location could have adverse effects on the setting of heritage resources by altering the aesthetics of the surrounding area and by altering visual amenity. Adverse setting</p>

Table 9-4 Potential Impacts of Nuclear Facilities on Cultural Heritage in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Cultural Heritage in the Absence of Details on Location, Design or Mitigation
	<p>effects could also occur as a result of increased vehicular movements to and from the site associated with the movement of personnel and materials, although these are considered less likely to be significant.</p> <p>Benefits to Heritage Resources by Reducing the Risk of Other Development</p> <p>The presence of a new nuclear power station would impose limits on the amount of development that can occur in its vicinity and this could indirectly protect some cultural heritage resources from adverse effects e.g. it could avoid the disturbance of below ground archaeological deposits.</p> <p>Contamination Effects</p> <p>During operation there could be contamination of the surrounding soils and watercourses which could have adverse effects on below ground archaeology.</p> <p>Effects Caused by Accidents</p> <p>Although the risk of accidents occurring is considered to be very low owing to the strict and independent regulatory regimes in operation in the UK, if an accident were to occur there could be adverse impacts on cultural heritage resources as a result of direct loss of features or as a result of a deterioration in setting.</p>
<p>Decommissioning (including interim waste storage, transport and final disposal)</p> <p>(minimum of 30 years)</p>	<p>Effects of Restoration</p> <p>Although the decommissioning and subsequent restoration of sites would occur a very long time into the future, there could be benefits for the setting of nearby heritage features and also any historic landscapes depending upon how the site is restored.</p> <p>Disturbance to or loss of below ground archaeological remains</p> <p>It is assumed that the chances of this occurring would be far greater when the site is initially constructed. However, there is still the potential for anything remaining following construction to be disturbed or damaged by the decommissioning works depending upon how structures are removed/demolished and if foundations would be removed.</p> <p>Effects Caused by Accidents</p> <p>Although the risk of accidents occurring is considered to be very low</p>

Table 9-4 Potential Impacts of Nuclear Facilities on Cultural Heritage in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Cultural Heritage in the Absence of Details on Location, Design or Mitigation
	<p>owing to the strict and independent regulatory regimes in operation in the UK, if an accident were to occur there could be adverse impacts on cultural heritage resources as a result of direct loss of features or as a result of a deterioration in setting.</p> <p>Transport of Radioactive Waste for Final Disposal</p> <p>Once final disposal facilities are constructed and operational, radioactive waste from new nuclear power station sites would be transported for final disposal. The main risks to cultural heritage would be through unplanned releases of radioactive materials into the environment as a result of accidents which could lead to radioactive releases into the air, water or soil. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from the Radioactive Material Transport Event Database (RAMTED) for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s.⁹⁸ The majority of incidents that have occurred have resulted in trivial or no radiological consequences. During interim storage of several decades the initial fission product activity of the waste would decline as more active compounds decay and it may only require a single movement of lower activity material to the final disposal locations. It is not possible to specify which transportation routes will be used as the location of new power stations and geological disposal facilities is not currently known.</p> <p>Final Disposal of Radioactive Waste</p> <p>The Government considers that it would be technically possible to dispose of higher-activity waste from new nuclear power stations in a geological disposal facility. The risks to cultural heritage of</p>

⁹⁸ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review HPA - RPD-034.

Table 9-4 Potential Impacts of Nuclear Facilities on Cultural Heritage in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Cultural Heritage in the Absence of Details on Location, Design or Mitigation
	<p>disposal in a geological disposal facility relate to both the impacts of construction of the facility and the waste emplacement and disposal within it. Such impacts, may relate to direct loss of features, structures or landscapes and disturbance during construction. The containment of radioactivity would be central to any safety case presented to the regulators, who would have to be satisfied that such risks would be acceptably small before such a facility could be built and operated.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR facility in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for cultural heritage depending upon the chosen design or location with respect to heritage resources and their setting. Impacts may include direct loss of heritage features through construction or a deterioration in the setting of such features caused by visual intrusion, noise emissions or associated activity including transport activity.</p>

Significant effects of the SSA criteria

- 9.22 The SSA criteria have been assessed against the relevant SEA objectives for effects on cultural heritage (refer to Table 9-3) using the matrices in Appendix D.
- 9.23 Criterion 3.1 seeks to avoid, minimise or mitigate impacts on sites of amenity, cultural heritage and landscape value. This should apply to the avoidance of adverse impacts during the construction, operation and decommissioning phases and should lead to more informed judgements about siting in relation to cultural heritage resources. The criterion is discretionary and so the extent to which adverse effects would be minimised would be determined on a case-by-case basis so it is not definite that all adverse impacts would be avoided in every case.
- 9.24 Whilst offering some degree of protection to nationally important heritage sites like Scheduled Monuments, criterion 3.1 would not protect those features that are of importance at a local level e.g. Conservation Areas or areas which are not protected by a specific designation, for example historic landscapes or some below ground archaeological remains. Whilst the text of the criterion itself does not limit the protection to internationally and nationally important cultural

heritage resources, the supporting text identifies a need for nominators to give consideration to the wider cultural heritage resource. Local issues will need to be considered at local level through the planning system.

- 9.25 The focus solely upon those cultural heritage features that are a statutory, national, designation means that many aspects of the cultural heritage resource will not be considered through the process. It will, therefore, be essential to ensure that effects on these other resources are documented in a project specific EIA when sites have been identified and the reactor design and operational characteristics confirmed.
- 9.26 Criteria 1.4 and 1.5 identify the need to avoid increased flood risk and also for any new flood defence infrastructure not to adversely affect neighbouring areas. These criteria could, therefore, offer some indirect benefits to heritage features that are not located at the site of the new nuclear power station.
- 9.27 Either directly or indirectly criteria 1.1, 1.2, 1.4, 1.5, 1.7, 1.8, 1.10 and 1.12 work towards reducing the risk of accidents and incidents occurring at new nuclear power stations which, if they occurred, could adversely affect heritage resources. However, some of these criteria are discretionary and so would be dealt with on a case by case basis. Criteria 1.3, 1.6, 1.8 and 1.9 are all identified for local consideration and also address safety issues that will have to be considered by the IPC for specific new nuclear power station sites. A low level of risk of accidents would always remain.

Cumulative effects

- 9.28 All of the above effects on cultural heritage could occur at individual sites developed for new nuclear power stations. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites or at other locations across the UK, then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. However, cumulative effects on cultural heritage resources might include the loss of heritage resources, particularly those that are not protected by a statutory designation as the SSA criteria do not specifically address this issue.
- 9.29 However, the process of developing the NPS, using the SSA criteria to identify sites and also the assessment that will be undertaken through the SEA will enable the cumulative effects of developing the sites to be considered and this information will be used to inform the decision about which sites should be included in the NPS. The SSA criterion that seeks to avoid adverse impacts on heritage resources is discretionary and would not entirely rule out the potential

for adverse effects to occur. However, it would ensure that such issues are considered as part of the decision-making process and could help to reduce the number and severity of the cumulative effects on cultural heritage.

Mitigation

- 9.30 As a result of the SEA, the SSA included, within criterion 3.1 that adverse impacts on Listed Buildings and Areas of Archaeological Importance should also be avoided as they are also nationally important cultural heritage resources.
- 9.31 Whilst the SEA and the SSA are both able to ensure consideration of effects upon international and national cultural heritage resources, there is a risk that there could be loss of resources that are not of national value, for example some parts of the UK may be very valuable from a historic landscape perspective but might not be protected through the SSA. A local level criterion could be developed addressing the need to protect the wider heritage resource. The SSA considered it was not appropriate to include specific SSA criteria to deal with issues that are more effectively dealt with at the local level both once sites have been nominated and once individual applications have been submitted. Once sites have been nominated it is intended that more detailed baseline data is collated in relation to the location of Conservation Areas and also data obtained from Sites and Monuments Records as appropriate which will enable these issues to be explored in further detail.
- 9.32 It will also be important for the EIAs that accompany planning consents for individual sites to include consideration of the effects on local heritage resources and also the cumulative effects on the heritage resource.

10 EFFECTS ON LANDSCAPE

Summary

- 10.1. This section considers how the proposed SSA criteria will impact on those SEA objectives which cover Landscape. It considers whether the use of the proposed SSA criteria to determine sites for new nuclear power stations will have positive or negative effects on the ability to achieve these objectives. The SEA objectives being considered in this section are:
 24. To avoid adverse impacts on nationally important landscapes.
 25. To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness.
- 10.2. SSA criterion 3.1 specifically seeks to minimise impacts upon areas of amenity and landscape value and would thus have a positive impact on the ability to achieve SEA objective 24. The development of new nuclear power stations would be likely to require the construction of new transmission infrastructure and cooling technologies, which could have a negative impact on the SEA objectives related to Landscape. There is an SSA criterion which addresses transmission infrastructure (criterion 4.3), although it is identified for local consideration. Whilst an NPS for Electricity Networks is being developed to consider the transmission lines that will be needed for new generation capacity, the effects of the transmission infrastructure will not be known when decisions are made about which the sites to include in the Nuclear NPS. For this reason, the environmental study has concluded that some risk of negative effects could still exist. Criterion 4.2 addressing cooling technologies states that nominators should identify suitable countermeasures to avoid, minimise or mitigate the effects of cooling.
- 10.3. SSA criterion 3.1 makes reference to the need for those nominating sites for inclusion in the Nuclear NPS to consider the effects upon local landscape character, quality and tranquil areas and would thus have a positive impact on the ability to achieve SEA objective 25. However, due to the potential for the changes to the transmission network to have adverse effects on the ability to achieve this SEA objective (as outlined above), the SSA criteria could also have a negative impact in this area.
- 10.4. Table 10-1 summarises the assessment results.

Table 10-1 Effects of the SSA criteria on Landscape												
SEA Objective	Geographical Scale of Effect											
	Site			Locality (<8km from site)			8-100km from Site			100+km from Site		
	C	O	D	C	O	D	C	O	D	C	O	D
24. To avoid adverse impacts on nationally important landscapes	+ Direct	+ Direct	+ Direct	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	- Direct Indirect	- Direct Indirect	- Direct Indirect
25. To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness	+ Direct	+ Direct	+ Direct	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	+/- Direct Indirect	- Direct Indirect	- Direct Indirect	- Direct Indirect
C = Construction; O = Operation; D = Decommissioning												

Introduction and Background

- 10.5 This section sets out the findings of the assessment of the SSA criteria against the SEA objectives relating to landscape issues.
- 10.6 Landscape is an important national resource. The UK has a wide variety of landscape character derived from the underlying geology, vegetation cover, natural weathering and human activity over millions of years. Landscape has an intrinsic cultural connection with the human environment not only in terms of its evolution but also its aesthetic quality and its important contribution to local and regional identities. Although landscape is continually evolving its value as a resource for future generations is very important. It has specific consequences for human health and socio-cultural well being as well as issues relating to the

economy, tourism and recreation⁹⁹.

- 10.7 Consequently large areas of the UK have been afforded protection through planning policies in order to maintain the quality of the most scenic areas.
- 10.8 A range of legislative measures have been developed to provide protection to landscape. Principally these include:
- The National Parks and Access to the Countryside Act 1949
 - The Wildlife and Countryside Act 1981
 - The Nature Conservation and Amenity Lands Order (Northern Ireland) 1985
 - The Environment Act 1995
 - The Countryside and Rights of Way Act 2000
 - The National Parks (Scotland) Act 2000
- 10.9 Table 10-2 presents details of the key landscape designations, including the level at which they operate e.g. national or local level and whether they are statutory or non-statutory designations.

Table 10-2 Status of Landscape Designations in the UK		
Cultural Heritage Feature	Level of the Designation	Statutory or Non-Statutory?
National Parks	National	Statutory
Areas of Outstanding Natural Beauty	National	Statutory
National Scenic Areas (Scotland only)	National	Statutory
Heritage Coast (England and Wales only)	National	Non-statutory
Preferred Conservation Zones (Scotland only)	National	Non-statutory

⁹⁹ Highways Agency et al. Design Manual for Roads and Bridges Volume 11, Landscape and Visual Amenity

Table 10-2 Status of Landscape Designations in the UK		
Cultural Heritage Feature	Level of the Designation	Statutory or Non-Statutory?
Country Parks	Local	Statutory (Non-statutory in Northern Ireland)
Regional Parks (Scotland)	Regional	Statutory
Woodland and Forest Parks	Local	Non-statutory
Local Authority landscape designations	Local	Non-statutory

- 10.10 Significant areas of the UK are under statutory landscape designation. The National Parks in England, Wales and Scotland, whilst designated to conserve and enhance their special qualities are also very important visitor attractions as they are also intended to promote opportunities for the public to enjoy their special qualities. AONBs and National Scenic Areas in Scotland share this national importance.
- 10.11 Significant stretches of the English and Welsh coastline are designated as Heritage Coast, the equivalent designation in Scotland is Preferred Conservation Zones. Whilst this is not a statutory designation, there are parts of the coastline which are managed at a national level for their natural beauty and also to make them accessible to members of the public. Many of these areas are well connected by a network of public footpaths and they are an important recreational resource.
- 10.12 Many of the landscapes across the UK have considerable historical interest and these elements should be protected. In Wales, Cadw, the Welsh Historic Monuments and the International Council of Monuments and Sites has compiled a two volume register of Landscapes of Outstanding Historic Interest and comprises 58 landscapes ranging from former industrial centres to ancient rural settlements. These are non-statutory designations but they represent the value of those landscapes in historic terms.
- 10.13 Key problems and issues that face landscape in the UK are described in Appendix C3 and strategic level baseline data for the UK is presented in Appendix D.

Assessment of the environmental effects of the SSA criteria on Landscape

10.14 This section presents the SEA objectives and guide questions that have been used to undertake the assessment of the SSA criteria. It outlines the potential generic impacts of a new nuclear power station in the absence of location specific information and assesses the performance of the SSA criteria against the SEA objectives and identifies mitigation measures that should be implemented to reduce adverse effects and maximise potential benefits, as the SEA and the NPS are developed further.

Relevant SEA objectives and Guide Questions

10.15 Table 10-3 identifies the SEA objectives and guide questions relevant to this topic.

Table 10-3 Relevant SEA Objectives and Guide Questions for Landscape	
Relevant SEA Objectives	Guide Questions
24. To avoid adverse impacts on nationally important landscapes	Will it adversely affect landscapes within or immediately adjacent to a National Park?
25. To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness	Will it adversely affect landscapes in or immediately adjacent to an AONB or NSA?
	Will it adversely affect Heritage Coast or Preferred Conservation Zones?
	Will it adversely affect local landscapes/townscapes of value?
	Will it affect the levels of tranquillity in an area?
	Will it adversely affect landscape character or distinctiveness?
	Will it result in increased levels of light pollution?

Overview of Potential Impacts

- 10.16 The adoption of a Nuclear NPS is a facilitative action for the development of new nuclear power stations and their associated infrastructure. These facilities have the potential to have effects on landscape character, quality, tranquility and sensitive visual receptors¹⁰⁰. Whilst some of these effects may be specific to nuclear power generation, many will be common to other major infrastructure projects.
- 10.17 Nuclear facilities will comprise significant new structures being developed within a receiving landscape. This would include reactor buildings, turbine buildings, control buildings, service and maintenance buildings, generator buildings, water treatment facilities and auxiliary and ancillary buildings and infrastructure. Certain designs currently being assessed through the GDA may also require cooling towers depending upon their location. These have the potential to create significant visual elements and greatly change the character of the landscape. New power stations may also require overhead transmission lines and pylons to be constructed. These may also impact upon landscape character and sensitive visual receptors over long distances.
- 10.18 Such impacts could affect a range of visual receptors whether these are residential occupants or recreational visitors. This may also affect the way that people perceive the area if the new power station represents a significant change of land use and a departure from historical socio-cultural associations. The extent of impacts would be very dependant upon the quality and character of the landscape in that area and also the presence of sensitive visual receptors. The particular design of reactor would also be an important factor as some designs are more visually intrusive than others.
- 10.19 New nuclear power stations will also produce radioactive waste. This waste would be stored on site in safe and secure interim storage throughout operation and decommissioning prior to it being transported for final disposal. The Government considers that it would be technically possible to dispose of new radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new nuclear power stations. The interim storage, transport and disposal of the waste could have effects on landscape as identified in Table 10-4. The environmental effects of waste management in relation to new build waste will also be considered in the Environmental Report.
- 10.20 Table 10-4 presents the potential impacts of a new nuclear power station.

¹⁰⁰ Sensitive visual receptors may include residential properties, public buildings, workplaces (indoor and outdoor), outdoor locations where the public has access and recreational buildings.

These potential impacts could occur if aspects of the new nuclear power station were developed, in the absence of a consideration of them and in the absence of suitable mitigation measures being developed. Only once further details of each of the new nuclear power station sites are obtained would it be possible to determine the significant effects that could occur. Many of the potential impacts identified are not unique to the construction, operation and decommissioning of new nuclear power stations but rather any large infrastructure project.

Table 10-4 Potential Impacts of Nuclear Facilities on Landscape Resources in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Landscape in the Absence of Details on Location, Design or Mitigation
Construction (5-6 years)	<p>Excavations and earthworks</p> <p>Earthworks and excavations may be needed to prepare a site for construction which could introduce a new physical landform to an area adversely affecting landscape character.</p> <p>Use of cranes and construction of large buildings</p> <p>The activity introduced by construction plant, site compounds and the development of new buildings using tall cranes would introduce new features into a landscape which could adversely affect landscape character and cause visual intrusion. This may also lead to a reduction in tranquillity in that area.</p> <p>Construction traffic</p> <p>Movements of construction traffic may also introduce a new visual element into a landscape which may be realised on roads in the area surrounding the construction site. Construction traffic and associated activity may also cause localised noise impacts which could adversely affect the tranquillity of a particular area.</p> <p>Dust may also be produced by construction activity. Traffic generation could cause visual intrusion over a wide area if not appropriately managed through a construction environmental management plan.</p>
Operation (40 years)	<p>Physical presence of buildings and infrastructure</p> <p>The presence of new buildings, some of which may be tall, introduces a new element into the receiving landscape, which can adversely affect landscape quality and character. It is estimated that the total land-take for a 1GW Pressurised Water Reactor nuclear power plant in the UK would need between 25 and 75 hectares of land¹⁰¹. Some reactor designs may also</p>

¹⁰¹ <http://www.publications.parliament.uk/pa/cm198889/cmhansrd/1989-02-03/Writtens-2.html>

Table 10-4 Potential Impacts of Nuclear Facilities on Landscape Resources in the Absence of Details on Location, Design or Mitigation

Phase of Activity (duration)	Potential Impacts on Landscape in the Absence of Details on Location, Design or Mitigation
	<p>require cooling towers which could introduce features that could be visually prominent over a very wide area. Buildings and cooling towers can be up to 60m high¹⁰². Similarly, the construction of overhead transmission lines and pylons could create landscape and visual effects over significant distances. Such effects may also change people's perceptions of an area and its socio-cultural associations. However, the significance of these effects will depend heavily upon the sensitivity and value of the particular landscape, precisely where the buildings are situated and also the presence of any sensitive visual receptors within its zone of visual influence.</p> <p>Vehicle traffic movements</p> <p>Movements of traffic may also introduce a new visual element into a landscape which may be realised on roads in the area surrounding the site. Similarly, new road infrastructure may need to be constructed to serve the site which could have landscape and visual impacts.</p> <p>Vehicle movements and operational activity may also cause localised noise impacts which could adversely affect the tranquillity of a particular area.</p> <p>Interim Waste Storage on Site</p> <p>Interim waste stores may be designed in a number of different ways including above or below ground structures. It is not considered that an interim waste store would increase the landscape effects of a nuclear power station which would already include larger structures, such as the reactor building or cooling towers.</p>
Decommissioning (including interim waste storage, transport and final disposal)	<p>Presence of remaining buildings and infrastructure</p> <p>The effects upon the landscape would continue during the decommissioning and dismantling of the power station.</p> <p>Use of cranes and machinery to dismantle buildings</p> <p>The re-introduction of tall cranes and machinery to dismantle the power station buildings could cause further visual intrusion</p>

¹⁰² Referenced in Sustainable Development Commission (2006) The role of nuclear power in a low carbon economy, Paper 3: Landscape, environment and community impacts of nuclear power

Table 10-4 Potential Impacts of Nuclear Facilities on Landscape Resources in the Absence of Details on Location, Design or Mitigation	
Phase of Activity (duration)	Potential Impacts on Landscape in the Absence of Details on Location, Design or Mitigation
(minimum of 30 years)	<p>and landscape effects comparable to those during operation.</p> <p>Vehicle movements during decommissioning</p> <p>Movements of decommissioning traffic and waste transportation traffic may also introduce a new visual element into a landscape which may be realised on roads in the area surrounding the site.</p> <p>Vehicle movements and decommissioning activity may also cause localised noise impacts which could adversely affect the tranquillity of a particular area.</p> <p>Interim Waste Storage on Site</p> <p>Interim waste stores may be designed in a number of different ways including above or below ground structures. It is not considered that an interim waste store would increase the landscape effects of a nuclear power station which would already include larger structures, such as the reactor building or cooling towers. During decommissioning the interim waste store would be one of the last remaining structures on site and landscape and visual effects would be present for as long as the storage site exists.</p> <p>Final Disposal of Radioactive Waste</p> <p>By its nature, the majority of structures to geological disposal facilities will be underground i.e. where the waste will be emplaced. However, above surface structures will be required which could have landscape and visual amenity effects depending upon where they are located.</p> <p>LLW would be disposed of at a low level waste facility such as the LLWR in West Cumbria or an alternative future facility. The emerging NDA Strategy is looking at a range of possible alternative LLW disposal options for the future. Each of these options may have different implications for landscape depending upon their design and location.</p>

Significant Effects of the SSA criteria

10.21 The SSA criteria have been assessed against the relevant SEA objectives using the matrices in Appendix D. The following text presents a summary of these findings.

- 10.22 The NPS is a facilitative action for new nuclear power stations, therefore its adoption is likely to result in the development of new power stations that may have adverse landscape and visual impacts.
- 10.23 SSA criterion 3.1 seeks to avoid, minimise or mitigate impacts upon areas of amenity, cultural heritage and landscape value and therefore could avoid adverse impacts on nationally important landscapes and landscape character and tranquillity in general. However, the criterion is only discretionary and so the importance of a receiving landscape when assessing nominated sites would be made on a case-by-case basis in the SSA.
- 10.24 It is expected that significant emphasis will be placed upon the importance of nationally important, statutory designations such as National Parks and AONBs. This should apply to the avoidance of adverse impacts during the construction, operation and decommissioning phases and given that landscape and visual impacts may be realised over a wide area, it is anticipated that the criterion should take this into account.
- 10.25 The criteria not only identify nationally designated landscapes but the supporting text encourages nominators to consider adverse impacts upon the character, quality and tranquillity of local level landscape designations and non-designated landscapes that have an important role to play in an area's character. The cumulative effects upon the non-designated or locally designated landscape resource may be significant at the national scale if numerous new power stations and their supporting infrastructure are developed. Cumulative effects are not specifically covered in the SSA although an assessment of such effects will be required in the Environmental Report. Positive effects have also been assigned against SEA objective 25.
- 10.26 Criterion 4.2 addressing suitable sources of cooling has the potential to adversely affect landscape and visual amenity, if, for example, cooling towers are used which are visually intrusive and generate steam clouds. However, the criterion should be applied as a whole and, therefore, criterion 3.1 would need to be integral to nominators' considerations and criterion 4.2 states that sites may be ruled out on a discretionary basis, unless operators can identify suitable countermeasures to avoid, minimise or mitigate the potential impacts of cooling.
- 10.27 There is the potential for the development of transmission infrastructure for new nuclear power stations to have adverse landscape effects. Criterion 4.3 indicates that access to transmission infrastructure is an issue for local consideration by the IPC. A National Policy Statement is also planned for electricity networks which will consider transmission lines needed for all new generation plant and this will be used by the IPC when making decisions about individual nuclear power station developments. However, the landscape effects

of transmission infrastructure will not be considered at the strategic level when making decisions about which sites are to be included in the Nuclear NPS and, therefore negative effects have been recorded for SEA objectives 24 and 25 as there is a risk that negative effects could occur.

- 10.28 Criteria 1.4 and 1.5 have the potential to adversely affect nationally designated landscapes if they cause changes to the landscape as a result of the implementation of coastal or flood defence measures. These may be as a direct result of flood protection structures or as a result of causing downstream flooding through loss of floodplain. However, the criteria should be applied as a whole and, therefore, criterion 3.1 would need to be integral to nominators' considerations and would provide the necessary protection to such sites.
- 10.29 In addition, Criteria 2.1 and 2.2 seek to avoid, minimise or mitigate adverse impacts upon internationally and nationally designated wildlife sites which can also be areas of international and national landscape importance.

Cumulative Effects

- 10.30 All of the above effects on landscape could occur at individual sites developed for new nuclear power stations. Additionally, if multiple new nuclear power station sites are developed, either in close proximity to each other or existing nuclear power station sites or at other locations across the UK then cumulative and synergistic effects could occur. At this stage of the SEA it is not possible to precisely determine the cumulative effects as the locations and number of the sites to be developed is not known. This is particularly important for landscape and visual effects, as the existing character and quality of the receiving environment and the location of sensitive receptors is essential to understand these effects. Cumulative landscape effects might include the loss of important landscape resources across the UK associated with the development of multiple sites and multiple transmission lines.
- 10.31 However, the process of developing the NPS, using the SSA criteria to identify sites and also the assessment that will be undertaken through the SEA will enable the cumulative effects of developing the sites to be considered and this information will be used to inform the decision about which sites should be included in the NPS. The SSA criterion that seeks to avoid adverse impacts on landscape resources is discretionary and would not entirely rule out the potential for adverse effects to occur. However, it would ensure that such issues are considered as part of the decision-making process and could help to reduce the number and severity of the cumulative effects on landscape resources. A strategic assessment of the landscape impacts of new transmission lines will not be undertaken through the SSA at the strategic level.

Mitigation

- 10.32 Criteria relating to landscape protection were recommended for inclusion through the SEA process. Explanatory text supporting criterion 3.1 highlighting the need to consider effects on landscape resources when thinking about the potential upgrades to the electricity transmission infrastructure was also recommended by the SEA. Criterion 4.3 (access to transmission infrastructure) could also be made discretionary to ensure potential transmission routes are considered when identifying sites for new nuclear power stations. However, it was considered that this was too specific to individual projects to be included in a strategic siting assessment and information regarding power station design and grid connection would not be known at this stage.
- 10.33 On the basis of the SEA, the SSA criteria were modified to include consideration of locally designated or non-designated landscape character, quality and tranquil areas at this stage. Cumulative effects are not specifically covered in the SSA although an assessment of such effects will be required in the Environmental Report.
- 10.34 Mitigations could include undertaking a consideration of cumulative impacts upon designated landscapes, landscape character, quality and tranquillity through the EIAs required for each new site. This should also consider the visual impacts upon sensitive visual receptors.

11 MONITORING FRAMEWORK

The SEA Directive Requirements

- 11.1 The SEA Directive and the Regulations require that the plan or programme is monitored to test the actual significant effects of implementing the plan against those predicted through the assessment.
- 11.2 This section explains the purpose of monitoring in the SEA process and sets out an indicative monitoring framework which would be refined and updated in the Environmental Report.
- 11.3 The SEA Directive defines the requirements for monitoring with details provided in Box 2.

Box 2: SEA Directive Requirements Applicable to Monitoring

“Member States shall monitor the significant environmental effects of the implementation of plans and programmes... in order, inter alia, to identify at an early stage unforeseen adverse effects, and to be able to undertake appropriate remedial action” (Article 10.1).

“In order to comply with paragraph 1, existing monitoring arrangements may be used if appropriate with a view to avoiding duplication of monitoring” (Article 10.2)

The Environmental Report should provide “a description of the measures envisaged concerning monitoring” (Annex I (i)).

The Purpose of Monitoring

- 11.4 Monitoring in the SEA process allows the actual significant environmental effects of implementing the plan or programme to be tested against those predicted. It, therefore, helps to ensure that any undesirable environmental effects are identified and remedial action is implemented accordingly.
- 11.5 The process of monitoring can also be used to determine how the plan or programme is performing against objectives and targets, to improve the SEA process by providing feedback on the accuracy of predictions and to overcome gaps in baseline data that can be used in future SEAs.
- 11.6 Although monitoring is the last stage in the SEA process, it is a very valuable one which can contribute to the improvement of decision-making and the protection of the environment in the long-term.

The Approach to Monitoring

- 11.7 The Practical Guide states that ‘the Directive’s provisions on monitoring apply when the plan or programme is being put into effect, rather than during its preparation and adoption. However, preparations for monitoring will need to be

considered in the course of preparing the plan or programme’.

- 11.8 In this study, only the significant effects of the SSA criteria have been assessed and reported. The SSA criteria following consultation will be updated and nominations for potential new nuclear power stations sites will be invited using the SSA criteria. The list of nominated sites will then be assessed using the SSA criteria and the SEA objectives to produce a list of sites for inclusion in the NPS. The NPS will, then, be put into effect when nuclear power stations are developed.
- 11.9 When individual sites are brought forward for development they will be subject to site specific licensing requirements and regulatory requirements which themselves will require monitoring activity. For example, the relevant environmental protection agency is likely to monitor discharges to water during construction as well as operation and decommissioning, as part of discharge consents. So, whilst the responsibility for monitoring the implementation of the NPS and the significant environmental effects reported in the SEA lies with BERR, there is likely to be some degree of overlap between work undertaken by the regulating bodies as part of site specific monitoring linked to licences and discharge consents.

The Monitoring Framework

- 11.10 As the significant environmental effects of all elements of the NPS are not known it is only possible to develop an outline monitoring framework in this Environmental Report that is based upon the significant environmental effects of the SSA criteria. This can then be reviewed and developed further as part of the second stage of the NPS SEA.
- 11.11 The SEA to date has identified the significant environmental effects of the SSA criteria. Without knowing the exact locations of new nuclear power station sites the assessment has shown that a wide range of environmental effects are still possible and the likelihood of such effects occurring will depend upon how the discretionary criteria are applied by Government when deciding which sites to include in the NPS.
- 11.12 The assessment has gone beyond simply identifying the effects of national significance and has sought to add value by identifying potential local level impacts for consideration at a lower level. This approach is also reflected in the SSA Consultation document where it has highlighted issues for local consideration. It is not considered appropriate or practical to identify detailed local level monitoring indicators, so the focus has been upon those indicators that can be readily collated at the strategic level. It is intended to refine the indicators identified further following the site nominations process, as a better

understanding will be obtained of the likely significant effects of each nominated site. It would not be practicable to monitor certain effects i.e. localised ones at a national, strategic level.

- 11.13 Table 11-1 presents the indicative monitoring framework based upon the assessment of the criteria. The assessment of the SSA criteria has identified that most uncertainty regarding potential effects lies with the discretionary criteria, as they will not necessarily rule out areas for nomination and instead consideration of the issues they raise will be dealt with on a case-by-case basis. This uncertainty will be reduced following the nominations process and following the assessment in the Environmental Report.
- 11.14 The outline monitoring framework is based around the SEA objectives and includes the following elements:
- The potentially significant effect that may need to be monitored.
 - A potential monitoring indicator
- 11.15 In the final monitoring framework in the Environmental Report the following will also be included:
- A potential target
 - The potential data source
 - The frequency of the monitoring
- 11.16 These have not been defined to date, as the results of the assessment of nominated sites will be required and further consultation with statutory bodies to discuss the appropriateness of targets and deliverability.

Table 11-1 Indicative Monitoring Framework					
SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review Time-scale
Biodiversity, Flora and Fauna					
1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance.	Generally, the SSA criteria work towards specifically avoiding impacts (including indirect effects) upon national and international designated sites of nature conservation importance which contain a high proportion of the locally important ecological networks and protected habitats and species. However, the SSA criteria do not seek to minimise adverse impacts on valuable ecological networks, ecosystem functionality and priority habitats and species that are not central to the integrity of national or internationally designated sites. In the Environmental Report specific monitoring indicators should be identified based upon the significant environmental effects identified.	<p>For the areas in which sites are brought forward, indicators should be developed which consider:</p> <p>Condition and/or conservation status of internationally and nationally designated sites:</p> <p>SPAs (and pSPAs)</p> <p>SACs (and cSAC, dSACs/pSACs)</p> <p>Ramsar Sites</p> <p>NNRs</p> <p>MNRs</p> <p>SSSI/ASSIs (Northern Ireland only)</p> <p>MCAs</p> <p>AoSs (England, Scotland and Wales) and Wildlife Refuges (Northern Ireland).</p> <p>Sites designated under the Marine</p>	A range of targets could be developed to accompany the indicators that could eventually be used to monitor the implementation of the NPS. These will be based upon national targets where relevant but also locally based targets depending upon the locations of the nominated sites. For example, a target could relate to the limits established for particular authorisations for new nuclear power stations.	The proposed source for the monitoring data will be identified in consultation with relevant authorities.	Depending upon the indicators that are eventually selected for the monitoring framework, a timescale for the collation of data will be established, for example every five years.

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-
2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality		Bill. Biosphere Reserves Location of Sensitive Marine Areas Limestone Pavement Orders				
3. To avoid adverse impacts on Priority Habitats and Species including European Protected Species		This may include the amount of land lost to nuclear power station development. It may be considered appropriate to monitor the condition of any local level sites affected (to be determined when assessing the nominated sites): Location of Local Wildlife Sites Location of LNRs (England, Scotland, Wales) and LANRs in Northern Ireland				
Population and Human Health						

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-
4. To create employment opportunities	<p>The SSA process, as a facilitative action being promoted by Government, works towards increasing the likelihood of the development of new nuclear power stations. This will potentially lead to a wide range of new job opportunities. Consequently, major positive effects have been identified during all phases, with the exception of decommissioning, as it is expected that, whilst jobs will be available during decommissioning, there will be fewer jobs provided once a power station ceases to operate.</p> <p>The SSA criteria also appear to work positively towards avoiding adverse effects on existing communities and</p>	<p>For the areas in which sites are brought forward, indicators should be developed which consider:</p> <p>Changes in population dynamics e.g. age-structure, the working-age population</p>	As above	As above	As above	
5. To encourage the development of sustainable communities ¹⁰³		<p>Levels of unemployment, economic activity, job density</p> <p>Access to facilities and essential services</p>				
6. To avoid adverse impacts on physical health		<p>Average earnings by residence</p> <p>Radiation exposure to the public and the environment as collated through indicators presented in RIFE reports</p>				

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
7. To avoid adverse impacts on mental health	<p>their health and well-being. However, this does not rule out the risk of adverse health effects that are not directly linked to the siting process. The effects of the SSA criteria upon mental health and well-being are uncertain, though we are not aware of any evidence of an adverse impact.</p> <p>There are a large number of potential impacts that could occur throughout all phases of the nuclear power stations life but it is not possible to provide detail on whether these effects will definitely occur without knowing how many new nuclear power stations will be built, where they will be situated, the type of nuclear reactor that will be used and how they will be operated.</p>	<p>Life expectancy at birth and age 65</p> <p>Perinatal, infant and neonatal mortality rates</p> <p>Cancer mortality/incidence rates</p> <p>Green space such as National Trails (England and Wales) and Long Distance Routes (Scotland) lost to new nuclear power station development</p> <p>Changes to skills levels in the local workforce</p> <p>Index of Multiple Deprivation Data</p>				

¹⁰³ The Egan Review states that ‘sustainable communities’ meet the diverse needs of existing and future residents, their children and other users, contribute to a high quality of life and provide opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economic prosperity’ (ODPM (2004) The Egan Review, Skills for Sustainable Communities)

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
Materials Assets						
8. To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure	When applied in combination, the criteria work towards achieving some of the SEA objectives relevant to material assets. Positive effects have been identified in relation as there are criteria in place to avoid, minimise or mitigate adverse effects on amenity land. In some cases, however, both positive and negative effects can be expected as some criteria would address issues only at the local level and therefore would not be effective at the strategic level. There is some uncertainty in the assessment in relation to planning blight and property/land values as	For the areas in which sites are brought forward, indicators should be developed which consider: Average property values in the vicinity of new nuclear power stations Green Space such as recreational/amenity land lost to new nuclear power stations Changes to traffic congestion hotspots in the vicinity of new nuclear power stations	As above	As above	As above	
9. To avoid disruption to basic services and infrastructure ¹⁰⁴						10. To avoid adverse impacts on property and land values and to avoid planning blight

Table 11-1 Indicative Monitoring Framework						
SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
11. To avoid the loss of access and recreational opportunities, their quality and user convenience	the effects would depend upon the location of new nuclear power station sites and there are no specific criteria addressing these issues. Therefore, there are positive, negative and uncertain effects that should be monitored.					
Air and Climatic Factors						
12. To avoid adverse impacts upon air quality	Some of the criteria indirectly help to protect air quality by reducing the risk of accidents occurring and hence reduce the risk of unplanned radioactive discharges. However, the transportation of materials and movement of staff to the sites could	For the areas in which sites are brought forward, indicators should be developed which consider:	As above	As above	As above	
13. To minimise greenhouse gas emissions		Location and number of AQMAs in the vicinity of a new nuclear power station site				

¹⁰⁴ Basic services include General Practitioners surgeries, post offices, primary schools, food shops and bus stops.

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible	<p>also affect local air quality.</p> <p>The SSA criteria, being a facilitative action, would also increase the likelihood of new nuclear power stations being built which would reduce CO₂ emissions generated by the energy sector.</p> <p>There are criteria which seek to minimise the risk of flooding and so should help to avoid the loss of floodplain. However, they are discretionary and so it is recommended that effects on flood risk and floodplain are monitored.</p>	<p>Creation of new flood defences to protect the facility</p> <p>Area of fluvial and tidal floodplain lost to a new nuclear power station</p> <p>Breaches of gaseous discharge authorisations and limits</p>				
Water						
15. To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology)	The SSA criteria provide little in the way of specific direct avoidance of adverse impacts upon the water or coastal environment other than indirectly through the minimisation of accident risk, the protection of nationally designated sites and minimisation of flood risk. There are	<p>For the areas in which sites are brought forward, indicators should be developed which consider:</p> <p>Chemical and biological water quality of rivers in the vicinity of new nuclear power station sites</p> <p>Number of new nuclear power</p>	As above	As above	As above	

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assists the achievement of Water Framework Directive objectives	both positive and negative effects that would need to be monitored.	station sites that include Sustainable Drainage Systems Condition of Freshwater Fish Directive Sites and Shellfish Waters in the vicinity of new nuclear power station sites. Condition of aquatic/water dependent SAC/SPA designations affected by/in proximity to the development Breaches of aqueous discharge authorisations and limits				
17. To avoid adverse impacts on the supply of water resources						
18. To avoid adverse impacts on groundwater quality, distribution and flow, and assist achievement of Water Framework Directive objectives						
Soils and Geology						
19. To avoid damage to geological resources	Whilst the SSA criteria provide some degree of protection to geological resources, including nationally	For the areas in which sites are brought forward, indicators should be developed which consider:	As above	As above	As above	

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
20. To avoid use of greenfield land and encourage the re-use of brownfield sites	designated geological sites (SSSI), many aspects of the soil and geological resource would not be protected. This is largely because they relate to issues which can only really be addressed at the local level.	Area of land lost within SSSIs/ASSIs, Geoparks and RIGS to a new nuclear power station				
21. To avoid the contamination of soils and adverse impacts on soil functions		<p>Sterilisation of potential mineral sites as a result of a new nuclear power station</p> <p>Number of brownfield versus greenfield sites used to develop new nuclear power stations</p>				
Cultural Heritage including architectural and archaeological heritage						
22. To avoid adverse impacts on the internationally and nationally important features of the historic environment	Criterion 3.1 seeks to avoid adverse impacts on internationally and nationally designated sites of cultural heritage importance and so should provide positive effects. The criterion is discretionary and so there would remain the risk of adverse effects occurring. There would be a risk of positive and/or negative effects occurring on cultural heritage features that are not situated within designated sites of international or national importance.	For the areas in which sites are brought forward, indicators should be developed which consider:	As above	As above	As above	
23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes		The loss of internationally and nationally designated heritage resources including Scheduled Monuments, World Heritage Sites, Historic Battlefields, Designated Protected Wrecks, Registered Parks and Gardens (and their equivalents outside of England), Listed Buildings.				

Table 11-1 Indicative Monitoring Framework

SEA Objective	Potential Effects to Monitor (to be refined in the Environmental Report)	Potential Monitoring Indicators (to be refined in the Environmental Report)	Target	Information/Data Source	Review scale	Time-scale
Landscape						
24. To avoid adverse impacts on nationally important landscapes	The development of new nuclear power stations has the potential to cause adverse effects upon landscape and visual amenity over potentially a very wide area.	For the areas in which sites are brought forward, indicators should be developed which consider:	As above	As above	As above	
25. To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness	However, Criterion 3.1 specifically seeks to avoid, minimise or mitigate impacts upon areas of amenity and landscape value. However, the criterion is discretionary and so there would remain the risk of adverse effects occurring. The effects on landscape are driven by the character of the receiving environment as well as the design of the new development and so the assessment of the nominated sites will provide a better understanding of the effects that could occur on the landscape resource.	Areas of Green Space, such as designated landscapes below, lost to the development of a new nuclear power station: National Parks AONBs (England, Wales, Northern Ireland) and NSA (Scotland) Heritage Coast (England and Wales) and Preferred Conservation Zones (Scotland) Country Parks Regional Parks Woodland Parks				

Refinement of the Monitoring Framework

11.17 Following the assessment of the nominated sites there is a case for refining the monitoring framework in the following ways in the Environmental Report:

- The significant effects that need monitoring to be refined in view of the effects likely to be generated by each of the sites.
- The indicators that should be used to monitor the significant environmental effects.
- The development of targets that could be used to monitor performance of the NPS.
- Details of how frequently data relating to each indicator should be collated and what sources should be used.

11.18 The monitoring process should also be a focussed exercise that seeks to draw upon monitoring frameworks already established by other organisations. The potential for overlap and the use of existing monitoring network data will be explored further in the Environmental Report. The development of more appropriate and specifically tailored indicators to the significant environmental effects recorded at the nominated sites stage will also ensure that the process is appropriately focussed.

ANNEX A: ABBREVIATIONS

AGR	Advanced Gas-Cooled Reactor
ALARP	As Low as Reasonably Practicable
AONB	Area of Outstanding Natural Beauty
AoSP	Area of Special Protection
AQMA	Air Quality Management Area
ASSI	Area of Special Scientific Interest
BAP	Biodiversity Action Plan
BAT	Best Available Techniques
BERR	Department for Business, Enterprise and Regulatory Reform
CCS	Carbon Capture and Storage
CCW	Countryside Council for Wales
CO ₂	Carbon dioxide
COMAH	Control of Major Accident Hazard
COMARE	Committee on Medical Aspects of Radiation in the Environment
CoRWM	Committee on Radioactive Waste Management
CROW	Countryside and Rights of Way Act
DCLG	Department for Communities and Local Government
Defra	Department for the Environment, Food and Rural Affairs
DPA	Data Protection Act
DTI	Department for Trade and Industry
EA	Environment Agency
EEA	European Economic Area
EHSNI	Environment and Heritage Service Northern Ireland
EIA	Environmental Impact Assessment
EU	European Union
GDA	Generic Design Assessment
GIS	Geographical Information System
GP	General Practitioner

GW	Gigawatts
HIA	Health Impact Assessment
HLW	High Level Waste
HRA	Habitats Regulations Assessment
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
ICRP	International Committee on Radiological Protection
ILW	Intermediate Level Waste
IPC	Infrastructure Planning Commission
IPRI	Industrial Pollution and Radiochemical Inspectorate
IROPI	Imperative Reasons of Overriding Public Interest
LANR	Local Authority Nature Reserve
LLW	Low-Level Waste
LLWR	Low Level Waste Repository
LNR	Local Nature Reserve
MCA	Marine Consultation Area
MNR	Marine Nature Reserve
MRWS	Managing Radioactive Waste Safely
MtC	megatonnes of carbon
mSv	Millisievert
MW	Megawatts
NII	Nuclear Installations Inspectorate
NNR	National Nature Reserve
NPS	National Policy Statement
NSA	National Scenic Area
OCNS	Office for Civil Nuclear Security
OSPAR	Oslo and Paris Conventions
PPS	Planning Policy Statement
PWR	Pressurised Water Reactor
RAMTED	Radioactive Material Transport Event Database
RIFE	Radioactivity in Food and the Environment
RIGS	Regionally Important Geological and Geomorphological Site

RSA93	Radioactive Substances Act 1993
SAC	Special Area of Conservation
SAP	Safety Assessment Principles
SCI	Site of Community Importance
SEA	Strategic Environmental Assessment
SEPA	Scottish Environment Protection Agency
SMP	Shoreline Management Plan
SNH	Scottish Natural Heritage
SO ₂	Sulphur dioxide
SPA	Special Protection Area
SSA	Strategic Siting Assessment
SSSI	Site of Special Scientific Interest
UK	United Kingdom
UN	United Nations
WHO	World Health Organisation

ANNEX B: HABITATS REGULATIONS ASSESSMENT

B.1 Under Article 6(3) of the EU Habitats Directive¹⁰⁵ as transposed in the UK, an “Appropriate Assessment” needs to be undertaken in respect of any plan or project which:

- either alone or in combination with other plans or projects, is likely to have a significant effect on a European site in Great Britain or a European offshore marine site.¹⁰⁶
- is not directly connected with the management of the site for nature conservation e.g. a site conservation plan.¹⁰⁷

C.1 In mainland UK there are three principal instruments transposing the Directive in to UK law:

- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (SI 1994 No.2716) in relation to England, Wales and Scotland out to territorial water limits (12 nautical miles) (“the 1994 Regulations”);
- The Conservation (Natural Habitats etc.) Regulations (Northern Ireland) 1995 (as amended) (SR 1995 No. 380), in relation to Northern Ireland out to territorial water limits (12 nautical miles) (“the 1995 Regulations”); and
- The Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007 (SI 2007 No. 1842) (“the Offshore Marine Regulations”), in relation to the UK offshore marine area (beyond 12 nautical miles).

B.2 The process of identifying whether significant effects are likely (screening) and the Appropriate Assessment that may then be required is commonly known as Habitats Regulations Assessment (HRA).

B.3 A separate HRA screening exercise has been undertaken during the

¹⁰⁵ Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora

¹⁰⁶ These are Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) which form the Natura 2000 network of protected sites.

¹⁰⁷ It is possible to have a plan which contains a mix of conservation management and other objectives. In that case the non conservation management element of the plan may require assessment.

preparation of this Study to determine whether the SSA criteria are likely to have an adverse effect on the integrity of sites listed in the Natura 2000 network. The Screening Report has identified that adverse effects on integrity could occur, so a strategic level Appropriate Assessment will be undertaken once sites have been nominated. The Screening Report has been issued to the Countryside Council for Wales, Natural England and the Scottish Environment Protection Agency and is available at <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>. If appropriate, Government will conduct further nomination and assessment processes in the future, for sites that might come forward for deployment beyond 2025. Further HRA will be undertaken as necessary on these nominations.

ANNEX C: THE RESPONSE TO THE CONSULTATION ON THE SCOPE OF THE OF THE SEA

INTRODUCTION

C.1. On 13 March 2008, the Government launched a statutory consultation on the scope of the Strategic Environmental Assessment for the proposed Nuclear National Policy Statement¹⁰⁸. The Government published the consultation on the BERR website and said that it would consider comments received by the closing date of 21 April 2008.

RESPONSES RECEIVED

C.2. A total of 25 responses were received. Of these:

- nine were from the statutory consultees¹⁰⁹;
- three were sent in by the Department of Health, the Health Protection Agency and the Nuclear Installations Inspectorate (which is part of the Health and Safety Executive);
- four were from organisations involved in the nuclear industry (EDF, British Energy, Toshiba-Westinghouse Electric Company and the Nuclear Industries Association);
- three were from non-governmental organisations (Greenpeace, the Royal Society for the Protection of Birds and the Campaign to Protect Rural England);
- two were from professional bodies (The Institution of Engineering and Technology and The Institute of Historic Building Conservation);
- two were from stakeholder groups (the North East Chamber of Commerce and West Lakes Renaissance);
- one was from Suffolk County Council; and one was from an individual from Dundee University.

¹⁰⁸ BERR, March 2008, Consultation on Strategic Environmental Assessment Scoping Report for Proposed National Policy Statement for New Nuclear Power, URN 08/680

¹⁰⁹ Environment Agency (combined response with Environment Agency Wales); English Heritage; Natural England; Department of the Environment, Northern Ireland; Cadw; Countryside Council for Wales; Scottish Natural Heritage; and Scottish Environment Protection Agency. Historic Scotland did not comment.

OVERVIEW

- C.3. The consultation document (“the Scoping Report”) proposed how the SEA would be undertaken, the level and type of information to be covered in the SEA Environmental Report and how the SEA would be integrated into the development of the proposed Nuclear National Policy Statement.
- C.4. A summary of comments received and the Government’s response is set out below. In light of the responses from the consultation, the Government has updated the SEA. The SEA is an iterative process and will continue to be refined and developed. The responses to the consultation have been published on the BERR website¹¹⁰.
- C.5. The Scoping Consultation stated that the First Environmental Report would be issued alongside the consultation on the SSA criteria and would include an assessment of the alternatives as part of the SSA as well as a broader assessment of the draft SSA Exclusionary and Discretionary criteria. The Scoping Report also explained that a Second Environmental Report would be issued alongside a final draft of the NPS which would document the assessment of all relevant elements of the NPS including the nominated sites.
- C.6. The environmental study sets out an assessment of the potential environmental and sustainability effects of building new nuclear power stations on sites that have been screened through the use of the SSA criteria¹¹¹. It also considers alternatives to those criteria. It does not assess the impacts of the proposed Nuclear NPS as a whole since the NPS is still at an early stage in its development and could not be meaningfully assessed at this stage.
- C.7. The document is called an “environmental study” rather than a “First Environmental Report” to make clear that it focuses on the SSA criteria and is not intended to assess the Nuclear NPS as a whole. An Environmental Report, which will assess the Nuclear NPS and reasonable alternatives to it, will be published alongside the consultation on the draft Nuclear NPS,
- C.8. Those responding to the consultation expressed a range of views on the scope of the SEA, with some suggesting the information was comprehensive and others suggesting additional information be included. Some respondents expressed general views on the role of renewable energy,

¹¹⁰ <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>

¹¹¹ In this document, we use “the environmental effects of the SSA criteria” as shorthand to mean the same thing, recognising that criteria, of themselves, do not have environmental effects.

for example the need for an SEA covering all alternative forms of generation, and opposing new nuclear power stations, which the Government has noted.

RESPONSES TO THE QUESTIONS

Question 1: Are there any other plans, programmes or environmental protection objectives that should be identified and reviewed as part of the SEA process?

Key issues presented in the responses

C.9. While some respondents felt the list of plans, programmes and environmental objectives was comprehensive, others suggested additional plans and programmes (or prospective plans and programmes) relating to England, Wales, Scotland and Northern Ireland be reviewed as part of the SEA process. These included the Draft Marine Bill, The Power of Place: The Future of the Historic Environment (English Heritage, 2000), Working for Healthier Tomorrow by Dame Carol Black, the Sludge Directive 86/278/EEC and Waste Licensing Regulation 1994.

Government Response

C.10. The Government has considered the additional plans and programmes suggested by respondents and Appendix B of the Environmental Study Appendices¹¹² has been updated to include additional plans and programmes as appropriate (e.g. the Draft Marine Bill and Working for a Healthier Tomorrow).

C.11. However, the Government considers that a number of suggested plans or programmes, such as Shoreline Management Plans and BAP Habitats are more appropriately reviewed at the nominated sites stage where more detailed local information will be available. Those plans or programmes will be taken into account at that time.

C.12. The Government is not proposing to review specific Acts and Regulations (e.g. the Remediation of Contaminated Land 2001 and Waste Licensing Regulation 1994) as the SEA focuses on plans, programmes and environmental objectives at a high level.

¹¹² BERR, July 2008, Towards a Nuclear National Policy Statement – Applying the draft Strategic Siting Criteria: a study of the potential environmental and sustainability effects: Appendices, URN 08/926AN

- C.13. As the SEA develops we will continue to review which additional plans and programmes might be relevant to the SEA and we welcome further suggestions.

Question 2: Can you provide any additional information to help us supplement our baseline data? Any further information relating to the baseline indicators and trends over time would be very useful.

Key issues presented in responses

- C.14. Some respondents felt that the baseline data was sufficiently detailed. A number of respondents suggested additional information to supplement the baseline data set out in the Scoping Report. Examples included Listed Buildings, Conservation Areas, Protected Wrecks, River Basin Characterisation maps and information regarding radioactivity levels.

Government Response

- C.15. The baseline data has been updated in light of the responses. For example, data regarding the number of listed buildings across the UK has been gathered and is listed in the Environmental Study. The Radioactivity in Food and the Environment Studies have also been reviewed as part of the baseline data process and details added to the Environmental Study. The Government considers that some suggestions, such as locations of Conservation Areas or Marine Conservation Zones, (if and when they are designated) are more easily gathered at a local level. The Government therefore proposes gathering this data once sites for new nuclear power stations have been nominated. The division of baseline data into stages is a reflection of the practicalities of collating indicators for the whole of the UK - some indicators are more appropriately gathered at local level.

Question 3: Do you consider that there is any important information that has not been addressed in view of the SEA scope?

Key issues presented in responses

- C.16. Respondents expressed a range of views. Some felt that a wider range of socio-economic factors than those required by the SEA Directive should be considered, and some suggested including references to European Protected Species, consideration of the retention of existing employment in the nuclear industry and the role of geomorphological¹¹³ processes. Some respondents felt that the SEA should address the management of radioactive waste and spent fuel from new nuclear power stations, and the risks of accidents and terrorist attack.

¹¹³ Geomorphology is the science concerned with understanding the form of the Earth's land surface and the processes by which it is shaped, both in the present day as well as in the past.

Government Response

- C.17. In light of the comments received, additional information has been included such as a reference to European Protected Species. Geomorphology is considered as part of the soils and geology and water topics in the environmental study. The SEA is incorporating wider sustainability issues and contains objectives on population and human health, which consider the impacts on employment and sustainable communities. An index of Multiple Deprivation data will be gathered for the assessment of nominated sites. The environmental study does consider the potential effects of accidents. In terms of security issues, this is considered under SSA criterion 4.1 which has been assessed in the environmental study. The SSA consultation document makes it clear that operators would be required to adopt the concept of “defence in depth”¹¹⁴ in protecting nuclear power stations. This will require them to make adequate land available so that effective control over activities and access may be exercised on and around each nuclear power station. The Government will seek specific guidance from the Office for Nuclear Security in assessing nominations against this criterion.
- C.18. The Environmental Study considers the possible impacts of waste insofar as relevant to the assessment of the impacts of siting new nuclear power stations in accordance with the SSA criteria. However, this assessment is necessarily conducted in the absence of information in relation to the precise location of power station sites or firm proposals in relation to particular reactor designs. The Environmental Report for the Nuclear NPS will take the relevant aspects of new build radioactive waste management into account at the strategic level..

Question 4: Do you consider that the range of environmental problems and issues covered is appropriate?

Key issues presented in responses

- C.19. Some respondents felt the range of environmental issues covered was appropriate whilst others suggested additional issues. These included the impact of military activities, non-designated landscapes, clarification on assessment of cumulative impacts, greater consideration of the nature conservation role of freshwater areas including lakes and wetlands and peats, coastal biodiversity and the impact of water abstraction or discharges associated with nuclear power station cooling processes.

¹¹⁴ Defence-in-depth is defined by the IAEA as “a concept used to design security systems that require an adversary to overcome or circumvent multiple obstacles, either similar or diverse, in order to achieve his objective”.

Government Response

C.20. There is a specific SSA criteria which considers military activities and the environmental study takes account of the possible effects of water abstraction and increases in water temperature on marine life. The supporting text around SSA criterion 3.1 makes it clear that nominators should consider adverse impacts upon locally designated landscape and non-designated landscape, as well as nationally designated ones. The environmental study explores potential issues for consideration of cumulative impacts but the Government believes that, at this stage of the SEA, it is not possible to precisely determine the cumulative impacts as the locations and number of the sites to be developed is not known

Question 5: Are there any changes you consider should be made on the proposed SEA Objectives?

Key issues presented in responses

C.21. A number of respondents felt that the SEA objectives should not simply be expressed in terms of “to avoid adverse impacts...”. Instead, they felt that the SEA objectives should take account of enhancements to bring out positive impacts such as the creation of employment and reduction of CO₂ emissions.

Government Response

C.22. The Government believes that specific enhancements may be better dealt with at the individual application stage as more details of the effects of the proposed development will be known at that point. The SEA will identify both positive and negative effects of nuclear power stations.

Question 6: Are there any other SEA Objectives, guide questions or indicators that should be included?

Key issues presented in responses

C.23. There were a number of suggested additions to the SEA objectives, guide questions and indicators, e.g. taking account of the Water Framework Directive and preventing radioactive contamination of soils, ground and groundwater. Another suggestion was to extend the SEA objectives to include the requirement for regulatory criteria relating to public health to be met.

C.24. Some additional guide questions were suggested, e.g. “*Will the proposal enable the BAP targets for maintenance, restoration and expansion to be met?*” (in relation to Biodiversity Action Plans (BAP)) and “*Will the proposal result in changes to coastal evolution that is needed to sustain coastal habitats?*” (in relation to coastal processes).

Government Response

- C.25. The Government has considered the additional SEA objectives, guide questions and indicators which have been suggested by respondents.
- C.26. In relation to additional objectives, the role of the regulatory regimes and the need to comply with dose limits are acknowledged as being very important in the environmental study. However, meeting the requirements of regulatory regimes is an underlying assumption of the SEA and therefore we do not consider it appropriate for them to be developed as specific SEA objectives. A new SEA objective has been added which seeks to prevent soil contamination and also protect soil functions. A guide question exists which relates to soil contamination and it is considered that this covers radioactive contamination as well as other forms of contamination.
- C.27. In regard to guide questions, some of the suggested additional guide questions, e.g. those relating to BAPs and coastal processes, have been used, while others have been used specifically to improve existing questions.

Question 7: Do you have any further suggestions regarding the scope of the SEA and its proposed assessment of the NPS?

Key issues presented in responses

- C.28. Respondents expressed a range of views, with some suggesting the Government should set out monitoring arrangements and consider further the assessment of alternatives. One respondent also suggested that the Government should undertake Appropriate Assessment under the Habitats Regulations. It was also suggested that the Government should establish an SEA steering group

Government Response

- C.29. The environmental study has set out an indicative monitoring framework and, as the SEA develops, this will be developed further. In relation to a consideration of alternatives, the Government will consider reasonable alternatives in the Environmental Report, which will be published alongside the draft Nuclear NPS. In Chapter 2 of the environmental study, the Government has focused on alternatives to the SSA criteria
- C.30. The Government has also issued a Habitats Regulations Assessment Screening Report. This has concluded the Screening Report should be updated when sites have been nominated. Depending upon the outcome of that screening exercise, it may be necessary to conduct an Appropriate Assessment on the draft NPS focusing on those sites for which significant effects cannot be ruled out. The Government is not persuaded that an SEA Steering Group was necessary to work on the development of the Strategic Siting Assessment criteria. However further considera-

tion will be given to whether this would be appropriate in the further stages of preparing the SEA.

ANNEX D: THE SEA BASELINE AND CONTEXT

The SEA Directive Requirements

- D.1. The SEA Directive and Regulations require consideration of any relevant environmental conditions and trends, objectives for environmental protection and relationships between the plan or programme being assessed and other plans and programmes.
- D.2. This section sets out the other plans and programmes taken into consideration as part of this SEA and provides the methodology for gathering environmental baseline data, together with a summary of this data.
- D.3. Annex 1 of the SEA Directive defines the requirements for establishing the baseline and context for the SEA. Box D1 provides a summary of these requirements.

Box D1: SEA Directive Requirements for Establishing the Baseline and Context

The SEA Directive requires that the SEA covers:

“the relationship (of the plan or programme) with other relevant plans and programmes” (Annex 1(a))

“the relevant aspects of the current state of the environment and the likely evolution thereof without implementation of the plan or programme” (Annex 1 (b))

“the environmental characteristics of areas likely to be significantly affected” (Annex 1 c))

“the existing environmental problems which are relevant to the plan or programme including, in particular, those relating to any areas of particular environmental importance, such as areas designated pursuant to Directive 79/409/EEC and 92/43/EEC” (Annex 1 (d))

“the environmental protection objectives, established at international, (European) Community or national level, which are relevant to the plan or programme and the way those objectives and any environmental considerations have been taken into account during its preparation” (Annex 1 (e))

Links to other Plans, Programmes and Environmental Protection Objectives

- D.4. A comprehensive review of other relevant plans, programmes and environmental protection objectives was initiated at the scoping stage. There is no definitive list of the documents that should be reviewed as part of the SEA. The documents reviewed for every SEA will vary depending upon the scope of

the plan being assessed and the level at which the plan sits within the plan-making hierarchy, i.e. whether it is an international, national, regional or local plan. As this SEA is being undertaken for a national plan that will have implications across the UK, the review of other relevant plans and programmes and other environmental protection objectives focussed upon international documents and those produced at a national level in England, Wales, Scotland and Northern Ireland. The process was informed by the Practical Guide which provides an indicative list of the types of documents that could be reviewed.

- D.5. The review of plans, programmes and environmental protection objectives is a valuable element of the SEA process as it assists with the following:
- The identification of environmental objectives of other relevant plans or programmes that should guide the SEA process
 - The baseline data collation process, by identifying key indicators and baseline trends
 - The development of the SEA framework, which should comprise objectives, indicators and targets
 - Determining whether there are any clear potential conflicts or challenges between the plans, programmes and environmental protection objectives and the emerging plan which is the subject of the SEA process.
- D.6. A series of tables in Appendix B present the review of relevant plans, programmes and environmental protection objectives and document the following:
- The primary objectives of the documents, including their environmental protection objectives where appropriate
 - Key indicators and targets of relevance in the documents
 - How the objectives within the plans and programmes should be taken into consideration in the SEA and the plan-making process, including any clear potential conflicts between them and the emerging NPS.
- D.7. The review of the relevant plans, programmes and environmental protection objectives identified a range of key themes and principles including:
- **Biodiversity, Flora and Fauna:** The overall goal of the UK Biodiversity Action Plan (BAP) is to conserve and enhance biological diversity within the UK and to contribute to the conservation of global biodiversity through all appropriate

mechanisms.

- **Population and Human Health:** A central principle of the UK Sustainable Development Strategy is 'ensuring a strong, healthy and just society' and a key priority is the need to build sustainable communities where people want to live and work now and into the future. Opportunities should be sought to reduce health inequalities where possible.
- **Material Assets:** There is a need to protect material assets by seeking to protect the quality of the built and natural environment and highlighting the need to establish sustainable communities.
- **Air and Climatic Factors:** There is emphasis on the need to consider the impacts of adverse air quality upon human health. Carbon dioxide emissions also need to be reduced in line with Government targets. Adaptation and mitigation measures need to be implemented to manage and also avoid the impacts of climate change.
- **Water:** There is emphasis on the need to ensure natural resource protection and use, including water resource use and protecting and enhancing water quality. Reducing flood risk and preventing an increase in flood risk is a central theme to many of the documents and planning guidance relating to development and flood risk is prepared by each of the Devolved Administrations. There is also a strong emphasis placed upon the need for holistic coastal zone management.
- **Soils and Geology:** The use of brownfield sites and the protection of greenfield areas is encouraged. The need to protect soil functions is also of paramount importance.
- **Cultural Heritage including architectural and archaeological heritage:** There is a need to ensure that heritage resources are protected including undesignated and non-statutory sites.
- **Landscape:** All elements of the landscape resource should be protected, including its historic and cultural associations.

D.8. Further details regarding the review are provided in Appendix B.

The Environmental Baseline

D.9. The gathering of baseline data provides a basis for predicting and monitoring the environmental effects of implementing a plan or programme. By gathering

baseline data it is possible to determine the following:

- The current status of the environment
- Sensitive receptors e.g. rare habitats, sensitive populations
- Current issues and problems and trends through time
- Environmental performance against established thresholds and targets.

Methodology

D.10. Whilst this SEA is being undertaken for a NPS which will have national implications, the Nuclear NPS will also identify sites at a more local scale which will need to be assessed through the SEA. Consequently, a two-stage approach to the baseline data collation process has been adopted. Data relating to international and national patterns and designations was collated to inform the Study. Following the nomination of sites, regional and local level data will be collated to inform the assessment presented in the Environmental Report.

Stage One of the Baseline Data Collation

- D.11. To enable a robust assessment of the SSA exclusionary and discretionary criteria, an understanding of the environmental constraints at a national scale across the UK was required.
- D.12. The starting point for the collation of baseline data was the environmental topics referred to in Annex 1 of the SEA Directive: biodiversity, population, human health, flora, fauna, soil, water, air, climatic factors, material assets and cultural heritage including architectural and archaeological heritage. Data was also collated in relation to geology.
- D.13. As recommended in the Practical Guide the baseline data collation was based around a series of indicators linked to the SEA objectives (refer to Annex E for further details). Data was collated for international and national features with an emphasis placed upon features which have a statutory importance, for example Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSI), National Parks, etc. This was supported by additional information on non-statutory features where possible. The emphasis was placed upon gathering spatial data, as the NPS and the integral SSA will lead to the identification of sites at a strategic level that are potentially suitable for new nuclear power stations. Much of the baseline data was sourced using Geographical Information Systems (GIS). Table D-1 presents the baseline indicators used to collate data for each SEA Directive topic to inform the preparation of the Study.

Table D-1 Indicators Used to Collate Data for the Study	
SEA Directive Topic	Indicators (First Stage)
Biodiversity, Flora and Fauna	<p>Location of SPAs (and pSPAs), SACs (and cSACs, dSACs/pSACs), Ramsar Sites, National Nature Reserves (NNR), SSSI, Areas of Special Scientific Interest (ASSI) (Northern Ireland), Marine Conservation Zones (MCZ), Marine Nature Reserves (MNR), Marine Consultation Areas (MCA), Biosphere Reserves.</p> <p>Location of Areas of Ancient Woodland</p>
Population and Human Health	<p>Population</p> <p>The location of major settlements and areas of population</p> <p>Age structure working-age population</p> <p>Unemployment</p> <p>Economic activity rates</p> <p>Job density</p> <p>Average earnings by residence</p> <p>Radiation exposure to the public (from RIFE 12¹¹⁵)</p> <p>Radioactivity levels in the environment (from RIFE 12)</p> <p>Life expectancy at birth and at age 65</p> <p>Healthy life expectancy at age 65</p> <p>Index of Multiple Deprivation – overall deprivation domain for England, Wales, Scotland and Northern Ireland</p> <p>Standardised Mortality Ratio</p> <p>Perinatal, infant and neonatal mortality rates</p> <p>Cancer mortality statistics per 100,000 population</p> <p>Percentage of population in ‘not good health’</p> <p>Location of National Trails (England and Wales) and Long Distance Routes (Scotland)</p>

¹¹⁵ EA, Environment and Heritage Service, Food Standards agency, SEPA (2007) Radioactivity in Food and the Environment, 2006, RIFE 12

Table D-1 Indicators Used to Collate Data for the Study	
SEA Directive Topic	Indicators (First Stage)
Material Assets	<p>Location of strategic rail links</p> <p>Location of strategic road network (motorways and trunk roads)</p> <p>Location of airports</p> <p>Location of ports</p> <p>Average property values</p>
Air and Climatic Factors	<p>Location of Air Quality Management Areas (AQMAs)</p> <p>Regional distribution of net greenhouse gas emissions</p> <p>Contribution of sectors to greenhouse gas emissions</p> <p>Location of fluvial and tidal floodplain</p> <p>Radiation exposure to the public (from RIFE 12)</p> <p>Radioactivity levels in the environment (from RIFE 12)</p>
Water	<p>Chemical and biological water quality</p> <p>Freshwater Fish Directive Sites</p> <p>Bathing Water Quality</p> <p>Designated Shellfish Waters</p>
Soils and Geology	<p>Location of geological SSSI/ASSI</p> <p>Location of Geoparks</p>
Cultural Heritage	<p>Location of World Heritage Sites</p> <p>Location of Scheduled Monuments (Scheduled Zones in Northern Ireland which also includes battlefields)</p> <p>Location of Historic Battlefields (England)</p> <p>Location of Designated Protected Wrecks</p> <p>Location of Historic Parks and Gardens (England only)</p> <p>Location of Historic Garden and Designated Landscape (Scotland only)</p> <p>Location of Historic Gardens (Northern Ireland only)</p> <p>Register of Parks and Gardens of Special Historic Interest (Wales only)</p> <p>Number of Listed Buildings (locational data will be obtained during the second phase)</p>

Table D-1 Indicators Used to Collate Data for the Study	
SEA Directive Topic	Indicators (First Stage)
Landscape	Location of National Parks Location of Areas of Outstanding Natural Beauty (AONB) (England, Wales, Northern Ireland) and National Scenic Areas (NSA) (Scotland) Heritage Coast (England and Wales) and Preferred Conservation Zones (Scotland) Landscape Character Areas

Stage Two of the Baseline Data Collation for the Environmental Report

- D.14. Following the nomination of potential sites for new nuclear power stations, the baseline data collation process will be further refined. It is proposed that regional and local level data will be sourced, as appropriate, to enable a more detailed, although still strategic, assessment to be undertaken of each of the nominated sites. It is intended that these will be in addition to the data collated for Stage 1.
- D.15. Data that would typically be collated to inform an EIA, i.e. very site specific data or data requiring the execution of surveys, will not be gathered as this is a strategic study. The collation of the additional baseline data is likely to require liaison with regional/local bodies and is therefore best undertaken once nominated sites have been identified.
- D.16. Additional information about designated features and sites will also be obtained. For example, whilst the first stage in the data collation process to inform the Study only identified the location of designated sites e.g. SPAs, the second stage will seek to obtain more information about the relevant sites, for example the qualifying features, in the vicinity of nominated nuclear power station sites. Very detailed and site specific data will not be collated as this would be more appropriate for project level EIA to consider.
- D.17. Table D-2 presents the indicators that will be gathered for each of the SEA Directive topics during this second stage of data collation in the Environmental Report. This list may be amended or added to as the SEA evolves.

Table D-2 Indicators to be used in the Environmental Report	
SEA Directive Topic	Indicators to be Collated for the Environmental Report
Biodiversity, Flora and Fauna	<p>Location of Areas of Special Protection (AoSP) (England, Scotland and Wales) and Wildlife Refuges (Northern Ireland)</p> <p>Location of Sensitive Marine Areas</p> <p>Location of Local Wildlife Sites</p> <p>Location of Local Nature Reserves (LNR) (England, Scotland and Wales) and Local Authority Nature Reserves (LANR) (Northern Ireland)</p> <p>Location of Limestone Pavement Orders</p> <p>Collation of local level species records e.g. European Protected Species records and BAP habitats and species from Local Wildlife Trusts and local authority records</p> <p>Collation of more information about designated sites, e.g. the qualifying features where appropriate and their condition</p>
Population and human health	<p>Collation of additional data at the nominated sites stage in relation to the location of recreational land, Woodland Parks, Country Parks</p> <p>Collation of more regional/localised data in relation to access to services, housing and public transport infrastructure</p> <p>Radon levels in UK homes</p> <p>Locations of emergency services including hospitals, fire stations, police stations</p> <p>Satisfaction with the local area as a place to live</p> <p>Age standardised incidence and mortality statistics for most common cancers</p> <p>Age standardised mortality rates</p> <p>Collation of additional regional/local level data at the nominated sites stage in relation to the structure of the population and its vulnerability, including data about the age structure and incidence of key illnesses and diseases. There will also be an emphasis placed upon obtaining age standardised incidence and mortality rates for specific diseases for males and females</p>

Table D-2 Indicators to be used in the Environmental Report	
SEA Directive Topic	Indicators to be Collated for the Environmental Report
	<p>Key skills and the major skills gaps in the regional/local workforce</p> <p>Additional Index of Multiple Deprivation data will be sought for each of the nominated sites by breaking the index down into the relevant sub-domains</p>
Material Assets	<p>As for human health collation of more regional/localised data in relation to access to services, housing and public transport infrastructure</p> <p>The location of Integrated Pollution Prevention and Control sites i.e. other industrial sites</p> <p>Control of Major Accident Hazard (COMAH) sites</p>
Air and Climatic Factors	<p>Areas benefiting from flood defences including coastal defences</p> <p>Flood water storage areas</p>
Water	<p>Chemical and biological water quality – further details</p> <p>Groundwater vulnerability</p> <p>Location of Groundwater Source Protection Zones</p>
Soils and Geology	<p>Location of Regionally Important Geological/Geomorphological Sites (RIGS)</p> <p>Recorded mineral sites</p> <p>Areas of known mining instability</p> <p>The location of Geological Conservation Review Sites</p> <p>Collation of data in relation to the importance of soil functions and quality e.g. data about contamination, the location of areas of peat</p>
Cultural Heritage	<p>Location of Conservation Areas</p> <p>Register of Landscapes of Outstanding Historic Interest</p> <p>Consult the relevant Sites and Monuments Records as necessary</p>

Table D-2 Indicators to be used in the Environmental Report	
SEA Directive Topic	Indicators to be Collated for the Environmental Report
Landscape	Location of Country Parks Location of Regional Parks Location of Woodland Parks Identification of landscapes of local importance Landscape Character Areas (further details)

The Collated Data and Proposed Data Collation

D.18. Appendix C1 presents the baseline data collated to date and also presents the additional indicators for which data will be sourced during stage two of the baseline data collation process and reported in the Environmental Report. The appendix is structured to provide the following information:

- Details of the indicators that have been collated and also, where relevant, the legislative or statutory framework that supports the indicator, for example with designated areas such as SPAs.
- Data for England, Northern Ireland, Scotland and Wales.
- Data about trends through time where available.
- The source of the information provided.

D.19. The trend information presented in Appendix C1 provides details of how the data collated for each of the indicators has changed through time i.e. whether the condition of environmental resources has got better or worse. This information can be used to determine how patterns are likely to develop into the future, for example whether performance is likely to improve or whether projections suggest that there could be a decline in performance irrespective of the construction of a nuclear power station. This type of information is presented for the indicators as relevant and consideration is also given to how targets established by regulators and other organisations might affect environmental performance in the future. For example, whether there are long-term aspirations to improve the extent and quality of certain environmental resources. One major factor that will affect the future environment is climate change. It is acknowledged that this is a significant global threat, for which suitable mitigation and adaptation measures needs to be developed. The effectiveness of such mitigation, the resilience of certain environments and the adaptability of them to climate change will be critical in determining the future

state of the environment.

- D.20. Appendix C2 presents details of radioactivity levels in the environment around the existing nuclear power stations sites in 2006. Depending upon where new nuclear power station sites are situated further details may be obtained when assessing the nominated sites.
- D.21. Appendix C1 is supported by Figures 1 to 5 which show the geographical distribution of some of the key designated sites and features across the UK. These figures can be seen at <http://www.berr.gov.uk/energy/nuclear-whitepaper/consultations/page44523.html>
- D.22. Table D-3 provides a summary of the data presented on these figures. An indication is provided in brackets of whether an information layer only applies to a specific part of the UK.

Table D-3 Features Shown on the Plans	
Figure Number and Name	Features Shown
Figure 1 – Nature Conservation Features	SAC Ramsar Site SPA NNR MNR (England, Wales and Northern Ireland only) MCA (Scotland only) ASSI (Northern Ireland only) SSSI (England, Wales and Scotland only)
Figure 2 – Heritage Features	Battlefields (England only) Scheduled Monuments (Scheduled Zones in Northern Ireland which also includes battlefields) World Heritage Sites Historic Park and Garden (England only) Historic Garden and Designated Landscape (Scotland only) Historic Garden (Northern Ireland only) Register of Parks and Gardens of Special Historic Interest (Wales only) Protected Wreck Site (England only)

Figure 3 – Landscape Features	NSA (Scotland only) National Parks AONB (England, Wales and Northern Ireland only) Heritage Coast (England and Wales only)
Figure 4 – Flood Areas	Flood Zones (England, Wales and Scotland)
Figure 5 – Settlements and Transport	National Trails (England and Wales) Long Distance Routes (Scotland) Strategic Rail links Motorways and A Roads Airports Ferry Crossings/Ports Urban Areas

Environmental Issues and Opportunities

- D.23. The identification of key environmental issues and opportunities has been based upon the collation of baseline data, the review of other relevant plans, programmes and environmental protection objectives and scoping responses. The issues and opportunities identified are set out in Appendix C3. These are strategic only and this is particularly important in view of the national level scope of this SEA.
- D.24. Once site nominations are received, additional regional and local level data will be obtained for each of the sites and this will be used to understand some of the strategic environmental issues and problems at each of the nominated sites. These will be reported in the Environmental Report.

ANNEX E: THE ASSESSMENT METHODOLOGY

The SEA Directive Requirements

E.1. This annex outlines the approach adopted in undertaking the assessment of the SSA criteria. It sets out the SEA objectives against which the SSA criteria have been assessed, describing how they have been developed. Furthermore, details are provided of the following:

- aspects of the SSA and the NPS that have been assessed;
- integration of the SEA and the NPS processes;
- the rationale behind the assessment and the technical methodology for undertaking the assessment; and
- limitations of and main areas of uncertainty in the assessment methodology.

E.2. Overall this annex aims to enable an understanding of the determination of the significant effects of the SSA criteria. Box E1 provides details of the assessment requirements of the SEA Directive.

Box E1 SEA Directive Requirements for the Assessment of Effects

“Where an environmental assessment is required under Article 3(1), an environmental report shall be prepared in which the likely significant effects on the environment of implementing the plan or programme and reasonable alternatives taking into the account the objectives and geographical scope of the plan or programme, are identified, described and evaluated” (Article 5(1))

The information provided in the Environmental Report should include:

“the likely significant effects on the environment including on issues such as biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage, including architectural and archaeological heritage, landscape and the interrelationship between the above factors. These effects should include secondary, cumulative, synergistic, short, medium and long-term, permanent and temporary, positive and negative effects” (Annex 1 (f) and footnote)

“the measures envisaged to prevent, reduce and as fully as possible offset any significant adverse effects on the environment of implementing the plan or programme” (Annex 1 (g))

“an outline of the reasons for selecting the alternatives dealt with and a description of how the assessment was undertaken including any difficulties (such as technical deficiencies or lack of know-how) encountered in compiling the required information” (Annex 1 (h))

The SEA Objectives

- E.3. The use of SEA objectives is not a requirement of the SEA Directive but their use is a recognised method of assessing the effects of a plan or programme and is proposed in the Practical Guide.
- E.4. SEA objectives are aspirational and reflect a desired direction of change, for example the maintenance of biodiversity levels. It therefore follows that these objectives do not have to be met completely. Ideally, the SEA objectives should be supported by indicators, which can be used to determine performance of a proposal or option against the objective. The baseline data collation process should gather data for the indicators proposed to support the SEA objectives, highlighting the iterative nature of the stages in the SEA process.

Development of the SEA Objectives

- E.5. The SEA objectives have been developed in accordance with the Practical Guide. At least one objective has been developed for each SEA Directive topic to ensure that all necessary topics will be addressed through the SEA. The objectives were also derived using:
- The review of environmental plans, programmes and environmental protection objectives (we have also included a number of other initiatives) (refer to Annex D and Appendix B for details)
 - The baseline data collation (refer to Annex D, Appendix C1, C2 and Figures 1 to 5)
 - The identification of environmental problems (refer to Annex D and Appendix C3)
 - The results of scoping consultation feedback.
- E.6. Whilst the objectives have been grouped into the SEA Directive topics, there are significant inter-relationships and linkages between all of the objectives. For example an objective relating to flood risk has been grouped in the air quality and climate category but this also has implications for water resources, human health, population and material assets. The grouping of the objectives should therefore be seen as a tool for assisting the development of the objectives, rather than a specific indication that an objective is only relevant to one particular SEA Directive topic.
- E.7. Each SEA objective is supported by a series of guide questions. The guide questions are intended to provide more direction and focus to the SEA objectives as the latter are more high-level. The guide questions have been

used to assist the overall assessment process and have helped to ensure that all the necessary impacts have been addressed.

- E.8. Table E-1 presents the SEA objectives used in the assessment and shows how they were derived. Table E-2 presents the SEA objectives, the supporting guide questions and indicators. In Table E-2 there is a column which identifies some of the potential issues associated with nuclear power station development. This list is not exhaustive and Sections 3 to 10 of this report present further details of some of the potential impacts of new nuclear power stations during the construction, operation and decommissioning phases.
- E.9. In light of comments received the SEA objectives presented in Tables E-1 and E-2 have been amended following the scoping consultation. Further details about how the objectives, guide questions and indicators have been amended are presented in Appendix A.

Table E-1 Derivation of the SEA Objectives				
Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
Biodiversity, Flora and Fauna				
<p>The protection of biodiversity, flora and fauna is a central component and theme of many international documents. Some of the key objectives in the international documents are:</p> <p>To conserve biological diversity (EU Biodiversity Strategy)</p> <p>The EU Sixth Environmental Action Plan identifies that protecting, conserving, restoring and developing the functioning of natural systems, natural habitats, wild flora and fauna is</p>	<p>The overarching theme of all national documents is the need to ensure that biodiversity and the impacts upon it are a central consideration of all decision-making. Opportunities to enhance biodiversity should also be pursued where possible.</p> <p>The overall goal of the UK BAP is to conserve and enhance biological diversity within the UK and to contribute to the conservation of global biodiversity through all</p>	<p>Potential for direct physical damage to habitats including fragmentation and severance.</p> <p>There might also be disturbance to species or alteration to habitats.</p> <p>Increased sediment loading and discharges, e.g. low level radiation, or as a result of accidents or spillages, e.g. fuel, oil, could adversely affect both terrestrial and aquatic ecology.</p> <p>Physical works associated with the construction and</p>	<p>There are many internationally and nationally designated sites situated across the UK which must be afforded the highest levels of protection. These sites include SPAs, pSPAs, SACs, cSACs, SSSIs/ASSIs and Ramsar sites. The location of the nature conservation features is shown on Figure 1.</p> <p>Regional and local level designations are also important once the sites are nominated. Furthermore, protected species and</p>	<ol style="list-style-type: none"> 1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance 2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality 3. To avoid adverse impacts on Priority Habitats and Species including European Protected Species

¹¹⁶ It should be noted that the impacts identified in this column are potential impacts only, many of which could be mitigated through careful planning and the implementation of mitigation measures. The table is not intended to identify all those impacts that would definitely occur but rather inform the development of appropriate SEA objectives for the purposes of the assessment process. The assessment will identify a range of effects.

¹¹⁷ For baseline details refer to Appendix B.

Table E-1 Derivation of the SEA Objectives

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
<p>needed to halt desertification and the loss of biodiversity, including the diversity of genetic resources, both in the EU and on a global scale.</p> <p>The Bern Convention on the Conservation of European Wildlife and Natural Habitats requires every contracting party to the Convention to promote national policies for the conservation of wild flora, wild fauna and natural habitats, with particular attention to endangered and vulnerable species, especially endemic ones, and endangered habitats, in accordance with the provisions of this Convention.</p> <p>The Ramsar Convention includes a number of objectives which seek to</p>	<p>appropriate mechanisms.</p> <p>Similar principles and objectives are mirrored in the biodiversity strategies and action plans of the devolved administrations.</p>	<p>operation of the site could lead to modifications to watercourse/waterbody morphology and hydrology.</p> <p>Contamination of soils as a result of the construction, operation and decommissioning of the new nuclear power station could have adverse effects for habitats and species.</p> <p>Biodiversity impacts could be long-term and impacts could continue during operation and potentially following decommissioning.</p>	<p>valuable but not protected flora and fauna are present across the UK, but these have not been mapped at this stage.</p>	

Table E-1 Derivation of the SEA Objectives

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
<p>ensure the wise use of wetlands.</p> <p>The OSPAR (the Oslo Paris Convention) Biological Diversity Strategy seeks to protect and enhance the ecosystems and the biological diversity of the maritime area, which are, or could be, affected as a result of human activities.</p> <p>The Bonn Convention on the Conservation of Migratory Species of Wild Animals includes an objective which seeks to provide immediate protection for migratory species included in Annex 1 of the Convention.</p> <p>All of the documents are further supported by the EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) and</p>				

Table E-1 Derivation of the SEA Objectives				
Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
the EU Directive on the Conservation of Wild Birds (79/406/EEC) which require the highest level of protection to be afforded to biodiversity, flora and fauna.				
Population and Human Health				
All of the international documents in some way address the principles of protecting population and human health, for example by addressing issues like climate change and highlighting that proposals for spatial development	All of the national documents in some way address the principles of protecting population and human health. A central principle of the UK Sustainable Development Strategy is 'ensuring a	The construction, operation and decommissioning of the nuclear power stations could create job opportunities. There could be job opportunities created by the power stations.	The trend in the employment rate is increasing, the trend in the unemployment rate is flat and the trend in the inactivity rate is falling ¹¹⁸ . Differences in unemployment rates in local areas within regions are greater than differences	4. To create employment opportunities 5. To encourage the development of sustainable communities ¹¹⁹ 6. To avoid adverse impacts on physical health

¹¹⁸ <http://www.statistics.gov.uk/CCI/nugget.asp?ID=12>

¹¹⁹ The Egan Review states that 'sustainable communities' meet the diverse needs of existing and future residents, their children and other users, contribute to a high quality of life and provide opportunity and choice. They achieve this in ways that make effective use of natural resources, enhance the environment, promote social cohesion and inclusion and strengthen economic prosperity' (ODPM (2004) The Egan Review, Skills for Sustainable Communities)

Table E-1 Derivation of the SEA Objectives

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
<p>should be comprehensively reviewed to understand their impacts upon quality of life.</p> <p>The above principle is clearly embodied within the EU Sixth Environmental Action Plan 2002 – 2012 which states that there is a need to contribute to the high level of quality of life for citizens, by providing an environment where the level of pollution does not give rise to harmful effects on human health and the environment. Sustainable urban development should also be promoted.</p>	<p>strong, healthy and just society’ and a key priority is the need to build sustainable communities where people want to live and work now and into the future.</p> <p>A key objective of The New Performance Framework for Local Authorities and Local Authority Partnerships is ‘to promote better health and well-being for all’.</p>	<p>There may be impacts upon property values.</p> <p>Perceptions of the risks associated with the new nuclear power stations could deter people from choosing to live in the area and could lead to localised demographic changes.</p> <p>The construction works could lead to disruption to services like electricity, water, gas etc.</p> <p>During the construction, operation and decommissioning phases there could be a risk of accidents.</p> <p>Whilst operational, site staff could be exposed to low-levels of radiation.</p> <p>Throughout the construction, operation and decommissioning there</p>	<p>between regions. New nuclear power stations present an opportunity to provide new employment opportunities.</p> <p>Life expectancy in the UK has increased.</p> <p>In 2005, radiation doses to people living around nuclear sites remained well below national and European limits. The limit is 1 (mSv).</p> <p>Food and drinking water in the general diet and in sources of public drinking water were analysed across the UK. Results showed that radioactivity from naturally occurring sources was the most significant source of exposure to communities in areas remote from nuclear sites. Man-made radionuclides only contributed a small</p>	<p>7. To avoid adverse impacts on mental health</p>

Table E-1 Derivation of the SEA Objectives

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development ¹¹⁶	Relevant Baseline Data for the UK ¹¹⁷	SEA Objective
		<p>could be exposure to noise and vibration.</p> <p>The perception of the health impacts of the facilities could have adverse impacts upon well-being.</p> <p>The wider population living in the vicinity of the new nuclear power station could be exposed to risks from ionising radiation during the operation of the facility. The radiation dose may arise from direct radiation, inhalation and ingestion of radioactive materials through food and through the food chain as a result of the discharge and disposal of radioactive wastes.</p> <p>There is the potential for loss of land used for recreational purposes and also impacts upon adjacent land uses, for example</p>	<p>proportion of the total public radiation dose in general diet.</p>	

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		<p>footpaths.</p> <p>Alterations to level of lighting could lead to light pollution for nearby residents.</p>		
Material Assets				
<p>This is a very broad topic area and all of the international documents address the protection of material assets by seeking to protect the quality of the built and natural environment and highlighting the need to establish sustainable communities.</p>	<p>This is a very broad topic area and all of the national documents address the protection and enhancement of material assets by seeking to protect the quality of the built and natural environment and highlighting the need to establish sustainable communities.</p>	<p>The construction and operation of new nuclear power stations could increase pressure on the use of the strategic transport network to enable delivery of raw materials and also ensuring suitable access for workers.</p> <p>See also impacts identified in the population and human health section relating to land values and loss of</p>	<p>There is a comprehensive transport network across the UK comprising road, rail, air, inland waterways and ports. However, some areas are more poorly served than others.</p> <p>Between 1990 and 2004, motor vehicle traffic rose by 21% in Great Britain and congestion is a significant issue.</p>	<p>8. To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure</p> <p>9. To avoid disruption to basic services and infrastructure¹²⁰</p> <p>10. To avoid adverse impacts on property and land values and to avoid planning blight</p>

¹²⁰ Basic services include General Practitioners surgeries, post offices, primary schools, food shops and bus stops.

Table E-1 Derivation of the SEA Objectives

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development ¹¹⁶	Relevant Baseline Data for the UK ¹¹⁷	SEA Objective
		recreational land.		11. To avoid the loss of access and recreational opportunities, their quality and user convenience
Air and Climatic Factors				
<p>There are a number of international air quality directives which establish the need for the protection of air quality. The EU Air Quality Framework Directives (96/62/EC) and Daughter Directives (1999/30/EC), (2000/69/EC), (2002/3/EC), (2004/107/EC) set the framework for protecting and enhancing air quality in Europe.</p> <p>The UN Framework</p>	<p>The UK Air Quality Strategy 2007 provides the overall framework for ensuring that air quality is protected and enhanced. This strategy also emphasises the need to consider the impacts of adverse air quality upon human health.</p> <p>The UK Sustainable Development Strategy identified climate change and energy as a priority issue that needs to be</p>	<p>The construction of new nuclear power stations could lead to dust generation and an increase in vehicular emissions from construction vehicles, although such impacts would tend to be quite localised.</p> <p>During operation there could be vehicular emissions and releases of radionuclides into the atmosphere.</p> <p>The operation of nuclear</p>	<p>The UK's air is cleaner in overall terms than at any time since the industrial revolution, but it still causes serious adverse health effects and there are significant benefits to be gained from improving air quality further. Pollutants from sources such as cars, aircraft and industrial plants lead to levels of pollution which are still having a marked affect on our health</p>	<p>12. To avoid adverse impacts upon air quality</p> <p>13. To minimise greenhouse gas emissions</p> <p>14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible</p>

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
Convention on Climate Change sets an overall intergovernmental effort to tackle the challenges and threats posed by climate change.	tackled. Climate change and objectives are reiterated throughout the national documents with one of the most important being “Climate Change – the UK Programme 2006: Tomorrow’s Climate, Today’s Challenge”. This essentially outlines how the UK is to meet greenhouse gas reduction commitments.	power stations could lead to a reduction in CO ₂ emissions compared with some other energy generating sources. Depending upon the location of the new nuclear power stations there could be increased flood risk as a result of direct loss of floodplain and potentially through increasing runoff rates.	and natural environment. Air pollution is currently estimated to reduce the life expectancy of every person in the UK by an average of 7-8 months. Emissions of the six greenhouse gases covered by the Kyoto Protocol (CO ₂ , methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride) fell by 15.3% between the base year and 2005 from 775.2 to 656.2million tonnes of CO ₂ equivalent. The biggest contributor to CO ₂ emissions in 2005 was from energy industries (37%) compared to 22% for road transport (Defra, 2007) ¹²¹ .	

¹²¹ Defra (2007) 2005 UK Climate Change Sustainable Development Indicator and Greenhouse Gas Emissions Final Figures: Statistical Release

Table E-1 Derivation of the SEA Objectives				
Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
Water				
<p>International documents emphasise the need to protect both water quality and water resource availability. The most significant international water related Directive of recent years is the EU Water Framework Directive (2000/60/EC) which establishes a framework for the protection of inland surface waters, transitional waters, coastal waters and groundwater. The emphasis is upon holistic river basin planning.</p> <p>There are a number of other Directives addressing water quality including the Groundwater Directive (80/68/EEC), Surface Water Abstraction Directive (75/440/EEC) and the Drinking Water Directive</p>	<p>The UK Sustainable Development Strategy emphasises the need to ensure natural resource protection and use including water resource use and protecting and enhancing water quality.</p> <p>Reducing flood risk and preventing an increase in flood risk is a central theme to many of the documents and planning guidance relating to development and flood risk prepared by each of the Devolved Administrations.</p>	<p>There could be the potential for adverse impacts to water quality during the construction, operational and decommissioning phases as a result of the disturbance of contaminated soil, accidental spillages of fuels, oils or cleaning fluids and the mobilisation of sediment. Impacts on water quality could have knock on effects on human health if drinking water is affected.</p> <p>The compaction of the soil could result in increased surface runoff and works undertaken in close proximity to rivers or streams could lead to modifications to bank stability. Any changes to flow patterns in the watercourses could lead to</p>	<p>There are significant areas of the UK at risk of tidal and fluvial flooding. The locations of the flood areas are shown on Figure 4.</p> <p>There are a number of sensitive water receptors in the UK including Shellfish Waters, Freshwater Fish Directive sites and other habitats and species dependent upon a healthy water environment.</p>	<p>15. To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology)</p> <p>16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives</p> <p>17. To avoid adverse impacts on the supply of water resources</p> <p>18. To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives</p>

Table E-1 Derivation of the SEA Objectives				
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<p>(98/83/EC).</p> <p>The OSPAR Radioactive Substances Strategy is a very important document that seeks to prevent the pollution of the maritime area by reducing discharges. The aim of the OSPAR strategy is to ensure progressive reduction of concentrations of radionuclides in the marine environment resulting from radioactive discharges such that by 2020 they add close to zero to historic levels.</p>		<p>increased sedimentation.</p> <p>Groundwater abstraction could lead to alterations to the water table and groundwater distribution and flow.</p> <p>New nuclear power stations would require cooling water and increased abstraction from waterbodies to service the facilities, which could lead to alterations to aquatic ecosystems.</p>		
Soils and Geology				
<p>Protection of natural resources is a central theme of all of the international documents.</p> <p>A priority area in the Sixth Environmental Action Plan is</p>	<p>The UK Sustainable Development Strategy highlights that natural resource protection and environmental enhancement is a priority issue to be</p>	<p>The construction of new nuclear power stations could lead to soil compaction and potentially increase erosion risks.</p> <p>During operation there could</p>	<p>The collation of baseline data has to date focussed upon the location of key geological sites including SSSIs and Geoparks.</p> <p>Around one third of the SSSIs in the UK are notified</p>	<p>19. To avoid damage to geological resources</p> <p>20. To avoid the use of greenfield land and encourage the re-use of brownfield sites</p>

Table E-1 Derivation of the SEA Objectives

Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
<p>natural resources and waste and the need to ensure that the use of non-renewable resources does not exceed the carrying capacity of the environment.</p> <p>Different EU policies, for example waste, water provide some degree of protection to soils but they are not sufficiently comprehensive to provide the necessary level of protection to soils. For this reason the European Commission adopted a Soil Thematic Strategy. It establishes why further high-level protection is needed for soils and establishes a ten year work programme. Within the common framework established by the strategy, EU Member States will be able to decide how best to protect soil and</p>	<p>addressed.</p> <p>The Draft Soil Strategy for England published by Defra in 2008 seeks to ensure that a sound framework for policy making is developed that will ensure the sustainable management of the soil resource.</p>	<p>be contamination risks associated with the release of radioactive substances and other hazardous materials as a result of accidents.</p> <p>The creation of new access roads to the power stations could lead to an increase in runoff from roads which could also lead to soil contamination.</p> <p>Once a nuclear power station site has been decommissioned some soil contamination could remain which could have implications for future uses of the land.</p> <p>There could be direct loss of geological resources as a result of the need to construct the site. There could also be indirect effects as a result of the waste</p>	<p>for some geological interest features.</p> <p>Geological conditions will be explored in more detail once nominated sites are received for new nuclear power stations. The additional data gathered will include details about the location of RIGS, coal mining affected areas and COMAH sites.</p>	<p>21. To avoid the contamination of soils and adverse impacts on soil functions</p>

Table E-1 Derivation of the SEA Objectives				
Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
use it in a sustainable manner.		generated by the process and how this would be treated and disposed of.		
Cultural Heritage including architectural and archaeological heritage				
Whilst there are no specific documents identified that specifically address cultural heritage, the European Landscape Convention incorporates cultural heritage issues and recognises the links between the landscape and heritage.	There is a clear emphasis throughout all of the documents upon the need to ensure that heritage resources are protected. For example, the Scotland Sustainable Development Strategy emphasises the need to protect natural heritage and resources. Planning guidance for all of the devolved administrations includes planning policy guidance relating to the protection of archaeological and built heritage resources.	Construction of the new nuclear power stations could result in damage to archaeological and built heritage features. Impacts could be direct e.g. direct loss or indirect e.g. an impact upon setting. During operation there could be adverse impacts upon the setting, and during decommissioning there could also continue to be adverse impacts upon heritage features.	Across the UK there are a number of cultural heritage features including World Heritage Sites, Scheduled Monuments, Registered Parks and Gardens, protected wrecks and historic battlefields. The location of all of these sites is shown on Figure 2. These resources are an important educational and economic resource, as well as providing us with valuable evidence of our past and the factors that	22. To avoid adverse impacts on the internationally and nationally important features of the historic environment 23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes

Table E-1 Derivation of the SEA Objectives				
Relevant International Plans, Programmes and Environmental Protection Objectives.	Relevant National Plans, Programmes and Environmental Protection Objectives.	Potential Issues Associated with Nuclear Power Station Development¹¹⁶	Relevant Baseline Data for the UK¹¹⁷	SEA Objective
			have influenced communities today.	
Landscape				
The European Landscape Convention seeks to foster the protection, management and planning of the European landscape.	<p>Protecting and enhancing the natural environment is a central theme of many of the national documents.</p> <p>There are no specific national landscape strategies of relevance but landscape concerns are clearly presented throughout most of the documents.</p> <p>For example, the “Environment Strategy Wales” seeks to protect and enhance landscape and seascape.</p>	<p>The construction of new nuclear power stations could introduce a new prominent feature into the existing landscape which could have impacts upon landscape character and quality, and upon nearby visual receptors.</p> <p>The above impacts could continue throughout operation and decommissioning.</p>	<p>There are a number of areas designated across the UK as AONBs/NSAs and National Parks because of the high quality of the landscape and the need to protect and enhance such areas. The location of these areas is shown on Figure 3.</p> <p>Significant stretches of the England and Wales coast are identified as Heritage Coast.</p>	<p>24. To avoid adverse impacts on nationally important landscapes</p> <p>25. To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness.</p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
Biodiversity, Flora, Fauna	<p>1. To avoid adverse impacts on the integrity of wildlife sites of international and national importance</p> <p>2. To avoid adverse impacts on valuable ecological networks and ecosystem functionality</p> <p>3. To avoid adverse impacts on Priority Habitats and Species, including European Protected Species</p>	<p>Will it result in the loss of habitats of international/national importance?</p> <p>Will it affect other statutory or non-statutory wildlife sites?</p> <p>Will it result in harm¹²² to internationally or nationally important species?</p> <p>Will it adversely affect the achievement of favourable conservation status for internationally and nationally important wildlife sites?</p> <p>Will it affect the structure and function/ecosystem processes that are essential to restoring, securing and/or maintaining a favourable condition of a feature or a site?</p> <p>Will the proposal enable the BAP targets for maintenance, restoration and expansion to be met?</p> <p>Will the proposal result in changes to coastal evolution that is needed to sustain coastal habitats?</p>	<p><i>Collated for the Study</i></p> <p>Presence and location of the following internationally and nationally designated sites:</p> <p>SPAs (and pSPAs)</p> <p>SACs (and cSACs and dSACs/pSACs)</p> <p>Ramsar Sites</p> <p>NNRs</p> <p>MNRs</p> <p>SSSI/ASSIs (Northern Ireland only)</p> <p>MCAs</p> <p><i>To be collated for the Environmental Report as appropriate</i></p> <p>Presence and location of the following:</p> <p>AoSs (England, Scotland and Wales) and Wildlife Refuges (Northern Ireland).</p> <p>Biosphere Reserves</p>

¹²² Harm includes: killing, disturbing, obstructing access to a breeding site or resting place, damaging or destroying a breeding site or resting place.

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
		<p>Will it result in the release of harmful substances e.g. oil, fuel and other pollution into waterbodies which could affect aquatic ecosystems?</p> <p>Will it result in the accidental migration of radionuclides which could harm aquatic or terrestrial ecosystems?</p> <p>Will it result in changes to stream hydrology and morphology that could affect aquatic or terrestrial ecosystems?</p> <p>Will it result in thermal discharges that could adversely affect aquatic ecosystems?</p> <p>Will it result in soil contamination that could damage aquatic or terrestrial ecosystems?</p>	<p>Areas of Ancient Woodland</p> <p>Sensitive Marine Areas</p> <p>Local Wildlife Sites</p> <p>LNRs (England, Scotland, Wales) and LANRs in Northern Ireland.</p> <p>Limestone Pavement Orders</p> <p>Collation of information regarding presence of local level protected species (e.g. protected species records from Local Wildlife Trusts and local authority records) may be deemed appropriate.</p> <p>Condition of designated sites</p>
Population and human health	<p>4. To create employment opportunities</p> <p>5. To encourage the development of sustainable communities</p> <p>6. To avoid adverse impacts on physical health</p> <p>7. To avoid adverse impacts on mental health</p>	<p>Will it create both temporary and permanent jobs in areas of need?</p> <p>Will it result in in-migration of population?</p> <p>Will it result in out-migration of population?</p> <p>Will it affect the population dynamics of nearby communities (age-structure)?</p> <p>Will it result in changes to services and</p>	<p><i>Collated for the Study</i></p> <p>Population size</p> <p>The location of major settlements and areas of population</p> <p>Age structure – working age population</p> <p>Unemployment rates</p> <p>Economic activity rates</p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
		<p>service capacity in population centres?</p> <p>Will it adversely affect the health of local communities through accidental radioactive discharges or exposure to radiation?</p> <p>Will it adversely affect the health of the workforce?</p> <p>Will it impact upon different vulnerable communities locally?</p> <p>Will it help to reduce health inequalities?</p> <p>Will the storage of radioactive waste result in adverse physical and mental health effects for local communities?</p> <p>Will exposure to noise and vibration as a result of plant activities lead to physical and mental health impacts on nearby communities?</p> <p>Will the perceptions of adverse risk as a result of activities lead to adverse impacts on mental health for nearby communities?</p> <p>Will it adversely affect the ability of an individual to enjoy and pursue a healthy lifestyle?</p>	<p>Job density</p> <p>Average earnings by residence</p> <p>Radiation exposure to the public</p> <p>Radioactivity levels in the environment</p> <p>Life expectancy at birth and age 65</p> <p>Index of Multiple Deprivation – overall domain and sub-domains where relevant</p> <p>Perinatal, infant and neonatal mortality rates</p> <p>Healthy life expectancy at age 65</p> <p>Standardised Mortality Ratio</p> <p>Cancer mortality statistics per 100,000 population</p> <p>Age standardised incidence and mortality statistics for most common cancers</p> <p>Percentage of population in ‘not good’ health</p> <p>Age standardised mortality rates</p> <p>Location of National Trails (England and Wales) and Long Distance Routes</p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
			<p>(Scotland)</p> <p><i>To be collated for the Environmental Report as appropriate</i></p> <p>Ten most common causes of cancer deaths in males and females</p> <p>Radon levels in UK homes</p> <p>Locations of emergency services including hospitals, fire stations, police stations.</p> <p>Key skills and the major skills gaps in the regional/local workforce</p> <p>Satisfaction with the local area as a place to live</p> <p>Collation of additional regional/local level data at the nominated sites stage as appropriate in relation to the structure of the population and its vulnerability including data about the age structure, incidence of key illnesses and diseases, overall levels of reported health. There will also be an emphasis placed upon obtaining age standardised incidence and mortality rates for specific diseases for males and females.</p>

Table E-2 The SEA Objectives, Indicators and Guide Questions			
SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
			<p>Collation of additional data at the nominated sites stage in relation to the location of recreational land, Woodland Parks, Country Parks where appropriate.</p> <p>Collation of more regional/localised data in relation to access to services, housing and public transport infrastructure where appropriate.</p> <p>Additional Index of Multiple Deprivation data will be sought for each of the nominated sites by breaking the index down into the relevant sub-domains.</p>
Material Assets	<p>8. To avoid adverse impacts on the function and efficiency of the strategic transport infrastructure</p> <p>9. To avoid disruption to basic services and infrastructure¹²³</p> <p>10. To avoid adverse impacts on property and land values and to avoid planning blight</p> <p>11. To avoid the loss of access and recreational opportunities, their quality</p>	<p>Will it result in the direct loss of strategic road/rail/air/port infrastructure?</p> <p>Will it result in increased congestion/pressure on key transport infrastructure?</p> <p>Will it result in a decrease in property and land values as a result of a change in perceptions or blight?</p> <p>Will it result in loss or disruption to basic</p>	<p><i>Collated for the Study</i></p> <p>Average property values</p> <p>Presence and location of the following:</p> <p>Strategic rail links</p> <p>Strategic road network</p> <p>Airports</p> <p>Ports</p>

¹²³ Basic services include General Practitioners surgeries, post offices, primary schools, food shops and bus stops.

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
	and user convenience	<p>services and infrastructure?</p> <p>Will it result in the loss of recreational and amenity land?</p>	<p><i>To be collated for the Environmental Report as appropriate</i></p> <p>Presence and location of COMAH Sites</p> <p>Presence and location of Integrated Pollution Prevention and Control Sites</p> <p>Collation of more regional/localised data in relation to access to services, housing and public transport infrastructure where appropriate.</p>
Air and Climatic Factors	<p>12. To avoid adverse impacts upon air quality</p> <p>13. To minimise greenhouse gas emissions</p> <p>14. To avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible</p>	<p>Will it result in the release of low level radionuclides that may adversely affect human health or biodiversity?</p> <p>Will it result in increased vehicular emissions (particularly CO₂)?</p> <p>Will it contribute to an increase in the number or expansion of AQMAs?</p> <p>Will it result in the loss of floodplain?</p> <p>Will it increase surface water runoff and therefore increase flood risk?</p> <p>Will it take account of future effects and risks of climate change e.g. sea level rise?</p> <p>Will future changes in weather patterns</p>	<p><i>Collated for the Study</i></p> <p>Presence and location of AQMAs (to be refined in Environmental Report as appropriate)</p> <p>Regional distribution of net greenhouse gas emissions</p> <p>Contribution of sectors to greenhouse gas emissions</p> <p>Location of fluvial and tidal floodplain</p> <p>Radiation exposure to the public (from RIFE 12)</p> <p>Radioactivity levels in the environment (from RIFE 12)</p> <p><i>To be collated for the Environmental</i></p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
		<p>be considered?</p> <p>Are there alternatives to reduce risk of flooding through secondary defences or design of the station?</p>	<p><i>Report as appropriate</i></p> <p>Areas benefiting from flood defences</p> <p>Location of coastal defences</p> <p>Flood water storage areas</p>
Water	<p>15. To avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology)</p> <p>16. To avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives</p> <p>17. To avoid adverse impacts on the supply of water resources</p> <p>18. To avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives</p>	<p>Will it result in the increased sedimentation of watercourses?</p> <p>Will it adversely affect channel geomorphology?</p> <p>Will it cause a deterioration in surface and groundwater quality as a result of accidental pollution, for example spillages, leaks?</p> <p>Will it cause a deterioration in surface and groundwater quality as a result of the disturbance of contaminated soil?</p> <p>Will it result in demand for higher defence standards that will impact on coastal processes?</p> <p>Can the higher defence standards be achieved without compromising habitat quality and sediment transport?</p> <p>Will it increase turbidity in watercourses?</p>	<p><i>Collated for the Study</i></p> <p>Chemical and biological water quality (further details to be collated at nominated sites stage where applicable)</p> <p>Freshwater Fish Directive Sites</p> <p>Bathing Water Quality</p> <p>Designated Shellfish Waters</p> <p><i>To be collated for the Environmental Report as appropriate</i></p> <p>Groundwater Source Protection Zones (England and Wales)</p> <p>Groundwater Vulnerability</p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
		<p>Will it increase the temperature of watercourses?</p> <p>Will it adversely affect water supply as a result of abstraction?</p> <p>Will hydrology and flow regimes be adversely affected by water abstraction?</p> <p>Will it affect designated Shellfish Waters?</p> <p>Will it affect Freshwater Fish Directive sites?</p>	
<p>Soils and Geology (<i>Geology is not an SEA Directive topic but is linked to the soil resource and is essential to consider</i>)</p>	<p>19. To avoid damage to geological resources</p> <p>20. To avoid the use of greenfield land and encourage the re-use of brownfield sites</p> <p>21. To avoid the contamination of soils and adverse impacts on soil functions</p>	<p>Will it result in the compaction and erosion of soils?</p> <p>Will it lead to the removal or alteration of soil structure and function?</p> <p>Will it lead to the contamination of soils which would affect biodiversity and human health?</p> <p>Will it compromise the future extraction/use of geological/mineral reserves?</p> <p>Will it result in the loss agricultural land?</p> <p>Will it lead to damage to geological</p>	<p><i>Collated for the Study</i></p> <p>Presence and location of the following:</p> <p>Geological SSSIs/ASSIs (to be refined in Environmental Report as appropriate)</p> <p>Geoparks</p> <p><i>To be collated for the Environmental Report as appropriate</i></p> <p>Location of RIGS</p> <p>Recorded mineral sites</p> <p>Areas of known mining instability</p> <p>Location of Geological Conservation</p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
		<p>SSSIs and other geological sites?</p> <p>Will it result in the loss of greenfield land?</p> <p>Will it adversely affect land under land management agreements?</p>	<p>Review Sites</p> <p>Collation of data in relation to the importance of soil functions and quality e.g. data about contamination, the location of areas of peat.</p>
<p>Cultural Heritage including architectural and archaeological heritage</p>	<p>22. To avoid adverse impacts on the internationally and nationally important features of the historic environment.</p> <p>23. To avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes.</p>	<p>Will it adversely affect historic sites of international/national importance and their setting?</p> <p>Will it adversely affect other historic sites of known value?</p> <p>Will it adversely affect landscapes of historic importance?</p>	<p><i>Collated for the Study</i></p> <p>Presence and location of the following:</p> <p>World Heritage Sites</p> <p>Scheduled Monuments</p> <p>Historic Battlefields (England)</p> <p>Designated Protected Wrecks</p> <p>Historic Parks and Gardens (England only)</p> <p>Historic Garden and Designated Landscape (Scotland only)</p> <p>Historic Gardens (Northern Ireland only)</p> <p>Register of Parks and Gardens of Special Historic Interest (Wales only)</p> <p>Listed Buildings</p> <p><i>To be collated for the Environmental Report as appropriate</i></p>

Table E-2 The SEA Objectives, Indicators and Guide Questions

SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
			Presence and location of the following: Conservation Areas The Register of Landscapes of Outstanding Historic Interest in Wales will be consulted as necessary The relevant Sites and Monuments records will be consulted.
Landscape	24. To avoid adverse impacts on nationally important landscapes 25. To avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness	Will it adversely affect landscapes within or immediately adjacent to a National Park? Will it adversely affect landscapes in or immediately adjacent to an AONB or NSA? Will it adversely affect Heritage Coast or Preferred Conservation Zones? Will it adversely affect local landscapes/townscapes of value? Will it affect the levels of tranquillity in an area? Will it adversely affect landscape character or distinctiveness? Will it result in increased levels of light pollution?	<i>Collated for the Study</i> Presence and location of the following: National Parks AONBs (England, Wales, Northern Ireland) and NSA (Scotland) Heritage Coast (England and Wales) and Preferred Conservation Zones (Scotland) Landscape Character Areas <i>To be collated for the Environmental Report as appropriate</i> Presence and location of the following: Country Parks Regional Parks

Table E-2 The SEA Objectives, Indicators and Guide Questions			
SEA Directive Topic	SEA Objective	Guide Questions	Relevant Baseline Indicators
			Woodland Parks Identification of landscapes of local importance Landscape Character Areas (further details)

Internal Compatibility of the SEA Objectives

- E.10. The Practical Guide recommends that an internal test of compatibility is undertaken of the SEA objectives. This process can highlight any potential conflicts which might need to be resolved between the objectives. It also demonstrates the close inter-relationships and linkages between many of them.
- E.11. An assessment of the internal compatibility of the objectives was undertaken for the purposes of the SEA Scoping Report¹²⁴. This compatibility exercise has been reviewed following the scoping consultation, as some modifications have been made to the SEA objectives. There are no clear areas of conflict between any of the SEA objectives. However, there remain some areas of uncertainty regarding compatibility including:
- The compatibility of Objective 4 '*to create employment opportunities*' with the objectives that seek to avoid adverse impacts on biodiversity, water quality, air quality, landscape and cultural heritage resources as it is unknown exactly where development would occur.
 - Objective 20 '*to protect greenfield sites and encourage the re-use of brownfield sites where possible*' could potentially conflict with those objectives that seek to protect biodiversity, flora and fauna, as some brownfield sites have the potential to be highly biodiverse.
- E.12. These tensions have been taken into consideration during the assessment process.

The Consideration of Alternatives

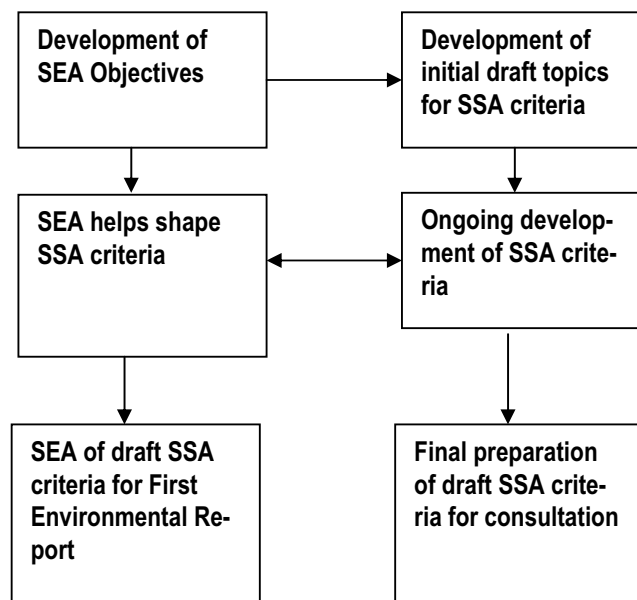
- E.13. An assessment of the effects of the reasonable alternatives considered has been included in this environmental study. Further details of the approach adopted for this assessment and the results are provided in Chapter 2. The assessment of alternatives will continue throughout the SEA and further details will be reported in the Environmental Report in relation to the alternative nominated sites.

¹²⁴ BERR (March 2008) Consultation on Strategic Environmental Assessment Scoping Report for Proposed National Policy Statement for New Nuclear Power

The Assessment of the SSA criteria

E.14. This Environmental study documents the assessment of the SSA criteria against the SEA objectives. The purpose of the assessment was to identify the significant environmental effects of the SSA criteria and to recommend measures to mitigate any adverse effects and to improve them where possible. Building upon Diagram B-1 in Annex B, Diagram E-1 below illustrates at what stages the SEA has been involved in the SSA criteria development.

Diagram E-1 Involvement of SEA in SSA criteria Development



E.15. The assessment process has been iterative to ensure the SSA has been properly informed by the SEA. An assessment of an early draft of the SSA criteria was undertaken and, as a result a series of mitigation measures and means of improving the criteria from an environmental perspective have been reflected in the criteria. Details of this early assessment are reported in Section 2, as it helped to inform the development of alternative criteria.

E.16. The following sub-sections explain how the assessment of the SSA criteria was undertaken following this early assessment and the subsequent modifications to the criteria i.e. it reports the significant environmental effects of the SSA criteria


that are currently being consulted upon¹²⁵.

The Approach to the Assessment

- E.17. The SSA criteria were assessed collectively against the SEA objectives using the matrix presented in Table E-3. This meant that for each SEA Objective, a matrix was produced which documented the effects of all of the criteria on that particular aspect of the environmental resource for example, ecological networks.
- E.18. In practice, the SSA criteria are intended to be applied collectively to assess the site nominations received. For this reason, the adopted approach was considered most appropriate and realistic and enabled the inherent consideration of cumulative and synergistic effects. The adverse effects of one criterion might also be offset by another criterion and this assessment approach enabled such issues to be highlighted. The approach still enabled individual shortcomings of each criterion to be identified and specific mitigation measures to be developed.
- E.19. The rationale used to assess the SSA criteria was first to understand how a new nuclear power station could potentially affect the environmental resource e.g. water during the construction, operation and decommissioning phases. This information was then used to determine how the SSA criteria could help to avoid, mitigate, deliver such effects which then guided the assessment of the performance of the SSA criteria against the SEA objectives.
- E.20. The assessment has, therefore, considered generic effects of new nuclear power station development, as well as identifying the specific effects of the SSA criteria. For each specific environmental topic, a table is presented which documents the potential generic effects during construction, operation and decommissioning. Generic effects have also been considered through the assessment of alternatives in Section 2. Based upon the assessment results, mitigation measures have been recommended that will need to be considered once consultation responses are received and when producing the final SSA criteria.
- E.21. The following sub-sections define the terms used in the assessment relating to the timescales, spatial scales and the symbols used to populate the matrix.

¹²⁵ BERR (2008) The role of Nuclear Power in a Low Carbon Economy, Consultation on the Strategic Siting Assessment for New Nuclear Power Stations in the UK.

Table E-3 Matrix Used to Assess the SSA criteria

SEA Objective	Potentially Sensitive Receptors	Geographical Scale of Effect													
		Site			Locality (<8km from site)			8-100km from Site			100+km from Site				
To avoid adverse impacts on wildlife sites of international and national importance	e.g. SPA SAC Ramsar Sites NNR SSSI ASSI MNR	Construct	Operation	Decomm.	Construct	Operation	Decomm.	Construct	Operation	Decomm.	Construct	Operation	Decomm.		
		+													
		Direct													
		Indirect													
		Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	Low	
		The summary text explains the assessment notation.				 This relates to the confidence of the assessment in the predictions.				+					
This section of the matrix reports the performance of each of the relevant SSA criteria. Generic effects of constructing, operating and decommissioning new nuclear power stations are also identified where appropriate.															
Assumptions / Recommendations															
This box would be used to document the main assumptions in the assessment and any key recommendations for mitigation															

Spatial Scale of the Effects

E.22. Four different spatial scales were used in the assessment matrix and are defined in Table E-4 below.

Table E-4 Definition of Spatial Scales	
Spatial Scale	Definition
Site	This refers to the boundary of the nominated site.
Locality 8km from the site boundary	This scale refers to the area immediately bordering the site.
8-100km from site	This scale relates to those effects that could be realised in the wider local authority area and beyond depending upon location.
100+km from the site	This scale refers to impacts that could be realised at distances greater than 100km from the nominated sites.

E.23. The identification of effects beyond the site boundary also enabled the identification of those effects that could potentially affect other Member States to ensure that the SEA Directive requirements in relation to the identification and consideration of transboundary effects were documented. Those Members States that could be affected have been consulted and sent a copy of this Environmental Report in accordance with Article 7(1) of the SEA Directive. Transboundary effects are reported where relevant in Sections 3 to 10.

Definitions of Timescales

E.24. As part of the assessment it was important to understand when during the lifetime of a new nuclear power station, effects could be realised i.e. during construction, operation and decommissioning. Table E-5 defines each of the phases.

Table E-5 Definitions of Timescales	
Phase of the Nuclear Power Station	Definition
Construction and Commissioning	This phase begins at the commencement of the construction works and ends when the construction of the nuclear power station is complete. It is anticipated that this phase would last approximately 5 years

Table E-5 Definitions of Timescales	
Phase of the Nuclear Power Station	Definition
Operation	This phase begins when construction is complete and when power is generated at the site. It would end when power generation ceases. Operators will need to set out their proposed station life time in the Funded Decommissioning Programme they will submit to the SoS for approval prior to the construction of the station. To aid operators in devising Funded Decommissioning Programmes, we have set out draft guidance on the key points which the SoS would expect a Programme to address. Part of this guidance, which will help operators set out and cost the steps involved in decommissioning a nuclear power station and managing and disposing of the waste in a way that SoS may approve, is called the Base Case. The Base Case is built on exiting policy and regulations, and makes additional assumptions to ensure that it represents a realistic and prudent way to estimate the costs of and carry out these activities. The Base Case assumes that the life time of a new nuclear power station will be 40 years, however we note that reactor lives might be extended to 60 years. The Base Case will not be prescriptive. Operators may propose alternative station lifetimes or life extensions and SoS would consider alternatives on a case by case basis.
Decommissioning	Decommissioning begins when power generation ceases, the reactor is shut down and there is no intention of further use for the purpose of generating electricity. Work then begins to decommission the site. It is anticipated that this phase would last a minimum of 30 years and would not cease until all station buildings and facilities have been removed and the site has been returned to an end state which has been agreed with the regulators and the planning authority. This is likely to be a state similar to "greenfield" depending on the state of the site prior to the construction of the station. The exact decommissioning timescales will be set out in the Funded Decommissioning Programme for the station that the operator will submit to the Secretary of State for approval.

E.25. In addition to understanding the types of effects that could occur during each phase of a nuclear power station's life, it was important for the timescale of the effects to be clarified i.e. whether they would persist in the short, medium or long-term and if they would be temporary or permanent. Clarity regarding the permanency and duration of the effects has been provided in the summary text of the matrices.

The Nature of the Effect

E.26. As part of the assessment it was necessary to determine the nature of the effect i.e. if it was positive, negative or uncertain and if effects would be direct or indirect. Table E-6 presents

the definitions of the symbols used to present the nature of the effects.

Table E-6 Definition of Assessment Symbology	
Symbol	Definition
++	The criteria would make a major positive contribution (either direct or indirect) towards the achievement of the SEA Objective i.e. if they would positively fulfil all elements of the objective.
+	The criteria would make a positive contribution (either direct or indirect) towards the achievement of the SEA Objective i.e. they would partially contribute to the achievement of the objective but would not provide guaranteed protection to an environmental resource.
0	There would be no significant contribution towards the achievement of the SEA Objective.
-	The criteria would not contribute to the achievement of the SEA Objective and would work against the achievement of the objective, potentially resulting in negative impacts upon sensitive receptors.
--	The criteria would not contribute to the achievement of the SEA Objective and would work against the achievement of all elements of the objective, potentially resulting in major negative impacts upon sensitive receptors.
+/-	The criteria would make both a positive and negative contribution to the achievement of the SEA Objective. Without further information it is not possible to confirm whether the positive or negative effects would outweigh one other.
?	There is insufficient information available to determine the effects that could be realised.
NA	There is no clear link between the criteria and the SEA Objective.
Direct	Effects that would occur as a result of a single pathway e.g. the direct loss of cultural heritage resources because of land take.
Indirect	Secondary effects that frequently occur as a result of a complex pathway e.g. the introduction of new coastal flood defences could lead to change in coastal processes which could have effects on ecological habitats and recreation/amenity.

E.27. In line with the provisions of Annex II of the SEA Directive, the assessment of significant effects through the SEA and the application of the assessment symbols presented in Table E-6 has had regard to:

- The probability, duration, frequency and reversibility of the effects
- The cumulative nature of the effects
- The transboundary nature of the effects

- The risks to human health or the environment (e.g. due to accidents)
- The magnitude and spatial extent of the effects (geographical area and size of the population likely to be affected)
- The value and vulnerability of the area likely to be affected
 - special natural characteristics or cultural heritage
 - exceeded environmental quality standards or limit values
 - intensive land-use
- The effects on areas or landscapes which have a recognised national, European Community or international protection status

Levels of Confidence in the Prediction

E.28. There is an element of uncertainty involved in all predictions of environmental effects and it is important for readers to understand the confidence of the assessment and how likely it is that the effects predicted will be realised. Table E-7 presents the definitions of confidence that were used in the assessment.

Table E-7 Definitions of Levels of Confidence	
Level of Confidence	Definition
Low	The prediction of an effect is the best estimate in light of the information currently available. Further information would be beneficial to confirm the assessment of the effect and to increase levels of certainty.
High	The prediction of an effect is an informed judgement based upon reliable information. Further information would be unlikely to change the level of certainty in the prediction.

Reporting of the Assessment

- E.29. The results of the assessment of the SSA criteria are presented in Sections 3 to 10 of this Study by SEA Directive topic. This is to provide readers with an understanding of how the SSA criteria perform against the SEA objectives and what level of protection might be afforded to that aspect of the environment through the application of the criteria.
- E.30. Each section provides some background to each of the SEA Directive topics, presents the SEA objectives that were used to undertake the assessment, identifies the potential generic impacts of the construction, operation and decommissioning phases of a new nuclear power station on the environmental topic and reports the significant effects of the SSA criteria. An extract of the matrices is provided at the end of each section summarising the overall conclusions with the completed matrices presented in Appendix D.

Evidence Base

E.31. Predictions of effects should be informed by evidence where possible, for example previous research or examples from similar situations. Evidence was used where relevant to support predictions presented in the matrices and included international and UK literature and the preliminary assessment results of the GDA process. Causal chain analysis was used to assist the identification of the potential generic impacts of new nuclear power stations during the construction, operation and decommissioning phases.

Limits of the Assessment

- E.32. The level of detail reported in the assessment has been limited by the amount of specific siting and technology information that was available. When assessing the SSA criteria there was no information available about where new nuclear power stations would be located, the type of reactors that would be used at the sites and their operational characteristics. Consequently, the assessment of the SSA criteria could only consider how the criteria could be applied across the UK and hence how they could affect the achievement of the SEA objectives. Nonetheless it has been possible through the assessment to identify where protection of the environment would occur and where there could be risks of adverse effects.
- E.33. The level of detail presented in the Environmental Report will develop from the high-level basis in this Study, to a slightly more detailed, although still strategic assessment of the nominated sites. Through the nominations process and the gathering of some additional baseline data it will be possible to gain a greater understanding of the potential constraints and opportunities associated with each of the sites which is essential to understanding the potential significance of the environmental effects.
- E.34. The role of the SEA within the overall hierarchy of decision-making has to be recognised. Other facilitative actions and the processes would need to be completed as a part of other regulatory regimes before a new nuclear power station can be built. In some circumstances it will only be possible to assess certain effects through these other processes. For example, only at the site specific level, once designs have been confirmed will it be possible to accurately assess the likely impact of discharges from the sites. However, the SEA can identify risks associated with these discharges and could help to minimise the impact of such development on particularly vulnerable or sensitive locations. The roles of these other regulatory regimes have been cross-referenced as appropriate throughout this document.
- E.35. Throughout the assessment it was also very important to recognise the scope of the SSA criteria and what they are seeking to achieve. They are essentially helping to guide the siting of new nuclear power stations and so are not designed to resolve potential adverse effects that could occur during a specific operational phase e.g. the compaction of soils during the construction process. This is the role of other assessment processes, such as EIA and can be furthered through detailed site design only.

The Assessment of the Nominated Sites

E.36. The Environmental Report will assess the nominated sites against the SEA objectives. The

assessment of cumulative and synergistic effects will also be a very important element of the assessment, as it will be able to identify the potential effects of developing multiple new nuclear power stations across the UK.

ANNEX F – BACKGROUND INFORMATION ON MANAGEMENT AND DISPOSAL OF RADIOACTIVE WASTE

- F.1. This Annex covers the following elements associated with the management and disposal of radioactive waste:
- It provides context for the assessment of the environmental impacts of creating new waste by explaining the background to waste management and UK policy
 - It provides details of the consideration of waste through the SEA and other regulatory processes
 - It explains what assessments of the impacts of waste storage, transport and disposal have been undertaken to-date
- F.2. This Study includes a summary of the potential environmental effects of interim storage of waste on site, transportation and final disposal of the waste in geological disposal facilities. These effects will be assessed in further detail in the Environmental Report once more information becomes available about the location of the nominated sites.

Radioactive waste management – the UK context

Radioactive waste streams

- F.3. The UK has accumulated a substantial legacy of nuclear waste from a variety of nuclear programmes going back over 50 years. Government has been undertaking work to ensure the safe and secure long-term management of this waste. In 2001, the UK government initiated the Managing Radioactive Waste Safely (MRWS) programme to establish how higher activity waste should be managed in the long term. This led to the publication of the MRWS White Paper, 'A Framework for Implementing Geological Disposal' in June 2008. The MRWS White Paper complemented the policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom published in March 2007.
- F.4. The construction of new nuclear power stations will increase the amount of waste that is required to be stored, transported and disposed of.
- F.5. The legacy of radioactive waste in the UK falls into a number of main streams as outlined in Table F-1:

Table F-1 Main Waste Streams in the UK¹²⁶	
High Level Waste (HLW)	Defined in the UK as waste “ <i>in which the temperature may rise significantly as a result of their radioactivity, so that this factor has to be taken into account in designing storage or disposal facilities</i> ” ¹²⁷ . HLW arises in the UK initially as a highly radioactive liquid, which is a by-product from the reprocessing of spent nuclear fuel. By 2015, the majority of HLW will have been transformed into a ‘passively safe’ solid form by a treatment process called ‘vitrification’, which involves adding the HLW to molten glass and pouring the mixture into 150 litre capacity stainless steel containers. Current plans are that vitrified HLW be stored for at least 50 years, to allow a significant proportion of the radioactivity to decay away, for the waste to become cooler, and so make it easier to transport and dispose of.
Intermediate Level Waste (ILW)	Defined in the UK as waste “ <i>with radioactivity levels exceeding the upper boundaries for low-level wastes, but which do not require heating to be taken into account in the design of storage or disposal facilities</i> ” ¹²⁸ . ILW arises mainly from the reprocessing of spent fuel and from general operations and maintenance at nuclear sites, and can include metal items such as fuel cladding and reactor components, and sludges from the treatment of radioactive liquid effluents. As decommissioning and clean up of nuclear sites proceeds, more ILW will arise. Like other radioactive waste, ILW needs to be contained to protect workers and the public from radiation. Typically, ILW is packaged for disposal by encapsulation in cement in highly-engineered 500 litre stainless steel drums or in higher capacity steel or concrete boxes.
Low Level Waste (LLW)	LLW is the lowest activity category of radioactive waste, and was defined in the recently updated Government LLW policy statement ¹²⁸ as: “ <i>Radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/ gamma activity</i> ” LLW currently being generated consists largely of paper, plastics and scrap metal items that have been used in hospitals, research establishments and the nuclear industry. Although LLW makes up more than 90 per cent of the UK’s waste legacy by volume, it contains less than 0.01 per cent of the total radioactivity ¹²⁹ . Most operational LLW is super-compacted to reduce its volume and sent for disposal at the LLW repository (LLWR) near the village of Drigg in West Cumbria (“LLWR” will be the shorthand for this facility throughout the rest of this document), where it is encapsulated in cement and packaged in large steel containers. These are then placed in an engineered vault a few metres below the surface. A small fraction of the total volume of LLW cannot be disposed of in this way due principally to the concentration of specific radionuclides (for example, those with very long half lives) and so will need to be disposed of in a geological disposal facility.
Spent fuel	Fuel that has been used to power nuclear reactors is not currently classified as waste, because it still contains large amounts of uranium (and some plutonium) which can potentially be separated out through reprocessing and used to make new fuel. However, in the absence of any proposals from industry, the Government has

¹²⁶ Waste Stream descriptions reproduced from MRWS White Paper. Defra, BERR and the devolved administrations for Wales and Northern Ireland (2008) Managing Radioactive Waste Safely, A Framework for Geological Disposal pp16-17

¹²⁷ Her Majesty’s Stationery Office, Review of Radioactive Waste Management Policy: Final Conclusions, (Cm2919) July 1995.

¹²⁸ Defra, DTI, Scottish Executive, Welsh Assembly Government, Northern Ireland Department of the Environment (March 2007) Policy for Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom
<http://www.defra.gov.uk/environment/radioactivity/waste/pdf/llw-policystatement070326.pdf>

¹²⁹ UK Radioactive Waste Inventory 2007 (June 2008)
www.nda.gov.uk/strategy/waste/geological-disposal.cfm

Table F-1 Main Waste Streams in the UK¹²⁶

concluded that any new nuclear power stations that might be built in the UK should proceed on the basis that spent fuel will not be reprocessed. Most of the UK's spent fuel from existing civil reactors has been reprocessed in this way, producing separated plutonium and uranium and HLW, ILW and LLW as waste by-products. Spent fuel need not be reprocessed, however, and could instead be packaged and disposed of in a geological disposal facility, as is planned in Finland, Germany and Sweden. Some spent fuel from existing UK Advanced Gas-cooled Reactor (AGR) power stations and all the spent fuel from Sizewell B Pressurised Water Reactor (PWR) is not currently destined for reprocessing and may ultimately need to be managed in this way.

Radioactive Waste Management Policy

LLW Management Policy

- F.6. UK Government policy¹³⁰ for the long-term management of the UK's low level solid radioactive waste covers all aspects of the generation, management and regulation of solid LLW. It is intended to provide a high level framework within which decisions regarding LLW management can be made by the relevant waste managers. The policy does not aim to be prescriptive in its approach, recognising the wide range of LLW types and their radioactivity.
- F.7. Waste managers are required to produce plans for the management of all radioactive waste, including LLW and these must be prepared to the satisfaction of the relevant regulatory bodies. The policy states that all nuclear licensed sites should have a plan for the management of their LLW holdings and predicted future arisings, integrated into a wider waste management strategy. The policy outlines key requirements for the development of LLW management plans including the use of the waste hierarchy and the use of a risk based approach.
- F.8. The policy identifies that the use of centralised disposal facilities like the LLWR, or a similar future facility may be the appropriate location for the disposal of LLW. However, other solutions may be suitable depending upon the properties of the waste to be disposed of. Other options should be considered when developing waste management plans, taking account of the proximity principle¹³¹.
- F.9. The transportation of radioactive waste is regulated in the UK and the Government believes that the regulatory regime provides a safe environment for

¹³⁰ Defra, DTI, Department of the Environment, Welsh Assembly Government, Scottish Executive (March, 2007) Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom

¹³¹ This is a key element of EU environmental and municipal waste management policy. It means to enable waste to be disposed of in one of the nearest appropriate installation(s).

the transportation of LLW (see paras 1.32 to 1.36). The policy recognises that transportation of wastes will increase conventional transport risks and environmental burdens associated with this transportation. For this reason, transport issues must be explicitly considered in options assessment for LLW management plans.

- F.10. The Government intends to ensure that there are disposal routes available for the long-term management of LLW arisings. The NDA is required to formulate and publish plans for LLW management and disposal in its Strategy and Annual Plans and is also expected to:
- Produce a national strategy for nuclear LLW management
 - Develop and publish a plan for the optimal use of the LLWR
 - As part of the process of preparing plans for the decommissioning of sites, assess the extent to which other LLW disposal options could be employed to manage the waste arisings.
 - In view of the above, assess, if and at what point in the future, a replacement(s) for the LLWR might be required and planned for.
- F.11. In Scotland, a proposal for a low level radioactive waste disposal at Dounreay to take waste from Dounreay site decommissioning is currently subject to the planning process. It is also recognised that an additional facility will be needed in southern Scotland to manage radioactive wastes generated from processes in other locations. Any such facilities will be developed in line with the UK Government Policy¹³².

Higher Activity Waste Management Policy

- F.12. In 2003, as part of the MRWS programme, the Government appointed an independent committee, the Committee on Radioactive Waste Management (CoRWM) to review and recommend options to identify a long-term solution to managing higher activity radioactive wastes in the UK.
- F.13. To ensure its recommendations had wide-ranging support, CoRWM sought to combine the use of the best possible science and other expert advice with a wide-ranging programme of public and stakeholder engagement. CoRWM published an integrated package of recommendations in July 2006¹³³. In October 2006 the UK Government and the devolved administrations published

¹³² Defra, DTI, Department of the Environment, Welsh Assembly Government, Scottish Executive (March, 2007) Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom

¹³³ CoRWM (July 2006) Managing our Radioactive Waste Safely, CoRWM's recommendations to Government

a response¹³⁴ accepting CoRWM's recommendations that geological disposal, preceded by with safe and secure interim storage, is the best available approach for the long-term management of existing higher-activity radioactive wastes and confirmed its support for exploring an approach based on voluntarism and partnership with local communities.

- F.14. During 2007, Government published the consultation 'A Framework for Implementing Geological Disposal' to seek views on proposals for delivering geological disposal. This covered:
- the technical programme and aspects of design and delivery of a geological disposal facility for the long-term management of higher activity radioactive waste
 - the process and criteria to be used to decide the siting of that facility, including:
 - development of a voluntarism/partnership approach; and
 - the assessment and evaluation of potential disposal sites including the initial screening-out of areas unlikely to be suitable for geological disposal.
- F.15. Following consideration of the responses Government produced an Analysis and Summary of Responses in January 2008 and published the White Paper – 'Managing Radioactive Waste Safely: A Framework for Implementing Geological Disposal' on 12th June 2008. This set out Government's policy for implementing geological disposal for the long term management of higher activity waste.
- F.16. Higher activity radioactive waste to be managed in the long-term through geological disposal comprise:
- Waste that cannot be managed under the 'Policy for the Long term Management of Solid Low Level Radioactive Waste in the United Kingdom published in March 2007.
 - Waste not managed under the Scottish Executive's policy for higher activity waste, currently interim near-surface, near-site storage.¹³⁵
- F.17. The Nuclear Decommissioning Authority (NDA) (now incorporating the skills and experience of the former Nirex organisation) has been given the responsibility of developing and delivering geological disposal. Whilst the

¹³⁴ UK Government and the devolved administrations, "Response to the Report and Recommendations from the Committee on Radioactive Waste Management (CoRWM)" October 2006. www.defra.gov.uk/environment/radioactivity/waste/pdf/corwm-govresponse.pdf

¹³⁵ The Scottish Government (June 2007) Ministers to Decline to Endorse Deep Storage. News Release available at <http://www.scotland.gov.uk/News/Releases/2007/06/25101822>

Government believes that geological disposal will provide a technically possible means of disposing of existing and new waste, the NDA will keep options such as Borehole Disposal of certain types of waste under review. The cost implications of the various options explored will be estimated by the NDA as part of its work programme and Government will look to CoRWM to provide independent scrutiny and advice on the NDA research programme. This is in addition to the extensive programme of research that will be carried out during the development of the geological disposal programme as work progresses to assess a particular site or sites. Implementation will be undertaken on a staged basis, with clear decision points allowing progress to be reviewed and costs, affordability, and value for money, safety, and environmental and sustainability impacts to be assessed before decisions are taken on how to move to the next stage.

- F.18. The main focus of CoRWM's original work was on existing legacy wastes i.e. those wastes already in existence and those expected to be generated by existing nuclear facilities. CoRWM took no position on the desirability or otherwise of new nuclear build.

Government's Proposals for Management and Disposal of Waste from New Nuclear Power Stations

- F.19. The construction of new nuclear power stations will generate additional radioactive waste – LLW, ILW and spent fuel - that will need to be effectively stored, transported and disposed of. In 2007 the Government consulted on the ethical question of whether to create new waste, and on the Government's view that waste produced by new nuclear power stations could be disposed of in the same geological disposal facilities as legacy waste.
- F.20. The quantity of additional waste generated by new nuclear power stations will depend on the number and type of stations that are constructed. The designs of new nuclear power stations have more compact structures than most existing UK nuclear power facilities, use fewer materials and are expected to produce less ILW and LLW when decommissioned.

Proposals for Disposal – Higher Activity Wastes from New Nuclear Power Stations

- F.21. The Nuclear White Paper outlined the Government's proposals for the disposal of higher activity wastes from new nuclear power stations stating:

“Having reviewed the arguments and evidence put forward, the Government believes that it is technically possible to dispose of new higher-activity radioactive waste in a geological disposal facility and that this would be a viable solution and the right approach for managing waste from any new

*nuclear power stations. The Government considers that it would be technically possible and desirable to dispose of both new and legacy waste in the same geological disposal facilities and that this should be explored through the Managing Radioactive Waste Safety programme. The Government considers that waste can and should be stored in safe and secure interim storage facilities until a geological facility becomes available. Our policy is that before development consents for new nuclear power stations are granted, the Government will need to be satisfied that effective arrangements exist or will exist to manage and dispose of the waste they will produce”.*¹³⁶

Proposals for Disposal – LLW from New Nuclear Power Stations

F.22. LLW from new nuclear power stations will be managed in accordance with the Government’s LLW management policy (see paragraphs 1.6 to 1.11) and the NDA have been charged with developing a national strategy for nuclear LLW management. A LLW Strategy Group has been set up that includes senior representatives from the NDA, Regulators, Stakeholder groups, and LLW Consignor sites that are actively generating LLW. The Group has been developed to promote the implementation of the waste hierarchy and to promote innovation and value for money by planning for effective waste disposal solutions. It will form a key point of contact for integration and engagement on LLW issues and the strategy development.

Interim Storage of Radioactive Waste

- F.23. Interim stores provide safe and secure protection for waste packages, although for a period much shorter than the half-life of the radioactive materials which require management. In terms of preventing hazardous releases to the outside environment, a number of engineered barriers are provided to complement the safety management arrangements.
- F.24. Shielding of the waste packages reduces the radiation emitted. To assure passive safety the focus of these engineered barriers is on the waste form first, then the container and finally, the store. The store building itself represents the final barrier of a series of barriers between the waste and the wider environment.
- F.25. The emphasis is on early immobilisation of operational and legacy waste materials to reduce their hazard. Such packaged wastes need to be placed into appropriate interim storage until they can be disposed of in the geological disposal facility. Packaging requirements are kept under review by the NDA’s Radioactive Waste Management Directorate (RWMD), under arrangements

¹³⁶ BERR, 2008, Meeting the Energy Challenge: A White Paper on Nuclear Power, URN 08/525, page 27.

scrutinised by the regulators so as to minimise the possibility that waste will have to be repackaged, prior to receipt in the repository, whilst in storage. Wastes will be made passively safe as soon as practicable, consistent with the objective of avoiding future repackaging and the attendant double handling of wastes.

- F.26. Existing stores for waste packages are typically designed to provide a service life of 50 to 100 years. The NDA intends that all new stores constructed on its sites should provide safe and secure storage to cover the minimum 100 year period recommended by CoRWM. Some existing stores have shorter lifespans than this and these stores will have their service lives extended as required, in order to provide sufficient safe and secure interim storage throughout the geological disposal facility development programme. The replacement of stores will be avoided wherever possible, but the NDA will ensure that its strategy allows for the safe and secure storage of the waste contained within them for a period of at least 100 years.
- F.27. The security of all stores is of paramount importance. NDA sites are operated under contract by site licensee companies (SLC). These SLCs, and other operators of interim waste stores such as British Energy, are regulated and advised by the Office for Civil Nuclear Security (OCNS). Account is taken of matters including the design and engineering of new stores and the refurbishment of existing stores, in light of the risks to the security of their contents, now and into the future.

Proposals for Interim Storage of waste from New Nuclear Power Stations

- F.28. Given the ability of interim stores to be maintained in order to hold waste safely and securely if necessary for long periods, or if necessary refurbished or replaced, the Government is satisfied that it is reasonable to proceed with allowing operators to build new nuclear power stations in advance of a geological disposal facility being available.
- F.29. The interim stores themselves may result in a range of non-radiological impacts upon the surrounding environment. These may include, but are not limited to:
- Effects on landscape, visual amenity as above ground stores may be visually intrusive
 - Effects on historic or archaeological features and their setting on or near to the site
 - Changes to water resources and the patterns of groundwater distribution and flow due to foundations and drainage design
 - Effects on biodiversity resources and habitats at the site
- F.30. The site specific environmental and amenity issues associated with interim

stores cannot be assessed in the absence of a specific site. This also includes assessment of flooding, coastal erosion or sea-level rise which may be an issue with stores located in coastal locations. Further detail and assessment will be undertaken once sites have been nominated in the Environmental Report. Furthermore, there are numerous designs of interim store which could be taken forward including both above and below ground designs. The alternative designs would have different effects upon the environment and different safety and security characteristics.

- F.31. As new stores are likely to be constructed at the sites of new nuclear power stations, the impacts of the stores must also be considered with respect to the wider activities and impacts of the entire power station site. For example, the visual impacts of the waste store may not be significant when compared to the overall visual impacts of the reactor buildings and possible cooling towers, although this will be also dependent upon the design of the store ultimately proposed.

Proposals for Transportation of Waste from New Nuclear Power Stations

- F.32. Waste will need to be transported safely from interim stores to the site of the geological disposal facility. It is recognised that the transport of radioactive wastes will increase conventional transport risks and would create the same environmental burdens as those associated with any long distance transport.¹³⁷
- F.33. The main risks to the environment from transporting radioactive materials would be through unplanned releases of radioactive materials as a result of accidents. However, the safety record for the transport of nuclear materials suggests that the risks are very low. Data from the Radioactive Material Transport Event Database (RAMTED) for the period 1958 to 2006 recorded 850 events associated with the transportation of radioactive materials. As set out in the White Paper on Nuclear Power, the Health Protection Agency has conducted an assessment of all events¹⁴⁸ involving radioactive material during transport since 1958 and found that most of the recorded events during this period had not resulted in any significant health effects for workers or members of the public. All 19 significant dose events involved industrial radiography sources that were transported without the source being properly returned to their container and occurred mainly in the 1970s, only two have occurred since the mid -1980s. None of these significant dose events involved the transport of nuclear

¹³⁷ Defra (2007) Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom

materials.¹³⁸ During interim storage of several decades the initial fission product activity of the waste would decline as more active compounds decay and it may only require a single movement of lower activity material to the final disposal locations. It is not possible to specify which transportation routes will be used as the locations of new power stations and geological disposal facilities are not currently known.

- F.34. The requirements for the safe transport of radioactive material by road, rail and sea stem from international agreements and European Directives. These requirements have been implemented in UK legislation setting out what types of transport package are allowed, how much radioactivity they are allowed to contain, and how they should perform against specified tests.¹³⁹ Regulation of the safety of radioactive material transport by road, rail and sea in Great Britain is carried out by the Department for Transport (DfT), HSE, the Office of Rail Regulation and the Maritime and Coastguard Agency. OCNS approval of carriers and transport plans will also be required where movement of nuclear material to the facility is involved.
- F.35. Security of radioactive waste storage and transport is kept under constant review by the regulators to ensure that facilities and practices remain robust. The NDA and any operators of new nuclear power stations will work with the environmental, safety and security regulators to ensure that they are all satisfied that these facilities and practices meet their strict requirements. The NDA and any operators of new nuclear power stations will consider the implications for waste transport to minimise movements of waste as far as possible.
- F.36. The transport of wastes from the power stations to interim storage could be minimised if the stores are co-located with the power stations, as the Base Case assumes¹⁴⁰. This would reduce risks of accidents and exposure to the public and the outside environment. However, on-site interim storage will not be mandatory and operators could put forward alternative proposals, such as

¹³⁸ Hughes, J. S, Roberts, D, Watson S.J July (2006) Review of Events Involving the Transport of Radioactive Materials in the UK, from 1958 to 2004 and their Radiological Consequences, HPA-RPD-014 and

Hughes, J.S and Harvey, M. P (2007) Radiological Consequences Resulting from Accidents and Incidents Involving the Transport of Radioactive Materials in the UK – 2006 Review, HPA-RPD-034.

¹³⁹ Defra, BERR and the Devolved Administrations for Wales and Northern Ireland (2008) Managing Radioactive Waste Safely, A Framework for Geological Disposal

¹⁴⁰ BERR, 2008, Consultation on Funded Decommissioning Programme Guidance for New Nuclear Power Stations, URN 08/637, Section 4

regional or central interim stores. Such proposals would be considered on their merits by the regulators and the Secretary of State.

Regulatory Control of Waste on Existing Nuclear Power Station Sites

F.37. There is currently a comprehensive regulatory regime in place for managing and transporting radioactive waste generated by existing nuclear power stations. The Health and Safety Executive (HSE) through its Nuclear Installations Inspectorate (NII) regulates nuclear safety under licences with conditions covering design, construction, operation, maintenance and decommissioning of nuclear facilities. The disposal of radioactive waste is regulated under the Radioactive Substances Act 1993 (RSA93). Radioactive gaseous, liquid or solid waste may only be disposed of or moved off the site in accordance with authorisations granted under RSA93. In England and Wales the regulator under RSA93 is the Environment Agency and in Scotland the regulator under RSA93 is the Scottish Environment Protection Agency (SEPA). The environment agencies are currently consulting on an update to their published Guidance on Requirements for Authorisation of geological and near-surface disposal facilities and are expected to publish the updated versions of both of these documents within the next year.

Regulatory control and management at the LLW Repository (LLWR) in Cumbria

F.38. The LLWR is the UK's national LLW disposal facility and is located on the West Cumbrian coast. It has operated as the principal national disposal facility for LLW since 1959. Prior to disposal in the engineered concrete vaults, the waste is compacted, containerised and grouted where possible.

F.39. Transportation of the waste to the site is by rail from Sellafield and by road from other UK nuclear facilities, hospitals, research establishments and other industries. Subject to the relevant authorisations and consents being obtained, the site could receive, treat and dispose of the UK's LLW until 2050, with final closure envisaged in 2059.¹⁴¹

F.40. All environmental discharges from the site are monitored. Environmental samples are regularly taken from locations on the site, and similarly, radioactivity is monitored at surrounding inland locations such as the Drigg Stream, River Irt, Drigg Village, local roads and Drigg Sand Dunes. There is no evidence of any abnormal levels of radioactivity associated with repository operations.¹⁴²

¹⁴¹ LLW Repository Ltd, <http://www.llwrsite.com/page/about-llw-repository/lifetime-strategy>

¹⁴² LLW Repository Ltd, <http://www.llwrsite.com/page/about-llw-repository/lifetime-strategy>

Consideration of Radioactive Waste in the SEA and other regulatory processes

- F.41. The White Paper on Nuclear Power made clear that it is the Government's policy that, before development consents for new nuclear power stations are granted, it will need to be satisfied that effective arrangements exist or will exist to manage and dispose of the waste the stations will produce. We currently expect the Nuclear NPS to set out whether the Government is satisfied that effective arrangements exist or will exist and we would then expect the SEA for the Nuclear NPS to take the relevant aspects of new build radioactive waste management into account at the strategic level.
- F.42. The Government's MRWS programme will provide a mechanism for identifying a suitable site(s) for construction of a geological disposal facility for higher activity radioactive waste. The process will explore the disposal of both new and legacy waste in the same geological disposal facility.
- F.43. In this study (in Sections 3-10) the potential impacts of interim storage of waste on site, transportation and final disposal of the waste have been explored although, at this stage, this is necessarily in the absence of details on location or design of the stations. We expect the Environmental Report in relation to the Nuclear NPS to take account of the fact that new nuclear power stations would create new radioactive waste.
- F.44. The Generic Design Assessment (GDA) process being undertaken by the nuclear regulators also involves consideration of the management of the waste that might be generated by the nuclear reactor designs that could be used in the UK. A broad conclusion of the preliminary assessment for those reactors is that, the amount of solid radioactive waste produced by such reactors would be comparable to the waste generated by comparable existing reactors around the world. Those designs should not lead to waste being produced that could not be disposed of.
- F.45. There is also a comprehensive environmental and safety regime that would have to be followed throughout the design, construction and operation of geological disposal facilities. The disposal of radioactive waste in such a facility will be subject to authorisation by the appropriate regulator under the Radioactive Substances Act 1993. The environment agencies are currently consulting on an update to its published Guidance on Requirements for Authorisation of geological disposal facilities and is expected to publish the updated version of this document within the next year.

Existing research and assessment of the management of radioactive waste

Overseas Research and Assessment

- F.46. There has been significant research undertaken at an international level as part of programmes to determine the suitability of geological disposal facilities for the disposal of various types of radioactive waste. Countries with experience in this field include Canada, Sweden, Finland and the USA. Underground investigations are underway in Sweden and Finland into geological disposal facilities for Spent Fuel following success in constructing facilities for ILW and LLW. In the USA a licence application has been submitted to construct a geological disposal facility to dispose of HLW and Spent Fuel.
- F.47. Examples of work that has been undertaken overseas to assess the safety and environmental impacts of geological disposal facilities include:
- The Final Disposal Facility for Spent Nuclear Fuel Environmental Impact Assessment Report – Posiva Oy – May 1999;
 - Feasibility studies for siting of a deep repository within different municipalities – Svensk Kambranslehantering – 1995, 1996, 2001;
 - Independent Assessment of Long-Term Management options for low and intermediate level wastes at Ontario Power Generation's Western Waste Management Facility – Golder Associates – February 2004;
 - Environmental Impact Statement for a Geologic Depository for the Disposal of Spent Nuclear Fuel and High – Level Radioactive Waste at Yucca Mountain Nevada – Department of Energy – February 2002 [NB. Supplementary Environmental Impact Assessment produced – 2007];
- F.48. Whilst these assessments provide useful information about the potential environmental effects of such facilities they are specific to the conditions and circumstances at each particular site and that particular country. However, it is possible for emerging experience in the UK to build upon that developed in other countries.
- F.49. Further experience in the development of geological disposal facilities are outlined in:
- Managing Radioactive Waste Safety: Literature Review of International Experience of Community Partnerships – NDA – 2007;
 - Nuclear Decommissioning Authority, "National Policies on the Long-term Management of Higher Activity Wastes", April 2008.

UK Research and Assessment

- F.50. Prior to the study undertaken by CoRWM, in 2003, Nirex published a series of

reports presenting a Phased Disposal Concept¹⁴³ for the long-term management of the UK's ILW, and certain types of LLW that are unsuitable for near surface disposal. The concept envisaged the emplacement of wastes in a facility constructed at depth within suitable host geology. The concept presented was generic and not specific to any one location or type of geology. The concept was set out in a series of documents covering the design and safety of the disposal facility and its operation, its supporting transport arrangements and the arrangements for its eventual closure.

F.51. Subsequent to the publication of these documents Nirex/the Nuclear Decommissioning Authority (NDA) undertook an indicative assessment of the non-radiological impacts of the key stages of the Phased Disposal Concept. This included the publication of the following documents:

- Non-Radiological Environmental Assessment of the Nirex Phased Disposal Concept. Stage 1: Generic Concept Design Assessment, Part 1: Scoping Report January 2005.
- Facilitating Change (2005) Non-Radiological Environmental Assessment Workshop, 23rd February, 2005.
- Non-Radiological Environmental Assessment of the Nirex Phased Disposal Concept. Stage 1: Generic Concept Design Assessment, Part 1: Scoping Report Annex D; Position Statement Following Preview Workshop. March 2005.
- Non-Radiological Environmental Assessment of the Nirex Phased Geological Disposal Concept. Stage 1: Generic Concept Design Assessment Characterisation Report. March 2007.
- Non-Radiological Environmental Assessment of the Nirex Phased Geological Disposal Concept. Stage 1: Generic Concept Design Assessment. Assessment Report. March 2007.

F.52. While the above assessments were generic, they have identified some of the potential effects associated with the development of a geological disposal facility at a high level. Potential effects may include:

- Effects on landscape, visual amenity and land use
- Effects on historic or archaeological features and their setting
- Excavation of significant quantities of geological material
- Effects on the surrounding geological resource and soil resource
- Changes to water resources and the patterns of groundwater distribution and flow
- Effects on biodiversity resources and habitats

¹⁴³ Nirex (July 2003) Nirex Report N/074, Generic Repository Studies, The Nirex Phased Disposal Concept.

- Effects on the road and rail networks associated with the delivery of the waste, materials and staff to the geological disposal facility site e.g. increased traffic on roads used to access the site.
- Effects on air quality and climate change
- Noise effects on people living in the vicinity of the geological disposal facility
- Employment benefits during all phases of the geological disposal facility's life and the potential for wider multiplier effects
- Radiological and non-radiological health and safety risks during all phases of the geological disposal facility's life
- Accidents risks associated with the transport of the waste to the geological disposal facility site

F.53. The list of effects presented above is indicative rather than exhaustive.

