

**Report on the Review of the
Nuclear National Policy
Statement of the UK**



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Expert Statement

**REPORT ON THE REVIEW OF THE NUCLEAR
NATIONAL POLICY STATEMENT OF THE UK
AND ASSOCIATED DOCUMENTS IN THE
FRAME OF TRANSBOUNDARY STRATEGIC
ENVIRONMENTAL ASSESSMENT PROCEDURE**

Ordered by the
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EXECUTIVE SUMMARY

To support the Low Carbon Transition Plan and the implementation of new energy generating capacity, the UK Government has embarked on fundamental reform of the planning system for nationally significant infrastructure. Under this system, development consent for nationally significant infrastructure will be administered by a new independent body, the Infrastructure Planning Commission (IPC).

Six National Policy Statements, one general and five technology specific, have been developed and submitted for public consultation. A number of support studies and assessments were performed to sustain the proposed course of development. These documents were published together with the draft NPSs as part of the consultation process conducted before Parliamentary scrutiny and formal approval by the Government of the NPSs. The consultation will close on Monday 22nd February 2010.

The Appraisal of Sustainability (AoS), incorporating Strategic Environmental Assessment (SEA), of the draft Nuclear National Policy Statement (Nuclear NPS) was undertaken by the UK's Department of Energy and Climate Change at a strategic level. The AoS considers the effects of the proposed policy at a national level and the sites to be assessed for their suitability for the deployment of new nuclear power stations by 2025.

The Appraisal of Sustainability in its strategic site assessment considers the following sites as potentially suitable for building the new NPPs in UK by 2025:

- Bradwell
- Braystones
- Hartlepool
- Heysham
- Hinkley Point
- Kirksanton
- Oldbury
- Sellafield
- Sizewell
- Wylfa



All sites considered for the construction of new NPPs by 2025 were evaluated using the same methodology which considered the following sustainable development themes:

- Air Quality
- Biodiversity and Ecosystems
- Climate Change (cross-cutting)
- Communities: Population, Employment and Viability
- Communities: Supporting Infrastructure
- Human Health and Well-Being
- Cultural Heritage
- Landscape
- Soils, Geology and Land Use
- Water Quality and Resources
- Flood Risk
- Radioactive and associated hazardous waste (cross-cutting)

One of the nominated sites, Dungeness, did not pass the discretionary criteria on biodiversity and there were concerns about flood risk and coastal processes.

The UK Government also commissioned an Alternative Sites Study to ensure that potential alternative sites were given due consideration. Three sites were identified through this process; Druridge Bay, Kingsnorth, and Owston Ferry. After further assessment the UK Government decided that none of these three sites should be considered as reasonable alternatives to the sites that have been nominated, and therefore should not be included in the draft Nuclear NPS. This is because the UK Government considers that these sites are not credible for deployment by the end of 2025.

The potential effects of new NPPs are different for different NPP life stages: construction, operation and decommissioning, however almost all of them are of local nature.

The AoS has identified that the potential for transboundary effects from any accidental release of radioactive emissions from the NPP site has a potentially strategic effect on sustainability. However, it is noted that there is a very low risk of such an event occurring. Prevention measures include existing risk assessment and regulatory processes. The HSE/NII will need to be satisfied that the radiological and other risks to the public associated with accidental releases of radioactive substances are as low as reasonably practicable and within the relevant radiological risk limits.

As for the climate change, its impact is assessed as positive because the operation of new NPPs will lead to the reduction of greenhouse gases emission to the atmosphere and will help UK to achieve its low carbon emission targets.

Based on scientific consensus and international experience, it is reasonable to conclude that, despite some differences in characteristics, waste and spent fuel from new nuclear build would not raise such different technical issues compared with nuclear waste from legacy programmes as to require a different technical solution.

Although the progress of research and work on planning, designing and constructing a Geological Disposal Facility worldwide is taken into consideration, there is not, up to date, a GDF in operation anywhere in the world. The feasibility of the technological solution is yet to be ascertained from the practical point of view of realisation and operation, as well as its timely availability to accommodate the waste generated by the new NPPs in UK.

The information provided in the draft Nuclear National Policy Statement for the consideration of the Infrastructure Planning Commission constitutes adequate guidance for making an informed and correct decision.

The impact assessments performed are comprehensive and systematic, and the results of these assessments are properly reflected in the draft Nuclear NPS. A certain extent of uncertainty at this strategic level cannot be eliminated, however adequate measures are taken for both the impacts and the potential mitigation options to be more thoroughly studied at the project level.

While it is believed that the possibility for transboundary effects of accidental radiation releases to be felt in Austria is remote, at this point of the process it cannot be completely excluded.

ZUSAMMENFASSUNG

Zur Unterstützung des 'Low Carbon Transition Plan' und der damit verbundenen Errichtung neuer Energieerzeugungsanlagen hat die Britische Regierung eine grundlegende Reform des Planungssystems für die national bedeutende Infrastruktur in Angriff genommen. Nach diesem System wird die Genehmigung dieser Infrastruktur durch eine neue unabhängige Stelle, die 'Infrastructure Planning Commission' (IPC), verwaltet.

Sechs nationale politische Erklärungen ('National Policy Statements', NPSs), eine allgemeine und fünf technologie-spezifische, wurden entwickelt und zur öffentlichen Konsultation vorgelegt. Zur Unterstützung des vorgeschlagenen Entwicklungsplans wurden eine Reihe von ergänzenden Studien und Bewertungen durchgeführt. Diese Dokumente wurden zusammen mit dem Entwurf der NPSs im Verlauf des Anhörungsprozesses, der vor der parlamentarischen Überprüfung und der formalen Genehmigung der NPSs durch die Regierung erfolgt, veröffentlicht. Die öffentliche Konsultation endet am Montag, 22. Februar 2010.

Das britische Ministerium für Energie und Klimawandel (Department of Energy and Climate Change) führte eine 'Beurteilung der Nachhaltigkeit' ('Appraisal of Sustainability', AoS) des Entwurfs des Nuclear NPS unter Einbeziehung einer 'Strategischen Umweltprüfung' ('Strategic Environmental Assessment', SEA) auf strategischer Ebene durch. Das AoS berücksichtigt die Auswirkungen der vorgeschlagenen Maßnahmen auf nationaler Ebene ebenso wie die Bewertung jener potenziellen Standorte, die für den Bau neuer Kernkraftwerke (KKW) bis zum Jahr 2025 vorgeschlagen wurden.

Die strategische Standortbewertung der AoS berücksichtigt die folgenden potenziell für den Bau neuer KKW in GB bis 2025 geeigneten Standorte:

- Bradwell
- Braystones
- Hartlepool
- Heysham
- Hinkley Point
- Kirksanton
- Oldbury
- Sellafield
- Sizewell
- Wylfa



Alle Standortkandidaten wurden unter Verwendung derselben Methodik evaluiert, die die folgenden Themen nachhaltiger Entwicklung berücksichtigte:

- Luftqualität
- Artenvielfalt and Ökosysteme
- Klimawandel (Querschnittsthemen)
- Gemeinden: Bevölkerung, Beschäftigung und Lebensqualität
- Gemeinden: Unterstützende Infrastrukturen
- Gesundheit und Wohlbefinden der Menschen
- Kulturerbe
- Landschaft
- Böden, Geologie und Landnutzung
- Wasserqualität und Ressourcen
- Überflutungsrisiken
- Radioaktive und verwandte Risikoabfälle (Querschnittsthemen)

Dungeness, einer der potenziellen Standorte, erfüllte die vorgegeben Kriterien bezüglich Beeinträchtigung der Artenvielfalt nicht. Zusätzlich gab es Bedenken hinsichtlich der möglichen Gefahren durch Überflutungen und Veränderungen in der Küstenregion (z. B. Hydrodynamik, Sedimenttransport etc.).

Die britische Regierung gab auch den Auftrag zu einer 'Alternative Sites Study', um sicherzustellen, dass potenzielle alternative Standorte gebührend berücksichtigt werden. Durch diesen Prozess wurden drei Standorte identifiziert: Druridge Bay, Kingsnorth und Owston Ferry. Nach einer weiteren Prüfung wurde beschlossen, dass keiner dieser drei Standorte als vernünftige Alternativen zu den bereits nominierten Standorten in Betracht gezogen werden kann und diese daher nicht in den Entwurf des Nuclear NPS aufgenommen werden sollten. Die Begründung dafür ist, dass nach Ansicht der britischen Regierung die erforderliche Entwicklung dieser Standorte nicht bis Ende 2025 abgeschlossen werden kann.

Die potenziellen Auswirkungen von neuen KKW sind, je nach Betriebsphase wie Errichtung, Betrieb und Stilllegung, unterschiedlich, jedoch sind fast alle nur von lokaler Bedeutung.

Das AoS hat festgestellt, dass das Potenzial für grenzüberschreitende Auswirkungen einer unbeabsichtigten Freisetzung von radioaktiven Emissionen aus einem KKW mögliche strategische Effekte auf die Nachhaltigkeit hat. Das Risiko, dass solch ein Ereignis eintritt, ist jedoch sehr gering. Vorbeugende Maßnahmen umfassen bestehende Risikobewertungen und regulatorische Vorgänge. Die HSE/NII (Health and Safety Executive/Nuclear Installations Inspectorate) wird davon überzeugt werden müssen, dass das radiologische Risiko und andere Risiken für die Öffentlichkeit in Verbindung mit der unbeabsichtigten Freisetzung von radioaktiven Stoffen so niedrig wie möglich sind und innerhalb der jeweiligen radiologischen Risikogrenzen bleiben.

Bezüglich Klimawandel: der Betrieb von neuen KKW wird als positiv betrachtet, da er zur Reduktion von Treibhausgasausstoß in die Atmosphäre führt und somit Großbritannien hilft, seine niedrigen CO₂-Emissionsziele zu erreichen.

Wissenschaftlicher Konsens und internationale Erfahrung lassen erwarten, dass, trotz einiger Unterschiede in ihren Eigenschaften, für Abfälle und abgebrannte Brennelemente neuer Kernkraftwerke im Vergleich zum Atommüll aus existierenden KKW keine anderen technischen Probleme zu erwarten sind, die neue technische Lösung verlangen.

Derzeit ist weltweit, auch unter Berücksichtigung der Fortschritte in der Forschung und der Arbeiten bezüglich Planung, Konstruktion und Bau eines geologischen Tiefenlagers (GDF), kein GDF in Betrieb. Die Machbarkeit einer technischen Lösung hinsichtlich Realisierung und Betrieb muss aus der praktischen Sicht erst nachgewiesen werden. Dies trifft auch auf die rechtzeitige Verfügbarkeit eines GDF für die Unterbringung der durch die neuen Kernkraftwerke in Großbritannien erzeugten Abfälle zu.

Die Information, die der Infrastrukturplanungs-Kommission mit dem Entwurf des Nuclear NPS zur Verfügung gestellt wird, bietet eine angemessene Grundlage für sachkundige und ordnungsgemäße Entscheidungen.

Die durchgeführten Folgenabschätzungen sind umfassend und systematisch. Die Resultate werden im Entwurf des Nuclear NPS sachgemäß beschrieben. Ein gewisser Grad an Unsicherheit kann auf dieser strategischen Ebene nicht ausgeschlossen werden, jedoch werden geeignete Maßnahmen dafür getroffen, die genauere Untersuchung der Auswirkungen und der Optionen zur Schadensbegrenzung auf der Projekt-Ebene zu ermöglichen.

Die Möglichkeit für grenzüberschreitende Auswirkungen durch unbeabsichtigte Strahlungsfreisetzung mit spürbaren Auswirkungen auf Österreich erscheint gering, kann zu diesem Zeitpunkt jedoch nicht völlig ausgeschlossen werden.

1 INTRODUCTION

1.1 Background

To support the Low Carbon Transition Plan and the implementation of new energy generating capacity, the UK Government has embarked on fundamental reform of the planning system for nationally significant infrastructure. Under this system, development consent for nationally significant infrastructure will be administered by a new independent body, the Infrastructure Planning Commission (IPC).

National Policy Statements (NPSs) lie at the centre of the new regime. They will be the primary consideration for the IPC when it makes decisions on applications for development consent. The UK Government currently envisages that there will be 12 National Policy Statements, covering major infrastructure for energy, transport, waste, water and waste water, out of which 6 were drafted and submitted to public consultation:

- The draft Overarching National Policy Statement for Energy (EN-1)
- The draft National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)
- The draft National Policy Statement for Renewable Energy Infrastructure (EN-3)
- The draft National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)
- The draft National Policy Statement for Electricity Networks Infrastructure (EN-5)
- The draft National Policy Statement for Nuclear Power Generation (EN-6)

A number of support studies and assessments were performed to sustain this proposed course of development. These documents were published together with the draft NPSs as part of the consultation process conducted before Parliamentary scrutiny and formal approval by the Government of the NPSs. The consultation will close on Monday 22nd February 2010.

A Consultation Document was also published by the UK Government, providing guidance for the process in the form of relevant questions to be answered by the concerned parties in order to collect their views on the subject matter.

Figure 1¹ presents the process for Nuclear NPS as it took place until present and its following stages up to the decision on construction start.

¹ <https://www.energy-nps-consultation.decc.gov.uk/home/diagram/>, Annex D of the Consultation Document

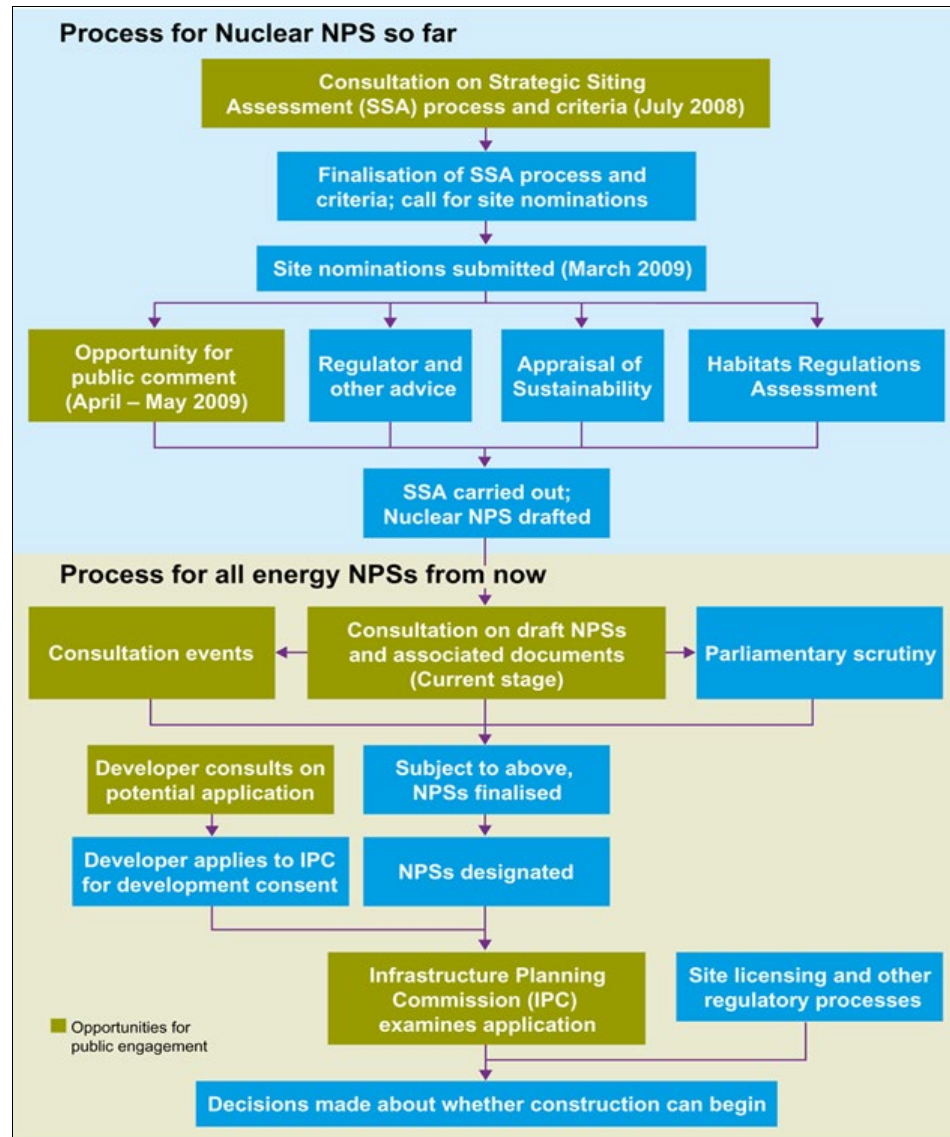


Figure 1: Process for Nuclear NPS

1.2 Objective and scope of the project

The objective of the project is to provide the expert opinion addressing the potential transboundary risks, from the Austrian point of view, pertaining to the future development and use of nuclear energy in UK, as proposed in the National Policy Statements and their supporting documents.

The focus of the review should be on the aspects which address potential transboundary effects in case of nuclear accidents, providing an expert opinion on the adequacy of:

- the UK process as a basis for decision making for the IPC, both procedural and content-wise
- addressing and providing sufficient details on the location related risks of the ten potential sites for new nuclear power plants defined in the NPS on nuclear energy, from the point of view of potential transboundary consequences.

It has to be noted that a scoping study for the SEA has been performed and submitted to public consultation in March 2008, and thus, the assessment of compliance of the UK process with the EU Directive 2001/42/EC from the point of view of process design has already been completed. As such, the process implementation is the only consideration to be made at this stage.

1.3 Implementation of the project

To achieve the above mentioned objective, and provide the answer to the relevant questions in the Consultation Document published as guidance by the UK Government, the Consultant examined the set of NPS's and supporting documents identified in the invitation to tender and in the technical proposal submitted for this tender:

- Draft Overarching National Policy Statement for Energy (EN-1)
- Appraisal of Sustainability of the Draft National Policy Statements for:
 1. Overarching Energy (EN-1)
 2. Fossil Fuel Electricity Generating Infrastructure (EN-2)
 3. Renewable Energy Infrastructure (EN-3)
 4. Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)
 5. Electricity Networks Infrastructure (EN-5)
 Non-Technical Summary and sections of the Main Report as relevant for the technical examination of EN-1
- Redpoint Modelling – Implementation of the EU 2020 Renewable Target in the UK Electricity Sector
- Draft National Policy Statement for Nuclear Power Generation (EN-6)
- Appraisal of Sustainability of the Draft Nuclear National Policy Statement (Non- Technical Summary, Main Report, Main Report Appendices)
- Appraisals of Sustainability for the 11 sites considered in the Strategic Site Assessment and 3 sites the Alternative Sites Study considered worthy of further consideration, in total 14 Site Reports, their Appendices and corresponding Maps
- Appraisal of Sustainability: Radioactive and Hazardous Waste
- The Arrangements for the Management and Disposal of Waste from New Nuclear Power Stations: A Summary of Evidence
- Consultation on draft National Policy Statements for Energy Infrastructure (“Consultation Document”)

A number of other documents were consulted during the review for corroboration of the statements, justifications and assessments review. These are referenced throughout the text where applicable.

Based on the review findings the answers to consultation questions were elaborated.

1.4 Structure of the report

This report is not to summarize the very large volume of information included in the documents reviewed, as this task is very well accomplished by the executive summaries of those documents, but rather to highlight certain aspects which have been found relevant for the review and for providing the answer to the consultation questions in the last section of this report.

Section 2 of the report presents each of the reviewed documents in terms of their objectives, relevant aspects in their contents and review findings.

Section 3 of the report presents the proposed answers to the consultation questions.

2 TECHNICAL EXAMINATION OF DOCUMENTATION

2.1 Structure and scope of documentation

The consultation seeks views on the six draft National Policy Statements for energy infrastructure:

- The draft Overarching National Policy Statement for Energy (EN-1)
- The draft National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)
- The draft National Policy Statement for Renewable Energy Infrastructure (EN-3)
- The draft National Policy Statement for Gas Supply Infrastructure and Gas and Oil Pipelines (EN-4)
- The draft National Policy Statement for Electricity Networks Infrastructure (EN-5)
- The draft National Policy Statement for Nuclear Power Generation (EN-6)

The draft Overarching NPS for Energy (EN-1) sets out the Government's energy policy, explains the need for new energy infrastructure and instructs the IPC on how to assess the impacts of energy infrastructure development in general. The other draft energy NPSs contain supplementary information for specific types of infrastructure.

The draft Nuclear NPS (EN-6) differs from the other draft technology-specific energy NPSs in that it also lists sites that the Government has judged to be potentially suitable for the deployment of new nuclear power stations by the end of 2025. The list of sites in the draft Nuclear NPS is the output from the Government's Strategic Siting Assessment (SSA) process. The draft Nuclear NPS also sets out the Government's preliminary conclusion that it is satisfied that effective arrangements will exist to manage and dispose of the waste that will be produced by new nuclear power stations in the UK.

Appraisals of Sustainability and Habitats Regulations Assessments have been carried out in relation to the draft energy NPSs. Appraisals of Sustainability (AoS) are required by the Planning Act and are intended to help to ensure that NPSs take account of environmental, social and economic considerations, with the objective of contributing to the achievement of sustainable development. The aim of the Habitats Regulations Assessments (HRA) is to assess the implications of NPSs for protected habitats.

In addition to the draft Nuclear NPS, and the Appraisal of Sustainability and Habitats Regulations Assessment reports, the UK Government also published other documents related to the Strategic Siting Assessment and the management and disposal of radioactive waste.

The table overleaf summarises the content and purpose of each document associated with the consultation on the draft Nuclear NPS which makes the subject of this review.

Document name	Content and purpose
Draft Overarching Energy NPS (EN-1)	<p>Sets out the Government’s energy policy, explains the need for new energy infrastructure and instructs the IPC on how to assess the impacts of energy infrastructure development in general.</p> <p>Will be used by the IPC. Includes information on:</p> <ul style="list-style-type: none"> ● Government policy and energy infrastructure (Part 2) ● Need for new energy infrastructure (Part 3) ● Assessment principles and generic impacts (Part 4)
Appraisal of Sustainability for the Draft NPSs EN-1 to EN-5	<p>Informs the development of the draft Overarching Energy NPS (EN-1) and the draft NPSs for fossil fuels, renewables, gas supply and gas and oil pipelines, and electricity networks (EN 2-5). Includes:</p> <ul style="list-style-type: none"> ● A Non-Technical Summary, which is also available separately; ● An explanation of the AoS process and methods; ● A discussion of the alternatives to the draft NPSs; ● An appraisal of the sustainability and environmental impacts of the proposals in the draft NPSs; ● Key recommendations; and ● Information on monitoring of significant effects.
Draft National Policy Statement for Nuclear Power Generation (EN-6)	<p>Will be used by the IPC. Includes information on:</p> <ul style="list-style-type: none"> ● Need for new nuclear power stations (Part 2) ● Policy and regulatory framework (Part 3) ● Assessment of arrangements for the management and disposal of waste from new nuclear power stations (Part 3) ● Impacts of new nuclear power stations and potential ways to mitigate them (Part 4) ● Sites that the Government considers to be potentially suitable for new nuclear power stations (Part 5)
Appraisal of Sustainability (AoS) of the draft Nuclear National Policy Statement: Main Report	<p>Informs the draft Nuclear NPS, to ensure it meets the requirements of sustainable development.</p> <p>Includes a Non-Technical Summary, which is also available separately, explanation of the AoS process and methods, and key recommendations.</p>
Appraisal of Sustainability – Site Reports (x14)	<p>AoS site reports for each of the 11 sites nominated into the Strategic Siting Assessment process, and for the three sites that the Alternative Sites Study considered worthy of further consideration.</p>
Appraisal of Sustainability – Technical Appendices (x14)	<p>Technical appendices containing baseline data and evidence used for the AoS on each of the 11 nominated sites, and for the three sites that the Alternative Sites Study considered worthy of further consideration.</p>
The arrangements for the management and disposal of waste from new nuclear power stations: a summary of evidence	<p>Further background information on the evidence that the Government has considered in assessing the arrangements for the management and disposal of waste from new nuclear power stations.</p>
Consultation document	<p>Describes background, context and purpose of the consultation on the six draft energy NPSs (EN 1-6). Includes consultation questions and explains how to respond. Chapter 5 focuses on the draft Nuclear NPS and associated documents. Also includes:</p> <ul style="list-style-type: none"> ● Wider context for draft Nuclear NPS; ● Site summaries for Druridge Bay, Kingsnorth and Owston Ferry; and ● Explanation of preliminary conclusion on arrangements for the management and disposal of waste from new nuclear power stations (Annex G)

2.2 Overarching National Policy Statement for Energy (EN-1)

2.2.1 2.2.1 Objective

This National Policy Statement sets out UK's national policy for the energy infrastructure. It has effect, in combination with the relevant technology-specific NPS, on the decisions by the Infrastructure Planning Commission (IPC) on applications for energy developments that fall within the scope of the NPSs. For such applications, this NPS, when combined with the relevant technology-specific energy NPS provides the primary basis for decisions by the IPC.

2.2.2 Contents

EN-1 covers:

- the high-level objectives, policy and regulatory framework for new energy infrastructure consistent with sustainable development and the Government's policies on mitigating and adapting to climate change;
- the need and urgency for new energy infrastructure and the social and economic benefits of meeting that need;
- the need for specific technologies, including the infrastructure covered by this NPS;
- the key principles to be followed in the consideration and examination of applications;
- the role of the Appraisal of Sustainability (AoS) and its outcome in relation to the suite of energy NPSs;
- policy on good design, climate change adaptation and other matters relevant to more than one technology specific NPS; and
- the assessment and handling of generic impacts that are not specific to particular technologies.

The need for new energy infrastructure is established in the draft Overarching Energy NPS both in general terms, by looking at the need for energy supply and a diverse mix of electricity generation, and in terms of the need for specific types of energy infrastructure.

The need for new energy infrastructure – about 60 GW of net capacity by 2025 – realized by a mix of both renewable and non-renewable sources and various technologies is justified with reference to various supporting studies. Among them, the Redpoint modelling² assessed the suitability of different financial support schemes in delivering a major expansion of renewable electricity generation in the UK consistent with the overall EU renewable energy targets for 2020, but it also considered, in a sensitivity study, the assumption that there is no new investment in nuclear prior to 2030, the key aim of this sensitivity analysis being to understand the impact on investment in new nuclear on investment in renewables. The study concluded that investment in new nuclear capacity has only a limited impact on investment in renewables, when nuclear build is disallowed,

² Implementation of EU 2020 Renewable Target in the UK Electricity Sector: Renewable Support Schemes, A report for the Department of Business, Enterprise and Regulatory Reform, Redpoint Energy Limited, June 2008

other new thermal capacity (Combined Cycle Gas Turbines (CCGT), Advanced Supercritical Coal plants (ASC) + Carbon Capture and Storage (CCS)) is built instead, preventing new nuclear build has a significant net welfare disbenefit because nuclear has a lower Long Run Marginal Cost (LRMC) than the other thermal technologies which are built instead, and that the increase in carbon dioxide emissions due to disallowing nuclear is up to 20 mtCO₂/annum.

The need and urgency for nuclear power in the mix of energy sources is further detailed in the Nuclear NPS and discussed in Section 2.4.2 of this report.

The Government concludes that the IPC should start its assessment of applications for infrastructure covered by the energy NPSs on the basis that need has been demonstrated, and that the IPC does not need to consider the relative advantages of one technology over another given the Government's view that companies should be permitted to determine the individual projects to bring forward within the strategic framework set by the Government, taking account of the clear benefits of a diverse energy mix.

The **assessment principles** presented as guidance for the IPC in part four of the document are general ones. In considering an application for development consent, the IPC should focus on whether the development itself is acceptable, and on the impacts of that development, rather than the control of processes (for example focus on whether the development itself is an acceptable use of the land, and on the impacts of that use, rather than the control of processes, emissions or discharges themselves). The IPC should work on the assumption that the relevant regulatory regimes (environment, pollution, safety, security, etc.) will be properly applied and enforced. It should act to complement but not seek to duplicate these regulatory regimes.

The **generic impacts** section covers the generic impacts relevant to any energy infrastructure, whatever the type. The technology-specific NPSs provide more detail on these impacts specific to the technology in question and address some impacts not covered in this NPS. For the nuclear energy these impacts are detailed in the EN-6 (see Section 2.4 of this report).

The generic impacts common to all energy infrastructure developments considered in the Overarching NPS are:

- air emissions
- biodiversity and geological conservation
- civil and military aviation and defence interests
- coastal change
- dust, odour, artificial light, smoke, steam and insect infestation
- flood risk
- historic environment
- landscape and visual impacts
- land use including open space, green infrastructure & green belt
- noise
- socio-economic
- traffic and transport impacts
- waste management
- water quality and resources

The focus of this Overarching NPS when presenting the guidance on generic impacts is on the impacts of the site/development on the environment. The impacts of the environment on the site/development are considered in the technology specific NPSs.

2.2.3 Review findings

The Overarching NPS for Energy (EN-1) provides the general Government policy for developing the UK's energy sector and the framework for the more detailed provisions of the technology specific NPSs. This NPS takes adequately into account the results of the appraisal for sustainability performed to inform it, as required by the SEA Directive and the guidance issued by the European Commission for the implementation of this directive^{3,4}. For further details on how this NPS is informed by its AoS see Section 2.3 of this report.

2.3 Appraisal of Sustainability for the draft Overarching Energy NPS (EN-1) and the four draft non-nuclear NPSs (EN 2-5)

Although the appraisal of sustainability for the EN-1 is published by the UK Government as part of the same document as the AoSs for EN-2 to EN-5 for fossil fuels, renewables, gas supply and gas and oil pipelines, and electricity networks, the EN-1 AoS is a stand-alone assessment. The other four AoSs have been included in the same document in order to avoid the repetition of the baseline information which was used for all of them. As such, the AoS for EN-1 is relevant when reviewing the Nuclear NPS, as EN-1 is the umbrella policy for the Nuclear NPS. The other four technology specific NPSs and their appraisals for sustainability are distinct policies and assessments elaborated for different energy technologies than nuclear and do not present interest for this review and as such, this section of the report will refer only to AoS for the EN-1.

2.3.1 Objective

The objective of this AoS is to identify, describe and evaluate the environmental, social and economic effects of the proposed energy policy, examining alternative options and weighing up their benefits and drawbacks, risks and uncertainties, and possibly modify this policy in accordance with the appraisal findings, before making the decision of adopting it.

³ Directive 2001/42/EC of the European Parliament and of the Council, of 27 June 2001, on the assessment of the effects of certain plans and programmes on the environment, Annex I

⁴ Implementation of Directive 2001/42 on the Assessment of the Effects of Certain Plans and Programmes on the Environment, Commission's Guidance on the implementation of Directive 2001/42/EC on the assessment of the effects of certain plans and programmes on the environment, http://ec.europa.eu/environment/eia/pdf/030923_sea_guidance.pdf

The SEA Directive provides a list of “issues” on which the effects have to be considered: 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; it also defines the type of effects to be considered: secondary, cumulative, synergistic, short, medium and long-term permanent and temporary, positive and negative effects.

For this AoS a set of 14 objectives has been developed, which cover, as shown in the Table 2 (page xii of the AoS), all the above mentioned issues listed by the SEA.

2.3.2 Contents

The introductory part of the AoS report gives an overview of the EN-1, presents the context of the appraisal and explains how to respond to the consultation.

The four alternatives which have been considered are also presented in this section:

1. No NPS – the effects of No NPS mean the effects of constructing energy infrastructure under a business as usual scenario where there is no NPS to set the framework for development consents;
2. An NPS that only set out high level Government energy policy;
3. An NPS that a) set out high level Government energy policy and b) defined, through generic criteria, types of locations which are unlikely (and/or likely) to be suitable for energy developments;
4. An NPS that a) set out high level Government energy policy, b) defined, through generic criteria, types of locations which are unlikely (and/or likely) to be suitable for energy developments, and c) set out guidance on how impacts of energy developments could be avoided or mitigated.

Part three of the AoS report presents the methodology of the appraisal.

The 14 appraisal objectives referred to in Section 2.3.1 above have been, besides incorporating the SEA Directive issues, informed by the examination of the baseline information, the review of other plans and programs, and by the comments received during the consultation on the Scoping Report⁵. The objectives present the preferred environmental, economic or social outcome which typically involves minimising detrimental effects and enhancing positive effects where relevant.

Guide questions have been developed for each of the objectives that provided a detailed framework against which the NPS has been appraised.

⁵ Consultation on Strategic Environmental Assessment Scoping Report for the proposed national policy statement for new nuclear power, March 2008, Department for Business Enterprise & Regulatory Reform

This appraisal of the NPS has been undertaken in a topic by topic manner, with the NPS tested against the AoS objectives and guide questions. The results of the appraisal are presented in terms of:

- the nature and scale of the potential effect (what is expected to happen) and any specific reference to the potential effect on sensitive environmental aspects
- when the effect could occur (timing)
- outline of mitigation measures for potentially significant negative effects or where options for enhancement have been identified
- assumptions and uncertainties in the appraisal
- additional information required to address uncertainties or information that will be required for the next tier of appraisal
- cross-referencing between topic areas.

In predicting effects, changes to the baseline which would occur as a result of the NPS were identified. These changes were then described (where possible) in terms of their geographic scale, the timescale over which they could occur, whether the effects would be temporary or permanent, positive or negative, likely or unlikely, frequent or rare and whether or not they are secondary, cumulative or synergistic. In most of the cases quantitative information was not available for use in the predictions. Where this has been the case, the prediction of effects was based on professional judgement and with reference to relevant legislation and regulations.

Part four of the AoS presents the appraisal results for each of the objectives. These results are summarized in Table 1 below.

Recommendations for monitoring measures and the next steps of the process are presented at the end of the report.

The Annexes include the review of plans and programs, the baseline information, the response to the scoping consultation and quality assurance checklists.

The conclusion of the AoS is that the Overarching NPS is envisaged to have a significant positive effect at the national policy level, by contributing to the delivery of a low carbon economy and security of supply.

Table 1: Results of the AoS for Overarching NPS

AoS objective (topic)	NPS effects on the objective
1. Climate change: To minimise detrimental effects on the climate from greenhouse gases and ozone depleting substances and maximise resilience to climate change.	Minor positive effects
2. Ecology (Flora and Fauna): To protect and enhance protected habitats, species, valuable ecological networks and ecosystem functionality.	Uncertain effects
3. Material assets and raw materials: To promote the sustainable use of resources and natural assests and to deliver secure, clean and affordable energy.	Significant positive effects
4. Economy and skills: To promote a strong and stable economy with opportunities for all.	Significant positive effects
5. Flood risk: To avoid an increase in flood risk (including coastal flood risk) and avoid siting flood sensitive infrastructure in areas of high flood risk.	No overall effect
6. Water quality and resources: To protect and enhance surface (including coastal) and ground water quality (including distribution and flow).	No overall effect
7. Traffic and transport: To minimise the detrimental impacts of travel and transport on communities on the environment whilst maximising positive effects.	No overall effect
8. Noise: To protect both human and ecological receptors from disturbing levels of noise.	No overall effect
9. Landscape, townscape and visual: To protect and enhance landscape quality, townscape quality and to enhance visual amenity.	No overall effect
10. Archaeology and cultural heritage: To protect and where appropriate enhance historic environment including heritage resources, historic buildings and archaeological features.	No overall effect
11. Air quality: To protect and enhance air quality on local, regional, national and international scale.	No overall effect
12. Soil and geology: To promote the use of brownfield land and, where this is not possible, to prioritise the protection of geologically important sites and agriculturally important land.	No overall effect
13. Health and well-being: To protect and enhance the physical and mental health of the population.	No overall effect
14. Equality: To encourage equality and sustainable communities.	No overall effect

2.3.3 Review findings

The AoS has been performed in a very systematic and comprehensive manner, making use of a combination of methods and sources of information, according to the state-of-the-art knowledge on the subject matter and considering all the EC and national guidance for the evaluation.

The comprehensiveness of the AoS and openness to all interested parties is visible. Evidence on the appraisal and on the quality assurance process applied to the appraisal is presented, showing that the best quality assurance practice was utilised both during appraisal and for the development of all associated documents.

The findings and conclusions of the appraisal are fully reflected in the Overarching NPS.

2.4 National Policy Statement for Nuclear Power Generation (EN-6)

Unlike the NPSs for fossil fuels, renewables, gas supply and oil pipelines and electricity networks (EN-2 to EN-5), the particularity of the Nuclear NPS is that it includes a list of suitable locations for nuclear energy developments. This approach is being proposed following its evaluation and the evaluation of other three possible approaches (see Section 2.5).

The Nuclear National Policy Statement is structured in five parts addressing the role of this policy in the UK's new planning system, the Government's policy on new nuclear power generation capacity, justifying the need and urgency for launching the new nuclear projects, policy guidance on the interaction between the regulatory and planning regimes, guidance for the IPC when considering nuclear specific impacts and siting issues and finally, summaries of analyses and conclusions drawn against the SSA criteria for each of the 10 sites found suitable for new NPPs.

Each of these five parts is discussed in more details in the following subsections, with focus on the aspects of relevance for the Umweltbundesamt. These relevant aspects are taken into discussion again in Section 2.5, "Review of the Appraisal of Sustainability of the Draft Nuclear National Policy Statement (EN-6)", where the assessments and conclusions of the UK Government are reviewed.

2.4.1 Objective

The objective of the draft Nuclear NPS is to provide the primary basis for planning decisions by the IPC on applications for development consent for a new nuclear power station. It sets out the role of nuclear power and the key features of relevant planning policy in which applications for new nuclear power stations should be considered. It describes the nominations and the Strategic Siting Assessment (SSA) process and includes a list of sites that have been assessed to be potentially suitable for new nuclear power stations, reducing the need for the IPC to consider alternative sites and helping to make the decision making more efficient.

2.4.2 Contents

The first part of this NPS refers to its role in the planning system, and defines the **infrastructure** making the object of this NPS as being nuclear power generation of a capacity of more than 50 MWe.

Because the power to consent to the construction of power stations greater than 50 MW capacity has been executivevely devolved to Scottish Ministers and is also devolved in Northern Ireland, the **geographical area** this NPS covers is England and Wales, none of the listed sites being in Scotland or Northern Ireland.

The NE-6 also states the limits of the **IPC attributions** to granting (or denying) consents for development of new NPPs only for applications for the nominated sites. When applications for other sites (even if situated in England and Wales) are received, the IPC retains only an advisory role, the decision being made by the Secretary of State.

The second part of the NPS explains the Government **policy on developing new nuclear** generation infrastructure, providing the Government opinion on the **need** for nuclear power, the **urgency** of constructing new NPPs and the need for nominating suitable sites in this NPS.

The need for nuclear power and the timeframe for developing new NPPs are sustained by various recent studies and predictions for the UK energy sector performed in the frame of the Low Carbon Transition Plan, setting out the Government's strategy for moving towards a low carbon economy (requiring electricity supply to be almost entirely decarbonised by 2050). These studies showed that 25 GW of new non-renewable capacity will be needed for meeting the target.

The effects of expanding the UK's nuclear programme in terms of carbon emissions were discussed in the White Paper on Nuclear Power⁶. The White Paper reviewed the evidence on the lifecycle CO₂ emissions from nuclear power stations, (including their construction and the mining and transportation of uranium). It concluded that emissions in the range of 7–22 g/kWh is a prudent estimate⁷. This is in line with research published by the OECD and IAEA and is similar to the lifecycle CO₂ emissions from wind power and much less than fossil fuelled plant⁸.

To ensure that this NPS does not act as restraint on the ability of energy companies to provide this capacity from nuclear power, it is essential that this NPS lists sufficient sites to allow nuclear to contribute as much as possible towards meeting the need, as there can be no certainty that development consent on all sites listed in the NPS will be granted as issues may emerge once they are analysed in detail by the IPC. On the basis of the SSA and the Alternative Sites Study the Government has concluded that only a limited number (ten) of sites are potentially suitable for the deployment of new nuclear power stations by the end of 2025, and is therefore necessary to include all of them in the NPS to ensure that sufficient sites are available for development even if a number of them fail at the project level. At the same time, the Government does not consider appropriate to include more than ten sites in this NPS at this stage when the need is balanced against the potential harm to Natura 2000 sites and other factors like planning blight.

With regard to the rate of development necessary for meeting the target, NE-6 states that it is important for the IPC, without prejudging its decision on any application, to consider and grant consent at a rate that is consistent with the rate at which energy companies may wish to build new nuclear power stations.

In its section 2.5.6, the draft NPS mentions the technical feasibility of constructing NPPs at all 10 selected sites by the end of 2025. The feasibility of such a claim is supported in the French experience, where multiple units were con-

⁶ This report does not present an opinion on the White Paper on Nuclear Power. The White Paper has been submitted to discussion and public consultation in UK in 2008 and falls outside the scope of this project.

⁷ Meeting the Energy Challenge: A White Paper on Nuclear Power, January 2008, CM 7296, URN 08/525 <http://www.berr.gov.uk/files/file43006.pdf>, p50

⁸ Sustainable Development Commission, The Role of Nuclear Power in a Low Carbon Economy, Paper 2: Reducing CO₂ Emissions – Nuclear and the Alternatives, March 2006

structed at multiple sites at even a faster rate. While it is not impossible to repeat the French experience, the UK context may be expected to be different, making such a rate of construction challenging. The French fleet of reactors, especially those constructed in the eighties, had an outstanding degree of standardization, while in UK two and possibly even more different types of reactors may be expected. Increased number of reactor types and sites, even in a case when generic designs are approved, increase the complexities and the need for resources for the regulatory process. An additional bottleneck may occur if the licence applications for several units are submitted within a short period of time. Furthermore, as the Finnish experience has shown, starting nuclear build after a long suspension can be challenging in terms of resources needed from engineering and analysis, over to manufacturing and construction (and eventually commissioning). New technologies and an increased interest in nuclear plants are already causing worldwide shortage of qualified engineers but also nuclear grade equipment manufacturers and contractors.

The sustainability of the proposed policy in terms of ensuring the necessary nuclear fuel is ascertained based on recent estimations of available resources worldwide⁹ confirming that there are adequate uranium resources to supply the expected global expansion of nuclear power.

The third part of NE-6 presents the policy of **assessment of development consent applications**. This Part contains additional (to EN-1) policy on the consideration of “alternative sites” and the Government’s policy on the siting of nuclear power stations, on the interaction between the regulatory and planning regimes, and on the assessment of other considerations that will be relevant to the IPC in reaching its decisions: consideration of good design; consideration of combined heat and power and consideration of climate change adaptation.

In respect of the interactions between the regulatory and planning regimes, the EN-6 nominates the Nuclear Installations Inspectorate (NII), the Office for Civil Nuclear Security (OCNS), the Environment Agency (EA) and the Department for Transport (referring also to their future reorganisation into a single corporation) as the organisations involved in the regulation of nuclear power generating stations. The Nuclear NPS guides the IPC to make its decisions in relation to a development consent application on the basis that:

- the relevant licensing and permitting regimes will be properly applied and enforced;
- it does not need to consider matters that are within the remit of the nuclear regulators; and that
- it should not delay a decision on whether to grant consent until completion of the licensing or permitting process.

When discussing **other considerations** in decision making, the consideration of “good design” refers mainly to durability and adaptability, but also to visual aesthetics, having regard to regulatory and other constraints. With regard to “combined heat and power” (CHP), the NPS presumption is that CHP opportunities will be limited, as constrained by the need to minimise the radiological consequences to the public in the unlikely event of a serious nuclear accident. With

⁹ NEA and IAEA, Uranium 2005: Resources, Production and Demand, 2006 (The ‘Red Book’)

regard to “climate change” considerations, the NPS instructs the IPC to refer to the NII and EA for advice on external hazards arising from maximum credible scenarios of climate change and necessary adaptation measures in response to their effects, including coastal erosion and increased risk from storm surge and rising sea levels; effects of higher temperatures, including higher temperatures of cooling water; increased risk of drought leading to a lack of available cooling water.

The Government’s conclusions with regard to **radioactive waste management**, based on the recommendations of the Committee on Radioactive Waste Management (CoRWM), are summarized as: “geological disposal is the way higher activity waste will be managed in the long term. This will be preceded by safe and secure interim storage until a geological disposal facility can receive waste. For the low level waste (LLW), liquid and gaseous discharges, and non-radioactive wastes, the Government considers that arrangements already exist for the effective management and disposal of wastes in these categories, as demonstrated by the experience of dealing with such wastes from existing nuclear power stations.” As a result the IPC need not consider this question.

Part four of the EN-6 presents the policy and guidance for the IPC when considering the **nuclear specific impacts** and **siting issues** of a development consent application.

The nuclear specific impacts drawn to the attention of the IPC are:

- flood risk, (including tsunamis and storm surge)
- water quality and resources
- coastal change
- biodiversity and geological conservation
- landscape and visual
- socio-economic
- human health and well being.

The specific siting considerations are referred to as “**flag for local consideration**” criteria. “Flag for local consideration” are siting criteria that the Government identified through the SSA consultation in 2008 but which were considered (usually due to the need for detailed site-specific investigations and data) more appropriately to be assessed at the local level. They will form an important consideration at the development consent stage. The fact that they are flagged for local consideration rather than applied through the SSA recognises that assessment at a strategic level cannot adequately address these issues. The flags for local consideration to be considered by the IPC are as follows:

- proximity to (civil) aircraft movements
- access to transmission networks
- (proximity) to significant infrastructure and resources
- emergency planning
- demographics.

This part of the NPS also presents the list of all SSA criteria (exclusionary and discretionary) which have been applied in determining the suitability of nominated sites (see Section 2.4.3).

The NPS refers the IPC to the relevant regulatory organisation (e.g. NII, HSE, MoD) for assessment of each of the above aspects during the development consent application phase.

It has to be mentioned that an expert opinion on the SSA criteria themselves was already provided and does not constitute the subject of this report.

Part five of the EN-6 presents the **SSA process** and its **criteria** and summarizes the reasons for concluding the suitability of each of the 10 sites.

The nominated sites were assessed against the conditions of nominating and the SSA criteria as stated in the guidance to nominators (see Section 2.4.3) published by the UK Government following the SSA consultation process. The key aspects considered in the assessment against each criterion are summarized in this part of the Nuclear NPS.

2.4.3 Assessment of sites nominated in the SSA process

The SSA criteria were initially proposed in the document entitled “TOWARDS A NUCLEAR NATIONAL POLICY STATEMENT: Consultation on the Strategic Siting Assessment Process and Siting Criteria for New Nuclear Power Stations in the UK”, published by the Department for Business Enterprise and Regulatory Reform (BERR) in July 2008.

The SSA criteria suffered a small number of changes following the consultation.

The initial criteria 1.1 Seismic risk (vibratory ground motion) and 1.2 Capable faulting were re-categorized as flag for local consideration following the SSA consultation. Criterion 4.1 Size of site to accommodate construction, operation and decommissioning was split into two criteria, of which the size of site for operation remained an SSA discretionary criterion, while the size of site for construction and decommissioning became a flag for local consideration. The summary of these changes is presented in Table 2 below.

Criteria 1.3 Non-seismic ground conditions, 1.6 Meteorological conditions, 1.8 Proximity to civil aircraft movements, 1.9 Proximity to mining, drilling and other underground operations, 1.11 Emergency planning, 3.2 Significant infrastructure/resources and 4.3 Access to transmission infrastructure remained flags for local consideration, to be assessed at the application stage and not through SSA.

Table 2: Changes to SSA criteria arising from consultation

SSA Criterion	Change arising from consultation
Size of site to accommodate operation	Previously included size of site to accommodate construction and decommissioning which is now flagged for local consideration
Seismic risk (vibratory ground motion)	From exclusionary to flag for local consideration
Capable faulting	From exclusionary to flag for local consideration
Tsunami, storm surge and coastal processes	Tsunami and storm surge to be merged with flood risk. Coastal processes becomes separate criterion

An assessment of the SSA criteria (both collectively and individually) against the SEA objectives has been performed and presented by the Department for Energy and Climate Change (DECC) in the report “TOWARDS A NUCLEAR NATIONAL POLICY STATEMENT: Applying the Strategic Siting Assessment Criteria: an update to the study of potential environmental and sustainability effects” of July 2008.

Further details on the AoS process and on the SEA objectives and their utilisation in the SSA process are provided in Section 2.5.2.

Based on the above mentioned study and the results of the consultation, the SSA criteria were updated, and published in the ANNEX C: GUIDANCE FOR NOMINATORS to the DECC document “TOWARDS A NUCLEAR NATIONAL POLICY STATEMENT: Government response to consultations on the Strategic Siting Assessment process and siting criteria for new nuclear power stations in the UK; and to the study on the potential environmental and sustainability effects of applying the criteria”, January 2009.

The final SSA criteria are presented in Table 3 below. For ease of reference both numbering schemes - the initial one presented for consultation and the latest one initiated in the guidance to nominators and further used in the EN-6 – are presented.

Not all these criteria are relevant from the point of view of possible transboundary effects. The ones which could have an impact on plant safety and security, and thus identify a potential transboundary impact of interest for the UBA have been selected for discussion in this report.

The selected criteria are indicated in the same Table 3 and the justification of their selection is presented, then their application for all the ten¹⁰ sites found suitable is discussed.

¹⁰ 11 sites were nominated. At the 11th nominated site, Dungeness, the strategic level Habitats Regulations Assessment concluded that mitigation is unlikely to be successful in relation to the adverse effects on the Natura 2000 sites considered. As such, the Dungeness site did not pass the SSA discretionary criteria on biodiversity and there were concerns about flood risk and coastal processes. The Government therefore decided that Dungeness would not be included in the draft Nuclear NPS.

Table 3: Final SSA criteria

EN-1 #	Criterion	Initial #	Category	Identifying a Potential Transboundary Impact	
C1	Demographics	1.10	Exclusionary	No	
C2 and D5	Proximity to military activities	1.12	Exclusionary and Discretionary	Yes	Impact on plant safety and security, external hazards (e.g aircraft crash, explosion) posing potential risk of accidental releases of radiation with possible transboundary effects
D1	Flooding, storm surge and tsunami	1.4 and part of 1.5	Discretionary	Yes	Impact on plant safety, flood hazards posing potential risk of accidental releases of radiation with possible transboundary effects
D2	Coastal processes	Part of 1.5	Discretionary	Yes	Impact on plant safety, landscape change/landslide and flood hazards posing potential risk of accidental releases of radiation with possible transboundary effects
D3	Proximity to hazardous facilities	1.7	Discretionary	Yes	Impact on plant safety, explosion hazards posing potential risk of accidental releases of radiation with possible transboundary effects
D4	Proximity to civil aircraft movements	1.8	Discretionary	Yes	Impact on plant safety, aircraft crash hazards posing potential risk of accidental releases of radiation with possible transboundary effects
D6	Internationally designated sites of ecological importance	2.1	Discretionary	No	
D7	Nationally designated sites of ecological importance	2.2	Discretionary	No	
D8	Areas of amenity, cultural heritage and landscape value	3.1	Discretionary	No	
D9	Size of site to accommodate operation	Part of 4.1	Discretionary	Yes	Impact on plant security, malevolent acts hazards posing potential risk of accidental releases of radiation with possible transboundary effects
D10	Access to suitable sources of cooling		Discretionary	Yes	Impact on plant safety, lack of cooling water hazards posing potential risk of accidental releases of radiation with possible transboundary effects

C2 and D5 Proximity to military activities

Against criterion C2, as set out in the guidance to nominators in the Government Response to consultation, sites could be rejected (in whole or in part) if the site is:

- within certain Military Low Flying Tactical Training Areas and Air Weapon Ranges;
- within the air space surrounding a Ministry of Defence aerodrome or an aerodrome used for defence activities contained within a designated Military Air Traffic Zone;

- within the air space surrounding a Ministry of Defence aerodrome or an aerodrome used for defence activities contained within a designated Air Traffic Zone;
- within or affects the use of the areas used for live firing or other military training activities;
- within the explosive safeguarding zones surrounding Ministry of Defence explosive storage facilities.

The assessment included consideration of whether any likely nuclear power station development within the nominated sites boundaries would adversely affect the capabilities of the armed forces to carry out essential training and operations, and whether the nuclear power stations could be protected against the risk of external hazards created by neighbouring military activities throughout their lifetime.

D1 Flooding, storm surge and tsunami

The assessment considered whether it is reasonable to conclude, at a strategic level, that a nuclear power station within the nominated site could be protected against flood risks throughout its lifetime, including the potential effects of climate change, storm surge and tsunami, taking into account possible countermeasures and mitigations. For the purposes of this assessment the lifetime of the station included allowing for the safe and secure storage of all the spent fuel and intermediate level waste produced from operation and decommissioning until it can be sent for final disposal in a geological disposal facility (GDF).

The Appraisal of Sustainability has identified small potential, adverse effects relating to flood risk due to rising sea levels, especially during the later stages of operation and decommissioning. This is considered a wider national issue, because of the potential impact on national energy supply and infrastructure.

The capacity of new nuclear power stations to withstand the potential impacts of climate change will be reviewed in more detail as part of the site licensing process and as part of the Flood Risk Assessment that applicants must undertake in conjunction with their applications to the IPC. The IPC must be satisfied that applicants have demonstrated to the satisfaction of the regulators that their application has taken account of the potential effects of the maximum credible scenario in the most recent marine and coastal flood projections, in order for this to progress. Any site which was selected for development and subsequent licensing would be required to periodically update these projections as part of the site licence conditions.

D2 Coastal processes

The assessment considered whether it was reasonable to conclude, at a strategic level, that a nuclear power station within the nominated site could be protected against coastal erosion and other landscape change scenarios, including the potential effects of climate change, for the lifetime of the station, taking into account possible countermeasures and mitigations.

D3 Proximity to hazardous facilities

The assessment considered whether it was reasonable to conclude that a new nuclear power station at the nominated site could be protected against potential risk arising from proximity to hazardous facilities arising throughout its lifetime taking into account suitable counter measures and mitigations.

D4 Proximity to civil aircraft movements

The assessment considered whether it is reasonable to conclude that:

- any likely nuclear power station development within the nominated site boundary can be protected against risks from civil aircraft movement (including consideration of applying flying restrictions); and
- the effects on air traffic and aerodromes can potentially be mitigated.

The consultation on the SSA process and criteria set out that there is a risk to all nuclear facilities (as there is everywhere), related to an aircraft crashing on or near to the site. Large aircraft crashes are a rare event in the UK, however, the risk across the country is not uniform.

D9 Size of site to accommodate operation

The assessment considered whether it was reasonable to conclude that there was enough land within the boundary nominated to safely and securely operate at least one new nuclear power station. This took consideration of whether the area nominated includes a provision for the safe and secure storage of all the spent fuel and intermediate level waste produced through operation, and from decommissioning, on the site of the station until it can be sent for disposal in a geological disposal facility. The assessment also included whether there is adequate land available so that effective control over activities and access may be exercised on and around a new nuclear power station on the nominated site.

Against this criterion the Government was advised by the Nuclear Installations Inspectorate and the Office for Civil Nuclear Security. Their advice involved consideration of both the size (approximately 30 hectares) and the shape (rectangle of adequate width) of the area, given that shape is particularly relevant in considering whether there is sufficient room for defence in depth of elements of the facility.

D10 Access to suitable sources of cooling

The Government considered whether it is reasonable to conclude that there are suitable sources of cooling for a new nuclear power station at the nominated site, taking account of potential measures to counter impacts, and mitigations.

Nominators were expected to offer information about cooling technologies that are feasible for likely nuclear power station developments within the nominated site. They were not expected to specify particular reactor designs or the number of reactors to be developed on the nominated site.

The Government considered this criterion in conjunction with advice from the Nuclear Installations Inspectorate and the Environment Agency.

When assessing the nominated sites against the SSA criteria, various types of impacts which could not be fully assessed at this stage have been identified. Although for the ten sites listed in the EN-6 the conclusion of the assessment was that no issues could be identified at this point which will impede on the development of nuclear power station by 2025 should applications be received, a number of particular aspects which will have to undergo a more detailed review at the application stage have been identified and indicated in the Government's assessment of each site.

Of these, some issues are related to SSA criteria which do not have an impact from the point of view of transboundary effects, for example uncertainties related to the measures for mitigating the effects on nationally designated sites of ecological importance.

Other issues for which more detailed assessment at a later stage is required by the EN-6, although related to SSA criteria which could have impact from the transboundary effects standpoint, like flood risk, concern local aspects, for example the effects of the site development on the surroundings, in some cases like Braystones or Kirksanton sites, where a flood risk analysis is required by the Government at the development consent application or site licensing stages to determine the possible risk increase and the viable mitigation measures for flooding of the areas (including human settlements) near the sites caused by site development.

The issues identified at this stage as requiring more detailed consideration later on, and which could have impact on plant safety, influencing the potential risk of accidental releases of radiation with possible transboundary effects, are summarized in Table 4 and presented for each site in the following.

Table 4: Issues requiring more detailed consideration at the later stages

Criterion	C2 and D5	D1	D2	D3	D4	D9	D10	Other issues
	Proximity to military activities	Flooding, storm surge and tsunami	Coastal processes	Proximity to hazardous facilities	Proximity to civil aircraft movements	Size of site to accommodate operation	Access to suitable sources of cooling	
Site								
Bradwell	x	x	x	√	x	x	x	x
Braystones	√	x	x	√	x	x	x	x
Hartlepool	x	x	x	√	x	x	x	x
Heysham	x	x	x	√	x	x	x	x
Hinkley Point	x	x	x	x	x	x	x	x
Kirksanton	√	x	x	√	x	x	x	√
Oldbury	x	x	x	x	x	x	x	x
Sellafield	√	√	x	x	x	x	x	x
Sizewell	x	x	√	x	x	x	x	x
Wilfa	x	x	x	x	x	x	x	x

Bradwell

D3 Proximity to hazardous facilities	<p>Issue: A small area in the south west tip of the site is within the land use planning consultation zones for the former COMAH establishment at Supergas. This was decommissioned in 1999. The land may still be covered by a Hazardous Substances Consent.</p> <p>Resolution: The IPC should satisfy itself that the Health and Safety Executive has reviewed the safety implications of any hazardous facilities which have the potential to pose a threat to the site and confirmed the acceptability of any ongoing co-existent operations. The IPC should ensure that the local authority has been consulted by the applicant where appropriate.</p>
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Braystones

C2 and D5 Proximity to military activities	<p>Issue: Public concern about historic munitions at Silecroft Range at 20 km from the site. Based on the advice of the Nuclear Installations Inspectorate and the Ministry of Defence it is reasonable to conclude that the risk to the station from military activities appears to be low, but the Nuclear Installations Inspectorate will assess the risks to the installation at a more detailed level during licensing.</p> <p>Resolution: The IPC should ensure that the applicant's documentation demonstrates that it has conducted an on and off site survey of hazards including any arising from the previous use of Silecroft Range or any other relevant site, and that the Nuclear Installations Inspectorate are satisfied with this.</p>
D3 Proximity to hazardous facilities	<p>Issue: Some responses during the opportunity for public comment raised the proximity of the Sellafield nuclear installation to the nominated site at Braystones.</p> <p>Resolution: The IPC should satisfy itself that the Health and Safety Executive have reviewed the safety implications of any hazardous facilities which have the potential to pose a risk to the site and confirmed the acceptability of any ongoing co-existent operations. The IPC should ensure that the local authority has been consulted where appropriate.</p>

Hartlepool

D3 Proximity to hazardous facilities	<p>Issue: Some responses during the opportunity for public comment pointed out a number of nearby industrial facilities, but not all of these are considered significant for the purposes of this assessment. Based on Health and Safety Executive records, there are two neighbouring 'upper Tier' Control of Major – Accident Hazards (COMAH) establishments whose land use planning consultation zones interact with the nominated site.</p> <p>Resolution: The IPC should satisfy itself that the Health and Safety Executive have reviewed the safety implications of any hazardous facilities which have the potential to pose a risk to the site and confirmed the acceptability of any ongoing co-existent operations. The IPC should ensure that the local authority has been consulted where appropriate.</p>
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Heysham

D3 Proximity to hazardous facilities	<p>Issue: The Health and Safety Executive has advised that an Upper Tier COMAH establishment at Solvent Resource Management Limited (SRML), Middleton Road, Morecambe is located on the Eastern boundary of the nominated site. HSE has noted that the significance and mitigation of hazards and associated risks from SRML's activities on any new nuclear facilities within the nominated site would need to be assessed by a nuclear site licence applicant during the licensing phase.</p> <p>Assessment at licensing stage will also need to take into account the hazards and associated risks from:</p> <ul style="list-style-type: none"> ● all notified major hazard pipelines. The licence applicant will need to obtain information from the Local Planning Authority and the relevant pipeline operators, about their routes and properties of fluids being conveyed; ● hazardous ship cargo movements through Heysham Port, given its proximity. <p>There is also a Licensed Explosive installation at Heysham Harbour, and although the proposed nuclear site is beyond the safeguarding zones used for planning purposes around that installation, the Health and Safety Executive advises that it would expect the licence applicant's safety case would confirm that any explosion at that installation would not have unacceptable consequences for nuclear operations.</p> <p>Resolution: The IPC should satisfy itself that the Health and Safety Executive have reviewed the safety implications of any hazardous facilities which have the potential to pose a risk to the site and confirmed the acceptability of any ongoing co-existent operations. The IPC should ensure that the local authority has been consulted where appropriate.</p>
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Kirksanton

C2 and D5 Proximity to military activities	<p>Issue: Comments were also received about the possibility of munitions left over from military training (possibly at Silecroft Range) posing a risk to the facility. The Ministry of Defence has confirmed that the nominated site is not in proximity to any historic munitions disposal site or Danger Area. The Ministry of Defence has noted that the coastline next to the Kirksanton site (to the south and west of the nominated site) forms the edge of the seaward Silecroft area.</p> <p>Resolution: The IPC should ensure that the applicant’s documentation demonstrates that it has conducted an on and off site survey of hazards including any arising from the previous use of Silecroft Range or any other relevant site, and that the Nuclear Installations Inspectorate are satisfied with this.</p>
D3 Proximity to hazardous facilities	<p>Issue: One respondent reported that there is an underground gas pipeline within 100 metres of the nominated site.</p> <p>Resolution: The IPC should satisfy itself that the Health and Safety Executive has reviewed the safety implications of any hazardous facilities which have the potential to pose a threat to the site and confirmed the acceptability of any ongoing co-existent operations. The IPC should ensure that the local authority has been consulted by the applicant where appropriate, including on the consideration the hazard posed by the gas pipeline near the site, if relevant.</p>
Other issues	<p>Issue: One response to the opportunity for public comments said that substantial iron ore mining was undertaken within the nominated site boundary in the past, which could affect the stability of the site.</p> <p>Resolution: Mining, drilling and other underground activities can pose risks to nearby nuclear power stations. However, full and proper assessment of these risks and whether there are appropriate engineering solutions will require site and design specific investigations. Consultation on the SSA Process and Criteria therefore outlined that whilst this is not an SSA criterion, it is important to the viability of the site and flagged for local consideration.</p>

Sellafield

C2 and D5 Proximity to military activities	<p>Issue: Responses were received in the opportunity for public comment for Kirksanton about the possibility of munitions left over from military training (possibly at Silecroft Range) posing a risk to any nuclear power station on the nominated site at Kirksanton. The Ministry of Defence has confirmed that the nominated site is not in proximity to any historic munitions disposal site or Danger Area. The Ministry of Defence has noted that the Sellafield site is approximately 20km from the northern boundary of what was the Silecroft range. Whilst the Ministry of Defence were not able to confirm the type of firing activities conducted at Silecroft Range from historical records, it has advised that extensive weapon testing was along the coast adjacent to Sellafield.</p> <p>Resolution: The IPC should ensure that the applicant’s documentation demonstrates that it has conducted an on and off site survey of hazards including any arising from the previous use of Silecroft Range or any other relevant site, and that the Nuclear Installations Inspectorate are satisfied with this.</p>
D1 Flooding, storm surge and tsunami	<p>Issue: Some responses during the opportunity for public comment were concerned about the proximity of the site to a floodplain. The Environment Agency has noted that there is flood risk from the River Ehen SAC to the east of the site boundary. There are areas of Flood Zone 2, medium probability, and flood zone 3, high probability, adjacent to the eastern boundary of the site. However, the Environment Agency has advised that the site could potentially be protected.</p> <p>Resolution: Any potential flood risk assessment should include consideration of fluvial flood risk from the River Ehen.</p>

Sizewell

D2 Coastal processes	<p>Issue: Comments were received about the surrounding shoreline and in particular about the role played by Minsmere Sluice. Future shoreline developments to the north of the site must also be considered in relation to Minsmere Sluice outfall and the effect that it has on the current position of the shore. The expected life of this existing structure is around 20 years. If the outfall pipe were no longer present this could potentially increase erosion towards the power station site. The Environment Agency has also advised that the positioning of the site is important. In considering precise location the Environment Agency consider that the applicant should consider the long term effects of coastal erosion need to be fully understood before fixing on a specific location.</p> <p>Resolution: The IPC should ensure that applicant’s proposals reflect consideration of the issues outlined above. In particular, the IPC should ensure that applicants have reflected how the site would be protected should the Minsmere Sluice outfall pipe no longer be present and should also carefully consider the effects on surrounding areas which may be more susceptible.</p>
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2.4.4 Review findings

The technical examination of the UK's Nuclear National Policy Statement (EN-6) revealed no aspects of concern with regard to the strategic planning or its future implementation. At the current stage of planning for new nuclear energy capacities in UK, details of the future projects and their potential transboundary impacts are not known. However, all reasonable measures are taken at this stage to ensure proper consideration of all aspects which could pose risks on nuclear safety and human health in the following stages of the process. The SEA process conducted is consistent, systematic and comprehensive.

The following aspects of interest for the next stages of deploying new nuclear power stations in UK were noted as result of the technical examination of the Nuclear National Policy Statement (EN-6):

- The SEA procedure does not replace the EIA or any of the regulatory licensing steps required by legislation. The EIA and the normal licensing process will still be followed, ensuring that the new NPPs will meet all relevant national and international safety requirements for new builds.
- The interaction between the regulatory and planning regimes is very well defined in this NPS, providing for clear separation of responsibilities and avoidance of overlaps in the next stage of evaluating applications for development consent. The IPC receives clear guidance on the aspects for which it should refer to the relevant regulatory authority (e.g. NII and/or OCNS) for assessing the “nuclear specific impacts”.

One example are the specific effects and consequences of external hazards arisen from climate change: rising sea levels (flood) and temperature (increased temperature of cooling water). These potential impacts of the site/environment on the safety of the NPP cannot be, at this “strategic planning” level of detail, properly assessed, but the IPC should satisfy itself when reviewing the application for development consent that the applicant will consider them and provide for mitigation measures when performing the Environmental Impact Assessment for the project. The specific expertise of the nuclear regulator is to be employed at that stage for informing the IPC's decision at that point.

- The policy on managing high activity level RAW in the long term taking into account the presumption of a once through fuel cycle – interim storage until a geological disposal is available – is at this point consistent with the international approach and state of knowledge. Although the maximum interim storage period considered (100 to 160 years) is longer than predictions of other countries facing the similar challenge, this solution is considered only to assess its practical viability as a contingency in the event of failure or delay in securing a repository, with regard to safety and security (See also Section 2.7). Research for and development of a geological disposal facility (GDF) are planned for and actively pursued, in accordance with the international practice.
- The application of the SSA criteria is consistent and the identification and evaluation of the possible effects are well described and justified.

2.5 Appraisal of Sustainability for the Nuclear National Policy Statement (EN-6)

Having to fulfil the requirements of the Planning Act of 2008 but also the requirements of the EU Directive 2001/42/EC, the UK Government performed an assessment considering socio-economic effects in the same way as environmental effects as required by the SEA Directive and documented this entire comprehensive assessment into a single report – the Appraisal of Sustainability.

2.5.1 Objective

Similarly with the AoSs for Overarching Energy NPS and for the other four technology specific NPSs, this AoS's objective is to identify, describe and evaluate the environmental, social and economic effects of the proposed energy policy, examining alternative options and weighing up their benefits and drawbacks, risks and uncertainties, and possibly modify this policy in accordance with the appraisal findings, before making the decision of adopting it.

It considers the effects of the proposed policy on nuclear energy development at a national level and the sites to be assessed for their suitability for the deployment of new nuclear power stations by 2025.

2.5.2 Content

The introductory part of this AoS presents the background for the Nuclear NPS and for this appraisal.

Part two presents the AoS process and methods, similar for all the AoS conducted.

The roles and interactions of the process of developing the draft NPS, including the SSA, and the AoS process, are set out in Figure 2. The AoS has been developed through a number of stages that reflect consultation responses and changes in legislation and guidance. The key steps in the development of the process so far are set out in Table 5.

25 SEA/AoS objectives were developed during the SEA scoping study performed in March 2008, taking into account the requirements of the SEA Directive.

Further on, considering the relevant baseline information, the policy context (e.g. EN-1), other plans and programs proposed or under implementation in UK and the recommendations of the scoping consultation in March 2008, the 25 SEA/AoS objectives were grouped into twelve Sustainable Development (SD) Themes for appraising the sites.

The grouping of the SEA/AoS objectives into SD themes is presented in Table 6.

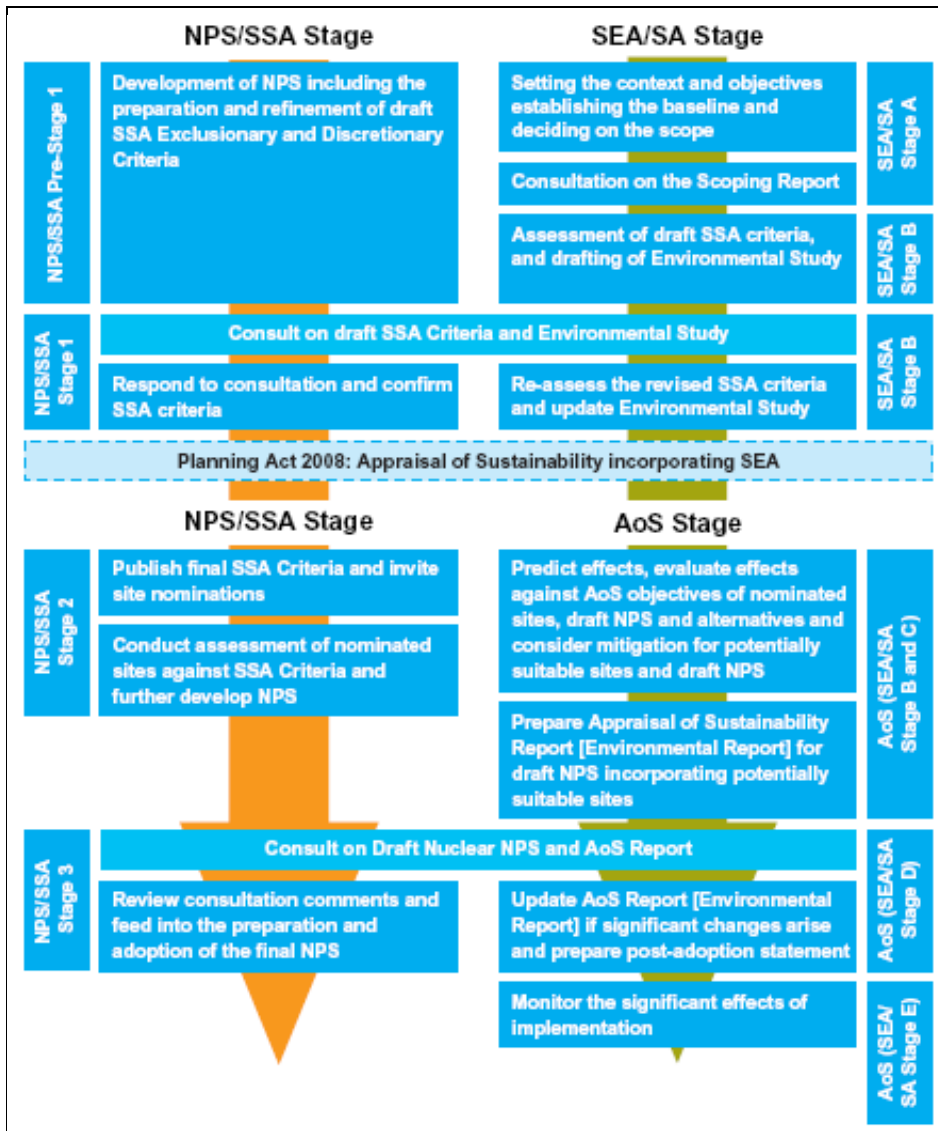


Figure 2: Roles and Interactions: AoS, SSA and NPS

Table 5: Key steps in developing the AoS

AoS Development	Purpose
Consultation on The SEA Scoping Report ¹¹ (March 2008)	A report comprising early consultation with the statutory bodies and other interested parties on the scope and level of detail proposed for the SEA (now AoS) in accordance with the SEA Directive.
The Environmental Study and Sustainability Study ¹² (July 2008)	As part of the consultation on the proposed SSA criteria, this comprised a study of the potential environmental and sustainability effects of applying the SSA criteria.
The Update Report ¹³ (January 2009)	A report to update the environmental study with changes made to the SSA criteria as a result of consultation. Also explains changes from an SEA to an AoS in accordance with new requirements outlined in the Planning Act 2008.
Ongoing consultation during appraisal stage (April – November 2009)	Liaison with statutory environmental bodies, relevant regulators and other Government departments to assist with refinement of AoS methods and assessments.
The AoS Report (November 2009)	Meeting the requirements of the Planning Act 2008 for AoS and incorporating the requirements of the SEA Directive. The AoS Report comprises: <ul style="list-style-type: none"> ● Non Technical Summary ● Main AoS ● Sites AoS
AoS Designation Statement	Following consultation on the draft Nuclear NPS and the AoS Report, this final AoS Statement will set out how the consultation and the appraisal have been taken into account in deciding the final NPS to be designated.

¹¹ BERR (March 2008) Consultation on Strategic Environmental Assessment for proposed National Policy Statement for new nuclear power, URN 08/680QAN, <http://www.berr.gov.uk/files/file45240.pdf>

¹² BERR (July 2008) Applying the Proposed Strategic Siting Assessment Criteria: A study of the potential environmental and sustainability effects, URN08/962, <http://www.berr.gov.uk/files/file47137.pdf>

¹³ BERR (January 2009) Government response to consultations on the Strategic Siting Assessment process and siting criteria for new nuclear power stations in the UK; and to the study on the potential environmental and sustainability effects of applying the criteria

Table 6: Sustainable Development (SD) Theme and SEA/AoS Objectives

<p>SD Theme: Climate Change (Mitigation) to minimise greenhouse gas emissions</p>
<p>SD Theme: Biodiversity and Ecosystems to avoid adverse impacts on the integrity of wildlife sites of international and national importance to avoid adverse impacts on valuable ecological networks and ecosystem functionality to avoid adverse impacts on Priority Habitats and Species including European Protected Species</p>
<p>SD Theme: Communities – population, employment, and viability to create employment opportunities to encourage the development of sustainable communities to avoid adverse impacts on property and land values and avoid planning blight</p>
<p>SD Theme: Communities – supporting infrastructure to avoid adverse impacts on the function and efficiency of the strategic transport infrastructure to avoid disruption to basic services and infrastructure</p>
<p>SD Theme: Human Health and Well-Being to avoid adverse impacts on physical health to avoid adverse impacts on mental health to avoid the loss of access and recreational opportunities, their quality and user convenience</p>
<p>SD Theme: Cultural Heritage to avoid adverse impacts on the internationally and nationally important features of the historic environment to avoid adverse impacts on the setting and quality of built heritage, archaeology and historic landscapes</p>
<p>SD Theme: Landscape to avoid adverse impacts on nationally important landscapes to avoid adverse impacts on landscape character, quality and tranquillity, diversity and distinctiveness</p>
<p>SD Theme: Air Quality to avoid adverse impacts on air quality</p>
<p>SD Theme: Soils, Geology, Land Use to avoid damage to geological resources to avoid the use of greenfield land and encourage the re-use of brownfield sites to avoid the contamination of soils and adverse impacts on soil functions</p>
<p>SD Theme: Water Quality and Resources to avoid adverse impacts on surface water hydrology and channel geomorphology (including coastal geomorphology) to avoid adverse impacts on surface water quality (including coastal and marine water quality) and assist achievement of Water Framework Directive objectives to avoid adverse impacts on the supply of water resources to avoid adverse impacts on groundwater quality, distribution and flow and assist achievement of Water Framework Directive objectives</p>
<p>SD Theme: Flood Risk to avoid increased flood risk (including coastal flood risk) and seek to reduce risks where possible <i>Climate Change (Adaptation)</i> is cross-cutting and has the potential to affect several of the above objectives for sustainable development, in particular biodiversity and flood risk. <i>Radioactive and associated hazardous waste</i> is cross-cutting and has the potential to affect many of the above objectives for sustainable development. As this topic is unique to new nuclear power stations, consideration of the likely significant effects is dealt with as a separate chapter in the AoS.</p>

These SD themes and topics covered by the SEA objectives were grouped into six broader headline topics for sustainability in order to make them more suitable for the higher level appraisals of the need and process alternatives. Guide questions were developed for each case.

The headline topics are presented in Table 7.

Table 7: *Headline Sustainable Development Topics for the Appraisal of Need and Process Alternatives*

Headline Sustainable Development Topics	AoS/SEA Topics (<i>italics refer to topics suggested in the SEA Directive</i>)
Climate Change	Climate change/ <i>Climatic Factors</i>
Security of Energy Supply	Communities, Health, Infrastructure/ <i>Population, Human Health, Material Assets</i>
Health and Safety	Communities, Health/ <i>Population, Human Health</i>
Radioactive Waste Generation	Cross-cutting topic
The Natural Environment	Biodiversity and Ecosystems, Soil, Air, Water, Landscape/ <i>Biodiversity, fauna, flora, soil, air, landscape</i>
The Built Environment	Landscape, Archaeology and Cultural Heritage, Material Assets/ <i>Biodiversity, fauna, flora, landscape, cultural heritage including architectural and archaeological heritage, material assets</i>
The Economy	Communities, Population, Employment

The effects of the Nuclear NPS on these topics have been identified, described and evaluated. Each topic was appraised using professional judgment and available information. The nature and significance of predicted potential effects were recorded with commentary in matrices using symbols and colours with a grading system.

Parts three, four and five of the AoS present the evaluation of alternatives.

The alternatives were assessed in terms of:

Need – Is the nuclear NPS needed?	<ul style="list-style-type: none"> ● A Nuclear NPS in line with Government policy that includes guidance for the IPC on potentially suitable sites (listing and/or selection criteria) ● A Nuclear NPS that prohibits the construction of new nuclear power stations ● No NPS specific to building new nuclear power stations
Process – How should the NPS be developed?	<ul style="list-style-type: none"> ● A Nuclear NPS with siting criteria ● A Nuclear NPS with a list of sites ● A Nuclear NPS with siting criteria and a list of sites ● A Nuclear NPS with siting criteria and a list of sites restricted to those in the vicinity of existing nuclear power stations
Location - where should new nuclear power stations be built?	Nominations for sites were invited by the Government during March 2009. Sites nominated by energy developers and assessed as being potentially suitable with regard to the SSA exclusionary criteria were subject to Appraisal of Sustainability using the 25 SEA/AoS objectives.

The draft Nuclear NPS needs to incorporate the national situation and also the local situations with regard to the potentially suitable sites in order to be able to guide the IPC to key issues that require particular attention when considering individual planning applications. The AoS appraised the NPS as a whole at the strategic level and also each of the potentially suitable sites.

It was not intended to consider the implications of different nuclear power station designs at each nominated site. It is considered that these are better addressed at the project level by the developer, the regulators, and the planning consultation process. Therefore, the AoS made a number of assumptions about the generic design characteristics of new nuclear power stations.

The assumptions about generic design characteristics were summarised into a base case in order to provide a standardised approach to the appraisal of the sites. The base case was used to guide the appraisal for each site, except in cases where a nominator had provided further detail. For example, if a developer is proposing cooling towers, (that would require less water to be abstracted), instead of direct cooling, this has been considered in the appraisal. The key assumptions used for the site level AoSs are outlined in Table 2.6 of the main AoS report, reproduced as Table 8 below.

The preferred options in terms of need and process are:

- A Nuclear NPS in line with Government policy that includes guidance for the IPC on potentially suitable sites (listing and/or selection criteria), and
- A Nuclear NPS with siting criteria and a list of sites.

With respect to the **need** for the Nuclear NPS, the alternatives evaluation found that:

The Nuclear NPS option would:

- not result in significant emissions of CO₂, NO_x and particulate matter to the atmosphere;
- improve the UK's security of supply, and would reduce the UK's reliance on imported gas;
- deliver low-carbon electricity at least cost, thereby contributing to emissions reduction targets and the fight against climate change;
- not be subject to fossil fuel price volatility; and
- not result in greatly increased risks to health and safety due to the strict regulatory regime in place.

In relation to the radioactive wastes the draft Nuclear NPS states that the Government is satisfied that effective arrangements will exist to manage and dispose of the waste that will be produced from new nuclear power stations will produce.

The NPS that prohibits Nuclear option would:

- make the UK reliant only on renewables and CCS technologies for reducing carbon emissions;
- increase the risk of the UK not meeting its carbon reduction targets;
- make the UK reliant on a smaller number of technologies which may undermine security of supply;
- expose the UK to higher risk of electricity supply interruptions; and
- incur higher costs to deliver the same amount of electricity.

No NPS would lead to failure to grant timely development consent for new nuclear power stations, would significantly increase the risk of the UK failing to meet its CO₂ reduction targets, because of the greater reliance being placed on fewer technologies.

Table 8: *Generic Design Characteristics for New Nuclear Power Stations*

Base Case Generic Design Characteristics for New Nuclear Power Station
1 nuclear reactor
Technology neutral (i.e. unknown reactor type)
A requirement for cooling water abstraction
Discharges of cooling water
Site boundary as indicated on nomination form
Timescales: Construction: approximately 5–6 yrs Operation: approximately 60 years (life extensions would require regulatory approval) Decommissioning: around 30 years 33 Interim radioactive waste storage facilities – 160 years from first arising of waste.
No. of employees: Construction: approx 4,000 (around 50% from within region) Operation: approx 500 Decommissioning= range of 400–800 at key phases Associated employment creation= 2000
Coastal and flood protection measures (where relevant)
Infrastructure for transporting reactor (for example, jetty, landing facility)
Highway improvements, access routes
Associated transmission infrastructure
Other associated infrastructure/plant
Radioactive discharges will be within legal limits

A similar approach was applied for selecting the type of **process**. The selected alternative combines siting criteria and a list of nominated sites and would therefore provide a structured and robust means of subjecting potential new nuclear power station sites to strategic scrutiny and sustainability appraisal. Further, an assessment of alternative sites would be undertaken, and the publication of a list of potentially suitable sites would enable the potential cumulative and synergistic effects of the sites to be assessed. In addition, the list of sites would have undergone a strategic level assessment which could reduce the likelihood of adverse sustainability effects occurring and provide a means of enabling such effects to be avoided or mitigated. This would reduce uncertainty and the length of time for a planning application as it would list sites which have been assessed at a strategic level. This would also allow for greater and earlier new nuclear build thereby contributing to meeting the Government’s climate change and security of supply objectives at least cost.

The suitable **locations** for new nuclear power plants have been considered through the Strategic Siting Assessment process. This process and its results are further considered in Sections 2.4 and 2.6 of this report.

Part six includes the AoS for the management of radioactive waste and non-radioactive hazardous waste. The findings of the appraisals of sustainability of the management of radioactive waste, spent fuel and hazardous wastes are summarised in this chapter and are supported by additional technical information on waste management that is included in Annex K that accompanies this Main AoS Report. Each waste stream in turn is appraised against the other 11 SD themes and any recommendations in relation to management of radioactive or hazardous wastes are presented at the end of each section.

Part seven contains the presentation of the findings by sustainable development topic and by site. It is structured as follows:

- summary of findings by sustainable development topic (details set out in Topic Summaries A1-A11 in Appendix 1 of the AoS);
- key interactions and cumulative effects between topics;
- summary of generic findings for the sites (details set out in Annexes A-J);
- summary of key findings specific to each potentially suitable site;
- an overall summary of AoS findings.

These findings reflect the impacts of the developments/sites on the environment (including here all the 11 SD themes) rather than the effects of the environment on the developments/sites, which cannot be evaluated at the strategic level and will be evaluated by the regulators during the development consent (during which environmental impact assessment at project level is conducted), generic design assessment, site licence and construction start decision stages that will follow.

2.5.3 Review findings

The AoS has been performed in a very transparent, systematic and comprehensive manner, making use of a combination of methods and sources of information, according to the state-of-the-art knowledge on the subject matter and considering all the EC and national guidance for the evaluation. The comprehensiveness of the appraisal and openness to all interested parties are visible, as well as the fact that the best quality assurance practice was utilised both during appraisal and for the development of all associated documents.

The findings and conclusions of the appraisal are fully reflected in the Nuclear NPS.

2.6 Appraisal of Sustainability for the Nuclear NPS – Site Reports

The Government has considered where new nuclear power stations should be located through the Strategic Siting Assessment process. Sites were nominated by third parties and the Government has assessed them against SSA criteria (see Section 2.4.3) and taken account of the Appraisal of Sustainability and Habitats Regulations Assessment in reaching a decision about their potential suitability.

Eleven nominated sites passed the exclusionary criteria and were subject to the discretionary criteria: Bradwell, Braystones, Dungeness, Hartlepool, Heysham, Hinkley Point, Kirksanton, Oldbury, Sellafield, Sizewell, and Wylfa. These eleven sites also underwent appraisal through the AoS process.

The Government also commissioned an Alternative Sites Study to ensure that potential alternative sites were given due consideration. The study drew on a number of information sources to identify sites that might be “worthy of further consideration” by the Government to determine whether these sites were suitable for the deployment of new nuclear power stations by 2025. Three sites were identified through this process: Druridge Bay, Kingsnorth, and Owston Ferry. A site AoS and HRA was undertaken for each of these sites.

2.6.1 Objective

A site level AoS has been undertaken for each of the nominated sites. These appraisals’ objective was to identify potential impacts and likely effects of a generic design of a new nuclear power station. The appraisals have been undertaken at a strategic level and were intended only as a high level assessment of the suitability of the sites from an environmental and sustainability perspective.

2.6.2 Content

Each of the fourteen site reports present a site characterisation in terms of the 11 sustainable development themes (the 12th, radioactive waste, is considered in the “Appraisal of Sustainability: Radioactive and Hazardous Waste”), followed by the appraisal against each of these themes:

- Air Quality
- Biodiversity and Ecosystems
- Climate Change
- Communities: Population, Employment and Viability
- Communities: Supporting Infrastructure
- Human Health and Well-Being
- Cultural Heritage
- Landscape
- Soils, Geology and Land Use
- Water Quality and Resources
- Flood Risk

The main outcomes of these evaluations for the different NPP life stages: construction, operation, decommissioning, are presented in tables 9-11:

Table 9: Summary of the Significance of Potential Strategic Sustainability Effects for construction

Sustainable Development Theme	Bradwell	Braystones	Dungeness	Hartlepool	Heysham	Hinkley Point	Kirksanton	Oldbury	Sellafield	Sizewell	Wylfa	Druridge Bay	Kingsnorth	Owston Ferry
Air Quality	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Biodiversity and Ecosystems	--?	--?	--?	--?	--?	-?	--?	--?	--?	--?	--?	--?	--?	--?
Climate Change	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Communities: Population, Employment and Viability	+ ?	+?	+?	+ ?	+?	+?	+?	+?	+?	+?	+ ?	+?	+?	+?
Communities: Supporting Infrastructure	-	-?	-?	-?	-	-?	-?	-?	-?	-	-?	-	-	-
Human Health and Well-Being	+	+	+	+	+	+	+	+	+	+	+	+	+	+?
Cultural Heritage	--?	-	-	-?	-	-	-	-	-	-	-	-	-	-
Landscape	-	--	-	-	-	-	--	-	--	--	-	--	-	-
Soils, Geology and Land Use	-?	-	-?	-?	-?	-?	-?	-	-	-	-?	-	-?	+?
Water Quality and Resources	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flood Risk	-	-	-	-	-	-	-	-	-	-	-	-	-	--

Table 10: Summary of the Significance of Potential Strategic Sustainability Effects for operation

Sustainable Development Theme	Bradwell	Braystones	Dungeness	Hartlepool	Heysham	Hinkley Point	Kirksanton	Oldbury	Sellafield	Sizewell	Wylfa	Druridge Bay	Kingsnorth	Owston Ferry
Air Quality	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?
Biodiversity and Ecosystems	--?	--?	--?	--?	--?	-?	--?	--?	--?	--?	--?	--?	--	--?
Climate Change	++	++	++	++	++	++	+	++	++	++	++	++	++	++
Communities: Population, Employment and Viability	+ ?	+?	+ ?	+ ?	+?	+?	+?	+?	+?	+?	+?	+?	+?	+?
Communities: Supporting Infrastructure	-	-?	-?	-?	-	-?	-?	-?	-?	-	-?	-	-	-
Human Health and Well-Being	+	+	+	+	+	+	+	+	+	+	+	+	+	+?
Cultural Heritage	--?	-	-	-?	-	-	-	-	-	-	-	-	-	-
Landscape	-	--	-	-	-	-	--	-	--	--	-	--	-	-
Soils, Geology and Land Use	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	0?	-?
Water Quality and Resources	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flood Risk	-	-	-	-	-	-	-	-	-	-	-	-	-	--

Table 11: Summary of the Significance of Potential Strategic Sustainability Effects for decommissioning

Sustainable Development Theme	Bradwell	Braystones	Dungeness	Hartlepool	Heysham	Hinkley Point	Kirksanton	Oldbury	Sellafield	Sizewell	Wylfa	Druridge Bay	Kingsnorth	Owston Ferry
Air Quality	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?
Biodiversity and Ecosystems	--?	--?	--?	--?	-?	--?	--?	--?	--?	--?	--?	--?	--	0
Climate Change	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?	-?
Communities: Population, Employment and Viability	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Communities: Supporting Infrastructure	-	-?	-?	-	-?	-?	-?	-?	-	-?	-?	-	-	-
Human Health and Well-Being	+	+	+	+	+	+	+	+	+	+	+	+	+	+?
Cultural Heritage	+?	-	-?	-	-	-	-	-	-	-	-	-	-	-
Landscape	0?	0?	0?	0?	0?	0?	0?	0?	0?	-	-	0?	0?	0?
Soils, Geology and Land Use	-?	-	-?	-?	-?	-?	-?	-	-?	-?	-?	-	-?	-?
Water Quality and Resources	-?	-	-?	-	-	-	-	-	-	-	-	-?	-?	-?
Flood Risk	-	-	-	-	-	-	-	-	-	-	-	-	-	--

Key: Significance and Categories of Potential Strategic Effects	
++	Development actively encouraged as it would resolve an existing sustainability problem; effect considered to be of regional/national/international significance
+	No sustainability constraints and development acceptable; effect considered to be of regional/ national/international significance
0	Neutral effect
-	Potential sustainability issues, mitigation and/or negotiation possible; effect considered to be of regional/national/international significance
--	Problematical because of known sustainability issues; mitigation or negotiation difficult and/or expensive; effect considered to be of regional/national/ international significance
Uncertainty	
?	Where the significance of an effect is particularly uncertain, for example because insufficient information is available at the plan stage to fully appraise the effects of the development or the potential for successful mitigation, the significance category is qualified by the addition of ‘?’

Potential transboundary impacts have been identified when assessing the sites against two of the SD themes: air quality and human health and well-being. These are summarized in the following.

Bradwell

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a new nuclear power station and interim radioactive waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including the Southend-on-Sea and Basildon conurbations due to prevailing wind direction (south west). The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of the existing Bradwell nuclear facility (decommissioning currently underway).
Human Health and Well-Being	There is a potential for any radioactive material discharged from the proposed site to travel both nationally and internationally (for example to countries on the European continent). However, current radiological monitoring of the nuclear power station that has been on the site since 1962, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) currently (2007) estimated as approximately 7% of the limit specified in the Ionising Radiations Regulations 1999 ¹⁴ . With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

¹⁴ The radiation to which members of the public are exposed by the operations of a nuclear power station is limited to 1mSv per year through the Ionising Radiations Regulations 1999 <http://www.statutelaw.gov.uk> (which includes all activities carried out under a nuclear site licence granted by the Nuclear Installations Inspectorate under the Nuclear Installations Act 1965) http://www.opsi.gov.uk/RevisedStatutes/Acts/ukpga/1965/cukpga_19650057_en_1, the Radioactive Substances Direction 2000 <http://www.defra.gov.uk/ENVIRONMENT/radioactivity/government/legislation/pdf/rsd2000.pdf> and the Radioactive Substances (Basic Safety Standards) (Scotland) Regulations 2000 <http://www.opsi.gov.uk/legislation/scotland/ssi2000/20000100.htm>

Braystones

Air Quality	<p>There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a new nuclear power station and interim radioactive waste storage on the site. The prevailing wind direction is south to south-westerly through the year. Although the prevailing wind direction could cause any emissions to be dispersed over the Irish sea, in extreme circumstances (both in terms of releases and meteorological conditions) there is a potential for transboundary effects, in particular the Isle of Man and the eastern coastline of Ireland. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators' risk assessment as carried out for the consenting process. There is, however, an opportunity to employ any lessons learned from the decommissioning of the nearby existing Sellafield nuclear power facility (currently ongoing).</p>
Human Health and Well-Being	<p>There is a potential for any radioactive material discharged from the site to travel both nationally and internationally (for example to the Republic of Ireland). However, current radiological monitoring of the nuclear power stations and other nuclear installations at the nearby Sellafield site, suggests that the risk to the public is low with total dosage from all sources (including direct radiation) estimated as being less than 38% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.</p>

Dungeness

Air Quality	<p>There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including coastal areas such as Hastings and Eastbourne conurbations due to prevailing wind direction (south-south west to south west). The prevailing wind direction may also lead to the dispersion of emissions away from UK populated areas and across the sea, however in extreme and severe circumstances this could lead to dispersion of emissions over continental Europe. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of the Dungeness A nuclear reactor and the currently operational Dungeness B reactor (anticipated operational period up to at least 2018).</p>
Human Health and Well-Being	<p>There is a potential for any radioactive material discharged from the site to travel both nationally and internationally (e.g., to countries on the European continent). However, current radiological monitoring of the nuclear power stations that have been on the site since, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) estimated as being less than 29% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.</p>

Hartlepool

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including the Middlesbrough and Darlington conurbations due to the prevailing wind direction (southwest to westerly). The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the planned decommissioning of the existing nuclear power station at Hartlepool.
Human Health and Well-Being	There is a potential for any radioactive material discharged from the site to travel both nationally and internationally (for example to countries on the European continent). However, current radiological monitoring of the nuclear power station that has been operating on the Hartlepool site since 1983, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) estimated as being less than 2.5% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

Heysham

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including coastal areas such as Blackpool, Preston and even Liverpool conurbations due to prevailing wind direction (south to south-south west). The prevailing wind direction may also lead to the dispersion of emissions away from UK populated areas and across the Irish Sea, however in extreme and severe circumstances this could lead to dispersion of emissions over Ireland. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of the Heysham 1 and 2 nuclear facilities, which are both currently operational but are anticipated to be decommissioned within the lifetime of the proposed new nuclear facility.
Human Health and Well-Being	There is a potential for any radioactive material discharged from the site to travel both nationally and internationally (for example, to the Republic of Ireland). However, current radiological monitoring of the nuclear power stations that have been on the Heysham site since 1983, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) estimated as being less than 4% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

Hinkley Point

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including the Bristol conurbation due to prevailing wind conditions. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process.
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Human Health and Well-Being	There is a potential for any radioactive material discharged from the proposed site to travel both nationally and internationally (for example, to the Republic of Ireland). However, current radiological monitoring of the nuclear power station that has been on the site since 1962, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) currently (2007) estimated as approximately 7% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.
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Kirksanton

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. The prevailing wind direction is south to south-westerly throughout the year. The prevailing wind direction could cause any emissions to be dispersed over the Irish sea, but additionally in the direction of urbanised areas such as Barrow-in-Furness and, in extreme circumstances (both in terms of releases and meteorological conditions) major conurbations along the west coast of England, such as Blackpool. The potential effects of release of radiation are discussed in the main AoS report; however detailed modelling would be required to be undertaken by the nominator, and would be considered as part of the HSE and Environmental Regulators risk assessment carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of nearby existing nuclear power facilities, such as Sellafield (currently ongoing).
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Human Health and Well-Being	There is a potential for any radioactive material discharged from a new nuclear power station development at the site to travel both nationally and internationally (eg, to the Republic of Ireland). However, current radiological monitoring of the nuclear power stations and other nuclear installations at the nearby Sellafield site since 1956, suggests that the risk to the public is low with total dosage from all sources (including direct radiation) being less than 38% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.
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Oldbury

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including conurbations downwind along the Severn Estuary (such as Chepstow and Bristol) and Gloucester due to prevailing wind directions (predominately southwest with high frequency north-easterly winds). The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of the existing Oldbury-upon-Severn nuclear facility (defueling is expected to commence during 2009).
Human Health and Well-Being	There is a potential for any radioactive material discharged from the site to travel both nationally and internationally (for example to the Republic of Ireland). However, current radiological monitoring of the nuclear power stations that have been on the site since 1967, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) estimated as being less than 7% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

Sellafield

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the nominated site. The prevailing wind direction is south to south-westerly through the year. Although the prevailing wind direction could cause any emissions to be dispersed over the Irish sea, in extreme circumstances (both in terms of releases and meteorological conditions) there is a potential for transboundary effects, in particular the Isle of Man and the eastern coastline of Ireland. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is, however, an opportunity to employ any lessons learned from the decommissioning of the existing Sellafield nuclear power facility (currently ongoing).
Human Health and Well-Being	There is a potential for any radioactive material discharged from the nominated site to travel both nationally and internationally (for example to the Republic of Ireland). However, current radiological monitoring of the nuclear power stations and other nuclear installations that have been adjacent to the nominated site since 1956, suggests that the risk to the public is low with total dosage from all sources (including direct radiation) estimated as being less than 38% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

Sizewell

Air Quality	<p>There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including the Ipswich conurbation due to prevailing wind direction (south west to south-south west). The potential effects of release of radiation are discussed in the main AoS report, however, detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is, however, an opportunity to employ any lessons learned from the decommissioning of the Sizewell A nuclear reactor and the currently operational Sizewell B reactor (anticipated operational period up to at least 2035).</p>
Human Health and Well-Being	<p>There is a potential for any radioactive material discharged from a new nuclear power station at the site to travel both nationally and internationally (for example to countries on the European continent). However, current radiological monitoring of the nuclear power stations that have been on the Sizewell site since 1966, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) estimated as being less than 0.5% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.</p>

Wylfa

Air Quality	<p>There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. The prevailing wind direction is south-westerly through the year, however there is a high frequency of north to north-east winds in spring. This has potentially negative significant consequences for a wide demographic area across the Isle of Anglesey, including the Holyhead conurbation. In extreme circumstances (both in terms of releases and meteorological conditions) there is a potential for transboundary effects, in particular the south eastern coastline of Ireland and north-western coastline of England. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of the existing Wylfa nuclear facility when it occurs (decommissioning currently expected to commence in 2010).</p>
Human Health and Well-Being	<p>There is a potential for any radioactive material discharged from the proposed site to travel both nationally and internationally (e.g., to the Republic of Ireland). However, current radiological monitoring of the nuclear power stations that have been on the site since 1971, suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) estimated as being less than 2% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.</p>

Druridge Bay

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. The prevailing wind direction is south-westerly, however there is a high frequency of north to north-east winds in late winter and spring. This has potentially negative significant consequences for a wide demographic area across the North East region, including the major conurbations of Newcastle, Gateshead, South Shields and Sunderland to the south of Druridge. In extreme circumstances (both in terms of releases and meteorological conditions) there is a potential for transboundary effects, in particular the western coastline of Denmark and Norway. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process.
Human Health and Well-Being	There is a potential for any radioactive material discharged from the proposed site to travel both nationally and internationally (for example to countries on the European continent). However, current radiological monitoring of the nuclear power station that lies some 73 kilometres south of Druridge Bay (Hartlepool Power Station), suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) currently (2007) estimated as approximately 2% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

Kingsnorth

Air Quality	There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area around the Medway conurbation. The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process.
Human Health and Well-Being	There is a potential for any radioactive material discharged from the proposed site to travel both nationally and internationally (for example to countries on the European continent). However, current radiological monitoring of the nuclear power station that lies some 32 kilometres north-east of Kingsnorth (Bradwell Power Station), suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) currently (2007) estimated as approximately 7% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.

Owston Ferry

Air Quality	<p>There is potential for release of radioactive emissions, planned and accidental, during the operation and decommissioning of a nuclear power station and waste storage on the site. This has potentially negative significant consequences for a wide demographic area, including the Southend-on-Sea and Basildon conurbations due to prevailing wind direction (south west). The potential effects of release of radiation are discussed in the main AoS report, however detailed modelling will be required and considered as part of the HSE and Environmental Regulators risk assessment as carried out for the consenting process. There is however an opportunity to employ any lessons learned from the decommissioning of the existing Bradwell nuclear facility (decommissioning currently underway).</p>
Human Health and Well-Being	<p>There is a potential for any radioactive material discharged from the proposed to travel both nationally and internationally (for example to countries on the European continent). However, current radiological monitoring of the nuclear power station that lies approximately 129 kilometres north of Owston Ferry (Hartlepool Power Station), suggests that the risk to the public is extremely low with total dosage from all sources (including direct radiation) currently (2007) estimated as approximately 2% of the limit specified in the Ionising Radiations Regulations 1999. With regard to transboundary effects, there is a requirement under Article 37 of the Euratom Treaty for the United Kingdom, before plant authorisation can be granted, to submit its assessment of the likely effects to a panel of European experts who decide whether contamination of the water, soil or airspace of another Member State is likely to take place.</p>

One cumulative effect has been identified in relation to the human health and well-being: the cumulative effect of the radioactive discharges has the potential to increase radiation doses to the UK population, and possibly citizens of other countries to a more significant level than that currently observed.

It is concluded that this will need to be taken into account when planning all future power plants in terms of their size, design, position and allowed emissions and discharges.

The overall conclusion related to the air quality is that release of radioactive emissions (planned and accidental) can have a significant strategic effect on air quality, including transboundary effects. The HSE and Environmental Regulator will consider this as part of the HSE and Environmental Regulators risk assessment carried out as part of the consenting process and must be satisfied risk to public health and safety is within acceptable limits.

The findings of the AoS helped to inform the SSA in identifying ten sites which are potentially suitable for the deployment of new nuclear power stations in England and Wales:

- Bradwell
- Braystones
- Hartlepool
- Heysham
- Hinkley Point
- Kirksanton
- Oldbury
- Sellafield
- Sizewell
- Wylfa



One site, Dungeness, did not pass the discretionary criteria on biodiversity and there were concerns about flood risk and coastal processes.

With regard to the three alternative sites the Government decided that none of these three sites should be considered as reasonable alternatives to the sites that have been nominated, and therefore should not be included in the draft Nuclear NPS. This is because the Government considers that these sites are not credible for deployment by the end of 2025.

2.6.3 Review findings

In undertaking the AoS of each nominated site, a wide range of information was considered including the scoping report, the Environmental Study, the Update Report, information from other Government departments, the statutory consultees and regulators, information from the nominators and other published reports. If additional local information was available, for example, an EIA scoping report or a locally relevant Strategic Flood Risk Assessment, it has been used to inform the appraisal where appropriate.

The site AoS reports identified likely strategically significant effects at the national or international levels and likely locally significant effects at the local or regional level.

The potential effects of new NPPs are different for different phases of NPP operation construction, operation and decommissioning, however almost all of them are of local nature.

The AoS has identified that the potential for transboundary effects from any accidental release of radioactive emissions from the NPP site has a potentially strategic effect on sustainability. However, it is noted that there is a very low risk of such an event occurring. Prevention measures include existing risk assessment and regulatory processes. The HSE/NII will need to be satisfied that the radiological and other risks to the public associated with accidental releases of radioactive substances are as low as reasonably practicable and within the relevant radiological risk limit.

As for the climate change its impact is believed as positive because the operation of new NPPs will lead to the reduction of greenhouse gases emission to the atmosphere and will help UK to achieve its low carbon emission targets.

Data from the Organisation for Economic Cooperation and Development (OECD) and the International Atomic Energy Agency (IAEA) suggest that lifecycle Carbon Dioxide emissions, i.e. CO₂ emitted during construction, operation and decommissioning (including fuel extraction) compare favourably with those from conventional fossil fuelled power stations. These data suggest Carbon Dioxide emissions in the range of 7–22 g/kWh for electricity generated from nuclear power. This compares with Carbon Dioxide emissions of approximately 385 g/kWh for gas fired and 755 g/kWh for coal fired electricity power stations.

Potential environmental and sustainability effects considered to be of a wider strategic significance were also identified, including preliminary consideration of how the potential adverse effects may be mitigated and possible suggestions for mitigation to be considered at the project level.

At this strategic level of appraisal, there are some uncertainties on the significance of some impacts and the effectiveness of suggested mitigation measures. It is recommended for the developers and the regulators to conduct further detailed studies at the project level stage.

The AoS has been performed in a very transparent, systematic and comprehensive manner, making use of a combination of methods and sources of information, according to the state-of-the-art knowledge on the subject matter and considering all the EC and national guidance for the evaluation. The comprehensiveness of the appraisal and openness to all interested parties are visible, as well as the fact that the best quality assurance practice was utilised both during appraisal and for the development of all associated documents.

The findings and conclusions of the appraisals are fully reflected in the Nuclear NPS.

2.7 Management and Disposal of Waste from New Nuclear Power Stations

2.7.1 Objective

The basis on which the UK's Government conclusion (Part 3 of the Nuclear NPS) on the arrangements for the management and disposal of the waste from new nuclear power stations has been reached is set out in Annex G of the "Consultation on draft National Policy Statements for Energy Infrastructure" (Consultation Document). That Annex considers the management and disposal of "higher activity" wastes in particular, in terms of technical achievability of a geological disposal, for which is presenting the current progress of research and technology in UK but also worldwide.

Before reaching its conclusion, the Government has reviewed, besides the information in above mentioned Annex G, a range of evidence on the arrangements for the management and disposal of the waste from new nuclear power stations. This evidence is summarized in the paper discussed in this section: "The arrangements for the management and disposal of waste from new nuclear power stations: a summary of evidence", which has been published as additional background information.

2.7.2 Contents

The draft Nuclear NPS sets out the preliminary view that the UK Government is satisfied that effective arrangements will exist to manage and dispose of the waste that will be produced from new nuclear power stations. The main aspects and approaches of radioactive waste management for new nuclear power stations are described in details in Annex G "Management and disposal of waste from new nuclear power stations" of the "Consultation on draft National Policy Statements for Energy Infrastructure".

Appraisal on arrangements for the management and disposal of waste from new nuclear power stations was done for all new sites and covers solid radioactive waste, non-radioactive hazardous waste, and liquid and gaseous radioactive discharges. The new nuclear power stations fuel cycle, as set out in the Nuclear White Paper¹⁵, does not foresee reprocessing of the fuel. Therefore the solid radioactive waste from new nuclear power stations falls into three defined categories: low level waste (LLW), intermediate level waste (ILW) and spent fuel. The White Paper also considers interim storage, transport and disposal separately for each waste category. Operational and decommissioning wastes are not considered separately, but under their respective waste category (ILW covers both operational ILW and decommissioning ILW).

The appraisal considered the technological and physical capability to manage and dispose of wastes from new nuclear power stations:

- Do acceptable technologies exist, or are they likely to exist within an appropriate timeframe, for managing and disposing of the waste (given its expected characteristics and quantities)?

¹⁵ MEETING THE ENERGY CHALLENGE – A White Paper on Nuclear Power, BERR, January 2008

- Does capacity exist, or is it likely to exist within an appropriate timeframe, to manage and dispose of the waste in a manner which is safe, secure and which ensures environmental and sustainability impacts are manageable?

The purpose of this appraisal was to ensure that the consideration of the arrangements for managing and disposing of waste takes account of the environmental and sustainability impacts of those arrangements.

The legal and institutional framework for the management of radioactive wastes in the UK is common for all types of wastes expected to arise after new nuclear power stations will be put in operation.

Based on scientific consensus and international experience it is concluded that, despite some differences in characteristics, waste and spent fuel from new nuclear build would not raise such different technical issues compared with nuclear waste from legacy programmes as to require a different technical solution.

The range of relevant UK and international legislation and conventions which cover radioactive waste management issues includes:

- All relevant Euratom Treaty requirements as transposed into UK law, including Council Directive 96/29/Euratom laying down basic safety standards for the protection of the health of workers and the general public against the dangers of ionising radiation (the Basic Safety Standards Directive).
- All relevant legislation, including the Radioactive Substances Act 1993 (RSA93), Ionising Radiations Regulations 1999, the Health and Safety at Work etc. Act 1974 (HSWA74), the Nuclear Installations Act 1965 (NIA65), the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG09) and the Nuclear Industries Security Regulations 2003.
- The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, and the Convention on Physical Protection of Nuclear Material.
- The principles of radiological protection established by the International Commission on Radiological Protection (ICRP) as reflected in European Union and UK legislation and standards, the latter based on independent advice from bodies such as the Health Protection Agency (HPA) and the Committee on Medical Aspects of Radiation in the Environment (COMARE).

With regard to funding arrangements, the legal framework for the Government's policy on waste and decommissioning funding arrangements for new nuclear power stations was put in place in the Energy Act 2008. Clauses in the Energy Act require operators of any new nuclear power stations to submit a Funded Decommissioning Programme (FDP) for approval to the Secretary of State.

2.7.3 Management of Spent Fuel (SF)

In the Nuclear White Paper the UK Government has 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 and that plans for, and financing of, waste management should proceed on this basis. However, the White Paper leaves the option to reprocess spent fuel from new nuclear power stations open and if such proposals come forward in the future, they would need to be considered on their merits at the time.

Spent Fuel – Interim Storage

The Nuclear White Paper explained the UK Government's policy on waste and decommissioning, including the Government's view on interim storage of higher activity wastes. It considers that spent fuel from new nuclear power stations can and should be stored in safe and secure interim storage facilities until a geological facility is available. More detail on the requirement for a robust programme of safe and secure interim storage was provided in the MRWS White Paper¹⁶, which stipulates that existing interim stores will have their service lives extended as required in order to provide sufficient safe and secure interim storage throughout the GDF development programme.

Owners and operators of new nuclear power stations will be required to have a Funded Decommissioning Programme (FDP), approved by the Secretary of State, in place before construction of a new nuclear power station begins and to comply with this programme thereafter. This ensures they set aside funds over the operating life of the power station to cover the full costs of decommissioning and their full share of waste management and disposal costs.

The Generic Design Assessment (GDA) and site licensing and permitting processes are intended to ensure that operators provide safe, secure and environmentally acceptable interim storage for spent fuel. Licensing consent for a new nuclear power station will not be granted unless the regulators are satisfied with the operator's proposal for interim storage of the spent fuel produced by the proposed new nuclear power station. GDA is intended to ensure that the technical aspects of designs for nuclear power stations are considered ahead of site-specific license applications.

The regulatory bodies involved are the Health and Safety Executive (HSE), the Environment Agencies, the Office for Civil Nuclear Security (OCNS), the Department for Transport (DfT) and the UK Safeguards Office.

The Nuclear White Paper set out that the Government is satisfied that interim storage will provide an extendable, safe and secure means of containing waste for as long as it takes to site and construct a GDF. This is based on experience in the UK and overseas of the interim storage of higher activity wastes and spent fuel in line with requirements for safety, security and environmental protection.

The UK already manages spent fuel from the nuclear power stations currently operating. Spent fuel from Magnox nuclear power stations is stored in either water filled ponds or, at Wylfa power station, in dry stores, prior to being sent to Sellafield for reprocessing. The decision whether to adopt dry or prolonged pool storage will rest with the operator and will require the approval of the regulators, but both represent technologies that are already being successfully deployed to store LWR spent fuel. The operator of the new nuclear power station would be responsible for developing the safety and environmental cases for dry storage of spent fuel in the UK.

According to some of scenarios the on-site interim storage might be required includes for around 160 years from the start of the power station's operation.

¹⁶ Managing Radioactive Waste Safely - A Framework for Implementing Geological Disposal, A White Paper by Defra, BERR and the devolved administrations for Wales and Northern Ireland, June 2008

However this is based on some conservative assumptions and there are a number of factors that could reduce, or potentially increase (in the event that the power station operates for more than 60 years), the total duration of on-site spent fuel storage.

Spent Fuel – Transport

The Nuclear White Paper set out the UK Government's view, which is that the risks of transporting nuclear materials are very small and there is an effective regulatory framework in place that ensures that these risks are minimised and sensibly managed by industry.

The policy for the transportation of radioactive wastes is that the wastes will be transported in accordance with the transport legislation for such material, which is based upon international (IAEA) regulations and European Agreements and Directives.

The UK Government's strategy is to ensure the safe transportation of spent fuel through the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG 2009)¹⁷. CDG 2009 implements the European Agreements concerning the International Carriage of Dangerous Goods by Road (ADR) and the International Carriage of Dangerous Goods by Rail (RID).

A large number of national and international requirements to ensure the safe transport of radioactive wastes cover legal aspects of radioactive waste transportation. The MRWS White Paper highlighted some key relevant UK and international legislation and conventions which include:

- International Atomic Energy Agency (IAEA) TS-R-1 Regulations for the Safe Transport of Radioactive Materials 1996 Edition (Revised) or 1996 Edition (As Amended 2005).
- International Maritime Organisation (IMO) International Maritime Dangerous Goods (IMDG) Code (Amdt 32-04).
- United Nations Economic Commission for Europe (UNECE) European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR) 2007 Edition.
- Intergovernmental Organisation for International Carriage by Rail (OTIF) Convention concerning International Carriage by Rail (COTIF) Appendix B. Uniform Rules concerning the Contract for International Carriage of Goods by Rail (CIM) Annex 1 Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) 2007 Edition.
- Council Directive 94/55/EC of 21 November 1994 on the Approximation of the Laws of Member States with regard to the Transport of Dangerous Goods by Road.
- Council Directive 96/49/EC of 23 July 1996 on the Approximation of the Laws of Member States with regard to the Transport of Dangerous Goods by Rail.
- The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (CDG09), SI 2009 No. 1348.

¹⁷ Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009, radioactive material is Class 7. http://www.opsi.gov.uk/si/si2009/uksi_20091348_en_1

- For British registered ships and all other ships whilst in UK territorial waters, The Merchant Shipping (Dangerous Goods and Marine Pollutants) Regulations 1997, SI 1997 No 2367; Merchant Shipping Notice No MSN 1791(M), The Carriage of Dangerous Goods and Marine Pollutants in Packaged Form – Amendment 32-04 to the International Maritime Dangerous Goods (IMDG) Code.

Regulation of the safety of radioactive material transport by road, rail and sea in Great Britain is carried out by DfT, HSE, the Office of Rail Regulation (ORR) and the Maritime and Coastguard Agency (MCA). The DfT exercises its statutory powers of enforcement on behalf of the Secretary of State for Transport.

Spent fuel from new nuclear power stations will be transported in a shielded transport flask designed to reduce external dose rates to low levels and to provide containment of radioactivity both during normal transport conditions and conditions representing transport accidents involving fire and impact. This is also the case with spent fuel from existing nuclear power stations.

The UK has decades of experience of transporting spent fuel in a safe and secure fashion. There has never been an incident involving radiological release from a UK transport of spent fuel.

Spent Fuel – Disposal

In October 2006, following recommendations made by CoRWM, the UK Government and the Devolved Administrations published a response accepting CoRWM's recommendations that geological disposal, preceded by safe and secure interim storage, was the best available approach for the long-term management of existing and committed higher activity radioactive wastes.

The Nuclear White Paper also 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 and that plans for, and financing of, waste management should proceed on that basis. This means that the spent fuel from new nuclear power stations would be treated as waste and disposed of in a GDF.

The MRWS White Paper states that implementation of geological disposal will be undertaken on a staged basis, with clear decision points allowing progress to be reviewed, including assessment of safety, environmental and sustainability impacts, costs, affordability and value for money.

NDA has concluded that compared with legacy wastes and existing spent fuel, no new issues arise that challenge the fundamental disposability of the spent fuel expected to arise from operation of the new reactors.

The site selection process will take a number of years to complete, due to the need for extensive technical investigations at any prospective site and the need to move at a pace consistent with maintaining public confidence.

The MRWS White Paper sets out the Government's commitment to strong and effective control and regulation of the GDF development process and describes how it will be enforced. Regulatory processes for granting any necessary licences or authorisations will provide opportunity for input and assessment of public and stakeholder views.

A number of geological disposal concepts, based on the use of multiple containment barriers, have been shown to be capable of meeting high standards of safety and security, as required in the UK.

In planning the implementation of the national policy of geological disposal, the NDA has assessed that a UK facility could be operational for the disposal of legacy ILW by about 2040, with legacy HLW/spent fuel emplacement beginning around 2075, consistent with the principles laid down in the Government's MRWS programme. Disposal of legacy waste is estimated to be completed by about 2130 and it is currently anticipated that disposal of new build wastes would begin once disposal of legacy wastes is completed (though it might be possible to dispose of new build ILW somewhat earlier). These proposals would be scrutinised by the regulators who would seek that the programme for disposals is optimised overall.

The UK does not present special geological difficulties that would make successful implementation unlikely on a technological basis. The British Geological Survey (BGS) undertook a review in support of the activities of the original CoRWM that concluded that at least 30% of the UK land mass has suitable geology for siting a deep geological disposal facility.¹⁸

Disposal containers: A range of disposal container designs and materials are envisaged in the disposal concepts that have been developed and assessed internationally. In all cases a metallic container is envisaged, but there is a subdivision into concepts that rely on a highly corrosion-resistant metal (e.g. copper) or alloy (e.g. nickel-based Alloy-22) or a thick-walled, "sacrificial" container that will take a long time to corrode through, typically carbon steel. The ability to fabricate these containers to the required quality standards has been demonstrated by a number of programmes and in many cases uses technological capacity provided by UK suppliers or that is available in the UK.

Geotechnical engineered barriers: Buffer material to surround each disposal container, backfill to fill access tunnels and shafts, and high integrity engineered seals to seal off key compartments of a disposal facility are variously envisaged to involve the use of swelling clay (typically bentonite) and concretes (as well as other components such as rock spoil in the case of tunnel backfill). The ability to utilise these various barriers has been demonstrated in various underground research.

2.7.4 Management of Intermediate Level Waste (ILW)

ILW is defined in the UK as waste "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". ILW arises mainly from the reprocessing of spent fuel, from general operations and maintenance at nuclear sites and from decommissioning.

¹⁸ UK Nirex Ltd and British Geological Survey, "A note by the British Geological Survey and Nirex on the Suitability of UK Geology for Siting a Repository for Radioactive Waste", document 1797, March 2006

The total quantity of ILW produced by a new nuclear programme will depend on the size of the programme, but is expected to be small in comparison with the volumes of legacy ILW. The 2007 consultation on the Future of Nuclear Power contained estimates that a new build programme equivalent to 10 AP-1000s would increase the quantity of ILW by around 3%¹⁹.

The volume of packaged ILW (both operational and decommissioning) produced by an EPR operating for 60 years is estimated to be in the range 2097–3651 m³ dependent upon the packaging system used. For an AP-1000 operating for 60 years, the volume of packaged ILW produced is estimated to be around 3450 m³.²⁰

ILW – Interim Storage

The description of the policy, strategic, legal and regulatory frameworks for the interim storage of spent fuel described in Section 2.7.3 above applies equally to ILW from new nuclear power stations.

Within its strategy, NDA made a commitment to review interim storage opportunities within the UK.

The philosophy adopted by the Requesting Parties in the GDA process is that new power station developments will include provision for safe and secure on-site interim storage of “operational” ILW.

The technology for storing ILW already exists and ILW conditioning and packaging is already being implemented in the UK. As of end of March 2009, some 45.000 ILW waste packages had been manufactured and were in safe and secure interim storage awaiting provision of a GDF.²¹

ILW – Transport

The description of the policy, strategic, legal and regulatory frameworks for the transport of spent fuel described in Section 2.7.3 above applies equally to ILW from new nuclear power stations.

ILW packaging arrangements are already being implemented in the UK for legacy wastes. Waste packaging already exists for some of the ILW that will be transported within the UK²².

¹⁹ The Future of Nuclear Power - The role of nuclear power in a low carbon UK economy, Consultation document, May 2007

²⁰ NDA-Generic Design Assessment: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the Westinghouse AP1000 Summary Disposability Assessment for the AP-1000. NDA-Generic Design Assessment: Summary of Disposability Assessment for Wastes and Spent Fuel arising from Operation of the EPR. October 2009

²¹ NDA interactions with Waste Producers on plans for packaging radioactive wastes April 2008 to March 2009, Report no. NDA/RWMD/012, 2009

²² http://mrws.decc.gov.uk/en/mrws/cms/Waste/Packaging_of_r/Packaging_of_r.aspx

ILW – Disposal

The description of the policy, strategic, legal and regulatory frameworks for the disposal of spent fuel described in Section 2.7.3 above applies equally to ILW from new nuclear power stations.

The assessments carried out by NDA to inform the GDA process have concluded that given a disposal site with suitable characteristics, the ILW from the AP-1000 and EPR reactors is expected to be disposable.

The technology identified in disposal concepts that would be suitable for ILW from new nuclear power stations is already available in terms of engineered barrier designs and materials. Given the similarity between new build and legacy wastes the same disposal technologies would be expected to apply.

*Disposal containers*²³: In line with international practice, the UK has developed standardised disposal containers and through the GDA process is working with the Requesting Parties to define package requirements for new build wastes. Containers chosen for new build ILW are likely to be fabricated from steel or concrete, using current UK or internationally approved designs. Large numbers of some types of these standard containers are routinely manufactured and used in the UK to package legacy ILW under regulatory control.

Geotechnical engineered barriers: Backfill material to surround each ILW disposal container after emplacement in a GDF, mass-backfill to fill access tunnels and shafts, and high integrity engineered seals to close-off key compartments of a GDF are variously envisaged to involve the use of cement-based grouts, crushed minerals and swelling clay, as well as other components such as rock spoil in the case of tunnel backfill.

2.7.5 Management of Low Level Waste (LLW)

LLW is the lowest activity category of radioactive waste, and was defined in the “Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom”²⁴ as: “Radioactive waste having a radioactive content not exceeding four gigabecquerels per tonne (GBq/te) of alpha or 12 GBq/te of beta/ gamma activity”.

Very low level waste (VLLW) is a subset of the LLW category of radioactive waste, covering miscellaneous waste arising with very low concentrations of radioactivity. VLLW is divided into two types: low volume VLLW and high volume VLLW. Low volume VLLW is defined as “radioactive waste that may be disposed of to an unspecified destination, with each 0.1 m³ having less than 400 kBq total activity or single items with less than 40 kBq of total activity”. High volume VLLW is defined as “having a maximum concentration of 4 MBq/tonne of total activity which may be disposed of to specified landfill sites”.

²³ Galson Sciences, Concepts for the Geological Disposal of Intermediate Level Radioactive Waste, Report for NDA, Report 0736-1, April 2008

²⁴ Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom, Defra, DTI and the Devolved Administrations, March 2007

Although LLW makes up more than 90% of the UK's radioactive waste legacy by volume, it contains less than 0.1% of the total radioactivity.²⁵

The inventory of LLW produced by new nuclear power stations is likely to be small when compared to volumes of legacy LLW.

LLW – Storage

In March 2007 the Government published its “Policy for the Long Term Management of Solid Low Level Radioactive Waste in the United Kingdom”²⁶. The policy outlines the priorities for managing LLW responsibly and safely, by:

- allowing greater flexibility in managing the wide range of LLW that already exists and will arise in the future;
- maintaining a focus on safety, with arrangements supported by the independent regulators, including the HSE and the environment agencies;
- seeking to first minimise the amount of low level waste created before looking at disposal options, through avoiding generation, minimising the amount of radioactive substances used, recycling and reuse;
- creating a UK-wide strategy for managing low level waste from the nuclear industry;
- initiating a UK-wide strategy for the management of non-nuclear industry LLW;
- emphasising the need to involve communities and the wider public in developing and delivering LLW management plans.

In line with a Government commitment given in the 2007 LLW Policy Statement, the NDA is currently developing a UK Nuclear Industry LLW Strategy and this was published for consultation in June 2009²⁷.

LLW storage and disposal technology is well-established²⁸. It is expected that LLW from new nuclear power stations will be handled in a manner similar to current practice and in line with Government policy on LLW. The LLW originating from new build power plants will not vary greatly from that of existing plants.

LLW generated during dismantling and decommissioning of nuclear power stations can be handled in the same way as described above for operational LLW. Storage of LLW on-site is currently being carried out in some cases and could be carried out in the same way in future.

LLW – Transport

The description of the policy, strategic, legal and regulatory frameworks with regard to the transport of radioactive waste described in Section 2.7.3 above applies equally to LLW from new nuclear power stations.

²⁵ MRWS White Paper

²⁶ http://decc.gov.uk/en/content/cms/what_we_do/uk_supply/energy_mix/nuclear/radioactivity/waste/low/low.aspx

²⁷ UK Nuclear Industry LLW Strategy.
www.nda.gov.uk/loader.cfm?csModule=security/getfile&pageid=29908

²⁸ <http://www.llwrsite.com/llw-repository-operations>

LLW transport²⁹ methods are well-established (by both road and rail). LLW is routinely transported in Industrial Packages or Type A packages that are designed, certified and transported by industry as permitted in the transport legislation.

The UK has an established road and rail infrastructure with annual road freight totalling 173 billion tonne kilometres and rail freight totalling 21 billion tonne kilometres³⁰. Half a million packages of radioactive materials are shipped within the UK each year.

LLW – Disposal

The Government's view, as set out in the 2007 LLW Policy Statement, is that of disposal to an appropriately engineered facility, either below or above ground, with no intent to retrieve.

Current practice is to send LLW to the Low Level Waste Repository (LLWR) in large metal containers, after appropriate volume reduction techniques have been applied. Where possible waste is compacted prior to transfer to LLWR. All waste is grouted in place within containers before being disposed of in concrete lined vaults.³¹

NDA has strategic responsibility to maintain the LLW disposal route for nuclear industry LLW under the 2007 LLW Policy Statement. This extends to pursuing capacity beyond the existing LLWR if it proves to be necessary in future decades.

2.7.6 Gaseous and Liquid Radioactive Discharges

This section covers planned releases of radioactive materials into the environment, either in liquid form into the sea or in gaseous form into the air. The liquid and gaseous radioactive discharges from new nuclear power stations will, in general, be lower than those of existing nuclear power stations in the UK.

Government policy recognises that the unnecessary introduction of radioactivity into the environment is undesirable, even at levels where doses to humans and other species are low and, on the basis of current knowledge, are unlikely to cause harm. The UK Strategy for radioactive discharges aims, in part, to deliver the UK's obligations under the OSPAR Radioactive Substances Strategy, in respect of progressive and substantial reductions in radioactive discharges.

Technology exists and is applied in the UK and internationally to reduce the radioactive discharges from operational and decommissioning nuclear power stations effectively and within regulatory limits. Current use of abatement technology is described in the revised UK Discharge Strategy published in July 2009. Government has no reason to believe that new nuclear power stations will be so different as to necessitate new technology. The specific abatement technologies

²⁹ <http://www.llwrsite.com/UserFiles/File/OperationalStrategy/InitialOperationalStrategy-January2009.pdf>

³⁰ www.dft.gov.uk/adobepdf/162469/221412/190425/220778/trends2008.pdf

³¹ UK Nuclear Industry LLW Strategy page

will depend on the reactor design but are likely to include the use of ion exchange resins and filtration to abate liquid discharges. The independent regulators will be scrutinising proposals. Ion exchange and filtration technologies reduce the amount of soluble and insoluble radionuclides in discharges. These techniques are consistent with best practice internationally and for existing sites are regarded as BAT in the UK.

2.7.7 Non Radioactive Hazardous Wastes

Non-radioactive wastes are produced from operating and maintaining both the “conventional” side of the new nuclear power station and the “nuclear island”, and this includes some non-radioactive hazardous wastes, such as waste pond water, laboratory chemicals, and lubricating and fuel oils. There is a wide body of legislation on waste in the form of both primary legislation and regulation. This largely addresses the implementation of a number of European Directives and Regulations established under the Waste Framework Directive³².

Non-radioactive hazardous wastes will be managed according to regulatory requirements and current practices and will be disposed of promptly using established disposal routes. The volume of non-radioactive hazardous wastes produced by new nuclear power stations is expected to be small in relation to the total volume of such wastes produced in the UK.

Hazardous waste arising during operation is expected to be dominated by waste pond water, laboratory chemicals and used transformer and lubricating oil, together with sump and bund cleaning wastes. No substantial on-site treatment is expected to be required for the management of nonradioactive hazardous wastes other than segregation of wastes dependent upon disposal route and safe storage pending commercial disposal. Based on existing nuclear power station sites, wastes would be disposed to commercial recycling and disposal routes at the nearest practicable facility in the same way as wastes from any other site.

2.7.8 Review findings

The draft Nuclear National Policy Statement sets out the preliminary view that it is satisfied that effective arrangements will exist to manage and dispose of the waste that will be produced from new nuclear power stations.

Appraisal on arrangements for the management and disposal of waste from new nuclear power stations (see Section 2.5) was done for the Nuclear NPS and for all nominated sites and covers solid radioactive waste, non-radioactive hazardous waste, and liquid and gaseous radioactive discharges.

Based on scientific consensus and international experience, it is reasonable to conclude that, despite some differences in characteristics, waste and spent fuel from new nuclear build would not raise such different technical issues compared with nuclear waste from legacy programmes as to require a different technical solution.

³² Directive 2008/98/EC of the European Parliament and of the Council, of 19 November 2008, on waste and repealing certain Directives

Although the progress of research and work on constructing a GDF worldwide is taken into consideration³³, there is not, up to date, a Geological Disposal Facility in operation anywhere in the world. The feasibility of this technology is yet to be ascertained from the practical point of view of realisation and operation, as well as its timely availability to accommodate the waste generated by the new NPPs in UK.

2.8 Consultation Document

The principal purpose of the consultation is to identify whether the draft energy National Policy Statements are fit for purpose: in other words, whether they provide a suitable framework for the Infrastructure Planning Commission to make decisions on applications for development consent for nationally significant energy infrastructure. In the case of the draft Nuclear NPS, the consultation also seeks views on the Government's assessment of the potential suitability of sites for the deployment of new nuclear power stations, and the Government's assessment of arrangements to manage and dispose of waste from new nuclear power stations.

This consultation also seeks views on the Appraisals of Sustainability and Habitats Regulations Assessments that have been carried out in relation to the draft energy NPSs. Appraisals of Sustainability (AoS) are required by the Planning Act and are intended to help to ensure that NPSs take account of environmental, social and economic considerations, with the objective of contributing to the achievement of sustainable development. The aim of the Habitats Regulations Assessments (HRA) is to assess the implications of NPSs for protected habitats.

2.8.1 Objective

The aim of the Consultation Document is to provide the comprehensive list of aspects in which the UK Government seeks views of the public and to provide guidance for answering to the consultation.

2.8.2 Contents

The document describes background, context and purpose of the consultation on the six draft energy NPSs (EN 1-6). It includes consultation a full list of questions and explains how to respond. Chapter 5 focuses on the draft Nuclear NPS and associated documents. The consultation document also includes:

- Wider context for draft Nuclear NPS;
- Site summaries for Druridge Bay, Kingsnorth and Owston Ferry; and
- Explanation of preliminary conclusion on arrangements for the management and disposal of waste from new nuclear power stations (Annex G).

³³ Moving Forward with Geological Disposal of Radioactive Waste, A Collective Statement by the NEA Radioactive Waste Management Committee (RWMC), OECD 2008, NEA No. 6433

3 ANSWERS TO CONSULTATION QUESTIONS

The proposed answers to the consultation questions are provided in the following.

Q 16 Do you think that the Government should formally approve ('designate') the draft Nuclear National Policy Statement?

A 16 We believe that, as the UK Government is supportive of nuclear power, the development while having an approved NPS, is superior to not having a NPS³⁴.

In the light of the analysis and appraisals undertaken, it is reasonable to conclude that the having a thoroughly discussed and finally approved Nuclear NPS will allow for a much clearer and transparent framework for the development of nuclear energy than it would be the case without the NPS .

Q 17 Does the draft Nuclear National Policy Statement provide the Infrastructure Planning Commission with the information it needs to reach a decision on whether or not to grant development consent?

A 17 Yes, the information provided in the draft Nuclear National Policy Statement for the consideration of the Infrastructure Planning Commission constitutes adequate guidance for making an informed and correct decision.

After reviewing the Nuclear NPS and the associated studies and evaluations, it is reasonable to conclude that the findings of these evaluations have been adequately reflected in the guidance to the IPC, allowing for all the relevant considerations to be taken into account in decision making.

Q 18 Does the draft Nuclear National Policy Statement provide suitable direction to the Infrastructure Planning Commission on the need and urgency for new nuclear power stations?

A 18 Yes, the draft Nuclear National Policy Statement provides the Infrastructure Planning Commission with suitable direction to consider both the aspects of need and urgency for new nuclear power stations.

Although the Nuclear NPS guides the IPC not to seek further assurance for the need of new nuclear energy developments, as this need is already established by the NPS itself, and guides the IPC towards avoiding unnecessary delays in granting development consents due to the urgency for new nuclear energy developments, there is satisfactory evidence that the safety and security of the new developments will not be overridden, and due consideration will be given to possible significant transboundary effects prior to granting development consents.

³⁴ It should be noted that the Austrian government, as established in the "Programme of the Austrian Federal Government for the XXIV Legislative Period", "remains convinced that nuclear energy represents neither a sustainable form of energy supply nor a viable way of combating climate change"

Q 19 Do you agree with the Government’s preliminary conclusion that effective arrangements will exist to manage and dispose of the waste that will be produced by new nuclear power stations in the UK?

A 19 In our opinion the question of management and disposal of the waste that will be produced by the new nuclear power stations in UK cannot be considered closed.

After examining the evidence presented on the current state and pursued course of action it is reasonable to conclude that the proposed arrangements for management and disposal of radioactive waste (HLW and ILW in particular) that will be produced by new nuclear power stations in UK are not too different to the solutions applied to the current UK NPP fleet.

Although the progress of research and work on constructing a GDF worldwide is taken into consideration, there is not, up to date, a GDF in operation anywhere in the world. The feasibility of the technological solution is yet to be ascertained from the practical point of view of realisation and operation, as well as its timely availability to accommodate the waste generated by the new NPPs in UK.

Q 20 Does the draft Nuclear National Policy Statement appropriately cover the impacts of new nuclear power stations and potential options to mitigate those impacts?

A 20 Yes, the draft Nuclear National Policy Statement appropriately covers the impacts of new nuclear power stations and potential options to mitigate those impacts, at the strategic level of assessment.

In the light of the reviewed evidence it can be concluded that the impact assessments performed are comprehensive and systematic, and the results of these assessments are properly reflected in the draft Nuclear NPS. A certain extent of uncertainty at this strategic level cannot be eliminated. A range of measures are taken at this stage to ensure that both the impacts and the potential mitigation options will be more thoroughly studied at the project level.

Q 21 Do you agree with the Government’s preliminary conclusion on the potential suitability of sites nominated into the Strategic Siting Assessment, as set out below? You can respond in general terms on the assessment as a whole, or against one or more specific sites.

a) General comments

The Government considers the following sites to be potentially suitable for the deployment of new nuclear power stations by the end of 2025:

- | | | | |
|-------------|------------------|---------------|----------|
| b) Bradwell | c) Braystones | d) Hartlepool | |
| e) Heysham | f) Hinkley Point | g) Kirksanton | |
| h) Oldbury | i) Sellafield | j) Sizewell | k) Wylfa |

The Government does not consider the following site to be potentially suitable for the deployment of new nuclear power stations by the end of 2025:

- l) Dungeness**

A 21 The UK Government's preliminary conclusion on the potential suitability of ten of the nominated sites and the decision to exclude the Dungeness site are, to a certain extent, satisfactorily justified.

The appraisals reviewed have shown that there are no significant differences between the eleven nominated sites with regard to transboundary concerns. The basis for excluding the Dungeness site are not related to transboundary concerns. The transboundary effects, assessed as unlikely at this stage, will still have to be more thoroughly considered in the EIA of each of the sites. There is reasonable assurance that the effects of the sites on the safety and security of the new NPPs will be given due consideration in the following stages: application for development consent, site licensing and construction licensing, under the relevant regulatory regimes. Public consultations will be held at these stages also.

While it is believed that the possibility for transboundary effects of accidental radiation releases to be felt in Austria is remote, at this point of the process it cannot be completely excluded.

Q 22 Do you agree with the Government's preliminary conclusion that the three sites identified in the Alternative Sites Study, as listed below, are not potentially suitable for the deployment of new nuclear power stations by the end of 2025? You can respond in general terms on the sites identified in the Study as a whole, or against one or more specific sites.

a) General comments

b) Druridge Bay

c) Kingsnorth

d) Owston Ferry

A 22 The exclusion from further consideration of the three sites identified in the Alternative Sites Study on the basis of their unsuitability for deployment by the end of 2025 does not eliminate the concerns for potential transboundary effects.

Even if not included in the Nuclear NPS, applications for development consent for these sites will still be possible, with the decision making entrusted to the Secretary of State at the IPC advice.

The appraisals reviewed have shown that the transboundary concerns were not among the reasons for excluding these three alternative sites from further consideration for development. The transboundary effects, assessed as unlikely at this stage, will still have to be more thoroughly considered in the EIA of each of the sites, if applications for development on these sites are received. There is reasonable assurance that the effects of the sites on the safety and security of the new NPPs will be given due consideration in the following stages: application for development consent, site licensing and construction licensing, under the relevant regulatory regimes. Public consultations will be held at these stages also.

While it is believed that the possibility for transboundary effects of accidental radiation releases to be felt in Austria is remote, at this point of the process it cannot be completely excluded.

Q 23 Do you agree with the findings from the Appraisal of Sustainability reports for the draft Nuclear National Policy Statement?

A 23 Yes, the findings from the Appraisal of Sustainability reports for the draft Nuclear National Policy Statement are well substantiated.

After reviewing the Appraisal of Sustainability reports (in terms of methodology, comprehensiveness, correctness and quality assurance) it is reasonable to conclude that their findings are well substantiated. Further consideration to those findings is to be given at the project level.

Q 24 Do you think that any findings from the Appraisal of Sustainability reports for the draft Nuclear National Policy Statement have not been taken account of properly in the draft Nuclear National Policy Statement?

A 24 No. We believe that all the findings from the Appraisals of Sustainability reports for the draft Nuclear National Policy Statement have been properly taken into account in the draft Nuclear NPS.

After reviewing the way in which the findings from the AoS have been taken into account in the draft Nuclear NPS, including the justification provided in each case, it can be concluded that all the findings were properly considered. In addition, a number of them for which the applicability at a later stage could not be now determined, were recommended for further investigation at project level.

Q 26 Do you have any comments on any aspect of the draft Nuclear National Policy Statement or its associated documents not covered by the previous questions?

A 26 No, the previous questions adequately covered the aspects of our interest for this consultation.

4 ABBREVIATIONS

AoS.....	Appraisal of Sustainability
ASC.....	Advanced Supercritical Coal plant
BAT.....	Best Available Technology
BERR.....	Department for Business, Enterprise and Regulatory Reform
CCGT.....	Combined Cycle Gas Turbine
CCS.....	Carbon Capture and Storage
CoRWM.....	Committee on Radioactive Waste Management
DECC.....	Department for Energy and Climate Change
EC.....	European Commission
EIA.....	Environmental Impact Assessment
FDP.....	Funded Decommissioning Programme
GDA.....	Generic Design Assessment
GDF.....	Geological Disposal Facility
HRA.....	Habitats Regulations Assessment
HSE.....	Health and Safety Executive
ILW.....	Intermediate Level Waste
IPC.....	Infrastructure Planning Commission
LLW.....	Low Level Waste
LLWR.....	Low Level Waste Repository
LWR.....	Light Water Reactor
MoD.....	Ministry of Defence
NDA.....	Nuclear Decommissioning Authority
NII.....	Nuclear Installations Inspectorate
NPS.....	National Policy Statement
OCNS.....	Office for Civil Nuclear Security
OSPAR.....	Oslo-Paris Convention for the Protection of the Marine Environment of the North East Atlantic
RWMD.....	Radioactive Waste Management Department
SEA.....	Strategic Environmental Assessment
SSA.....	Strategic Site Assessment
VLLW.....	Very Low Level Waste

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