DEPARTMENT OF ENERGY & CLIMATE CHANGE

Appraisal of Sustainability for the revised draft National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2)

Planning For New Energy Infrastructure

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Preface

This document is the Appraisal of Sustainability report (AoS) for the revised draft Energy National Policy Statement for Fossil Fuel Electricity Generating Infrastructure (EN-2). EN-2 is one of a suite of National Policy Statements (NPSs) which the Government intends should form the basis for decision-making on development consent for a new generation of large-scale energy infrastructure. EN-2 is one of five energy NPSs covering specific technologies, such as nuclear power or electricity networks: each of these needs to be read in conjunction with the Overarching Energy National Policy Statement (EN-1), which deals with matters common to all new large-scale energy infrastructure and sets out certain policies which apply to more than one type of such infrastructure.

The main function of this report is to set out the likely significant effects on the environment of developing new fossil fuel electricity generating infrastructure of the types, and on the scale, envisaged by EN-1 and EN-2, as well as indicating how the policies set out in EN-2 are consistent with the principles of sustainable development more generally.

The AoSs are designed to inform consultation on the revised drafts of the NPSs with which they are being published. If you have any comments on them, please respond as part of the re-consultation on the revised draft NPSs. The documents are available at www.energynpsconsultation.decc.gov.uk. The re-consultation will be open for 14 weeks from the 18th October 2010.

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1. Introduction

1.1. Context

This is the revised Appraisal of Sustainability (AoS) Report for the National Policy Statement (NPS) on Fossil Fuel Electricity Generating Infrastructure (EN-2). NPSs are made under the Planning Act 2008. The Act requires AoSs to be prepared for NPSs. The Introduction to the AoS of the Overarching Energy National Policy Statement (AoS-1) contains a general explanation of the relationship between the Planning Act 2008 and UK energy policy, and the functions of NPSs and AoSs.

This Report provides information on:

- the NPS for Fossil Fuel Electricity Generating Infrastructure (Section 1.2);
- alternatives considered (Section 1.3);
- findings of the Appraisal of Sustainability (AoS) (Section 3); and
- proposed measures for monitoring significant effects (Section 4).

This report should be read in conjunction with the revised AoS Report for EN-1, which provides information on the:

- suite of six Energy NPSs (EN1-6) (Section 1);
- methodology (including when the AoS was undertaken and by whom) (Section 2);
- scope of the appraisal (Section 2);
- method for collecting and presenting baseline information (Section 2);
- approach to completing the appraisal (including the AoS Framework with objectives for sustainability), assumptions and difficulties encountered during the appraisal (Section 2);
- assessment of alternatives (Section 3);
- overall appraisal of the NPS policies (Section 4); and
- monitoring proposals and next steps (Section 5).

Paragraph 2.6.1 of AoS 1 explains how the results of the assessment of likely significant effects is shown. For ease of reference, the table is reproduced here.

Key to Appraising Significance of Predicted Effects

Likely Significant Effects:		
Major Positive	++	Policy would resolve an existing sustainability problem; effect considered to be of national/international significance
Minor Positive	+	No sustainability constraints; effect considered to be of regional/ national/international significance
Neutral	0	Neutral effect ie no overall effects or not applicable
Minor Negative	-	Potential sustainability issues, mitigation possible; effect considered to be of regional/national/international significance
Major Negative	--	Problematical because of known sustainability issues; mitigation difficult and/or expensive; effect considered to be of national/international significance
Uncertainty	?	Where the significance of an effect is particularly uncertain, eg insufficient information is available at the plan stage to fully appraise the effects of the policy or the potential for successful mitigation, the significance category is qualified by the addition of the symbol "?"

1.2. The NPS for Fossil Fuel Electricity Generating Infrastructure

The NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2) in conjunction with the Overarching NPS for Energy (EN-1) sets out the relevant planning factors that should be considered by the IPC when determining whether development consent should be granted for a proposed scheme.

EN-2 has been developed via an iterative process, taking account of the ongoing appraisal of the predicted sustainability effects. As the revised draft NPS was developed, specific topic sections were reviewed by technical specialists and recommendations were made by the AoS team to the Government for its consideration. A record of some of these recommendations and responses to them, highlighting how the NPS was developed was provided in Section 2 of the AoS-2 published for consultation in November 2009. Iterative working continued with the revisions to EN-2 and AoS-2 made as a result of the public consultation.

1.2.1. The Content of the NPS for Fossil Fuel Electricity Generating Infrastructure (EN-2)

The definition of what is a nationally significant energy infrastructure project (and therefore requires consent under the Planning Act 2008), varies between technologies.

In the case of fossil fuel electricity generating infrastructure, the definition is electricity stations generating more than 50 megawatts onshore.

The Overarching NPS for Energy (EN-1) identifies the need for new energy generation capacity and a diverse mix of fuels and technologies, including fossil fuel electricity generating infrastructure, in order to meet energy policy objectives. EN-2 covers impacts that are specific to fossil fuel electricity generating infrastructure and should be read in conjunction with EN-1 which covers the general impacts of energy infrastructure.

The way in which the need for new energy infrastructure is established in EN-1 means that there is no need to consider at the level of individual projects whether there is a need for new energy infrastructure development of a particular type (see Part 3 of EN-1). However, when an application is made for development consent, the decision-maker will need to consider whether the benefits arising from the proposed development (including the contribution which it would make towards satisfying the need for new energy infrastructure) outweigh any adverse impacts which it would have (see Section 4.1 of EN-1).

Certain impacts may result from the development of new energy infrastructure regardless of the specific technologies involved. EN-1 identifies (in Part 5) the potential generic impacts of new energy infrastructure and provides the basis for decision making with respect to each impact topic (i.e. landscape and visual or socio-economic impacts) but does not cover impacts that would be specific to a particular energy technology.

Generic Impacts detailed within EN-1	
• Air emissions • Biodiversity and geological conservation • Civil and military aviation and defence interests • Coastal change • Dust, odour, artificial light, smoke and insect infestation • Flood Risk • Historic Environment	• Landscape and visual impacts • Land-use including open space, green infrastructure and green belt • Noise • Socio-economic • Traffic and transport Impacts • Waste management • Water quality and resources

EN-1 also contains (in Part 4) information about other matters which may be of relevance to the handling of any application for development consent for new large-scale energy infrastructure, such as adaptation to the effects of climate change, and the relationship between the planning regime and other statutory controls such as those on pollution and hazardous substances. It also sets out Government policy on combined

heat and power (CHP) and carbon capture readiness/carbon capture and storage (CCR/CCS), which, although they are of some relevance to all generating stations powered by combustion processes (coal, gas, oil, biomass, energy from waste), are in practice likely to be of most interest to developers of fossil fuel plant and are considered further in EN-2, along with fossil-fuel-specific aspects of other matters considered in Parts 4 and 5 of EN-1. The main topics where fossil fuel electricity generating infrastructure detailed in EN-2 may result in technology-specific impacts in addition to those set out in EN-1, are as follows.

Technology-Specific Impacts detailed within EN-2
• Air emissions • Landscape and visual • Noise • Release of dust by coal-fired generating stations • Residue management for coal-fired generating stations • Water quality and resources

1.3. Alternatives Considered

As explained in Section 1.3 of the AoS for EN-1, the AoS exercise for the energy NPSs also fulfils the requirements of the Strategic Environmental Assessment (SEA) Directive (2001/42/EC) to produce an environmental report on certain types of “plan or programme”. The energy NPSs are such a plan or programme because they set the framework for the granting of development consent to large-scale energy infrastructure.

The SEA Directive requires that when an environmental report on a proposed plan or programme is prepared, it must identify, describe and evaluate the likely significant effects of implementing reasonable alternatives to the plan or programme which it assesses, as well as the likely significant effects of the plan or programme itself. The analysis of reasonable alternatives is to take into account “the objectives and the geographical scope of the plan”.

Certain strategic alternatives to the draft NPS as a plan were appraised and reported in the draft of AoS-2 published as part of the November 2009 consultation. As a result of this consultation, Government decided to look again at the AoSs and the draft NPSs, including the analysis of alternatives. The work presented in this section cannot be compared directly with that reported in the November 2009 AoS-1 and is intended to take the place of the earlier assessment.

The analysis of reasonable alternatives provides a strategic context for the detailed assessment of the likely significant effects of NPS policies, as well as a means of evaluating them by comparing them with other ways of achieving the same wider energy policy objectives through the planning regime – both in terms of their comparative merits as ways of achieving those objectives and in terms of their environmental, social and economic impacts.

Part 3 of AoS-1 contains a strategic-level analysis of alternatives to the policies in EN-1 and describes the process of identifying and evaluating alternatives in more detail. Section 2.2 of the AoS for EN-2 is concerned with the analysis of alternatives to those policies in the NPS suite which are of most direct relevance to fossil fuel plant: CCR and CCS. Although, as noted above, EN-2 contains information on the fossil-fuel-specific aspects of issues and impacts which are considered in EN-1, such as land use or noise, the key points of policy on these are all laid down at a generic level in EN-1 and alternatives to them are considered in AoS-1. This AoS, like the other technology-specific AoSs, concentrates on different approaches to reducing or eliminating the impacts of the technology concerned which experience shows are most objectionable. Accordingly, the focus of the analysis of alternatives presented in Section 2.2 of AoS-2 is on CO_2 emissions.

The reasonable alternatives for consideration in the AoS for the Fossil fuel electricity generating Infrastructure NPS are the following:

a) a stricter approach to Carbon Capture and Storage (CCS) (e.g. no new coal without full CCS, or no new fossil fuel plants without a substantial amount of CCS from the outset); and

b) a stricter approach to Carbon Capture Readiness (CCR) (i.e. more demanding criteria set for demonstrating that retrofit of CCS will be economically feasible).

1.3.1. The NPS Policies

Burning fossil fuels continues to represent a relatively cheap and plentiful means of generating electricity. Fossil fuel electricity generating infrastructure is therefore attractive as a means of ensuring that UK electricity supplies remain secure and affordable. However, such infrastructure, particularly when powered by coal, emits large quantities of CO_2. While in theory, CCS technology could capture and safely store some 90% of these emissions, the combined process of capture, transport and storage has yet to be demonstrated (successfully or otherwise) at commercial scale. At this stage, while there is every reason to expect that it will be successfully demonstrated in due course, there is no guarantee whether or when this will happen, or how much it will cost. From a planning policy point of view, the challenge is therefore to strike a balance between maximising opportunities to demonstrate CCS; allowing the construction of new fossil fuel plant without CCS (which remains a necessary part of the generating

mix, at least in the short term, and which will in any event be replacing less efficient, and therefore more polluting older plant per KWh produced); and avoiding, as far as possible, the risk that such plant is unable to retrofit CCS once it has been successfully demonstrated (thus leading to potential "high carbon lock-in" in the UK's generating mix). In response to this challenge, the following policies have been developed.

New coal-fired generating stations in England and Wales are required under EN-1 and EN-2 to have CCS equipment fitted on at least 300MW of their proposed generating capacity. If the proposed capacity of the new coal-fired station is less than 300MW, then it is a requirement to show that the whole plant should be fitted with CCS. Since to date, there has been no demonstration of all three stages of the CCS process (capture, transport and storage) at commercial scale, the requirement to fit CCS to 300 MW capacity of new coal-fired plant is intended to ensure that no opportunity is missed to demonstrate CCS technology at a commercial scale and that all such plants become part of the UK's effort to demonstrate CCS at commercial scale, with a view to enabling much wider deployment of CCS world-wide once this has been achieved. It is not aimed at reducing CO_2 emissions in the short term, but is driven by the need to demonstrate the viability of the technology.

In addition, in anticipation of the time when CCS technology will have been successfully demonstrated at commercial scale, and it is appropriate to retrofit it to existing plants, EN-1 and EN-2 require new plants subject to the current Large Combustion Plant Directive (LCPD)[1] to be constructed only if it is expected that it will be technically and economically feasible for them to be retrofitted with CCS at a later date. Where such plants are consented, they will be required to set aside sufficient space for the capture equipment, and to demonstrate that there are no foreseeable technical barriers to transporting the captured CO_2 and sequestering it in a place of geological storage.

This policy applies to any portion of the capacity of a new coal-fired generating station which is not fitted with CCS from the outset, as well as to gas-, oil- or biomass-fired power stations of 300 MW or more capacity. The purpose of the policy is to try to minimise the extent to which the construction of new fossil fuel capacity without CCS risks resulting in "high carbon lock-in" in the UK generating mix at a time when we need to be progressively decarbonising UK electricity generation. Although applicable to biomass plants (covered by EN-3) as well as fossil fuel plants, in practice its impacts appear likely to be limited to plants covered by EN-2 because there is no current expectation that it would be economically feasible to retrofit CCS to a biomass plant.

1.3.2. Discussion of Alternative (a)

One alternative to the policy approach taken in EN-2 and the relevant parts of EN-1 would be to use the NPS to deepen and/or widen the CCS requirement. For example,

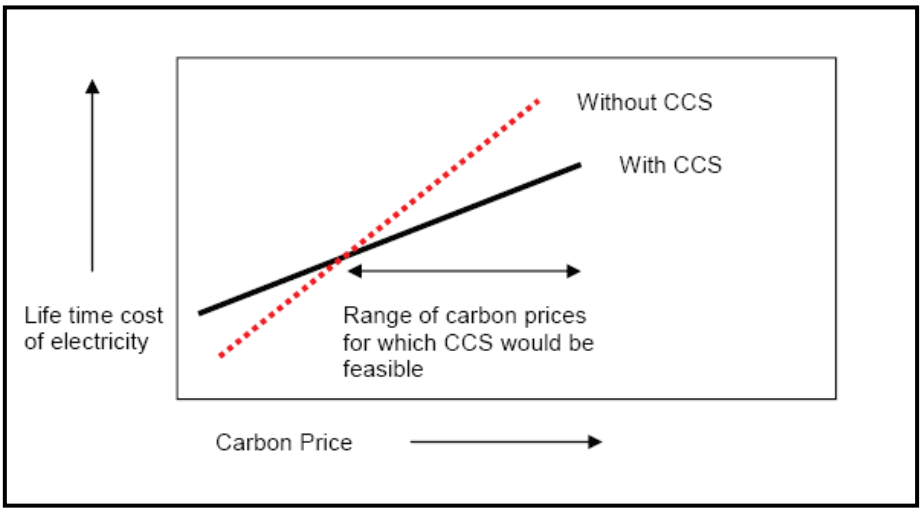
[1] and from 2016 the Industrial Emissions Directive (IED)

the NPSs could provide that no new coal plant will be consented unless it is fully fitted with CCS from the outset. A lesser requirement, which could still be stricter than the policy set out in EN-1 and EN-2, would be that the amount of CCS which each such plant was required to fit should be in direct proportion to its overall capacity (the 300 MW requirement applies equally to all plants over that capacity, regardless of whether their total capacity is, say, 400MW or 1600MW). Another possibility would be to impose a requirement to fit CCS from the outset on gas-fired plants as well (assuming that oil-fired plants remain un-economic for development). Broadly speaking, such an alternative would be aimed primarily at achieving the climate change aspects of overall NPS policy more quickly or effectively. Extending the requirements to gas plants might also be aimed at achieving an additional demonstration effect as well – although it is debatable how much "additional learning" would result from this.

1.3.3. Discussion of Alternative (b)

As regards CCR, the key limiting factor is generally whether it will be economically feasible to retrofit CCS, based on estimates of the likely cost of fitting and operating CCS and future carbon prices. The sooner it is assumed that carbon prices will rise to a significantly higher level and/or that fitting CCS will become significantly cheaper after successful demonstration at commercial scale, the more likely it is that retrofit will be economically feasible and the plant can be built CCR[2]. However, at present there can be no certainty as to the actual level of carbon prices in, say, the early 2020s when it may be expected that CCS will have been successfully demonstrated. Government guidance on assessing the economic feasibility of CCS retrofit suggests that applicants for consent should base their calculations on DECC projections of future carbon prices, but these necessarily cover a range of possible values. A policy of forcing applicants to base their case for economic feasibility on assumptions of a lower carbon price and/or higher cost of CCS (or equally on other variables on which the economic analysis is presented) would reduce the risk that if carbon prices are slow to rise or CCS is slow to be successfully demonstrated at commercial scale, England and Wales will be left with high carbon plant "locked in" to the generating mix or forcing it to close or operate at less than full capacity in order to meet emissions targets.

[2]Carbon Capture Readiness (CCR) A guidance note for Section 36 of the Electricity Act 1989 consent applications. pp 23-27.



The above diagram from the Government's guidance on CCR assists in demonstrating that this alternative is therefore focussed on looking at, in this example, greater emphasis on cost-benefit scenarios associated with a higher life time cost of electricity or lower carbon price. With respect to higher lifetime costs (i.e. more expensive CCS), then the economic case requires a higher carbon price to pass the economic feasibility test. Similarly a lower carbon price will require a lower magnitude "life time cost of electricity" (i.e. a less expensive CCS) to pass the same economic feasibility test.

These alternatives focus on different approaches to avoiding or reducing the likely significant impacts of fossil fuel electricity generating infrastructure development. Each alternative has been assessed independently of the other. They were considered as alternatives to dealing with each application on a case by case basis.

2. Assessment of NPS Alternatives

2.1. Introduction

The scope and methods of appraisal are detailed in AoS-1. The two strategic alternatives identified for the Fossil fuel electricity generating Infrastructure EN-2 were assessed using Sustainable Development themes that better keep the appraisal at the higher and strategic level. The preferred policy approach that was likely to better promote the implementation of the aims of the NPS was appraised further in detail using the AoS framework of objectives.

2.2. Alternatives

The findings of the appraisal of the strategic alternatives for EN-2 are set out below, arranged by Sustainable Development theme.

2.2.1. Climate Change[3]

Alternative (a), increasing the requirement of CCS on fossil fuel electricity generating capacity, has the potential to further reduce CO_2 emissions from this electricity generating infrastructure compared with EN-2. However, as with EN-2, the technical and economic viability of CCS has yet to be demonstrated, which with alternative (a) may need to be demonstrated to be viable at a larger scale. This may therefore increase the challenges in demonstrating viability.

However, even assuming that the viability of CCS is demonstrated and that a greater proportion of fossil fuel electricity generating capacity is associated with significantly reduced CO_2 emissions, the actual net benefits may not be positive on climate change. Under the EU Emission Trading Scheme (ETS),it is likely that reductions in CO_2 emissions in the UK will be offset by increases in emissions elsewhere in the EU, with no net reductions in emissions overall and no benefit in climate change terms.

Alternative (b), tightening the criteria for the demonstration of CCR viability, may reduce the number of fossil fuel electricity generating stations proposed for approval by the IPC, especially gas-fired generating stations. This would be beneficial in the medium to longer term from a climate change point of view.

Headline SD themes	EN-2	Alternative A	Alternative B
Climate Change		**0**	**+**

[3] AoS objective Climate Change

2.2.2. Security of Energy Supply[4]

Alternative (a), increasing the requirement of CCS on fossil fuel electricity generating capacity, may result in fewer proposals coming forward, especially for gas-fired stations, given that developers will need to be confident of economic and technical viability. This is likely to have a negative effect on security of supply. With respect to demands for raw materials, these are likely to be reduced with alternative (a) compared with EN-2, where this results in the approval of less fossil fuel electricity generating capacity.

Alternative (b), tightening the criteria for the demonstration of CCR viability, may reduce the number of proposals submitted to the IPC, especially gas-fired generating stations. This is likely to result in approval of a smaller total fossil fuel electricity generating capacity than would be the case with EN-2. This may therefore increase the risk of insufficient generating capacity being available to provide electricity supply through the transition to a low carbon economy. Alternative (b) may also result in reduced demands for raw materials compared with EN-2.

Headline SD themes	EN-2	Alternative A	Alternative B
Security of Energy Supply		-	-

2.2.3. Health and Well-Being[5]

Alternative (a), increasing the requirement of CCS on fossil fuel electricity generating capacity, may result in decreased negative effects on health and well-being compared with EN-2. The likely presence of less fossil fuel electricity generating capacity will result in reduced total emissions to air. Reduced emissions of NO_x and SO_x have been associated with positive effects on health. Levels of noise at fossil fuel electricity generating facilities will remain, but these are likely to be felt at a smaller number of localities. Alternative (a) may also increase negative effects on health and well being on a wider regional and national scale if security of energy supply cannot be maintained, and this has impacts on employment opportunities and economic growth. However, if CCS is demonstrated to be economically and technically viable on a larger scale then impacts on health and well-being are likely to be more negative with respect to effects from increased emissions, although increased employment opportunities associated with CCS technology may increase positive effects on health and well-being.

Alternative (b), tightening the criteria for the demonstration of CCR viability, is likely to result in a greater clustering of generating capacity proposals around preferred locations than would be the case with EN-2 (because the closer a power station is to the point

[4]Includes AoS objective Resources and Raw Materials
[5] Includes AoS objectives Noise, Air Quality, Health & Well-Being, and Equality

where captured CO_2 leaves the land to be deposited in a sub-sea geological storage site, the lower the costs of retrofitting CCS to that power station will be, making it more likely that retrofitting will be viable with a wider range of possible future carbon prices). This may therefore increase negative effects on health and well being from increased air emissions, although within statutory limits for each facility, within these regions. Levels of noise at fossil fuel electricity generating facilities will remain, but these are likely to be felt at a smaller number of localities. However, alternative (b) may also increase negative effects on health and well-being on a wider regional and national scale if security of energy supply cannot be maintained, and this has impacts on employment opportunities and economic growth.

Headline SD themes	EN-2	Alternative A	Alternative B
Health & Well-Being		**+/-**	**-?**

2.2.4. The Economy[6]

Alternative (a), increasing the requirement of CCS on fossil fuel electricity generating capacity, is likely to result in reduced benefits to the economy compared with EN-2. Fewer proposals are likely to come forward, for coal-fired generating stations and especially for gas-fired stations, given that investors will need to be confident of economic and technical viability of CCS. A reduced fossil fuel electricity generating capacity is also likely to increase reliance on more expensive energy generating technologies in the transition to a low carbon economy, and therefore increase energy bills to consumers. However, if CCS is demonstrated to be economically and technically viable on a larger scale, then the positive effects on the economy are likely to be greater than with the adoption of EN-2. This is related to greater employment opportunities in CCS and the likelihood that energy bills will be lower in the transition to a low carbon economy if there is more fossil fuel electricity generating capacity with CCS.

Alternative (b), tightening the criteria for the demonstration of CCR viability, may lead to the Infrastructure Planning Commission (IPC) approving a smaller total fossil fuel electricity generating capacity than would be the case with EN-2. This is likely to increase negative effects on the economy if security of energy supply cannot be maintained, and this has impacts on employment opportunities and economic growth. Lower potential uptake of CCS is also likely to result in reduced employment opportunities compared with EN-2.

Headline SD themes	EN-2	Alternative A	Alternative B
The Economy		**+**	**-**

[6] AoS objective Economy and Skills

2.2.5. The Built Environment[7]

Alternative (a), increasing the requirement of CCS on fossil fuel electricity generating capacity, may result in reduced negative effects on the built environment compared with EN-2. This alternative is likely to result in fewer proposals for fossil fuel electricity generating stations and therefore likely to result in reduced negative effects on flood risk. There are also likely to be reduced negative effects on traffic and transport, although those that remain, as with EN-2, are likely to be localised and short term in duration associated with construction and decommissioning. Effects on archaeology and cultural heritage with adoption of alternative (a) are also likely to be less negative compared with EN-2, again associated with likely fewer generating stations, although those that remain are again likely to be local in extent. However, if CCS is demonstrated to be economically and technically viable on a larger scale, then negative impacts on the built environment are likely to be smaller compared with adoption of EN-2, because the footprint of plant with CCS is greater than that of plant without CCS.

Alternative (b), tightening the criteria for the demonstration of CCR viability, is likely to result in clustering of applications within preferred locations and regions, for example, along the North Sea coast than is likely to be the case with EN-2. This increases the potential for greater negative impacts on the built environment in these regions, including cumulative effects, than would be the case with EN-2.

Headline SD themes	EN-2	Alternative A	Alternative B
The Built Environment		**0**	**-**

2.2.6. The Natural Environment[8]

Alternative (a), increasing the requirement of CCS on fossil fuel electricity generating capacity, may result in reduced negative effects on the natural environment compared with EN-2. This alternative is likely to result in fewer proposals for fossil fuel electricity generating stations and therefore likely to result in reduced negative effects on ecology. There are also likely to be reduced negative effects on water quality. Effects on landscape, townscape and visual character, and soils and geology, are also likely to be less than would be the case with EN-2. Those effects that remain are likely to be local in extent. However, if CCS is demonstrated to be economically and technically viable on a larger scale, then impacts on the natural environment are likely to be of greater negative magnitude compared with adoption of EN-2.

[7] Includes AoS objectives Flood Risk, Traffic & Transport, and Archaeology & Cultural Heritage
[8] Includes AoS objectives Ecology (flora & fauna), Water Quality, Landscape, Townscape & Visual, and Soils & Geology (12)

Alternative (b), increasing the requirement for the demonstration of CCR viability, is likely to result in more clustering of applications within preferred locations and regions – for example, along the North Sea coast – than would be the case with EN-2. This increases the potential for greater negative impacts on the natural environment in these regions, including cumulative effects, than would be the case with EN-2.

Headline SD themes	EN-2	Alternative A	Alternative B
The Natural Environment		**+/-**	**-**

2.2.7. Summary of Alternatives Findings and Preferred Approach for the NPS

Headline SD themes	EN-2	Alternative A	Alternative B
Climate Change		**0**	**+**
Security of Energy Supply		**-**	**-**
Health & Well-Being		**+/-**	**-?**
The Economy		**+**	**-**
The Built Environment		**0**	**-**
The Natural Environment		**+/-**	**-**

The alternative policy (a) to the adoption of EN-2, increasing the requirement of CCS on fossil fuel electricity generating capacity, could result in the potential for increased positive effects on climate change, with the potential for greater reductions in CO_2 emissions from England and Wales. Alternative (a) could have greater positive effects on the economy than EN-2 associated with the greater potential for employment within the CCS industry and a positive impact on energy prices. However, there are uncertainties associated with positive effects from alternative (a). The requirement to demonstrate the economic and technical viability on a larger scale than required under EN-2 may result in fewer applications for development consent, especially for gas-fired generating stations. This may therefore reduce the fossil fuel component of the energy generation mix that is planned to ultimately deliver a low carbon economy, and potentially increase costs to the economy during this transition.

Across the remaining sustainable development themes, the adoption of alternative (a) compared with EN-2 could therefore result in either greater positive or negative effects. Where CCS viability is not demonstrated on a wider and deeper basis, then there are likely to be smaller negative effects compared with EN-2. This is related to reduced energy and water resource use associated with the wider adoption of CCS, as well as

reduced footprint on health and well-being resulting from the narrower application of fossil fuel technology, as well as both the natural and built environment. Where CCS viability is demonstrated on a wider and deeper basis for fossil fuel electricity generating capacity, then there are likely to be greater negative effects on these same topics.

Deepening and/or widening the CCS requirement would carry significant risks while (as at present) the technology remains unproven at commercial scale and it is unclear how much it will cost to install and operate. While it is expected that developers may be prepared to fit CCS to 300 MW of a new coal-fired plant's capacity, probably in the expectation of receiving substantial direct public funding to support their investment up to that level, a requirement to fit as-yet-unproven CCS on the whole of a much larger power station, without full public funding support, and with the prospect of not being able to operate the whole development if the technology fails, could easily go so far towards discouraging potential investors that the UK finds itself with no commercial scale CCS demonstrations and no new coal-fired power stations. Similarly, any requirement which would require a greater commitment to CCS at the outset than the policy set out in EN-1 and EN-2 would be likely to discourage investment to some extent.

Widening the CCS requirement to include gas plants may also present economic barriers to developers. Economic viability is likely to be more challenging for gas power stations, where the absolute reductions in CO_2 emissions and associated carbon savings are likely to be less favourable than for an equivalent coal-fired generating plant of the same capacity.

In short, while encouraging the wider or deeper deployment of CCS in the short term may be attractive from the point of view of developing the technology to the stage where it becomes part of the mainstream of fossil fuel power plant construction and so can contribute to major reductions in CO_2 emissions worldwide, there is a risk that trying to do this simply through the planning regime, without taking account of other interventions which may be necessary to encourage a stronger commitment to CCS on the part of developers, could be counter-productive. Government has therefore concluded that rather than pursue alternative (a), it should continue with the policy as set out in EN-1 and EN-2 (which is justified as a means of maximising CCS demonstration opportunities), but consult later in the year on possible options for an emissions performance standard (EPS) for fossil fuel plant as part of a programme of electricity market reforms which it may be appropriate to make in order to facilitate the development of a low carbon energy system. An EPS regime would be concerned not merely with the amount of CCS capacity with which a plant is constructed, but with the performance of the CCS equipment – i.e., by how much its operation reduces the plant's emissions. Given the developing state of the technology, it seems preferable to establish any EPS requirements separately from the planning regime, which is primarily concerned with the initial construction of a development rather than its subsequent operation.

Accordingly, while the option of imposing stricter CCS requirements (whether initially or once the technology has been proven) will be considered in the context of the forthcoming Electricity Market Reform consultation, from a development control point of view, the CCS policy in EN-1 and EN-2 remains the preferred option.

The alternative policy (b) to the adoption of EN-2, tightening the criteria for the demonstration of CCR viability, may lead to fewer applications being presented to the IPC than would be the case with EN-2. This may therefore increase the risk that insufficient fossil fuel electricity generating capacity is available within the energy generation mix to support the transition to a low carbon economy, and reduce employment opportunities in this part of the energy sector. The impacts of this alternative on climate change in comparison with EN-2 however could be more positive, where later retrofitting of CCS on these facilities, with reform of the EU ETS, results in actual net reductions in CO_2 emissions from the EU.

Although there may be a reduced number of applications for fossil fuel electricity generating stations under alternative (b) than EN-2, it is likely to result in clustering of these applications in more preferential locations and regions, for example, regions along the North Sea coast. Therefore, effects on the remaining sustainable development topics, compared with EN-2, are likely to be less negative at a national scale, and clustering may be more efficient from an economic point of view, but it would increase cumulative effects in these preferential regions.

A tightening of the CCR criteria could have the desirable effect of reducing the extent to which the UK energy mix is at risk of high carbon lock-in, by resulting in there being fewer plants which it proved unfeasible to retrofit if carbon prices remain relatively low. However:

- tightened criteria would, as noted above, carry an increase risk of clustering of fossil fuel developments, with attendant negative cumulative impacts;

- tightened criteria would necessarily be based on a more precise estimate of future carbon prices. But at present, there is no sound basis for making any such estimate, and any figure chosen could easily prove either an underestimate (resulting in the potential loss of positive impacts from EN-2 policies and thus a worse outcome) or an overestimate (with consequences no better than those of EN-2); and

- since it is ultimately developers who will pay the price if they build plant which is unfeasible to retrofit with CCS or otherwise operate in compliance with any future regulatory limits on CO_2 emissions, it is probably better to give developers some scope to exercise their own judgments about future carbon prices and economic feasibility of CCS retrofit, so long as these are consistent with the range of outcomes which may be reasonably expected.

Accordingly, while the predictability of future carbon prices should be kept under review, and consideration given to tightening the CCR criteria if they become much more precisely predictable over the long term, there is no compelling case at this stage to reject the policies on CCR in EN-1 and EN-2, which remain the preferred option.

3. Appraisal Findings for revised draft EN-2

Fossil Fuel Electricity Generating Infrastructure may have various impacts on communities and the environment depending upon the nature of the development and its location. Certain of these impacts are common to other energy infrastructure development and the findings of the appraisal for these generic effects are detailed in the AoS-1. The likely significant effects of the technology specific policies, requirements and guidance in EN-2 were appraised against the baseline conditions using the AoS framework of 14 topics with objectives for sustainability. The appraisal focused on the technology specific impacts, with the generic impact of mitigation measures, represented by the development control policies set out in EN-1, being included in the AoS-1 in order to avoid duplication of assessment. It then considered the strategic effect of the implementation of EN-2 on the AoS objectives, giving consideration to the role of EN-2 in providing greater certainty to energy developers and facilitating Fossil Fuel Electricity Generating Infrastructure more rapidly than would otherwise occur. A summary of the generic effects from AoS-1 is included for context at the beginning of each topic appraisal. The likely significant effects arising specifically from Fossil fuel electricity generating Infrastructure are discussed, including suggestions for mitigating significant negative effects, and a summary of the appraisal of EN-1 is provided for each topic as follows:

3.1. Climate Change

AoS Objective	Assessment (by timescale)		
	S	M	L
1. Climate Change: To minimise detrimental effects on the climate from greenhouse gases and ozone depleting substances and maximise resilience to climate change	0	+?	+?

AoS-1 describes the effects of energy infrastructure on climate change as including:

- minor positive effects for climate change through the accelerated consenting/construction of low carbon electricity projects with the potential for cumulative positive effects in the medium to long term; and
- minor positive effects in the medium and long term for climate change adaptation objectives through the requirements in EN-1 (EN-2 to EN-6) for adaptation and resilience measure in all new energy sector developments.

As regards climate change mitigation, the policies set out in EN-1 and EN-2 which have particular relevance to fossil fuel electricity generating stations include the requirement for CCR and CCS associated with proposals for new fossil fuel electricity generating stations and the need to demonstrate that consideration has been given to opportunities to establish good quality CHP.

CCS has the potential to reduce CO_2 emissions by up to 90%, supporting the continued use of fossil fuels as an important element in the achievement of a low carbon economy and in reducing greenhouse gas (GHG) emissions to meet targets for 2020 and 2050. For example, CO_2 emissions have been estimated to be reduced by 89% for natural gas combined cycle stations, 87% from pulverised coal and 88% from integrated gasification combined cycle generation stations, with the adoption of CCS, on the basis of CO_2 kg/MWh produced.[9]

However, there is uncertainty associated with CCS as it is a developing technology. Subject to successful demonstration at commercial scale, the Government expects that by 2025 CCS will be retrofitted and operating on new coal-fired generating stations approved for development by the IPC following the additional technology-specific policies presented in EN-2.

Given that CCS is facilitated by EN-2 for fossil fuel electricity generating capacity, and specifically for coal-fired power stations, its policies are considered to have a neutral effect in the short term, given the development of the CCS demonstration projects. In the medium and long term, the effects are considered to be positive, assuming that with CCS demonstrated as technically and economically viable, it will make a significant contribution to the transition to a low carbon economy. However, a high degree of uncertainty remains with respect to this viability until the demonstration projects are complete.

Specific effects related to the adoption of EN-2 with respect to adaptation to, and resilience against, the impacts of climate change are addressed under separate AoS objectives such as flood risk and coastal change, resources and raw materials and water quality.

3.1.1. Summary

Adoption of EN-2 facilitates the implementation of CHP and CCR for all fossil fuel electricity generating stations and CCS specifically for coal-fired generating stations. In the short term, this is considered to have a neutral effect, given the development of CCS coal-fired generating station demonstration projects. However, in the medium to

[9] IPCC special report on Carbon Dioxide Capture and Storage (2005). Prepared by Working Group III of the Intergovernmental Panel on Climate Change. Metz, B., O.Davidson, H. C. de Coninck, M. Loos, and L.A. Meyer (Eds.). Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 442 pp. Available in full at http://www.ipcc.ch/pdf/special-reports/srccs/srccs_wholereport.pdf

long term, the effects are considered to be positive and strategic, but uncertain, given that CCS technology has yet to be demonstrated as both technically and economically viable.

3.2. Ecology (Flora and Fauna)

AoS Objective	Assessment (by timescale)		
	S	M	L
2. Ecology (Flora & Fauna): To protect and enhance protected habitats, species, valuable ecological networks and ecosystem functionality	**-?**	**-?**	**-?**

AoS-1 describes the generic impacts of energy infrastructure and their potential effects on ecology as including:

- loss of habitat (and species) - direct loss from land take or the abstraction of water resources, and indirect or temporary, for example during construction phases;
- disturbance of habitats and species - through noise, light and visual and dust pollution arising from construction, operation and decommissioning activities;
- pollution impacts - from emissions to water, ground and air with impacts on water, soil and air quality;
- habitat fragmentation/ severance/ isolation - through development (in particular linear features);
- obstructions - from tall structures presenting obstacles to migration and flight paths;
- changes to microclimates - alterations to wind patterns/ speeds, shading/ shadow effects; and
- habitat integrity and connectivity improvements from management, restoration and enhancements activities.

The adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure and specific effects on ecology is likely to be associated with impacts from infrastructure footprint and water demands. These result from meeting process and cooling water demands associated with fossil fuel electricity generation and the assumed requirement for additional CCS processes which will affect aquatic ecology, and the actual footprint resulting from the requirements for CCR, which will impact terrestrial habitats. There are also other potential effects on ecology associated with noise disturbance and air quality impacts.

Meeting the requirements of CCR and CCS will increase the footprint at the location of the generating station, as well as giving rise to some development along the routes of CCS delivery systems on land and sea bed, and storage systems at sea (although clustering of CCS or CCR generating plant in particular locations may help to minimise the amount of additional development arising from the transport and storage elements of each new scheme). This is likely to result in potential habitat fragmentation associated with larger site boundaries to meet CCR requirements, habitat disturbance in the short term associated with construction activity, and longer term permanent habitat loss from the actual operational footprint of CCS facilities. Given that the adoption of EN-2 facilitates continued fossil fuel use and especially coal-fired generating stations, this will be associated with the potential need for large volumes of process and cooling water. This indicates that coastal, estuarine and riverine locations are likely to be preferred. Such locations are likely to be associated with marginal habitats, specialist species and valuable ecological environments. Development in such locations increases the risk of permanent habitat fragmentation and loss with associated risks of species isolation and reduced biodiversity.

Further possible negative effects on aquatic ecology include discharging cooling water at higher temperatures than receiving waters, linked impacts from the abstraction of water that will reduce flows in water courses, resulting in possible negative effects on water quality, sediment transport, and potentially aquatic flora and fauna habitat, and the release of anti-fouling chemicals from cooling water systems. These are likely to be ongoing effects during the medium term operational phases of the generating stations, but reversible following decommissioning/demolition.

Potentially negative ecological effects will also result from noise above pre-construction ambient levels, which will occur during construction (short term, short duration higher noise levels), operation (medium term, long duration lower noise levels) and decommissioning/demolition activities (long term, short duration higher noise levels). Disturbance of fauna is likely to result from the effects of higher noise levels, which are likely to be at their greatest impact during construction and decommissioning/demolition, but are likely to be reversible in effect once these activities are completed.

Air quality impacts can also be potentially negative on ecology, through both an increase in air pollutant concentrations of NO_x and SO_x associated with operation of CCS facilities and effects on fauna and flora morbidity, and deposition of particulate matter from power station emissions.

Overall, these effects will be potentially negative in nature and occur through construction, operation with potentially longer term negative effects, and decommissioning of the respective facilities. However, the magnitude of these effects will be uncertain, as they will dependent on the location of the facilities as well as on the character of the terrestrial and aquatic habitats affected and on their environmental sensitivities and designations. Thus, negative effects on the ecology of internationally designated water bodies will be more strategically significant than those with regional or

local designations. There is the possibility of habitat restoration and encouragement of improved biodiversity following decommissioning and demolition of the facilities on the sites of interest.

The existing planning regime requires that all proposals include an Environmental Statement/Habitat Regulations Assessment where European wildlife sites are likely to be affected, and that this clearly sets out any effects on local, national and international designated sites of ecological conservation importance, on protected species and habitats or on other species identified as being of principal importance for the conservation of biodiversity.

A number of specific mitigation measures are identified in EN-2. This includes the adoption of technologies that have reduced water needs, emissions to air, and managed dust releases from coal-fired generating stations. Additional measures include the implementation of environmental construction management and decommissioning plans to manage risks associated with disruption during construction and decommissioning/demolition, and opportunities for habitat restoration and enhancement during the operational phases and decommissioning of the site(s) of interest. This, for example, includes programming of construction activities to minimise impacts on key life stages of specific species, transplanting flora from construction sites to other locations, and adoption of construction techniques that minimise impacts such as the management of construction materials on site to reduce sediment transport and deposition in nearby water bodies.

For operational mitigation of aquatic ecological effects, measures include the design of cooling systems with intake and outfall locations that avoid or minimise negative effects. This can involve specific measures to reduce excessive heat from discharges on receiving waters, and the risk of fish entrainment. Technologies that have lower water demands will also have reduced negative effects on water quality. For both aquatic and terrestrial ecological effects, operational and longer term mitigation measures include habitat enhancements both within the site boundary and in neighbouring areas.

3.2.1. Summary

Adoption of EN-2 to facilitate the development of fossil fuel electricity generating capacity as promoted by EN-1 is likely to have negative effects with respect to ecology in the short, medium and long term (during construction, operation and later decommissioning/demolition of any fossil fuel powered facility and associated CCS infrastructure), the significance of which will vary depending upon the technology adopted and location. However, there is a range of mitigation measures, including those proposed in EN2 for aquatic ecology, that can minimise these effects, but the extent of the mitigation is uncertain. Therefore, the likely residual significance of the effects is considered to be potentially negative at a strategic level in the short, medium and longer

term but with uncertainty across these timescales given uncertainty associated with footprint and location.

3.3. Resources and Raw Materials

AoS Objective	Assessment (by timescale)		
	S	M	L
3. Resources and Raw Materials: To promote the sustainable use of resources and natural assets and to deliver secure, clean and affordable energy	**-?**	**-?**	**-?**

AoS-1 describes the effects of the NPSs for energy infrastructure on resources and raw materials as including:

- positive effects on resources in the long term through the delivery of secure, clean and affordable energy;
- short-term minor negative effects on resources and raw materials through the use of resources for construction materials and production of construction waste from infrastructure projects;
- medium-long-term negative effects through production of nuclear waste and decommissioning redundant infrastructure; and
- negative effects on resources and raw materials in the short-medium term through continued reliance on fossil-fuels (coal, biomass).

Adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on resources and raw materials is associated with a range of possible effects. These are likely to result from impacts associated with potentially very large water demands from some fossil fuel electricity generating technology, the additional energy requirements associated with CCS for coal-fired generating stations, waste and residue management associated with coal-fired generating stations, and the requirement for significant volumes of raw materials associated with the construction of large infrastructure projects, including the additional future requirement of CCS related infrastructure associated with coal-fired generating stations.

The construction of large infrastructure itself results in the requirement for significant volumes of a range of raw and prepared materials. This could have negative effects on the sustainable use of resources during construction, unless sustainability is embedded

within the design and through the construction supply chain as part of "good design"[10]. The magnitude of negative effects could be strategic in extent, given the likely generating capacity and number of fossil fuel plants, which also includes the additional infrastructure associated with the assumed wider adoption of CCS from 2025.

Very high water demands are associated with generating technologies such as coal-fired and combined cycle gas turbine stations. Other technologies such as open cycle gas turbines have much lower water demands. CCS also has its own additional water demands which will need to be met. The actual water demands required will vary depending upon the technology chosen, especially the cooling system selected within the proposed design. Thus, the need for water resources will be through the operational phase of the development, and is likely to be a negative impact. The magnitude of any negative effects will depend on actual water demands, the specific location, availability of water resources and water supply, and the proximity of potentially negatively impacted designated sites. There is also a need to ensure that reference is made to the objective to meet or maintain Good Ecological Status/Good Ecological Potential of water bodies under the EU Water Framework Directive (WFD).[11] and that any increase in water abstraction or water use aligns with this objective.

CCS is associated with an "energy penalty" to meet the energy needs associated with the capture technology, compression of the CO_2, transmission and storage, which therefore reduces the overall efficiency of the fossil fuel/coal energy generation process. The IPCC[9] have produced estimates on this energy penalty across a range of generating technologies. For supercritical pulverized coal (PC) plants using current technology, the extra energy requirements range from 24-40%, while for natural gas combined cycle (NGCC) plants the range is 11-22% and for coal-based gasification combined cycle (IGCC) systems it is 14-25%. Where CCS is fitted, plants equipped with flue gas desulphurization (FGD) systems for SO_2 control require proportionally greater amounts of limestone and systems equipped with selective catalytic reduction (SCR) for NO_X require proportionally greater amounts of ammonia. Additional fuel will be required to meet these further energy needs for operating the same output capacity plant with CCS as compared to operating it without CCS, and may potentially increase emissions of SO_x and NO_x. These impacts are discussed in the appraisal of Air Quality. However, adoption of CCS technology is important in facilitating the development of fossil fuel and especially coal generating capacity as part of the transition to a low carbon economy.

There are also effects associated with the generation and management of coal residues as both coarse furnace bottom ash and fine pulverised fuel ash (PFA) are generated from the combustion of these fuel sources. FGD also produces its own by-product which is de-sulpho gypsum. These will require specific additional measures to manage these residues within the overall site waste management. Residues from oil and gas generating stations are much less in magnitude. Additional wastes are also associated

[10] PPS1 "Delivering Sustainable Development" paragraph 36
[11] http://www.environment-agency.gov.uk/research/planning/33106.aspx

with CCS, but the volumes of wastes generated are dependent upon the technology adopted[12.] Thus, the magnitude of the impacts will vary depending on the generation technology adopted, as well as on the potential markets to receive these residues as raw materials for their own manufacturing or other activities.

There is a requirement for the IPC to ensure that fossil fuel electricity generating station developments are sustainable as part of the principles of "good design". This should include the adoption of the principles of sustainable use of resources, within the supply chain, including the use of recycled and sustainably sourced materials as far as possible. Policy with respect to the siting of such infrastructure is to leave this to developers to propose. However, siting new developments at locations with existing, but due for decommissioning/demolition, power generation plants, may offer the opportunity to maximise the use of recycled materials, and thus maximise the sustainable use of raw materials, and is consistent with the AoS objective on soils and geology.

Where an Environmental Statement has been prepared, it must include an assessment of impacts on the water environment where this has been identified as being likely to be negatively affected by the proposed development. Where water resources availability is limited given the requirements of catchment abstraction management strategies[13]/WFD, or water supply infrastructure is limited from the water supply company of interest, licensing of any abstraction or the provision of potable supply of water to the proposed development is unlikely. Therefore, adoption of technologies that reduce water demands, as well as water efficiency measures throughout the proposed development will need to be explored and demonstrated to the IPC.

Residue management issues from coal-fired generating stations can be mitigated through a range of measures, and this will need to be discussed in the Environmental Statement. Measures include reducing the volumes of ash produced through use of coal with lower ash content or to co-fire with biomass. The re-use of the de-sulpho gypsum as a manufacturing source for building products such as plasterboard can mitigate negative effects from the production of these residues, as can the use of furnace bottom ash for concrete or road fill, and use of low carbon content PFA for pre-cast concrete or higher carbon content PFA for re-burning as fuel source. Other uses for ash include their use as part of the reclamation of derelict land. These will all need to be included in the waste management plan for the development and associated infrastructure.

3.3.1. Summary

The development of fossil fuel electricity generating stations, CCR and CCS facilitated by the adoption of EN-2 will have potentially negative impacts on resources and raw

[12] For example, for pre and post combustion technologies, amines used in both processes become contaminated and need replacement. These are also likely to be classified as Hazardous Waste in accordance with Annex I.B (29) "Scrubber Waste" of the EU Hazardous Waste Directive (91/689/EC).
[13] http://www.environment-agency.gov.uk/business/topics/water/119927.aspx

materials. These are related to the development of large infrastructure, with associated resource requirements for construction of fossil fuel electricity generating stations including CCS, water demands for process and cooling waters, including additional water and energy needs associated with CCS, and the management of residues from coal-fired generating stations. A range of mitigation measures are available, while the residual effects are likely to remain negative but uncertain and will vary depending upon generating technology and location and in relation to timing through construction, operation and decommissioning/demolition.

3.4. Economy and Skills

AoS Objective	Assessment (by timescale)		
	S	M	L
4. Economy and Skills: To promote a strong and stable economy with opportunities for all	+?	+?	+?

The significant positive strategic effects identified in AoS-1 for the energy NPSs include:

- improved vitality and competitiveness of the UK energy industry through providing greater clarity, with benefits for investment certainty and inward investment;
- enhanced economy, employment and jobs across England and Wales through provision of a secure and affordable supply of energy; and
- benefits for employment in the short, medium and long-term through the planning, construction, operation and decommissioning of energy infrastructure; including for skilled workers and particularly in the low carbon energy industries (for example, in research and development).

Negative effects at the project level identified include:

- potential negative economic effects on existing and future land uses, especially during construction; including disruption, land sterilisation, decreases in property values, and cumulative effects on tourism objectives due to visual effects from clusters of infrastructure development.

Adoption of EN-2, with its policies on CCR/CCS offers potentially positive effects on economy and skills. This is through associated increased employment opportunities from implementation of these technologies. There is a wide range of estimates of potential employment benefits associated with adoption and promotion of CCS

technologies for the UK as a whole. These range from 4000 to 6400[14] jobs to 30,000 to 60,000[15] jobs, both studies looking to 2030. Thus, the magnitude of the benefits is uncertain, but is likely to be of national significance and long term in time scale with the growth of investment and employment in these sectors. It is noted however, that in the case of CCS this is based on the assumed proven economic and technical viability of this technology.

Employment opportunities are also associated with the continued development of fossil fuel electricity generating capacity as supported by implementation of NPSs EN-1 and EN-2. This is in the short term with the development, planning and construction of power stations, in the medium term with the operation of plants, and in the future with their decommissioning and demolition. Employment is likely to be at its peak during construction, which will include the facilities themselves, but also likely to include supporting transport as well as other infrastructure. There will also be local and regional positive economic effects from the provision of local and regionally based goods and services to these facilities.

Potentially negative effects include skill shortages, especially during the construction phases of power station development. This could be regional in extent and may even be at a national scale if developments are taking place in parallel at sites across the country.

There are also potentially negative economic effects associated with implementation of CCS. These are impacts from disruption to the roads and other transport networks during the construction of associated pipelines and related infrastructure. However, these are likely to be short term and local in extent.

Mitigation measures associated with potential skill shortages at a strategic level include investment in training and skills in those disciplines at risk, employment of workers from both within and outside the EU, and strategic phasing of development in fossil fuel electricity generating capacity to manage demand for particular skill sets, while maintaining security of supply (although it is acknowledged that these cannot necessarily be secured in the context of an individual application).

3.4.1. Summary

The development of fossil fuel electricity generating capacity and CCS as facilitated with the adoption of EN-2 potentially has significant positive effects on economy and skills. The magnitude of these effects is uncertain, and is conditional on the adoption of CCS

[14] Element Energy, Poyry Energy and British Geological Survey, 2007, Development of a CO_2 Transport and Storage Network in the North Sea; Report for North Sea Basin Taskforce and BERR.
[15] AEA, 2008, Future Value of Coal Carbon Abatement Technologies to UK Industry. Report for the UK Department of Energy and Climate Change (URN 09/738).

technology, which has yet to be demonstrated to be economically and technically viable. Nevertheless, the economic impacts are likely to be positive at local, regional and national scale given the magnitude of investment likely to take place. There are potentially negative effects associated with potential skill shortages, but these can be relatively easily mitigated through a range of measures.

3.5. Flood Risk and Coastal Change

AoS Objective	Assessment (by timescale)		
	S	M	L
5. Flood Risk and Coastal Change: To avoid, reduce and manage flood risk (including coastal flood risk) from all sources and coastal erosion risks by locating infrastructure in lower risk areas and ensuring it is resilient over its lifetime without increasing risks elsewhere	-?	-?	0?

AoS-1 describes the effects of energy infrastructure on flood risk as including:

- changes to hydrological flows (surface and ground water) from alterations to land use, including increases in impermeable surfaces (built structures, hard standing etc) may result in negative and more uncertain effects in the short, medium and long term; and

- construction activities, the introduction of water management measures including sustainable drainage systems (positive effects for water management) and the development coastal/river defences which may have negative effects in the short term with uncertain effects in the longer term.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on flood risk and coastal change are primarily based on impacts from their likely location on the coast, within estuaries or alongside major rivers.

With respect to coastal locations, there is the need to consider the impacts of sea level rise as well as storm surge on the management of flood risk at the location of interest. For estuarine locations, generation stations are likely to be at risk from combined probability flood events from fluvial and coastal process, while stations located alongside major rivers are likely to be at risk from flooding from fluvial processes alone. At all locations, management of pluvial flood risk will also need to be considered, which is likely to be a greater issue for coal and biomass co-fired generating stations, given their larger footprints associated with hard standing fuel storage areas. These flood risks are likely to increase as a result of climate change, from more intense rainfall

events, ongoing sea level rise (associated with isostatic adjustment) and increased storminess and associated storm surge.[16]

The requirement for CCR and CCS increases the footprint associated with generating stations and CCS infrastructure. This increases the potential for flood risk on assumed CCS infrastructure, the need to ensure resilience under flood conditions and not to increase flood risk along the route of the infrastructure.

Flood risk will be an issue through the lifetime of the fossil fuel electricity generating stations. Given the likely location of these stations, this is a potential negative medium term issue, which could affect each of the construction and operational phases (short to medium terms) of the respective facilities. Following decommissioning, the effect is likely to be neutral. Flood risk management measures put in place to mitigate the impacts of flooding on or from individual sites may impact on coastal processes, hydrodynamics and sediment transport, which in turn may impact on designated habitats. However, the magnitude and extent of the flood risk will be dependent on the location of the generation station and associated facilities across each of these timescales.

Specific mitigation measures include the screening of sites to minimise flood risk. This will be based on reference to strategic flood risk assessments, as prepared by the relevant Local Authority, as well as, where available, integrated coastal zone management plans. Reference to these assessments will assist in quantifying flood risk at sites of interest, locating existing flood protection infrastructure, and identifying specific local flood risk issues that may be relevant at the locations of interest. This will need to consider the whole life time of the proposed development.

On preparing an application for a specific location, a flood risk assessment (FRA)[17] will be required by the IPC as part of the planning approval process, which will include a drainage impact assessment assessing the management of flood risk associated with pluvial flooding. The IPC will need to be satisfied that the FRA has adopted the sequential test or approach to site selection and to direct the most vulnerable infrastructure to areas of lowest flood risk at the site of interest; that priority has been given to the development of appropriate sustainable drainage systems; and that in flood risk areas, the infrastructure is appropriately flood resilient and resistant, with safe access and escape routes, and that residual risk has been adequately managed. Where the FRA is not able to locate the proposed nationally important infrastructure within low probability flood zones[18], given wider sustainability objectives, these can be located in

[16] http://ukclimateprojections.defra.gov.uk/content/view/826/500/
[17] http://www.communities.gov.uk/publications/planningandbuilding/pps25floodrisk; http://wales.gov.uk/topics/planning/policy/tans/tan15?lang=en
[18] Flood Zone 1 or 2 in England, Flood Zone A and B in Wales

higher risk flood zones[19] where the exception test is satisfied. This test provides a method of managing flood risk, while allowing necessary development to occur.

3.5.1. Summary

The development of fossil fuel electricity generating capacity with CCS as facilitated by EN-2 is likely to have negative effects with respect to flood risk during construction, operation and decommissioning/demolition, the significance of which will vary depending upon the technology adopted (foot print) and location. Following decommissioning, the effect is likely to be neutral. However, there is a range of mitigation measures that can minimise these effects, but the extent of the mitigation is uncertain. Therefore, the likely residual effects are considered to be negative, relatively minor in the short and medium terms, neutral in the longer term but with uncertainty across all these timescales.

3.6. Water Quality

AoS Objective	Assessment (by timescale)		
	S	M	L
6. Water Quality: To protect and enhance surface (including coastal) and groundwater quality (including distribution and flow)	-?	-?	-?

AoS-1 describes the effects of energy infrastructure on the water environment as including:

- increased water discharges and atmospheric pollution (eutrophication) can lead to reduced water quality;
- construction, operation and decommissioning activities can increase risk of pollution spills and leaks, which can result in reduced water quality;
- increased abstractions can reduce water levels and therefore modify surface and groundwater flow; and
- construction activities and associated land take can result in modified surface and groundwater flow.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on water quality are primarily from impacts associated with the design of water cooling systems.

[19] Flood Zone 3 in England, Flood Zone C in Wales

This includes discharging water at higher temperatures than receiving waters, which is likely to have an effect on aquatic flora and fauna (see appraisal of Ecology); linked effects from the abstraction of water that will reduce flows in water courses, resulting in negative effects on water quality, sediment transport, and aquatic flora and fauna habitat (see appraisal of Ecology); and the release of anti-fouling chemicals from cooling water systems. Water demands vary between generating technologies, with generally lower water requirements for gas compared with oil and coal-fired stations, and therefore related specific effects on water quality will vary depending on the fuel source adopted.

Other specific effects on water quality include potentially high sediment concentrations from surface water runoff during activities associated with construction (short term) and decommissioning (long term), as well as during operation from coal fuel and biomass storage areas to surface water courses. There is also the potential for leaching of water from the same storage areas to groundwater below the facility as well as deposition of dust and other airborne pollutants in the medium term during electricity generation on neighbouring and downwind water bodies (see appraisal of Air Quality).

Overall, these effects are likely to be negative and occur through construction, operation (with potentially longer term legacy negative effects) and decommissioning of the respective facilities. However, their magnitude will be dependent on the character of water bodies affected, their environmental sensitivities and designations. Thus, any negative effects on the water quality of internationally designated water bodies will be more strategically significant than those with regional or local designations. There is also a need to ensure that reference is made to the objective to achieve or maintain good ecological status or good ecological potential of water bodies in England and Wales under the EU Water Framework Directive[11] and that any development proposals aligns with this objective.

Potentially longer term legacy impacts include the presence of contamination on site during the operational period of the facility, and the effect that this could have on both surface and groundwater quality, including site restoration activities (see appraisal of Soils and Geology).

There are also potential longer term effects on water quality associated with climate change that may result in changes to the temperature regimes of waters used for both process and cooling requirements during the lifetime of the proposed generating station. Therefore, measures will need to be included by the applicant to ensure resilience to these potential effects of climate change on the operation of the proposed infrastructure with respect to the changes in the water quality of water resources and on the water supply used for operational purposes.

Where a project is likely to have negative effects on water quality, as part of the Environmental Assessment, the applicant is required to make an assessment of the existing status of water quality, potential impacts of the proposed development, and

proposed mitigation measures. In assessing proposals, the IPC will need to be satisfied that abstraction licences and discharge consents have been obtained from the Environment Agency, and in doing so, ensure that the proposal has due regard to the requirements of the EU Water Framework Directive and daughter directives.

Examples of mitigation measures that can reduce pollution risks to water quality include the implementation of environmental construction management and decommissioning plans to manage risks associated with, for example, sediment runoff during these phases of on-site activity. Operational mitigation measures proposed in EN-2 include the design of cooling systems with intake and outfall locations that avoid or minimise negative effects, including specific measures to reduce excessive heat from discharges on receiving waters. Technologies that have lower water demands will also have reduced negative effects on water quality. Other measures include the management and treatment of on-site drainage, both surface and sub-surface in fuel storage areas, and as set out in EN-2 dust control activities and the adoption of technologies to minimise and mitigate the release of air borne pollutants from generating facilities as outlined in the appraisal of Air Quality.

3.6.1. Summary

The development of fossil fuel electricity generating capacity and associated CCS as facilitated with the adoption of EN-2 is likely to have negative effects on water quality during construction, operation and decommissioning/demolition (short, medium and long term) of fossil fuel powered facilities, the significance of which will vary depending upon the technology adopted and location. However, there are ranges of mitigation measures, including those proposed in EN-2, that can minimise these effects, but the extent of the mitigation is uncertain. Therefore, the residual effects are likely to be negative, significant, but minor, in the short, medium and longer term but with uncertainty across these timescales.

3.7. Traffic and Transport

AoS Objective	Assessment (by timescale)		
	S	M	L
7. Traffic and Transport: To minimise detrimental impacts of travel and transport on communities and the environment, whilst maximising positive effects	0	0	0

As detailed in AoS-1, through the transport of materials, goods and personnel, energy infrastructure projects can have significant effects on traffic and transport networks, with the effects more pronounced during the construction stage. Identified effects include:

- disruption to road and public transport services; cycle ways and footpaths, especially during construction;
- increased traffic leading to congestion and increased journey times;
- increased noise and atmospheric emissions from road transport;
- impacts on aviation through interfering with the operation of radars and radio signals; and
- potential positive effects through new road facilities and transport links, upgrading of existing roads, enhanced public transport.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on traffic and transport include those associated with impacts from the delivery and movement of fuel and materials by road and rail, as well as the removal of residues from the power stations. Given the nature of coal and biomass fuel types compared with oil and gas, these impacts will be largely associated with coal-fired (and biomass co-fired) power stations. These impacts will result in medium term effects during the operation of these facilities, with greatest negative impact on the communities closest to the generating stations, as well as along transport delivery and removal routes. However the magnitude of these impacts is uncertain.

In addition, depending on the processes adopted, including CCS and fossil fuel emission mitigation measures, the use of hazardous chemicals will require them to be transported to these facilities. This will need to be carefully managed to avoid the risk of traffic accident and release into the atmosphere. Similarly, the risk associated with these related increases in the movement of hazardous substances will be on the communities closest to the generating stations, as well as along transport delivery and removal routes. Again, however the magnitude of these impacts is uncertain.

If a project is likely to have significant transport implications, the applicant's Environment Statement should include a transport assessment, using the current NATA/WebTAG methodology, or any successor approach. The IPC will expect applicants to have sought to site new facilities in the vicinity of existing transport routes wherever possible. There is also a preference for water-borne and rail transport over road transport. This, with other location drivers such as the need for water resources to meet high water demands, which means preferred sites are often close to the coast, estuaries or alongside large rivers, may support this preference and mitigate impacts associated with road transport.

Fuel type may also influence this, where coal and biomass fuels are imported to service generating plants through ports, as siting close to appropriate port facilities will reduce transport costs. Where development of new generating capacity is associated with new

transport links such as port development to increase transport capacity, applicants will be expected to have discussed the possibility of co-funding by Government for any third party benefits. The development of new infrastructure will also need to meet the appropriate planning requirements and have the necessary approvals.

3.7.1. Summary

The development of fossil fuel electricity generating capacity with CCS as facilitated with the adoption of EN-2 potentially has negative effects with respect to traffic and transport, which are likely to be mainly associated with coal-fired (and biomass co-fired) power stations. Mitigation measures are likely to result indirectly from a range of location drivers that include the need to meet high water demands, and to be close to ports that receive imports of coal and biomass fuel, and thus favour bulk transport by water and rail. However, residual negative effects are likely to remain, the magnitude of which are uncertain, but are likely to be localised on the communities closest to the generating stations, as well as along transport delivery and removal routes.

3.8. Noise

AoS Objective	Assessment (by timescale)		
	S	M	L
8. Noise: To protect both human and ecological receptors from disturbing levels of noise	0	0	0

AoS-1 identifies the potential for the following generic impacts on noise from energy infrastructure projects:

- noise generated as a result of construction activities (for example, from large construction equipment/machinery);
- operational noise (for example, from the operation of turbines);
- noise generated as a result of decommissioning (for example, from demolition of structures); and
- noise generated as a result of supporting or ancillary services (for example, from increased traffic movements).

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on noise and vibration result from impacts associated with the delivery and movement of fuel and materials to coal-fired (and biomass co-fired) power stations by road and rail (see

appraisal of traffic and transport); milling of coal and crushing of other materials for use in the generation cycle; continuous normal operation of gas and steam turbines; and from external noise sources such as air cooled condensers that also operate continuously during normal operation.

The geographical extent and magnitude of the impacts from noise will vary depending upon the source of the noise, the proximity of the proposed development to noise sensitive premises and areas, landscapes where noise will have a negative impact on their quality, and conservation designated sites where noise may have a negative impact on protected species and wildlife.

The Environmental Assessment associated with the proposed development should include a noise assessment of the impacts on amenity. There is however also a need to consider wider effects and mitigation measures for impacts on other receptor communities and environments.

It is recognised that there are limited mitigation measures available associated with the specific effects outlined above. Potential measures in EN-2 include site layout, whereby crushing and milling activities with associated transport linkages could be sited as far as possible from identified receptors. Noise from external apparatus may be unavoidable, but good design concepts could also be explored to reduce negative noise and vibration impacts similarly on receptor communities, human or biological. Monitoring programmes can also be implemented to ensure that noise levels remain within permitted levels set as part of planning conditions on the developer, for example, during construction activities, and that employees are protected against excessive levels of noise and vibration as part of occupational health and safety plans.

3.8.1. Summary

The development of fossil fuel electricity generating capacity with CCR/CCS as facilitated with the adoption of EN-2 is likely to have negative effects with respect to noise and vibration, and this is likely to be mainly associated with coal-fired (and biomass co-fired) power stations. Mitigation measures can be adopted to reduce the magnitude of these effects, but are likely to be limited in extent, and to vary depending upon the generation technology proposed for the site of interest. Therefore residual effects are likely to remain negative and localised.

3.9. Landscape, Townscape and Visual

AoS Objective	Assessment (by timescale)		
	S	M	L
9. Landscape, Townscape and Visual: To protect and enhance landscape quality, townscape quality and to enhance visual amenity	-?	-?	0?

AoS-1 notes that the landscape and visual effects of energy projects vary in accordance with the type of development, its location and the landscape setting of the proposed development:

- Negative effects can occur through construction and operation and can be temporary or permanent. Effects can occur in designated landscape areas (of local or national importance) and in non-designated areas, including towns, and can include negative effects on views, visual amenity and on local amenity (e.g. from light pollution).

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on landscape, townscape and visual character include negative landscape and visual effects from larger structures such as turbine and boiler halls, storage facilities, and water processing plants. Coal-fired and biomass co-fired generating stations will require more space than other types of generating technology given the need for bulk material storage. Cooling towers and exhaust stacks with their plumes will also have an effect on landscape and visual amenity.

The requirement for CCR for generating stations with a capacity of or greater than 300 MW means that sufficient space has to be available on or near the site to accommodate carbon capture retrofit in the future.

Effects on visual amenity and landscape will occur during construction and operation of these facilities, with opportunities for mitigation during demolition and decommissioning. The magnitude of these effects will be dependent on their specific location and related sensitivity of the receiving environment. More pronounced negative effects will result from location within or neighbouring to high landscape value environments such as AONB or National Parks.

Water demands for the generating technologies vary, although CCS has its own additional water requirements. This implies that favoured locations for new capacity fossil fuel facilities will be coastal, beside estuaries or alongside large rivers. Such receiving environments are likely to be areas of relatively low relief, which will exacerbate the negative visual effects from these facilities if located on green field sites.

If new facilities are located in areas already heavily industrialised, then the significance of the visual effect is likely to have a less negative impact. Consideration of CHP may favour siting in such a location.

The planning regime requires that all proposals must include an Environmental Statement, and that this must include a visual and landscape impact assessment. EN-2 also indicates that the design of the proposed facility and plant including materials used should be considered in relation to the local landscape. The visual impact of stacks should also be considered.

It is also recognised in EN-2 that it is not possible to eliminate negative visual and landscape effects, so that mitigation is therefore focussed on reducing the magnitude of this effect. EN-2 provides guidance to the IPC that it should expect applicants to adopt architectural treatments, within engineering and environmental constraints, that aim to minimise these effects. Other measures suggested within EN-2 include screening the site through a combination of earth bunds, mounds and tree planting. This will mitigate the impact of smaller, lower level structures, but not larger on-site structures.

With respect to minimising negative visual effects from tall structures and visible steam plumes the IPC should favour the use of modern hybrid cooling systems such as mechanical draught. Only if a proposal can demonstrate that application of a modern hybrid cooling system is not practicable should alternatives be approved.

Mitigation may be possible during the decommissioning and demolition of facilities with associated potential for some landscape restoration.

3.9.1. Summary

The development of fossil fuel electricity generating capacity with CCS as facilitated with the adoption of EN-2 potentially has negative effects on landscape, townscape and visual amenity. The magnitude of these negative effects will vary, depending on the generating technology associated with each application, as well as the proposed location and receptor landscape. Mitigation measures are possible, but negative potentially strategic residual effects are likely to remain through construction and operation phases of the development (short to medium term), but less so for the longer term following decommissioning and demolition.

3.10. Archaeology and Cultural Heritage

AoS Objective	Assessment (by timescale)		
	S	M	L
10. Archaeology and Cultural Heritage: Protect and where appropriate enhance the historic environment including heritage resources, historic buildings and archaeological features	0?	0?	0?

AoS-1 describes the effects of the NPSs for energy infrastructure on Archaeology and Cultural Heritage as including:

- disturbance or loss of heritage assets[20] as a result of ground works or excavation; and
- impacts on the setting of nearby heritage assets.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on archaeology and cultural heritage relate to the impacts from the required footprint associated with the overall size of the development. The requirement for CCR for generating stations with a capacity at or greater than 300 MW means that sufficient space has to be available on or near the site to accommodate carbon capture equipment in the future.

For new coal-fired generating stations, it is assumed that these will retrofit CCS from 2025 and will therefore require facilities to capture the carbon, pipeline transfer to the storage facilities and then the storage facilities themselves, which will be offshore. EN-2 notes that the IPC should include in any development consent for a coal-fired generating station a requirement that before construction can commence, the applicant should provide evidence that all necessary consents for the CCS chain are in place.

Other specific effects include those associated with the chosen technology and design of the generating facility. For example, coal-fired and biomass co-fired generating stations will require more space than other types of generating station for bulk material storage, increasing the risk of negative effects on archaeology and cultural heritage. Cooling towers and exhaust stacks with their plumes could also have an impact on cultural heritage through a negative impact on visual setting of important sites, structures and features.

[20] Those elements of the historic environment – buildings, monuments, sites or landscapes – that have significance due to their historic, archaeological, architectural or artistic interests are called 'heritage assets'.

The applicant, as part of the Environmental Statement, should provide a description of the heritage sites affected and the contribution of their setting to their significance. Where a development site includes heritage assets with an archaeological interest, an appropriate desk-based assessment should be undertaken.

Changes to site layout may assist in reducing potential negative effects on identified sites. However, it may not be possible to eliminate all such effects on archaeology and cultural heritage. Further mitigation would be focussed on measures such as mapping as part of site preparation with excavation, recording and documenting of identified sites within the construction activities programme before they are permanently covered by site infrastructure and buildings. For the remainder of site construction activities, a watching brief should be adopted, so that where unknown/unmapped features are disturbed, these can be assessed for archaeology and cultural heritage significance and appropriate mitigation measures taken, including recording and documenting any findings.

During decommissioning and demolition on the site, further monitoring will be required, to ensure no further damage to sites takes place, and that opportunities for restoration are maximised.

3.10.1. Summary

The development of fossil fuel electricity generating capacity with CCR/CCS as facilitated with the adoption of EN-2 is likely to have negative effects on archaeology and cultural heritage. The magnitude of these effects will vary, and is therefore uncertain, depending on the proposed location and on the generating technology, the footprint associated with each application, and therefore the risk of disturbance or damage to heritage assets. There are opportunities for mitigation during the planning stage and construction phases (short term); very limited for the medium term during operations; and possibly the potential for positive effects from restoration during decommissioning and demolition at the site of interest. However, the net effect is likely to remain negative for the site, but associated with uncertainty if regionally or nationally important assets are at risk.

3.11. Air Quality

AoS Objective	Assessment (by timescale)		
	S	M	L
11. Air Quality: To protect and enhance air quality on local, regional, national and international scale	0	-?	0

As detailed in AoS-1, energy infrastructure projects can have significant negative effects on air quality during construction, operation and decommissioning. These include:

- emissions generated as a result of construction activities (transport emissions from the transport of materials, resources and personnel; dust and fumes from machinery operation, excavation and drilling);
- emissions from project operation (operation of plant, transport of materials, resources and personnel); and
- emissions from plant, machinery and vehicles during the decommissioning of projects (including transport to and from site).

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on air quality relate mainly to impacts of continued fossil fuel electricity generation with the "energy penalty" associated with CCS. Emission releases of SO_x and NO_x are controlled by statutory limits with respect to the Large Combustion Plant Directive (LCPD), which are likely to be tightened following its replacement by the Industrial Emissions Directive (IED) in 2016. For the same capacity plant, adoption of CCS would result in increased release of NO_x and SO_x as part of the capture process from the generating technology. For example, pulverised coal with CCS is estimated to increase NO_x releases by 23%, while Integrated Gasification Combined Cycle with CCS is estimated to increase SO_x released by 15%, in both cases compared with no CCS in place[9]. These increases are related to the CCS "energy penalty" referred to earlier in the appraisal of the Resources and Raw Materials AoS Objective above. However, the statutory limits on emissions, means that total emissions of NO_x and SO_x from the plant could not increase, and that part of the power generated by the plant would be used for the CCS process, with less energy being fed into the electricity grid. Therefore, the plant's overall energy efficiency would reduce. Therefore, adoption of EN-2 maintains releases of SO_x and NO_x from fossil fuel electricity generating capacity, within the statutory limits and emissions ceilings as defined by the LCPD and upcoming IED.

Operation of coal-fired power stations is also associated with an increase in the release of particulates into the atmosphere, including PM_{10} (Particulate Matter of less than 10 micrometers in diameter) and trace elements found in coal. These have negative impacts on air quality, as well as public health, which are discussed in the appraisal of health and well-being.

There are also additional effects on air quality associated with the operation of coal-fired generating stations from activities such as the receipt and preparation of fuel, furnace maintenance and residue removal. All of these are associated with plant operation, and are therefore medium term and ongoing in duration, although only likely to be localised in extent, the geography of which will be determined by prevailing winds. In addition, the release of dust will be associated with construction activities on site, and

decommissioning and demolition. These are likely to be relatively short term, localised negative effects.

Where the development is likely to have a negative impact on air quality, the applicant is required to undertake an assessment of these impacts and proposed mitigation measures, and identify residual effects through the lifecycle of the development, as part of the Environmental Assessment.

A range of mitigation measures are proposed in EN-2 including measures to reduce the release of NO_x through the adoption of technologies such as Selective Catalytic Reduction (SCR). Using SCR, ammonia steam or air can be used to reduce NO_x emissions to water and nitrogen gas. Where urea is used as a catalyst, CO_2 is the main product, increasing GHG emissions. Other negative effects from adoption of this mitigation measure include the increased need to handle potentially hazardous materials such as ammonia. Mitigation measures to reduce SO_x emissions include the use of low sulphur coal as the fuel source, incorporation of desulphurisation plants or fluidized bed combustion of coal.

With respect to the release of particulates, a range of technologies exist to reduce releases from coal-fired plants including baghouse, electrostatic precipitator and cyclone collector. The use of Integrated Gasification Combined Cycle technology for coal-fired plants produces significantly lower particulate emissions to the atmosphere.

There are a range of mitigation measures available to manage the release of dust from coal-fired generating stations. This includes enclosed storage areas and adoption of, for example, air supported conveyers with the reduced opportunity for the release of dust; landscaping to reduce the potential of wind blown dust; dust suppression systems; and the control of vehicle movements and mobile plant movement around materials handling areas.

The developer needs to ensure that the Environment Agency has been consulted in all releases to the atmosphere. This will help to ensure that the IPC can receive timely advice and reassurance that the applications are taking into account all the necessary permitting and licensing requirements and that these are being considered in parallel to the planning process. This will be given additional scrutiny if the development is within or adjacent to an Air Quality Management Area (AQMA).

3.11.1. Summary

The development of fossil fuel electricity generating capacity with CCR/CCS as proposed with the adoption of EN-2 is likely to have negative effects with respect to air quality, mainly during plant operation. The adoption of CCS with coal-fired generating stations is associated with an “energy penalty”, which means that to maintain releases of SO_x and NO_x within statutory limits, net energy inputs to the electricity grid will be less

than would be case without CCS, for the same total capacity coal-fired generating station. The significance of the effects varies between different fossil fuel sources and technologies, between different releases to atmosphere, and also whether there is an AQMA within proximity to the development. For example, the release of SO_x and NO_x could be strategic in nature where these releases cross international borders on prevailing winds, or more regional and local in terms of impact on receptors from particulate and dust releases from power stations.

These effects are therefore considered to be potentially significant in nature and strategic in magnitude during the operational phase of the power plant, but remain uncertain, given the technical and economic uncertainty associated with the adoption of CCS technology. For construction and decommissioning, negative effects are likely to be local in extent through these periods, and following decommissioning air quality impacts from the development will be neutral. However, technology does exist to mitigate the magnitude of these negative effects, which will need to account for potentially additional emissions of NO_x and SO_x from the adoption of CCS in order to comply with air quality permitting, licensing requirements and under the existing LCPD and upcoming IED. These measures are therefore likely to reduce the negative impact on air quality, but some uncertainty remains associated with location and technology.

3.12. Soil and Geology

AoS Objective	Assessment (by timescale)		
	S	M	L
12. Soil and Geology: To promote the use of brown field land, and where this is not possible to prioritise the protection of geologically important sites and agriculturally important land	0?	0?	0?

AoS-1 identifies the potential for a number of generic effects on soil and geology which are applicable across the different types of energy infrastructure development. They include:

- disturbance or loss of soils and geologically important sites; and
- increased risk of pollution and potential contamination of soils.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on soils and geology mainly relate to the impact of the footprint associated with the overall size of the development. The requirement for CCR for generating stations with a capacity of or greater than 300 MW means that sufficient space has to be available on or near the site to accommodate carbon capture retrofit from 2025.

New coal-fired generating stations are assumed to retrofit CCS from 2025 and will require facilities to capture the carbon, pipeline transfer to the storage facilities and then the storage facilities themselves, which are likely to be offshore, and thus have the potential for negative impacts in the marine environment. EN-2 notes the requirement that the IPC should include in any development consent for a coal-fired generating station that before construction can commence, the applicant should provide evidence that all necessary consents for the CCS chain are in place.

Other specific effects include those associated with the technology and design of the generating facility. For example, coal-fired and biomass co-fired generating stations will require more space than other types of generating station for bulk material storage, increasing the risk of negative effects on soils and geology.

High water demands associated with some of the fossil fuel electricity generating technologies means that for these types of technologies, developers' preferred sites are likely to be on the coast, beside estuaries or alongside large rivers. This will reduce siting options, and may act to reduce flexibility with respect to this objective, potentially putting at risk good quality/high value agricultural land. However, there is also a requirement for developers to fully explore options for incorporating good CHP within their applications, which implies development in urban/industrial areas, where the siting of facilities on brown field land is more likely.

Effects on soils and geology will occur during construction and operation of these facilities, with opportunities for mitigation during demolition and decommissioning. The magnitude of these effects will depend upon their specific location and the availability of brown field land when considering all other siting constraints. Negative effects will occur where no brown field land of sufficient foot print is available, with limited other available land use types other than good quality/high value agricultural land or geologically important designated sites, which would increase risk of negative impacts for these land use types and sites.

Where a development is identified as having a negative impact on sites with geological conservation importance (terrestrial, aquatic and marine) the Environmental Statement should include a discussion of these effects. Mitigation measures should also be presented, including opportunities to conserve and enhance geological conservation interests.

Mitigation is limited to maximising the potential use of brown field land in developing site selection criteria, including the location and routing of CCS infrastructure, and avoiding agriculturally important land and sites of geological significance. Where this results in the selection of sites and routes that can be demonstrated to have greater negative sustainability impacts, minimising the loss of agriculturally important land and impacts on geologically importance conservation areas will need to be demonstrated.

3.12.1. Summary

The development of fossil fuel electricity generating capacity with CCR/CCS as facilitated with the adoption of EN-2 is likely to have negative effects on soils and geology. The magnitude of any such effects will vary depending on the proposed location of fossil fuel plant and the routes selected for CO_2 pipelines, the generating technology associated with each application, the footprint, and therefore the risk of disturbance or damage to geologically important sites or agriculturally important land. Nevertheless, it is considered that that the effects overall are likely to be site specific during the construction and operation phases, but with uncertainty reflecting specific siting and routing of the infrastructure, with an uncertain potential for land restoration following demolition and decommissioning. Mitigation measures include planning to avoid identified sites.

3.13. Health and Well-Being

AoS Objective	Assessment (by timescale)		
	S	M	L
13. Health and Well-being: To protect and enhance the physical and mental health of the population	-?	-?	-?
	+?	+?	+?

AoS-1 identifies the potential for the following positive effects on health and wellbeing from energy infrastructure projects:

- significant positive effects from an increase in employment opportunities and enhanced economy; and
- significant positive effects from enhanced energy security and affordability, particularly a reduction in fuel poverty.

However, potential significant negative effects on human health and wellbeing were also identified, with these effects more significant during the construction period:

- disruption and annoyance effects due to noise and vibration;
- effects on health from odour, dust and air pollution;
- effects on health and wellbeing from artificial light, smoke, steam or insect infestation; and
- effects from loss of amenity, open space, access and recreational areas.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on health and well-being are related to potentially negative impacts on air quality associated with the likely increased release of fine particulates, and continued release of NO_x and SO_x, as well as dust and other larger particulates into the atmosphere, principally from coal-fired plants and operation of CCS.

Recent studies undertaken by the Committee on the Health Effects of Air Pollutants (COMEAP) on cardiovascular disease and air pollution[21] and on the effect of long term exposure to air pollution on mortality[22] have identified linkages between poor air quality and impacts on health. For example, the principal conclusions from the 2006 study included that there were clear associations reported between both daily and long-term average concentrations of air pollutants and effects on the cardiovascular system, and many of these associations are likely to be causal in nature. The study also identified that fine particles were important in these associations. In the case of SO_x, an association was identified, although was considered to be a potential surrogate for sulphate particles. For NO_x, the association was weaker, and tentatively suggested to be less important than fine particles. In the 2009 study, it was concluded that the evidence assessed during the study as a whole points strongly to an association between long-term exposure to particulate air pollution and effects on mortality. Evidence relating to the possible effects of long-term exposure to the common air pollutant gases (such as SO_x and NO_x) is less well developed, but may change as evidence from more studies accumulates. Negative health effects are likely to be local and regional in extent, but effects could also be at a national scale, depending on the number of coal-fired plants that are constructed under EN-2 compared with other fuel types, and therefore associated cumulative effects. These effects are likely to be at their most acute in the medium term during operation, but could continue into the longer term on the effected populations. Mitigation of the magnitude of these potential effects is likely with the adoption of tighter emission standards associated with adoption of the IED from 2016.

A study by the EPA in the USA[23] focussing on health impacts of coal-burning electric utilities concluded that with the exception of mercury, there was no compelling evidence to indicate that emissions of trace elements or organic compounds cause human health problems. The health problems attributed to mercury were not due to direct exposure to emissions from coal-burning power plants but from bioaccumulation up the food chain. The reasons for this lack of evidence at the time of this study was considered to be related to the coal used in most US facilities, which contain low concentrations of

[21] Cardiovascular Disease and Air Pollution (2006) A report by the Committee on the Medical Effects of Air Pollutants.
[22] Long-Term Exposure to Air Pollution: Effect on Mortality (2009) A report by the Committee on the Medical Effects of Air Pollutants
[23] U.S. Environmental Protection Agency, 2000. Unified Air Toxics Website: Electric Utility Steam Generating Units Hazardous Air Pollutant Emission Study. (http://www.epa.gov/ttn/uatw/combust/utiltox/utoxpg.html) December 14, 2000.

potentially hazardous substances, and the technology used associated with pollution control systems. However, other studies have summarised a range of health impacts attributable to the combustion of fossil fuels, including coal and oil[24]. These included respiratory effects in children, genetic damage, male and female reproductive effects and cardiopulmonary and cancer mortality. As has been commented by others[25], the extent to which emissions from coal-fired power stations have direct impact on human health is a matter of robust scientific debate[26].

There are also potential occupational health and safety issues associated with adoption of both CCS and cleaner coal technologies. The Health and Safety Executive submitted a report in 2006[27] to the then Department for Trade and Industry, as a contribution to the Government's Energy Review at that time. This report highlighted a number of issues associated with the implementation of these technologies as well as recommendations to address identified topics of concern.

There are also technology specific noise impacts associated with fossil fuel electricity generation facilities that could have both direct and indirect negative effects on health and well being through raised ambient noise levels at nearby residential properties and disruption to amenity areas, reducing opportunities for recreation in these locations. These will be local in extent, but potentially very disruptive nonetheless.

However, there are potentially positive effects on health and well being from the adoption of NPSs EN-1 and EN-2 associated with the increased employment opportunities from implementation of CCS technology with the continued development of fossil fuel electricity generating capacity. These are likely to be of national significance and long term in time scale with the growth of employment in these sectors. These benefits are further discussed in the assessment of impacts on economy and skills.

As noted in the assessment of air quality, where the development is likely to have a negative impact on air quality, the applicant is required to undertake an assessment of these impacts and proposed mitigation measures, and identify residual effects through the lifecycle of the development, as part of the Environmental Assessment. A range of potential mitigation measures to reduce air emissions and airborne dust is presented in

[24] Lewtas, J. (2007) Air pollution combustion emissions: Characterization of causative agents and mechanisms associated with cancer, reproductive, and cardiovascular effects. Mutation Research 636, 95–133.
[25] Wilde, M (2008) Best Available Techniques (BAT) and Coal-fired Power Stations: Can the Energy Gap be plugged without Increasing Emissions? Journal of Environmental Law 20:1, 87-114.
[26] Research conducted on behalf of the Swedish Non-Governmental Organisation (NGO) Secretariat on Acid Rain used mathematical and statistical methodology employed by the EU's Clean Air for Europe (CAFE) programme to estimate the number of premature deaths attributable to SO_2 and NO_x emissions from coal-fired power stations. A break down of the figures concluded that almost 7,000 deaths in the UK could be attributable to UK coal-fired power stations. The UK energy industry has refuted the figures. See ENDS, 'Coal-fired power stations ''kill 7,000 people per year''' [2006] 374 ENDS Report 14.
[27] http://www.hse.gov.uk/consult/condocs/energyreview/energyreport.pdf

this same assessment of impacts on air quality above, including those related to the statutory emission limits under the LCPD, which are likely to be tightened once the IED comes into force. Occupational and wider health and safety issues also need to be addressed, where reference to Health and Safety Executive observations and recommendations with respect to CCS and new technology coal-fired generating stations will be of benefit.

Mitigation measures to reduce negative effects from noise and vibration across all generating stations are presented in the assessment of noise and vibration.

3.13.1. Summary

The development of fossil fuel electricity generating capacity as proposed with the adoption of EN-2 does potentially have negative effects on health and well being through impacts on air quality, mainly associated with plant operation. Air quality impacts are primarily related to generation by coal-fired power stations, and are likely to be more local and regional in extent, although strategic effects are possible with a greater number of coal-fired power stations. Other potential local negative effects result from noise and vibration. There are potentially positive effects on health and well-being associated with increased employment opportunities locally, regionally and nationally with the implementation of EN-2. A range of mitigation measures are available to reduce the negative effects on health and well being, principally driven by statutory emission limits, which are likely to tighten with the adoption of the IED in 2016, the choice of technology and associated reduced emissions with fossil fuel energy generation. However, given the ongoing scientific debate on the strength of the link between emissions and health effects, it is considered that overall, these effects on health and well being will remain negative, but associated with uncertainty.

3.14. Equality

AoS Objective	Assessment (by timescale)		
	S	M	L
14. Equality: To encourage equality and sustainable communities	0	0	0

AoS -1 notes that the Energy NPSs will have the following effects on Equality:

- positive effects through ensuring energy security and affordability, with benefits for all socio-economic groups, but particularly for those on low incomes and hence susceptible to fuel poverty; and

- indirect positive effects due to the enhanced economic benefits and increased employment and skills opportunities likely to be created as a result of the energy NPSs.

Specific effects associated with the adoption of EN-2 with respect to facilitating the development of fossil fuel electricity generating infrastructure with CCR/CCS on equality are likely to be neutral. This policy is important to the transition to a low carbon economy, maintaining energy supplies at reasonable cost to the population and economy of England and Wales. Access to affordable energy supplies maintains and encourages equality, reducing the impact of fuel poverty on low income households, supports the economy and employment and assists in the growth and development of sustainable communities. The main driver of CCS economic viability is also the price of carbon, which it is assumed will reach a point whereby coal-fired generating capacity with CCS becomes operationally economic in comparison with other more expensive electricity generating technologies.

The potential local negative effects on equality and community sustainability are likely to result from negative impacts on health and well being through reductions in air quality, and local water quality, increased noise and negative impacts on local ecology. Such negative impacts can affect lower income groups disproportionately with limited economic resources to move from geographically affected areas to those with reduced negative impacts.

Mitigation measures associated with potentially negative effects on equality include ensuring measures to reduce negative environmental effects from the construction, operation and decommissioning/demolition of fossil fuel electricity generating capacity are adopted as part of the planning consent and pollution control processes. Socio-economic benefits are also expected to be focussed on local communities, maximising direct and indirect employment opportunities.

3.14.1. Summary

The development of fossil fuel electricity generating capacity with CCR/CCS as facilitated with the adoption of EN-2 is likely to have local effects on equality. This includes potentially positive effects from increased employment opportunities. There are potentially negative effects through negative impacts on health and well-being and the environment, but these can be mitigated through the planning approvals and pollution control process.

3.15. Cumulative Effects

Cumulative effects associated with the adoption of EN-2 are likely to arise from the development of Carbon Capture and Storage (CCS) infrastructure and coal-fired and biomass co-fired power stations. Given the likely costs associated with the development

of this infrastructure and the off-shore location for the storage of the captured CO_2, there is likely to be a clustering of new fossil fuel, and especially coal-fired and biomass co-fired stations, around strategically located land based transfer stations prior to onward pumping of the CO_2 to offshore head works. The locations of any demonstration projects is therefore likely to be initially attractive places to locate future fossil fuel electricity generating capacity, which may reduce as the costs associated with CCS decline in the future.

Cumulative effects are likely to be initially associated with the construction of the CCS infrastructure with fossil fuel plant and other power stations with reasons to be located in similar areas. These effects may actually be more sustained than would be the case with the construction of a single power station with CCS infrastructure as new fossil fuel electricity generating capacity develops around CCS infrastructure clusters as highlighted earlier.

Given the likely location of CCS storage reservoirs within the oil and gas basins in the North Sea, this implies a key driver for the clustering of CCS and power generating stations in the South East, East Anglia, Humberside and the North East regions of England. This clustering around CCS infrastructure and especially land based transfer stations prior to offshore storage reinforces other location drivers. This includes availability of water resources to meet process water demands and cooling water requirements, as well as locations close to ports to receive imported fuel stock and other raw materials and for outward transport of residues to export markets.

These potential cumulative effects will be felt across a number of AoS objectives in an adverse manner including air quality, water quality, resource use, ecology and traffic and transport amongst others. These may be difficult to mitigate, where the location of suitable CCS storage reservoirs will be a key driver.

However, there is also the potential for positive cumulative effects at a regional scale associated with spatial clustering in a number of the regions identified above. These are across the AoS objectives economy and skills, health and well being and equality, and all relate to direct and indirect employment creation within these regions associated with development of CCS infrastructure with fossil fuel and other generating stations.

Similarly, cumulative effects of construction may arise in conjunction with the development of other energy technologies, particularly those contained in EN-4 where pipeline connections may be required to supply new gas or oil-fired power stations, and EN-3 with the development of off-shore wind generation capacity in potentially similar areas as those selected for CCS storage reservoirs. These will mainly affect the built and natural environment sustainable development themes.

Onshore cumulative effects across NPSs may further arise due to location/proximity. Fossil fuel electricity generating stations and CCS infrastructure favour coastal locations, as may other energy technologies in EN-3, EN-4, EN-5 and EN-6. Cumulative

effects on coastal landscapes and coastal change may arise should energy developments be concentrated in areas that provide the specific requirements of that development. Such effects would be permanent and long-term (until decommissioned), and also difficult to mitigate due to the scale of the energy developments, particularly where new fossil fuel electricity generating and CCS facilities are involved.

3.16. Summary of Key Findings of Appraisal

Fossil fuel electricity generating infrastructure development has similar effects to other types of energy infrastructure. These result from impacts associated with large facilities at single sites as well as those associated with linear features linked with the potential development of CCS infrastructure. The effects are likely to be more concentrated around these single large facilities, as well as spread across wider areas, but likely to be preferentially located within the eastern regions of England with respect to CCS. For the majority of the AoS objectives, the strategic effects of EN-2 were considered to be neutral or negative but uncertain.

However, through facilitating and enabling the fossil fuel electricity generating infrastructure necessary to support the transition to a low carbon economy and ensure security of supply, EN-2 is considered likely to have positive effects on the economy and skills, and health and well being as secondary benefits, in the short, medium and long term, and positive effects in the medium to long term, on the AoS climate change objective. However, uncertainty is also associated with these benefits given the need to demonstrate the economic and technical viability of CCS.

Effects on a range of AoS objectives (Ecology; Resources and Raw Materials; Flood Risk and Coastal Change; Water Quality; and Landscape, Townscape and Visual) are considered to be generally negative across short, medium and long terms. Again uncertainty is associated with this assessment, as at this level of appraisal, actual effects are dependent on the sensitivity of the environment and the location and design of infrastructure. EN-1 and EN-2, as well as this document, include extensive mitigations to ensure these effects are considered by applicants and the IPC when preparing and determining applications. Nevertheless, it is considered that residual negative, but uncertain, effects will remain.

The appraisal also concludes that there are likely to be negative effects on AoS topics for both Air Quality and Health and Well-being. These are considered to be linked, given the association between emissions from fossil fuel electricity generating plants and public health. A range of mitigation measures are expected, related to tighter emissions standards and are also proposed which can address both, but given the ongoing debate on this association, residual effects are considered to remain negative, but uncertain.

Neutral effects were identified for AoS objectives Traffic and Transport and Noise across all time scales specifically related to the adoption of EN-2. Traffic and Transport and Noise effects are considered to be localised and therefore neutral at regional,

national or international in scale and extent. Neutral effects were also identified for AoS objectives Archaeology and Cultural Heritage and Soils and Geology, as these are considered likely to be site related, but are associated with some uncertainty given the potential for impacts on sites of regional, national or international significance. Effects on equality are overall considered to be neutral, balanced between potential positive economic impacts associated with local employment creation, and potentially negative localised impacts on ecology and environment.

EN-2 contains a range of technology specific mitigation measures, along with those proposed in EN-1, which seek to address the range of negative effects identified.

A summary of the likely significant effects arising specifically from fossil fuel electricity generating infrastructure is set out in the following Table 2.1:

Table 2.1: Summary of Key AoS Findings Specific to Fossil fuel electricity generating Infrastructure

AoS Objective	Assessment (by timescale)		
	S	M	L
1. Climate Change	0	+?	+?
2. Ecology (Flora and Fauna)	-?	-?	-?
3. Resources and Raw Materials	-?	-?	-?
4. Economy and Skills	+?	+?	+?
5. Flood Risk and Coastal Change	-?	-?	0?
6. Water Quality	-?	-?	-?
7. Traffic and Transport	0	0	0
8. Noise	0	0	0
9. Landscape, Townscape and Visual	-?	-?	0?
10. Archaeology and Cultural Heritage	0?	0?	0?
11. Air Quality	0	-?	0
12. Soil and Geology	0?	0?	0?
13. Health and Well-Being	-?	-?	-?
	+?	+?	+?
14. Equality	0	0	0

The following changes are recommended for EN-2:

- Include cooling towers and exhaust stacks and their plumes as a technology specific effect in Section 2.6 of EN-2 rather than including them within EN-1 as a generic effect. This is because this is specifically related to energy generating infrastructure, for which issues of scale are likely to be important for fossil fuel technology specific as well as other generating plants. Their presence is likely to

have an effect on AoS objectives Landscape, Townscape and Visual as well as Archaeology and Cultural Heritage.

- Clarify and confirm that there are no residue management issues associated with CCS technologies as well as non-coal-fired generating stations and related technologies in Section 2.9 of EN-2.

Neither of these recommendations was adopted for inclusion within EN-2.

4. Monitoring and Next Steps

4.1. Monitoring

Monitoring should be focussed upon likely significant effects that may give rise to irreversible damage, with a view to identifying trends before such damage is caused and likely significant effects where there was uncertainty in the AoS such that monitoring would enable preventative or mitigation measures to be undertaken.

A draft Monitoring Strategy for the Energy NPSs and AoSs will be published alongside the main consultation documents. The Government will further develop the monitoring strategy during the re-consultation period to take into account responses received on the revised draft NPSs and AoSs. The Strategy sets out the proposed indicators for monitoring together with agreed responsibilities and frequencies of monitoring during the implementation of the NPSs. This will be summarised in the Post- Adoption Statement that will be published with the designated NPSs.

Although visual effects are potentially generic for major infrastructure projects, they are a particular characteristic of fossil fuel electricity generating technology and consideration should be given to monitoring the cumulative effects on landscape, given the comments on the potential for clustering in Section 3.15.

4.2. Quality Assurance Checklist

The Government's guidance on SEA contains a quality assurance checklist to help ensure that the requirements of the SEA Directive are met. This has been completed and is presented in Annex A.

4.3. Next Steps

The revised draft energy NPSs and AoS Reports will be available for re-consultation for a period of 14 weeks from 18 October 2010. The documents are available at www.energynpsconsultation.decc.gov.uk and details of how to comment are set out in the Consultation Document.

5. Annex A: Quality Assurance Checklist

The Government's Guidance on SEA[28] contains a quality assurance checklist to help ensure that the requirements of the SEA Directive are met. Those relevant to this stage have been highlighted below.

Quality Assurance Checklist	
Objectives and Context	
The plan's purpose and objectives are made clear.	**Section 1** of this AoS Report and **Section 2** of AoS-1.
Sustainability issues, including international and EC objectives, are considered in developing objectives and targets.	International and European objectives and targets are identified in **Annex B** and **Annex F**.
SEA objectives are clearly set out and linked to indicators and targets where appropriate.	**Section 2.4** of AoS-1 presents the AoS objectives and Guide Questions.
Links to other related plans, programmes and policies are identified and explained.	**Annex F** identifies a number of relevant plans and programmes.
Scoping	
The environmental consultation bodies are consulted in appropriate ways and at appropriate times on the content and scope of the Scoping Report.	The consultation on the Scoping Report ran for 5 weeks from the 13th February 2009 to 23rd March 2009. Two scoping workshops were also held during the scoping stage in March 2009 (one in Cardiff and one in London), to which all the consultation bodies were invited.
The SEA focuses on significant issues.	Significant issues were identified in the Scoping Report and were reiterated in **Annex F.**

[28] ODPM, Scottish Executive, Welsh Assembly Government, DoENI (2005) A Practical Guide to the Strategic Environmental Assessment Directive, ODPM, London.

Technical, procedural and other difficulties encountered are discussed; assumptions and uncertainties are made explicit.	These were stated throughout the **Scoping Report** where appropriate, and are presented in **Section 2.5** and **Section 2.6** of AoS-1.
Reasons are given for eliminating issues from further consideration.	These are stated in the **Scoping Report** as appropriate.
Alternatives	
Realistic alternatives are considered for key issues, and the reasons for choosing them are documented.	Alternatives were identified in **Section 3** of AoS-1. Technology-specific alternatives are presented in **Section 1.3** and are assessed in **Section 2.2** of this AoS Report.
Alternatives include 'do minimum' and/or 'business as usual' scenarios wherever relevant.	These were considered in **Section 3** of AoS-1.
The environmental effects (both adverse and beneficial) of each alternative are identified and compared.	Refer to **Section 3** in EN-1 for generic alternatives and to **Section 2.2** of this report for technology-specific alternatives.
Inconsistencies between the alternatives and other relevant plans, programmes or policies are identified and explained.	Refer to **Section 2.2** of this AoS report, **Section 3** of AoS-1 and the review of policies, plans and programmes in **Annex F**.
Reasons are given for selection or elimination of alternatives.	These are presented in **Section 3** of AoS-1.
Baseline Information	
Relevant aspects of the current state of the environment and their likely evolution without the plan are described.	This is set out in **Annex F**.
Characteristics of areas likely to be significantly affected are described, including areas wider than the physical boundary of the plan area where it is likely to be affected by the plan where practical.	Refer to **Annex F**.
Difficulties such as deficiencies in information or methods are explained.	These are stated throughout the report where appropriate.
Prediction and Evaluation of Significant Environmental Effects	

Effects identified include the types listed in the Directive (biodiversity, population, human health, fauna, flora, soil, water, air, climatic factors, material assets, cultural heritage and landscape) as relevant; other likely environmental effects are also covered as appropriate.	These are set out in **Annex F** and **Section 3** of this AoS Report.
Both positive and negative effects are considered, and the duration of effects (short, medium, or long tem) is addressed.	This is covered in the appraisal in **Section 3** of this AoS Report and in **Annex F**.
Likely secondary, cumulative and synergistic effects are identified where practicable.	Refer to **Section 3.15** of this AoS Report and **Section 4.16** of AoS-1.
Inter-relationships between effects are considered where practicable.	Refer to **Section 3** of this AoS Report.
The prediction and evaluation of effects makes use of relevant accepted standards, regulations and thresholds.	These are considered in the appraisal in **Annex F.**
Methods used to evaluate the effects are described.	These are described in **Section 4** of AoS-1.
Mitigation Measures	
Measures envisaged to prevent, reduce and offset any significant adverse effects of implementing the plan or programme are indicated.	This is presented in **Section 3** of this report and **Section 4** of AoS-1.
Issues to be taken into account in project consents are identified.	These are considered in **Section 3**.
Environmental Report	
Is clear and concise in its layout and presentation.	The layout of this AoS Report is set out in **Section 1**.
Uses simple, clear language and avoids or explains technical terms.	Abbreviations are presented in **Annex A** and technical terms are explained throughout where necessary.
Uses maps and other illustrations where appropriate.	Figures and tables have been used throughout to where appropriate.

Explains the methodology used. Explains who was consulted and what methods of consultation were used.	This is presented in **Section 4** of AoS-1. This is covered in **Section 1.4** of AoS-1.
Identifies sources of information, including expert judgement and matters of opinion.	This is covered in **Section 4** and **Annex F** of AoS-1.
Contains a non-technical summary covering the overall approach to the SEA, the objectives of the plan, the main options considered, and any changes to the plan resulting from the SEA.	An NTS is provided separately.
Consultation	
The SEA is consulted on as an integral part of the plan-making process.	Consultation has already taken place on the Scoping Report in February and March 2009. The AoS Report will be published alongside the draft NPS for consultation.
Consultation Bodies and the public likely to be affected by, or having an interest in, the plan or programme are consulted in ways and at times which give them an early and effective opportunity within appropriate timeframes to express their opinions on the draft plan and Environmental Report.	Stakeholders have been kept engaged throughout the report's preparation and comments have been sought during designated consultation periods and workshops.
Decision-making and Information on the Decision	
The AoS Report (Environmental Report) and the opinions of those consulted are taken into account in finalising and adopting the plan or programme.	This will be included in the Post Adoption Statement (to be issued following consultation).
An explanation is given of how they have been taken into account.	This will be included in the Post Adoption Statement (to be issued following consultation).
Reasons are given for choosing the plan or programme as adopted, in the light of other reasonable alternatives considered.	This will be included in the Post Adoption Statement (to be issued following consultation).
Monitoring Measures	

Measures proposed for monitoring are clear, practicable and linked to the indicators and objectives used in the SEA.	These are presented in **Section 5** of AoS-1 and in **Section 4.1**.
Monitoring is used, where appropriate, during implementation of the plan or programme to make good deficiencies in baseline information in the SEA.	These are presented in **Section 5** of AoS-1 and in **Section 4.1**.
Monitoring enables unforeseen adverse effects to be identified at an early stage (these effects may include predictions which prove to be incorrect).	These are presented in **Section 5** of AoS-1 and in **Section 4.1**.
Proposals are made for action in response to significant adverse effects.	This will be set out in the Post Adoption Statement (to be published following consultation).

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