



DBERR:
**The future of nuclear power – The role of nuclear power in
low carbon UK economy**

For other Responses to consultations visit: <http://www.jncc.gov.uk/page-3908>

For further information about Joint Nature Conservation Committee visit:
<http://www.jncc.gov.uk/page-1729>



From the Director of Resources and External Affairs

Marcus Yeo
Joint Nature Conservation Committee
Monkstone House, City Road
Peterborough PE1 1JY, United Kingdom

Telephone: 01733 866897 Fax: 01733 555948
Email: marcus.yeo@jncc.gov.uk
Website: www.jncc.gov.uk

10 October 2007

Response – Nuclear Technical 2007
Freepost SEA 12430
Thornton Heath
CR7 7XT

Dear Sir/Madam

Response to “The Future of Nuclear Power” consultation documents

Please find attached the response of the Joint Nature Conservation Committee (JNCC) to the above consultation.

The Joint Nature Conservation Committee (JNCC) is the statutory adviser to Government on UK and international nature conservation, on behalf of the Council for Nature Conservation and the Countryside, the Countryside Council for Wales, Natural England and Scottish Natural Heritage. Its work contributes to maintaining and enriching biological diversity, conserving geological features and sustaining natural systems.

Part of the JNCC’s statutory responsibilities is to advise ministers on the development and implementation of policies for, or affecting, nature conservation in the UK and internationally. Energy production and use in the UK impacts upon biodiversity and nature conservation interests both within the country and overseas.

Our advice in respect of “The Future of Nuclear Power” consultations is attached to this letter. We make three main recommendations:

- 1. Energy production and consumption within the United Kingdom has global environmental impacts. Government policy on reducing the UK’s global environmental footprint should be taken into account when considering nuclear new-build.**

In particular, we believe that the environmental costs of uranium ore extraction during the lifetime of any UK nuclear generation programme should be considered.

- 2. All of the sustainable development principles (as enunciated in the UK Sustainable Development Strategy) should be considered as part of the nuclear new-build programme, not merely the limited areas of carbon emissions and security of supply. In particular, we strongly caution against considering low carbon technologies to be necessarily sustainable *per se*.**

JNCC SUPPORT CO. Registered in England and Wales, company no. 05380206
Registered office: Monkstone House, City Road, Peterborough, Cambridgeshire PE1 1JY

It is essential that the sustainability, or otherwise, of energy supply and consumption in the UK is assessed on broader issues “*respecting the limits of the planet’s environment, resources and biodiversity*” (using the words of the UK Sustainable Development Strategy). In order to deliver this assessment consideration of the economics of nuclear energy should be based on the true benefits and costs (including the public costs of waste storage and decommissioning and potential impacts on biodiversity and ecosystem services).

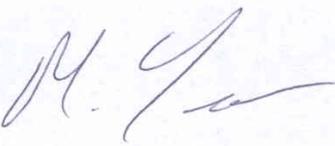
3. Strategic Environmental Assessment

One of the key tools in assessing the sustainability of proposals is the use of Strategic Environmental Assessment (SEA). This is required under Directive 2001/42/EC. Energy policies and programmes in the UK (for example, oil and gas or windfarm licensing rounds) are already subject to SEA, which BERR has carried out in UK waters in recent years. While the consultation documents confirm that SEA should be carried out we believe that the process should be more rigorous and more widely ranging than has been proposed.

We hope that our advice is clear and helpful in meeting your task. We would be very happy to organise a meeting to discuss our views and explore how we could help further your work. We will be publishing this advice on our website (www.jncc.gov.uk) and would therefore be content for you to publish it along with other consultation responses.

If you wish to discuss any aspect of our submission please contact Andrew Prior (andrew.prior@jncc.gov.uk) initially.

Yours sincerely



Marcus Yeo
Director of Resources and External Affairs

Joint Nature Conservation Committee

Response to the “The Future of Nuclear Power” consultations

For ease of reference we have set out our response to the consultations at the front of this document with the rationale for that advice and background information then provided in the following sections

Contents

- A. Responses to consultation questions**
- B. The Joint Nature Conservation Committee**
- C. The United Kingdom’s international obligations to halt biodiversity loss**
- D. The domestic framework – sustainability and nature conservation**
- E. United Kingdom global footprint**
- F. Impacts of climate change and energy production and use on biodiversity**
- G. Security of supply and biodiversity**
- H. Appendices**

A. Responses to consultation questions

We have responded to two consultations:

- The Role of Nuclear Power in a Low Carbon UK Economy consultation document (the “main consultation”)
- Consultations on the proposed processes for Justification and Strategic Siting Assessment (the “Siting consultation”)

Main consultation questions

The main consultation invites responses to eighteen questions. Our advice in respect of those questions is set out below:

- 1. To what extent do you believe that tackling climate change and ensuring the security of energy supplies are critical challenges for the UK that require significant action in the near term and a sustained strategy between now and 2050?**

We agree that tackling climate change is a critical challenge which requires strategic leadership and action from government at all levels. As explained in the attached supporting information (Section F) climate change is a key nature conservation issue. However, we believe that solutions to climate change must be sought within a sustainable development framework. This will require a full assessment of the economic, social and environmental costs and benefits associated with all aspects of nuclear power. Low carbon energy production should also be complemented by robust measures to reduce energy consumption and increase energy efficiency.

- 2. Do you agree or disagree with the Government’s views on carbon emissions from new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?**

We believe that the assumptions made in Chapter 2 of the consultation document are reasonable and that the carbon emissions from the construction and operation of nuclear power plants can be considered to be similar to those of wind farms.

However, while we recognise that the analysis attempts to consider lifecycle carbon emissions, we believe that this analysis does not fully take account of the carbon impact of three areas of nuclear generation:

- Mining and processing of low-grade uranium ores (which may become more significant over the next 25 years as worldwide demand for nuclear fuel increases)
- Treatment of nuclear waste (particularly as a long-term waste management programme has not yet been decided upon)
- Decommissioning

We believe that further work is required in this respect in order for a full-lifecycle analysis to be delivered. It is important that this is done because, as discussed below, the carbon savings associated with nuclear generation may not be any greater than renewable sources while being more expensive and having the potential to “crowd out” the market for other low carbon technologies.

3. Do you agree or disagree with the Government’s views on the security of supply impact of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree with the analysis set out on page 58 of the consultation document in respect of the need for a diverse generation mix. However, as discussed in our response to question 12 below, we believe that security of supply issues have the potential to give rise to adverse impacts on global biodiversity.

4. Do you agree or disagree with the Government’s views on the economics of new nuclear power stations? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We do not agree with the Government’s views on the economics of new nuclear power stations. We believe that there are greater uncertainties associated with both cost and carbon emissions savings than the consultation documents suggest. Additionally we believe that insufficient weighting has been given in the economic analysis to the costing of environmental factors (see Appendix 2 below).

We agree with the Sustainable Development Commission’s analysis of the situation in its position statement “The role of nuclear power in a low carbon economy” and in particular the conclusion that:

“if nuclear power can prove itself to be an economically viable competitor in a low carbon economy, without leading to a drain of investment for other alternatives, then its contribution to a sustainable economy may be positive. If, however, nuclear power requires public [financial] support (whether immediately or in the long-term) and/or diverts funds away from other viable alternatives, then its contribution may well be negative”

The role of public funding is central to this analysis. However, the consultation document does not discuss the cost to the taxpayer of decommissioning and the treatment or long-term storage of nuclear wastes.

5. Do you agree or disagree with the Government’s views on the value of having nuclear power as an option? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We believe that it is important that the United Kingdom has access to a broad mix of sustainable energy sources. We therefore agree that nuclear power should not be excluded as an option. However we stress that such an option should be fully assessed according to sustainable development principles.

6. Do you agree or disagree with the Government's views on the safety, security, health and non-proliferation issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The relevance of these issues to nature conservation is limited and therefore we have no comment to make in respect of this question. While an accident involving nuclear materials could have an impact on biodiversity we believe that such risks can be managed to an acceptable level.

7. Do you agree or disagree with the Government's views on the transport of nuclear materials? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The relevance of these issues to nature conservation is limited and therefore we have no comment to make in respect of this question. While an accident involving the transport of nuclear materials could have an impact on biodiversity we believe that such risks can be managed to an acceptable level.

8. Do you agree or disagree with the Government's views on waste and decommissioning? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The long-term risks to the environment from untested storage technologies are, we believe, significant, particularly given the extremely long periods of time (tens of thousands of years) during which adverse impacts on biodiversity might occur. Given the global uncertainties relating to the treatment and storage of existing nuclear waste we question the wisdom of creating further radioactive wastes when technical solutions for treatment and storage may be many years from useful and low-risk deployment. It may be prudent to delay deployment of nuclear new-build until these issues are fully resolved.

As discussed above both the economics and full lifecycle carbon emission assessment of nuclear new build should incorporate an analysis of waste and decommissioning issues. A failure to provide such assessments could give rise to unsustainable development proposals, result in an over-estimate of carbon savings and potentially displace more sustainable technologies.

9. What are the implications for the management of existing nuclear waste of taking a decision to allow energy companies to build new nuclear power stations?

As discussed above we strongly endorse the Sustainable Development Commission's advice that the financial costs of nuclear waste management are incorporated into any economic assessment of the benefit of nuclear power. If

government is to subsidise the private sector by funding the construction and operation of waste depositories then costings must be delivered on a transparent basis.

10. What do you think are the ethical considerations related to a decision to allow new nuclear power stations to be built? And how should these be balanced against the need to address climate change?

As discussed below the principles of sustainable development (as enunciated in the Government's Sustainable Development Strategy) include the need for good governance and a healthy and just society. Nuclear power should not be delivered at the expense of these principles.

11. Do you agree or disagree with the Government's views on environmental issues? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We agree with the Government's views on environmental issues. We believe that most of the impacts of nuclear generation on the environment, and particularly on nature conservation, are manageable. However, we remain concerned about the potential long-term risks associated with the treatment and storage of nuclear waste (see our response to question 8 above).

We strongly support the recognition that there needs to be a strategic assessment of the environmental issues relating to new nuclear power stations. We strongly recommend that such strategic assessment takes account of the global impacts of UK nuclear energy production and in particular the environmental impacts of the mining and processing of uranium ore in other countries (see our response to question 12).

While the consultation paper recognises the legal requirement to carry out Strategic Environmental Assessment (SEA) we stress that it is vital that the SEA process is adequately funded and takes account of a broad spectrum of opinion. We believe that well-resourced SEA can deliver benefits to industry and wider society. Through our close involvement with various SEA processes we believe that the generally high standard of environmental regulation in respect of North Sea oil and gas production has been contributed to greatly by the use of SEA, a process which has been commissioned by BERR in respect of most relevant areas of the UK's territorial waters and Exclusive Economic Zone. We believe that any nuclear new-build SEA process could build upon lessons learned from the oil and gas experience.

12. Do you agree or disagree with the Government's views on the supply of nuclear fuel? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

We believe that security of supply issues have the potential to give rise to adverse impacts on global biodiversity.

We are concerned that the analysis of the sourcing of nuclear fuel set out in the consultation document is over-simplistic. In particular we believe that it fails to

recognise that increased global demand for uranium will result in competition for fuel and the exploitation of additional mineral resources. While the consultation document correctly identifies that fuel is currently sourced from stable and well-governed countries such as Canada and Australia we do not believe that this can be guaranteed. Sourcing uranium ore from poorly-regulated countries (particularly those in central Asia and Africa) could increase the overseas environmental footprint of the United Kingdom without improving security of supply. Long term pollution and landscape degradation is likely to occur from poorly regulated mining operations. Any move to lower-grade uranium ores could result in further environmental damage and/or increased carbon emissions.

13. Do you agree or disagree with the Government's views on the supply chain and skills capacity? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

The relevance of these issues to nature conservation is limited and therefore we have no comment to make in respect of this question

14. Do you agree or disagree with the Government's views on reprocessing? What are your reasons? Are there any significant considerations that you believe are missing? If so, what are they?

There are environmental benefits and costs associated with the reprocessing of fuel. However, given the uncertainties associated with long-term storage (see our response to question 8) we agree with the caution expressed in the consultation document in respect of the risks associated with the production of separated plutonium. The relevance of these issues to nature conservation is limited and therefore we have no further comment to make in respect of this question

15. Are there any other issues or information that you believe need to be considered before taking a decision on giving energy companies the option of investing in nuclear power stations? And why?

We repeat our advice given above in respect of the need for full and transparent costing of the public financing of waste management and decommissioning. We believe that government needs to be open that the funding of these activities constitutes a subsidy to private companies and their shareholders and therefore may affect the cost-effectiveness of the carbon reduction potential of new nuclear power stations.

16. In the context of tackling climate change and ensuring energy security, do you agree or disagree that it would be in the public interest to give energy companies the option of investing in new nuclear power stations?

The relevance of how nuclear new-build is funded to nature conservation is limited and therefore we have no comment to make in respect of this question

17. Are there other conditions that you believe should be put in place before giving energy companies the option of investing in new nuclear power stations (for example, restricting build to the vicinity of existing sites, or restricting build to approximately replacing the existing capacity) ?

As discussed above we advise that full strategic environmental assessment (SEA) of any nuclear new-build programme is a legal requirement. Such assessment should be appropriately funded, incorporate full consultation procedures and include an analysis of the overseas impact of the programme.

18. Do you think these are the right facilitative actions to reduce the regulatory and planning risks associated with such investments? Are there any other measures that you think the Government should consider?

We recognise the requirement to streamline the planning system. However while sharing concerns about delays and the need for the delivery of projects of national strategic importance we believe that the proposals appear to be skewed towards the benefit of energy companies and their shareholders, funders and insurers rather than local communities. This is particularly a concern if the economic benefits of nuclear power are unclear (see discussion above). We believe that any changes to the consenting regime should have regard to the sustainable development principles of good governance and a fair and just society.

Siting consultation

Question 1a: Are Government plans to structure the proposed Justification process by making a time-limited “call for applications” helpful?

We believe that the proposals are acceptable provided that consultation time periods are of an appropriate length. We believe that the 12 week consultation period recommended by the Cabinet Office for government consultations would be appropriate.

Question 1b: Is the proposed application, assessment and decision-making process clear, appropriate and proportionate? If not, how can it be improved?

The proposed process is appropriate however we believe that the list of consultees should be extended to include the Government’s statutory advisors on nature conservation issues (Natural England, Countryside Council for Wales, Scottish Natural Heritage) and on sustainable development (the Sustainable Development Commission).

Question 1c: Is the indicative list of information, described in Appendix A, appropriate for applicants to be able to make applications?

No. As discussed above it should also refer to issues of fuel sourcing and the environment regulation of uranium ore mining and processing in relevant source

countries. The “other environmental benefits and detriments” section of the table at page 15 should include reference to impacts on the environment overseas.

Question 1d: The Government is planning, where possible, to consider concurrent applications for Justification (relating to new nuclear power station technologies) through a single Justification assessment process. Is the Government’s proposal appropriate?

It would appear to be appropriate to consider concurrent applications for different technologies.

Question 1e: Are there any other ways in which the draft Justification process can be improved? If so, we welcome your suggestions.

We believe that broad consultation on detailed guidance for the Justification process would benefit the process.

Question 2a: Is the proposed approach to the Strategic Siting Assessment a logical approach to identifying suitable sites? If not, how could it be improved?

We believe that the proposed approach is logical and appropriate but that further scoping will be required prior to the commencement of the SSA to ensure that full account is taken of all environmental issues.

We believe that the process could be improved by the formation of an SEA/SSA steering group to assist with the production of the Environmental Report. Such an approach has already utilised by BERR in respect of SEA for oil and gas and for offshore wind and greatly improves the robustness and transparency of the decision making process.

Question 2b: Does the proposed incorporation of Strategic Environmental Assessment into the Strategic Siting Assessment represent a reasonable and robust approach to assessing environmental issues that would be raised by the construction and operation of new nuclear power stations? If not, how could such issues be taken into account?

We believe that it is appropriate that the Strategic Environmental Assessment (SEA) and Strategic Siting Assessment (SSA) are carried out together. However we believe that the scope of the SEA should be greater than that of the SSA. Most notably if the SEA process is to take account of the environmental impacts of a programme of nuclear power station construction and operation it will need to consider waste transportation and storage issues. To fail to consider these issues in the SEA would risk non-compliance with the “SEA directive” (see Section D below). Issues concerning the siting of individual power stations (considered in the framework of the SSA) will therefore only form part (albeit a large majority) of the SEA work.

B. The Joint Nature Conservation Committee

The Joint Nature Conservation Committee (JNCC) is the government's advisor on nature conservation in the UK as a whole and internationally. Energy production and use in the United Kingdom impacts upon biodiversity and nature conservation interests both within the country and overseas.

As statutory consultees we liaise regularly with the Department for Business Enterprise and Regulatory Reform as well other stakeholders in the energy industry, particularly in respect of the consenting and regulation of energy production (offshore oil and gas exploration and marine renewable energy). Many of the issues discussed in this response are drawn upon our experience of those sectors.

The nuclear energy consultation documents invites comments on the full range of issues it identifies, taking into account all the circumstances surrounding UK energy policy. We do not consider it to be within our statutory remit to advise on issues such as what an optimum energy mix for the United Kingdom might be or how such a mix might be best delivered. Instead this paper intends only to comment upon energy policy to the extent that it impacts upon nature conservation interests. This paper therefore initially places the option of increasing nuclear generation capacity within the context of the legislative and policy framework relating to nature conservation. We also briefly discuss the UK sustainable development principles, of which the conservation of biodiversity is a key component delivering benefits to both the economy and society. From that starting point the paper then outlines the varied impacts of energy production, distribution and consumption in the United Kingdom on biodiversity, both at home and abroad.

C. The United Kingdom's international and European obligations to halt biodiversity loss

The United Kingdom is a party to a number of international obligations relating to nature conservation. Most notably the government has signed up to ambitious biodiversity targets which, on current trends, are in danger of not being met. For the reasons discussed in Appendices 3 and 4, the production, distribution and consumption of energy within the UK contribute towards biodiversity loss (primarily through climate change but also in other ways). In considering whether to build new nuclear power stations, therefore, we recommend that BERR fully considers the UK's international biodiversity obligations and how UK energy policy can be delivered in accordance with those requirements. A summary of these obligations is attached at Appendix 1

D. Sustainability and nature conservation

One of the main policy drivers common to both environmental and energy issues at both a European and domestic level is sustainable development. The United Kingdom Government Sustainable Development Strategy (“UKSDS”) was set out in “Securing the Future” in March 2005. The strategy sets out five principles of sustainable development; living within environmental limits, ensuring a just society, achieving a sustainable economy, promoting good governance, and using sound science responsibly.

The UKSDS is intended to inform all elements of government policy. In introducing the five guiding principles of the UKSDS it is specifically stated that

“These principles will form the basis for policy in the UK. For a policy to be sustainable, it must respect all five of these principles”¹.

We believe that decisions relating to nuclear new-build should be carried out in accordance with this stated aim – as the Minister for Energy stated in the foreword to the DTI Sustainable Development Action Plan 2005/6:

“We are responsible for the Government’s energy policy which is central to sustainable development”.

However, as previously highlighted in our response to the Energy Review, we are concerned that, on the basis of the consultation documents, some of the five sustainable development guiding principles are being overlooked. It is notable that the documents refer to “sustainability” (or its derivatives) only briefly and in passing, using the term only in the context of the goals of security of supply and carbon emissions. While these are laudable aims we believe that there is a very real risk that focussing solely on these goals could result in an unsustainable energy policy, contrary to the intention of stated government policy in the form of the UKSDS.

By way of example there appears to be a tendency in some areas of government², in a number of NGOs and elsewhere to consider low-carbon technologies as sustainable *per se* rather than considering individual technologies and projects on their own merits. Low-carbon technologies can have significant adverse impacts on nature conservation and wider environmental interests. For example, the long-term storage of nuclear waste could be both economically and environmentally unsustainable.

Biodiversity plays a vital role in delivering sustainable development because it underpins the provision of ecosystem goods and services, which are essential for human well-being and economic prosperity. A discussion of this relationship is attached at Appendix 2.

¹ “Securing the Future”, page 18

² e.g. The DTI Sustainable Development Action Plan 2005 /6

Domestic sustainability and biodiversity obligations pertaining to nuclear power

As explained in section 4 it is the stated government position that the UKSDS shall form the basis of all government policy formation. Additionally, there are specific biodiversity and sustainable development principles, including legislative provisions, which should be taken into account as part of the nuclear power consultations.

– Countryside and Rights of Way Act 2000

Section 74 of the Countryside and Rights of Way Act 2000 places a duty on all ministers and government departments to have regard to the conservation of biodiversity in carrying out their functions. This provision is intended to ensure that government policy and activity takes into account the Convention on Biological Diversity and its ambitious 2010 targets.

– Obligations on the Secretary of State and the regulatory bodies for gas and electricity

Both the Secretary of State and the Director of OFGEM are required to take into account the effect on the environment of the generation, transmission and supply of electricity³ when carrying out their functions.

Additionally, when formulating electricity infrastructure proposals (in this case nuclear generating stations) both licence holders and the Secretary of State (when considering granting consent for such proposals) must take into account the desirability of preserving natural beauty and conserving flora, fauna and geological and physiographical features⁴.

– Assessing the sustainability of plans and programmes

One of the key tools in assessing the sustainability of proposals is the use of Strategic Environmental Assessment (“SEA”). This is required under Directive 2001/42/EC and energy policies and programmes in the UK (for example oil and gas or windfarm licensing rounds) are already subject to SEA, which BERR has carried out in UK waters in recent years.

We believe that it is essential that any plan or programme emerging from the nuclear power consultation should be subject to full, well-resourced, Strategic Environmental Assessment which considers the effects of that plan or programme on nature conservation and biodiversity interests in accordance with the directive. It should be noted that well-resourced SEA can bring significant benefits to those businesses developing energy infrastructure. By virtue of SEA’s identification of areas of lower environmental constraint operators can select sites where stakeholder conflicts can be minimised and consent processes expedited, thereby significantly reducing cost.

³ Electricity Act 1989, s. 3A(5) – as amended by s.13 Utilities Act 2000

⁴ Schedule 9, Electricity Act 1989

Strategic Environmental Assessment should be distinguished from project-specific Environmental Impact Assessment⁵ which is concerned with the possible impacts of an individual power station development. Such developments may also be subject to Appropriate Assessment under the provisions of the Habitats (Nature Conservation, etc.) Regulations 1994⁶, which implement the provisions of the Habitats Directive (see above).

E. United Kingdom global footprint

Energy production and consumption in the UK does not only impact upon the environment at home. The raw uranium fuel for the UK domestic nuclear programme is extracted and refined abroad. Pollution arising from UK coal and oil fired power stations is a significant contributor to air pollution which impacts upon environments in Europe and beyond. Human-induced climate change is a global phenomenon which, as shown in Appendix 3, is already adversely affecting impacting upon habitats globally.

The consequences of biodiversity impacts abroad can in many cases be far greater than at home. In developing countries resources to assist with adapting to climate change may be scarce while those living in rural poverty in such countries are highly dependent upon ecosystem services for food, water and fuel.

A key element of sustainable development is, in the words of the UKSDS, to “*ensure that progress at home is not at the expense of the wider world*”⁷. The JNCC, through its Global Impacts Programme, is actively involved with projects designed to assess the size of the United Kingdom’s global ecological footprint. Such work feeds into Defra’s Sustainable Consumption and Production projects, providing the opportunity to develop the evidence base used to underpin policy advice in respect of biodiversity. As the UKSDS states establishing measures for international sustainable development is problematic, however if the government’s sustainable development goals are to be met it is essential that the nuclear review takes into account the overseas impacts of nuclear energy production.

⁵ e.g. under the Electricity Works (Environmental Impact Assessment)(England and Wales) Regulations 2000

⁶ SI 2001 No.1754

⁷ “Securing the Future”, page 23

F. Impacts of energy production and use on biodiversity

Energy use, climate change and biodiversity

It is not the purpose of this paper to rehearse the scientific evidence linking energy use (particularly the burning of fossil fuels) to climate change. It is sufficient to say here that there is scientific consensus that human-induced climate change is already impacting upon natural systems and the ability of those systems to adapt to or withstand the rate of future change is in many cases in question. There is good evidence that future climate change will radically affect both natural systems and the human-beings who depend upon them

A summary of these issues is attached at Appendix 3

Non-climate change impacts of energy production and use on biodiversity

Although it is the climate change impacts of energy production that have recently attracted the most attention there are other significant adverse impacts of energy production and consumption on biodiversity that are relevant. Generally speaking these can be classified into four main groups, namely; emissions (to air, land or water), land-take, impacts of construction and direct operational impacts (such displacement of species). A review of potential impacts is attached at Appendix 4. It should be noted that this list is not intended to be exhaustive but, instead, aims to illustrate the main nature conservation issues (other than climate change) associated with nuclear generation. The key message to be drawn from this discussion is that nearly all forms of generation can have adverse impacts on biodiversity and that, rather than any form of technology being regarded as “green” *per se*, each should be considered on its own merits, through well-resourced Strategic Environmental Assessment and, at a project level, Environmental Impact Assessment and, where relevant, Appropriate Assessment under the Habitats Directive.

G. Security of supply and biodiversity

Nature conservation and security of supply interests may in many cases be aligned. Reducing reliance on overseas supplies can decrease the overall ecological “footprint” of the United Kingdom (see section E above) because environmental protection in many overseas jurisdictions (particularly in the former Soviet republics, the Middle East and South-east Asia) is more limited than in Europe and therefore impacts on biodiversity can be far greater.

While raw nuclear fuel (uranium ore) is currently sourced from stable countries with good levels of environmental regulation (Australia and Canada), increased global demand is likely to lead to increased production occurring in other jurisdictions. The environmental impacts associated with the sourcing of fuel used in the UK should be considered as part of the nuclear new-build review.

Section H – appendices

Appendix 1

International and European biodiversity obligations

The following is a non-definitive list of the international and European obligations of the UK in respect of biodiversity and nature conservation insofar as they relate to the scope of the nuclear generation consultation:

1. The Convention on Biological Diversity

The Biodiversity Convention, to which the UK is a signatory, supports the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources. At the 6th Conference of the Parties to the Convention in 2002 a target was agreed to

“achieve by 2010 a significant reduction of the current rate of biodiversity loss at the global, regional and national level as a contribution to poverty alleviation and to the benefit of all life on earth”.

The 2010 target was subsequently endorsed by the UK at the World Summit on Sustainable Development in Johannesburg in 2002 and this target now drives global conservation efforts including, as will be discussed below, those set out in European and domestic environmental policy.

The Convention also requires signatories to integrate conservation issues and the sustainable use of biological diversity into relevant sectoral plans and programmes such as those relating to energy production and delivery. This issue is discussed further below insofar as it relates to Strategic Environmental Assessment.

2. The Convention on the Conservation of European Wildlife and Natural Habitats (“The Bern Convention”)

The Bern Convention of 1979 aims to conserve wild flora and fauna and their natural habitats, and to promote European cooperation in nature conservation. It is implemented through two European Council Directives: the EC Birds Directive (79/409/EEC) and the EC Habitats Directive (92/43/EEC) (see below) which are legally binding upon the United Kingdom.

3. The Convention on Migratory Species (“The Bonn Convention”)

The Bonn Convention, which was ratified by the United Kingdom in 1985, aims to protect species of wild animals that migrate across or outside national boundaries. The UK is party to a number of further agreements under the convention related to migratory waterbirds (the African-Eurasian Waterbird Agreement) and all European bats. These agreements are relevant to electricity generation and distribution because the development, construction or operation of

transmission systems (particularly overhead lines which are the subject of a convention resolution¹) can impact upon migratory species.

4. The Oslo and Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (“OSPAR Convention”)

OSPAR, which was signed by the UK in 1992 to replace predecessors from the 1970s, aims to prevent and eliminate pollution, to assess the quality of the marine environment, and to protect and conserve ecosystems and biological diversity in the north-east Atlantic region. OSPAR is particularly relevant to the UK’s energy production as much of its oil and gas is produced in the marine environment. However nuclear developments in the coastal environment, and in particular discharges of cooling water, are relevant to OSPAR.

5. European Union obligations

5.1. European Council Directive 92/43/EEC – “the Habitats Directive”

As discussed above, one of the key legislative implementing instruments of the Bern Convention within the European Community is the Habitats Directive. The Directive requires member states to, *inter alia*, contribute towards the creation of a European network of protected areas by designating Special Areas of Conservation (“SACs”). Along with Special Protection Areas (SPAs) designated under the Birds Directive, these create the network of sites known as ‘Natura 2000’.

Energy production and consumption in the UK can impact upon SPAs and SACs both directly (through infrastructure development) and indirectly (through pollution).

Member States are required under Article 6 of the Directive to take appropriate steps to avoid deterioration of the habitats within Natura 2000 sites. This obligation extends to the requirement to carry out “Appropriate Assessment” of development proposals, including those put forward by the energy sector, to ensure that significant adverse effects do not occur to these protected areas. The DTI (as the consenting body for most large scale energy projects) regularly carries out these Appropriate Assessments in respect of oil and gas infrastructure development and windfarm construction.

5.2. Directive 2001/42/EC of the European Parliament and Council – “the SEA directive”

The so-called “SEA directive” requires member states to carry out strategic environmental assessment (“SEA”) of the effects of certain plans and

¹ CMS Resolution 7.4 (Electrocution of migratory birds) - www.cms.int/bodies/COP/cop7/proceedings/pdf/en/part_I/Res_Rec/RES_7_04_Electrocution.pdf

programmes on the environment. Such assessments include possible impacts of those plans or programmes on nature conservation interests, and ways of minimising or mitigating such impacts.

Energy policies and programmes in the UK (for example oil and gas or windfarm licensing rounds) are subject to the provisions of the directive and BERR has carried out SEA in respect of the marine environment in recent years, in order to better blend these activities with environmental protection.

We support the nuclear energy consultation document's proposals to satisfy SEA requirements through a Strategic Siting Assessment (SSA). However we stress the importance of the SSA being comprehensive and well-resourced.

5.3. European 2010 targets – the EC Biodiversity Strategy

The 2010 targets to reduce biodiversity loss, and other obligations under the Biodiversity Convention, have been incorporated into European environmental policy. The European Council held in Gothenburg in 2001 resolved to “*to protect and restore habitats and natural systems and halt the loss of biodiversity by 2010*” and at the fifth “Environment for Europe” Ministerial Conference in 2003 the Kiev Resolution was passed, adopting the EU target of halting the loss of biodiversity by 2010.

These aims are incorporated into the EC Biodiversity Strategy (COM (98) 42). This sets out a framework of necessary actions which the EC must fulfil to meet its legal obligations under article 6 of the Convention on Biological Diversity, and “*aims to anticipate, prevent and attack the causes of significant reduction or loss of biological diversity at the source*”. The overall goal is to ensure that species and ecosystems reach satisfactory conservation status within the EU and beyond. One of the key strategic themes is the “*conservation and sustainable use of biological diversity*” and key policy areas include the “*conservation of natural resources*” and “*energy and transport*”. The objectives of the energy and transport policy area include assessing the best options for biodiversity when deciding on energy sources, minimising the impact of infrastructure development for energy transport and production on biodiversity, and minimising the impacts caused by climate change and acidification.

The integration of biodiversity concerns into other EU sectoral policy areas, including energy, needs to be strengthened. One way to help achieve this is by including biodiversity concerns in relevant strategic environment assessments.

5.4. The Sixth Environment Action Programme of the European Community (“6th EAP”)

The 6th EAP sets out the European Union's priorities for environmental action until 2012. Three of the priority areas identified for urgent action are relevant to energy production and use, two relating to climate change and the

consumption of non-renewable resources and the other relating to nature and biodiversity. This latter priority area sets out an objective which aims to “*protect and restore the functioning of natural systems and halt the loss of biodiversity in the European Union and globally*”.

Appendix 2

The relationship between biodiversity and sustainable development

As part of any discussion on the relationship between energy supply and sustainable development consideration is required of the role that biodiversity plays in delivering sustainable development. The natural environment, including its living components (biodiversity) underpins the provision of ecosystem goods and services, which are essential for human wellbeing and economic prosperity, and are therefore critical for sustainable development. It is therefore important that all government policies, including those on energy recognise and adapt to any impacts the policy might have on biodiversity. Ecosystem services include *provisioning services* such as food and water; *regulating services* such as flood and disease control; *cultural services* such as spiritual, recreational, and cultural benefits; and *supporting services*, such as nutrient cycling, that maintain the conditions for life on Earth². People living in rural poverty overseas are particularly dependent on these ecosystem services³.

A range of methods have been developed to value ecosystems and the services they provide in monetary terms. Although these techniques cannot yet capture all aspects of the value of biodiversity, economic assessments provide impressive estimates of the considerable worth of ecosystems and ecosystem services at the minimum. Economic valuation studies have demonstrated the importance of the ecosystem services provided by forests, wetlands, watersheds, and coral reefs, and highlighted their significant cultural, carbon storage, medicinal and recreation benefits⁴. Many case studies exist⁵, but to give just one example for the UK, the aggregate total annual and capitalised values of the social and environmental benefits of woodland in Great Britain were estimated at £1 billion and £29.2 billion respectively⁶. These figures include the value of the forest ecosystem services of recreation, landscape amenity, carbon sequestration, pollution absorption, water supply and quality, and protection of archaeological artefacts. The values may be even greater with the inclusion of additional benefits from the provision of genetic information and tourism opportunities, and the regulation of flooding and erosion.

The true economic value of ecosystem goods and services are not currently reflected in market prices, preventing the best possible decisions for both the economy and the environment. In order to make socially optimal choices, and thereby deliver sustainable development, we recommend that the assessment of the energy options should be based on the true benefits and costs of the

² Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-being: Biodiversity Synthesis*. World Resources Institute, Washington DC.

³ Ash, N., Jenkins, M. Biodiversity and Poverty Reduction: The Importance of Biodiversity for Ecosystem Services. UNEP World Conservation Monitoring Centre, Cambridge, UK.

⁴ References provided in: Pagiola, S., von Ritter, K., Bishop, J. 2004. *How Much is an Ecosystem Worth? Assessing the Economic Value of Conservation*. The World Bank, Washington, DC.

⁵ See, for example: McCracken, J.R., and H. Abaza. 2001. *Environmental Valuation: A Worldwide Compendium of Case Studies*. Earthscan, London. See also: EVRI. 2004. *Environmental Valuation Reference Inventory*. Environment Canada. Available at www.evri.ca

⁶ Willis et al. 2003. *The Social and Environmental Benefits of Forests in Great Britain*. University of Newcastle.

alternatives, including the impacts on biodiversity and ecosystem services. Such an approach would utilise an evaluation of whole-life costs and benefits when making decisions about energy sources to ensure that both the short and the long term aspects were considered, both within the UK and overseas.

An analysis of the value of the impacts on biodiversity of different methods of energy production is outside the scope of this document. However generally pricing does not currently reflect the environmental costs of the production, distribution and consumption of energy. By way of example users in the UK do not currently pay for the full climate change costs of their consumption decisions. Instead, the environmental costs of energy use in the UK will be borne by the cost of future generations at home and abroad adapting to climate change impacts.

If environmental (including biodiversity) costs were to be explicitly accounted for within fuel costs then it is likely that unit costs of those fuels would increase substantially. While such an approach might be politically difficult we believe that consumers may respond favourably if the links between energy costs and environmental damage are made clear (particularly if linked to increased environmental education) and pricing structures make the more sustainable options (renewable energy etc) more financially attractive. Energy efficiency programmes could also reduce this burden considerably. It will be important to ensure that those living with fuel poverty do not bear a disproportionate burden of any price increases necessary to reflect sustainable development principles.

Appendix 3

Energy, Climate Change and Biodiversity

This appendix describes the impact of climate change on biodiversity and discusses the potential for future climate change to radically affect both nature systems and the human-beings who depend upon them

1. Observed biological responses to climate change

The existence of reliable climate and biodiversity data in the UK has allowed biological responses to historic climate change to be tracked, particularly those changes occurring since the 1950s. The following documented responses⁷ of species and habitats to climate change are typical of the hundreds recorded in Europe:

- Across Europe, a 6-day advancement of leafing in spring occurred between the 1960s and 1998
- Simultaneously, autumn events have become later. On average across Europe, leaf colouring and leaf fall are occurring nearly 5 days later than they did in the 1960s, extending the growing season by about 10 days.
- As a consequence, the breeding distributions of a number of bird and butterfly species have shifted northwards across Britain during the 20th century.
- A number of British species have responded to earlier spring warming either in producing leaves earlier, earlier arrival by migrant birds, or earlier reproduction

It should be noted that not all species might have been able to respond to the fast rate of warming and extremely large numbers of sedentary and specialised species may have failed to respond to the northward shift of their climatic space, particularly in the human-modified landscapes of the United Kingdom⁸.

Globally climate change is already affecting habitats and species ranging from reef-forming corals in the Indian Ocean to animals such as polar bears dependent on the formation of pack-ice.

2. Possible future biological responses to climate change

Fossil records, and data from pollen and ice-cores suggest that the Earth's climate has always been in a state of flux. Current levels of biodiversity therefore represent species and eco-systems that have adapted successfully to periods of

⁷ Drawn from a synthesis of published papers published by Scottish Natural Heritage – “Natural Heritage Trends Notes: Climate change” - http://www.snh.org.uk/trends/trends_notes/show_topic.asp?topic_id=15

⁸ Thomas, C.D., Bodsworth, E.J., Wilson, R.J., Simmons, A.D., Davies, Z.G., Musche, M. & Conradt, L. (2001) “Ecological and evolutionary processes at expanding range margins” *Nature*, 411, 577–581

climatic upheaval, most notably glaciations⁹. However the rate of change likely to be experienced over the coming centuries is likely to be far greater than that experienced in recent times. Many species and systems may be unable to adapt adequately to the pace of change, particularly where other human threats are present¹⁰.

The observed impacts of climate change on species discussed above are seen by many commentators¹¹ as early indicators of how species and ecosystems are likely to respond to future climate change. Therefore, climate change can be expected to result in shifting ranges with species moving polewards and to higher altitudes in response to warmer climate. Timings of reproductive events and feeding patterns can also be expected to change in response to warmer climate or wetter or drier conditions. Many species can also be expected to respond to increased atmospheric CO₂ levels.

Additionally, climate change may also provide opportunities to invasive species and diseases¹². Altered environmental conditions may also result in the release of “latent” species that have already arrived in an environment but not yet colonised habitats¹³. Ecosystems already degraded by human activities are less likely to cope with rapid climate change or invasive species.

Marine acidification is a process which appears to be accelerating as levels of CO₂ in the atmosphere increase¹⁴ with potentially adverse impacts on biodiversity. Ocean acidification could give disrupt the process of calcification, by which animals such as corals and molluscs make shells and plates from calcium carbonate. Tropical and subtropical corals are expected to be among the worst affected, with implications for the stability and longevity of the reefs that they build and the organisms that depend on them. Cold-water coral reefs may also be adversely affected. Other calcifying organisms that may be affected are components of the phytoplankton and the zooplankton, which form a major food source for fish and other animals.

Most commentators consider it probable that the impacts described above will result in extinctions of species, particularly sedentary or specialised species that will be unable to respond by shifting ranges quickly enough or species present in severely fragmented habitats where the ability to migrate in response is lost¹⁵. Recent estimates quantifying possible extinction rates arising from climate change are not without controversy¹⁶ but predict that a large percentage of extant species could be consigned to extinction by expected climate trends over the next 50 years.

⁹ Intergovernmental Panel on Climate Change (2002) – “Climate Change and Biodiversity – IPCC Technical Paper V”, IPCC, Geneva, Switzerland

¹⁰ *ibid*

¹¹ e.g. Hughes, 2000, Parmesan, 2003, Thomas *et al*, 2004

¹² Stachowicz *et al*, 2002, Weltzin *et al*, 2003

¹³ IUCN, Royal Society for the Protection of Birds, English Nature and the World Wide Fund for Nature (2002) “*Climate Change and Nature: Adapting for the Future*”, IUCN, Cambridge, UK

¹⁴ “Ocean acidification due to increasing atmospheric carbon dioxide”, The Royal Society - <http://www.royalsoc.ac.uk/displaypagedoc.asp?id=13539>

¹⁵ Collingham & Huntley 2000, Travis 2003

¹⁶ for example consider Thomas *et al* 2004a and subsequent communications of Harte *et al* 2004, Thuiller *et al* 2004, Buckley & Roughgarden 2004 and response of Thomas *et al* 2004b

3. The threat to global biodiversity and ecosystem services

Scientific consensus exists on the threat that climate change will bring to global biodiversity¹⁷. The level of species loss will be directly related to the extent to which global warming can be limited by the reduction of greenhouse gas emissions. It is thought that containment of global warming to 2°C will result in some species loss but will provide scope for management options for the conservation of global biodiversity. At 4°C global average temperature rise it is thought that, in addition to enormous financial costs in adaptation, there will be many extinction events and very few conservation management options available. At the top-end of the IPCC predictions of around 6°C global temperature rise the outlook for biodiversity is described as “dire”¹⁸.

Based on recent work¹⁹ the stabilisation of greenhouse gas emissions at the equivalent of 450ppmv CO₂ (401 ppmv CO₂, 42.5ppmv CH₄ and 6.5ppmv N₂O) would imply a “medium likelihood” of staying below this 2°C level. It is therefore vital both for biodiversity and humankind (because of people’s dependence on ecosystem services) that government energy policy, in conjunction with international activity, aggressively targets this 450ppmv level. However, given that atmospheric CO₂ has risen from pre-industrial levels of 280ppmv to 381 ppmv today and is rising at more than 2ppmv per year, there is only a very short timescale available to achieve this target.

It should also be noted that the conservation of natural resources can assist with human adaptation to climate change because healthy ecosystems can deliver flexibility. For example, wetlands and coastal salt marshes can provide a barrier to inundation from sea level rise more efficiently than traditional reinforced coastal defences. Mangrove ecosystems in the tropics can provide protection against the increased frequency and intensity of storm surges and cyclones that many commentators associate with climate change.

¹⁷ “Global Climate Change and Biodiversity” - Summary of papers and discussion (2003) ed .Green, R., Harley, M., Miles, L., Scharlemann, J., Andrew Watkinson, A.& Watts, O., University of East Anglia, Norwich, UK

¹⁸ *ibid*

¹⁹ “Avoiding dangerous climate change”, DEFRA, 2006

Appendix 4

Non-climate change impacts of nuclear generation in the UK

Although it is the climate change effects that have recently attracted the most attention there are other significant adverse impacts of energy production and consumption on biodiversity that should be taken into account when considering energy policy. Generally speaking these can be classified into four main groups, namely; emissions (to air, land or water), land-take, impacts of construction and direct operational impacts (such as bird strike or displacement of species). It should be noted that this review of potential impacts is not intended to be exhaustive but, instead, aims to illustrate the main nature conservation issues (other than climate change) associated with nuclear generation.

Sites for energy infrastructure often utilise land that supports biodiversity. However the total footprint of power stations and other energy facilities in the UK is small, for instance compared to housing. The provision of compensatory land by power companies can mitigate these sorts of impacts. For example a number of generation licence holders have developed ponds and wetland to compensate for that lost in construction.

Extraction of cooling water, from freshwater or coastal sources, can adversely impact upon aquatic ecosystems and requires careful management. Fish-take and injury to marine mammals (particularly seals) can occur from the extraction of seawater for the cooling of coastal generation projects. Cooling water, if significantly different in temperature from the water to which it is discharged, can impact on local biological communities and outlet areas are often known to support harmful invasive species.

Additionally operational effects such as noise, lighting and maintenance traffic can give rise to further impacts on biodiversity. These factors can lead to disturbance or displacement of wildlife.

Visual impacts, particularly of large scale thermal plants, including nuclear facilities, for electricity generation, are also significant environmental impacts.

Radioactivity can impact upon the abundance, distribution, life history and mutation rates of plants and animals. Whilst, barring accidents, radiation from operational activities at nuclear power stations is contained within facilities to environmentally acceptable levels the storage, discharge or transport of wastes from generation or processing can lead to radiation entering the environment.

There is little evidence that the routine, well-regulated operation of nuclear generation gives rise to significant adverse impacts on biodiversity. Most documented adverse impacts of radioactive isotopes in the environment have arisen from poor regulation and/or accidental release²⁰. In the UK whilst electricity generation from nuclear

²⁰ Moller, A.P and Mousseau, T.A (2006) "Biological consequences of Chernobyl: 20 years on", Trends in Ecology and Evolution, 21(4), 200-207

sources increased by 50% between 1985 and 2003 radioactive emissions to air and water fell by 76% and 82% respectively²¹.

However, in respect of two aspects of nuclear power adverse impacts on biodiversity could occur; extraction of uranium ore and long-term storage and security of nuclear waste.

Environmental standards relating to the extraction of uranium ore are not consistent, even in countries with a relatively good environmental record. It is likely that over the next 25-30 years uranium ore supplies in more stable countries such as Australia and Canada will become depleted and the UK may need to rely upon supplies from countries with a poor record of environmental protection. These overseas impacts of uranium ore extraction should therefore be considered as part of any review of the economics of nuclear power.

In respect of waste storage, the long-term risks to the environment from untested storage technologies are, we believe, significant, particularly given the extremely long periods of time (tens of thousands of years) during which adverse impacts on biodiversity might occur. Given the global uncertainties relating to the treatment and storage of existing nuclear waste (most of which is currently stored in temporary facilities pending the development of suitable technologies) we question the wisdom of creating further radioactive wastes when technical solutions for treatment and storage may be many years from useful and low-risk deployment. Although impacts on biodiversity from long-term storage might only be localised they could have the potential to be significant and of wider geographical range (particularly if contamination of ground water occurs), given the known impacts of even relatively low levels of radioactivity on biological receptors²².

²¹ The environment in your pocket 2005, DEFRA / National Statistics

²² Moller, A.P and Mousseau, T.A (2006) "Biological consequences of Chernobyl: 20 years on", Trends in Ecology and Evolution, 21(4), 200-207