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Trade and Industry Committee

New nuclear? Examining the issues

Fourth Report of Session 2005–06

Report, together with formal minutes and oral evidence

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Footnotes

In the footnotes of this Report, references to oral evidence are indicated by 'Q' followed by the question number. References to written evidence are indicated in the form 'Appendix' followed by the Appendix number. The Appendices are published in a separate volume as 'Written evidence submitted in connection with the inquiries on the Government's Energy Review'.

Contents

Report	<i>Page</i>
1 Introduction	3
2 Building a national consensus	6
The role of politics	6
A Government commitment to nuclear power	6
A cross-party consensus	7
The Energy Review process	8
Engaging the public	9
Public opinion	9
Creating 'buy-in'	10
3 Constructing and operating nuclear power stations	12
Planning and licensing	12
The regulatory process	12
Constraints under the existing system	13
How might the system be reformed?	14
Feasibility and risks	16
Finding suitable sites	18
Advantages of using existing sites	19
Risks of using existing sites	20
Looking elsewhere	21
Choosing the right technology	22
Available reactor designs	23
Future reactor designs	24
Factors to consider	24
The supply chain	25
UK capacity and constraints	26
Global capacity and constraints	28
Uranium fuel availability	29
Demand for uranium	29
Uranium supplies	30
Future developments	31
Fuel reprocessing	32
Security and proliferation	33
Security regulation in the UK	33
Risks to security	34
The implications of nuclear new build	35
Proliferation	36
4 Managing decommissioning and long-term waste disposal	38
Adding to the stock	38
The existing waste legacy	38
Decommissioning implications of new build	39

Waste arising from new build	40
Finding and funding a long-term solution	42
Sorting out the past first	43
In search of a solution	43
The Committee on Radioactive Waste Management	44
The long-term storage of new waste	46
Financing the storage of new waste	47
5 Financing nuclear new build	50
The UK's electricity market	50
Nuclear power in a liberalised market	50
Market players in the UK	51
Assessing the costs	52
The component costs of nuclear generation	53
Current cost estimates	54
Costing other forms of generation	56
Should costs matter to the Government?	57
Creating the returns	58
What the industry wants	58
Current instruments for reducing carbon emissions	60
Approaches to long-term carbon pricing	62
6 Wider policy concerns	66
Reducing carbon dioxide emissions	66
Is nuclear power low carbon?	66
The impact of nuclear power on reducing emissions	68
Other approaches to reducing emissions	70
Renewables	70
Energy efficiency	71
Providing grid capacity	71
A centralised grid network?	71
Connecting new nuclear build	72
Securing electricity supply	73
Will there be an 'energy gap'?	73
Providing capacity	75
Conclusions and recommendations	77
Formal minutes	85
List of witnesses	86
List of written evidence	87

1 Introduction

1. The Government's decision on the future of the energy sector, and with it the outlook for nuclear power in the UK, is one of the most important issues it has faced in its time in office. The outcome of the 2006 Energy Review will have ramifications not just for this generation, but for generations to follow.¹ This means it is vital that the Government makes its current assessment on the basis of all the available evidence, with a view to putting in place a framework to safeguard the long-term sustainability of the UK's energy supply.

2. The scope of the Energy Review is vast, and the timescale—at barely six months—is short. We decided that the most useful way in which we could contribute to the debate was to focus on three areas of energy policy where we felt some of the assumptions made by interested parties needed close investigation. Accordingly, we announced our intention of inquiring into “the particular considerations that should apply to nuclear” new build; the implications of increasing dependence on gas and coal imports; and the capacity of microgeneration to meet a substantial proportion of the UK electricity demand in the medium and long-term. This Report is on the first of these topics.

3. Coverage of the Energy Review, rightly or wrongly, has focused on the role that nuclear power may play in the future energy mix. **We believe that, in determining its policy on the future of nuclear energy, there are a number of issues that the Government needs to address. Our inquiry has sought to examine these to provide a comprehensive overview of the matters for debate, and to highlight those we believe are absolutely crucial. In so doing, we have not sought to reach a conclusion either for or against new nuclear build, but to reach definitive conclusions on those issues where the evidence base allows us to do so.**

4. **Most of the technical objections to nuclear power, such as the availability of fuel and the carbon profile of nuclear power stations, have answers. Political issues, such as security and proliferation, are matters of judgement. There are other questions, however, that are both technical and political in nature, such as waste management. The purpose of this Report is to help focus debate on the issues that really need to be discussed and not those that have definitive answers.**

5. **If the Government really wishes to meet its objectives for carbon emissions and energy security, its policy must sustain those technologies it wishes to be part of the energy mix. However, we do not believe that the way to energy security is for the Government to fix the proportion of the energy mix that should come from particular technologies. Rather, it should ensure a fair competitive environment for existing technologies, while supporting innovation in new ones. A policy designed to enable the construction of new nuclear power stations would be credible only if it was based on four key elements:**

- **A broad national consensus on the role of nuclear power, that has both cross-party political support and wider public backing;**

1 Department of Trade and Industry, *Our energy challenge—securing clean, affordable energy for the long-term*, January 2006

- A carbon-pricing framework that provides long-term incentives for investment in all low carbon technologies;
- A long-term storage solution in place for the UK's existing radioactive waste legacy; and
- A review of the planning and licensing system to reduce the lead time for construction.

6. Two of these areas require action for the successful implementation of energy policy, regardless of a decision on nuclear power. The planning system and carbon pricing are as much issues for renewable energy and the future of fossil fuel plants as they are for nuclear. Moreover, it would be necessary to ensure any decision in favour of new nuclear build would not undermine efforts elsewhere, such as in energy efficiency.

7. In addition, there are issues which the Government and Parliament must consider that have a strong ethical dimension and will ultimately require a political judgment. These include:

- Whether, as a country, we should create new radioactive waste, which subsequent generations will have to manage;
- Whether the UK's nuclear policy poses internal security risks and undermines efforts to prevent proliferation; and
- The extent to which the UK needs to demonstrate leadership in reducing carbon emissions, given the modest contribution it can make relative to the rest of the world.

8. Finally, our Report highlights issues surrounding nuclear power, where there has been debate, or where, underpinned by the principles outlined above, the market and the Government should be able to find a solution. Among our conclusions are that:

- Although new reactors may be able to use existing sites, this cannot be guaranteed. Further research would be needed to identify alternative sites;
- There are reactor technologies that could seek licensing in the UK now, although we would be amongst the first in the world to use them;
- Constraints in the domestic skills capacity could be overcome with sufficient investment and use of international resources;
- Constraints in infrastructure capacity could be overcome with sufficient investment, although there are concerns regarding certain reactor components;
- There should be sufficient uranium supplies to meet any future UK demand;
- Financing the management of decommissioning and waste storage is possible, provided a system for charging the industry is in place from the start;

- The UK has the market players willing to deliver a programme of new build, although the current electricity market does not provide favourable conditions for them to do so;
- Nuclear power is a low carbon source of electricity, comparable to renewable energy; and
- There is a clear understanding that the costs of developing new nuclear power stations, including subsequent decommissioning and waste disposal, would be met by the private sector developers of each station.

9. Finally, we are concerned about the manner in which this Energy Review has been conducted. Throughout the process, the Government has hinted strongly that it has already made its mind up on nuclear power. The last review took three years to complete, yet this one has been conducted in the space of six months, and has focused primarily on the electricity sector, at the expense of consideration of transport and heating—both equally important sources of carbon emissions in the UK. This has not been an Energy Review, but an Electricity Review.

10. What is more, it is clear to us that the outcome of the Energy Review has largely been determined before adequate consideration could possibly have been taken of important evidence that should inform the Government's policy decision. This includes the Committee on Radioactive Waste Management's final report and recommendations for the long-term storage of the UK's high level radioactive waste, expected at the end of July 2006; and the Health and Safety Executive's recently published expert report, which includes analysis of the potential for pre-licensing of nuclear reactors. Further, there has been insufficient analysis of the extent of the 'energy gap' the UK faces, for example, given the potential for further lifetime extensions of some of the existing nuclear fleet. All of these areas bear crucially on the key principles we have highlighted above.

11. During our inquiry we took formal evidence from the Institute of Physics; the UK Energy Research Centre; the Nuclear Industry Association; British Energy; Sir Jonathon Porritt, Chairman of the Sustainable Development Commission; the Chief Executives of E.ON UK and EDF Energy; the Health and Safety Executive; the Environment Agency; Professor Gordon MacKerron, Chairman of the Committee on Radioactive Waste Management; Roger Brunt, Director of the Office for Civil Nuclear Security; Professor Keith Palmer; Dr Dieter Helm; and Ofgem. A full list of the witnesses is given on page 86.

12. We also received 56 memoranda from other companies, associations, and individuals. We would like to express our thanks to all those who have contributed to this inquiry.

2 Building a national consensus

13. The conclusions of the Government’s current review should frame the UK’s energy policy for the foreseeable future. It is axiomatic that energy is fundamentally important to the operation of our economy. Hence, the objectives set by Government for energy policy and the means of achieving them affect the whole of society. Because of this, it is vital that policy is formulated and implemented on the basis of a broad national consensus—or at least acceptance at both a political level and among the public in general, that policy has been developed objectively and after consideration of all relevant issues. In this Chapter we look both at the role of politics in building a national consensus on energy policy, and the position of nuclear power within this, before considering the importance of enabling the general public to understand any decisions made with regard to nuclear power.

The role of politics

14. In determining their investment decisions in future generating capacity, power companies need to have a degree of certainty over the returns they expect to receive. Where there is uncertainty, investment will be geared instead towards achieving a short-term payback—an outcome that is not necessarily commensurate with meeting Government objectives for energy policy which, for example in the case of reducing carbon emissions, are largely focused on the long-term. For nuclear power, the industry has told us that it would require a lasting commitment by the Government on the basis of a broad cross-party political support if it was to make investments in new build. This section looks at the importance of these factors, and the extent to which they are being met within the current Energy Review.

A Government commitment to nuclear power

15. The 2003 Energy White Paper did not contain specific proposals for building new nuclear power stations, although it did not rule out the possibility that, at some point in the future, nuclear power could be necessary to meet the Government’s climate change objectives.² This position of ‘keeping the nuclear option open’ means there is no moratorium on new build in the UK. The reality, though, is that there are a number of practical constraints, as outlined later in this Report, which make it very unlikely that the industry would wish to build new nuclear power stations without there first being a change in Government policy. Indeed, the 2003 White Paper stated that before “any decision to proceed with building new nuclear power stations, there will need to be the fullest public consultation and the publication of a further white paper setting out [its] proposals”.³

16. The industry told us that if the Government wanted new nuclear build, its starting point would need to be a clear statement that nuclear power represented an important and necessary component of the UK’s future energy sector.⁴ For example, in its written evidence, E.ON UK told us that investors would need “a white paper and a positive

2 Department of Trade and Industry, *Our energy future – creating a low carbon economy*, 2003

3 *Ibid.* page 12

4 Appendix 38 (Nuclear Industry Association)

statement from the Government of the role it believes nuclear has to play in a diverse and low carbon fuel mix”.⁵ This would also be the wish of the finance community. Professor Keith Palmer, of NM Rothschild, told us: “one would not expect to proceed with big investments unless it was clear that the direction of travel was broadly supported by the Government”.⁶

17. While we agree with this view in principle, we received conflicting evidence on the form that a long-term commitment would need to take. The Nuclear Industry Association (NIA) believed that the Government would have to “provide direction on the scope of any potential programme”.⁷ However, one of our other witnesses noted that: “If one set a specific number for nuclear power it would take away from those incentives to perform against competing technologies”.⁸ Indeed, given the expectation that the private sector would deliver any new build, without financial assistance, the Government would not be in a position rigidly to determine the size of such a programme. As another witness said to us: “the answer will turn out to be whatever the private sector is willing to do”.⁹ It seems, then, that official support for more nuclear power would have to take place within the context of a renewed commitment to other aspects of energy policy, such as efforts on renewables and energy efficiency. The evidence of this commitment would need to take the form of Government action on some of the barriers to nuclear power, as highlighted in this Report, as well as on barriers to other low-carbon technologies, enabling the market to deliver the proportion of nuclear energy in the generation mix that it believes is optimal.

A cross-party consensus

18. The period over which investors seek a return on their generating assets can be 20 years or more. Governments will come and go across such a timescale, creating the political risk that energy policy could change under a different administration. If investors believed a different ruling party might in the future change the direction of policy, they would not be willing to risk having their assets stranded. This means they would either seek a higher cost of capital on such projects, or instead, would make investments that provided a relatively short-term pay-off. As such, political uncertainty poses a concern for any part of the energy sector where the viability of a particular technology is partly dependent on the policy framework of the government of the day. This is as true for renewable energy and other low-carbon technologies as it is for nuclear power.

19. Because of this concern, an additional key element to the Government’s future energy policy needs to be the establishment of a political consensus on the technologies that should compete in the energy mix, and whether nuclear power should be a part of that. The nuclear industry made this point clearly in its evidence to us.¹⁰ For example, the Chief Executive of E.ON UK said: “The reassurance I need is that there is a broad level of cross-party support for this because we are investing over several government cycles, not just

5 Appendix 22 (E.ON UK)

6 Q 208 (Prof Keith Palmer)

7 Appendix 38 (Nuclear Industry Association)

8 Q 49 (Prof Jim Skea)

9 Q 298 (Dr Dieter Helm)

10 Appendices 5 (British Energy), 16 (EDF Energy) and 22 (E.ON UK); CBI, *Response to ‘Our Energy Challenge...’, 2006*

one”.¹¹ Dr Dieter Helm contrasted for us the successful development of nuclear power in France, where there has been a long-term political consensus in favour, with the “very poor record of nuclear development in the UK”, as an illustration of the importance of cross-party support for adopting a policy of new build.¹² He noted too, that “if there is not cross-party support for a nuclear programme, or at least the framework within which one might be constructed, then it is going to be very expensive”.¹³ The evidence we received suggests that the Government’s Energy Review has, to date, not taken account of this vital consideration.

The Energy Review process

20. The current Energy Review is being undertaken within the Government with little consideration of the need for cross-party involvement. Whilst we do not deny that energy policy requires political as well as economic judgements, the failure to include the main political parties in the process militates against the possibility that they will sign up to the final outcome. So long as the Energy Review is carried out in isolation by the Government, there is little prospect that it will make steps towards reconciling the divergent views both across and within parties.

21. Throughout our inquiry, we were concerned that some of the pronouncements made by the Prime Minister have been perceived as pre-empting the results of the Energy Review. In a speech given at the CBI annual dinner on 16 May 2006, he was quoted as saying that the UK’s future reliance on gas imports “put the replacement of nuclear power stations, a big push on renewables and a step change on energy efficiency, engaging both business and consumers, back on the agenda with a vengeance”.¹⁴ This has been widely seen as evidence that the Government has already made its mind up to go ahead with new nuclear build, before the Energy Review has completed its analysis of the evidence. For example, in its evidence to us, the Environment Agency said: “he may not be listening to our advice”.¹⁵ In response to questioning from us on this concern, Sir Jonathon Porritt, Chairman of the Sustainable Development Commission, said: “I think the way in which the Government is handling the process around the Energy Review is not clever. It is allowing an awful lot of people to assume that ... this is, indeed, an exercise in rubber-stamping”.¹⁶ We hope sincerely that this is not the case, and look forward to seeing the final analysis.

22. We register also our concern with regard to the timing of the current Energy Review. As our colleagues on the Environmental Audit Committee have pointed out, it comes little more than two and a half years after the 2003 Energy White Paper, and only two months after the Government’s most recent report assessing progress against the White Paper

11 Q 261 (Dr Paul Golby)

12 Q 267 (Dr Dieter Helm)

13 *Ibid.*

14 www.epolitix.com

15 Q 376 (Mr Clive Bates)

16 Q 107 (Sir Jonathon Porritt)

objectives.¹⁷ Whereas the previous energy review took three years to complete, the Government is intent on announcing the results of the 2006 Review just six months after it published its consultation document. This announcement will come less than a month after it has received the Scottish Executive's formal submission; and only a matter of days after receiving an expert report it commissioned from the Health and Safety Executive on the potential risks arising from recent and potential energy developments (which also considers the possible role of pre-licensing nuclear reactor designs). Furthermore, the announcement will come before the completion of important work elsewhere, such as the Stern Review of the Economics of Climate Change; the Barker Review of Land Use Planning; and the final recommendations of the Committee on Radioactive Waste Management. As a consequence, we are concerned that important evidence will potentially not be taken into full consideration in determining the outcome of the Energy Review. Again, this will not help the Government in gaining cross-party support for its eventual policy conclusions.

23. A clear government commitment to the future role of nuclear power, based on a broad cross-party political consensus, would be necessary for the power industry to be willing to invest in a new programme of reactors. However, market delivery of new build, and the absence of public subsidy and guarantees, would constrain the Government's ability to determine the scope of any new programme. What is more, the way in which it has conducted its Energy Review to date suggests that the Government will have to work hard if it is to gain cross-party and wider public support for its policy decisions.

Engaging the public

24. The building of a national consensus on energy policy goes wider than the confines of Whitehall and Westminster—it must reach out to encompass the whole of society. After all, it is the consumers of energy that must ultimately live in the environment their choice helps create, and pay for the electricity they demand, and hence the generating assets that produce it. In this section, we look at current public opinion on nuclear power and the wider role of Government in securing the backing of the general public for its energy policy.

Public opinion

25. In the course of our inquiry, a number of statistics were quoted to us which indicated both support for, and opposition to, nuclear power. The nuclear industry highlighted growing acceptance of nuclear energy as a means of combating climate change, and within the context of support for other forms of low-carbon generation, such as renewables.¹⁸ For example, BNFL plc cited in their submission to the Energy Review a poll showing that 41% of the public would now be in favour of replacing existing nuclear power stations with new ones, to keep the same proportion of nuclear energy. 28% of those polled opposed this. It quoted other surveys, including one showing 54% of people in favour of new nuclear build

¹⁷ Environmental Audit Committee, *Sixth Report of Session 2005-06, Keeping the lights on: Nuclear, Renewables and Climate Change*, HC 584-1

¹⁸ Q 47 (Prof Jim Skea)

if it would help tackle climate change, and another indicating that 62% of people would support an energy policy that combined increased renewable generation with cautious new nuclear generation.¹⁹ This suggests possibly a “grudging acceptance” of the potential need for more nuclear power in the future.²⁰

26. On the other hand, the Sustainable Development Commission cited evidence that there is less than 30% support for a new programme of nuclear power stations.²¹ We acknowledge here the inherent difficulty in collecting robust and objective survey data that accurately reflects public perceptions about nuclear power. Clearly, it is hard to gauge the precise extent to which the public would favour a programme of new nuclear build, as opposed to other options for reducing carbon emissions and ensuring security of electricity supply.

Creating ‘buy-in’

27. Whatever the position of public opinion on new nuclear build, if the Government decides to encourage this, it would be vital for the Government to engage actively to gain public acceptance of the policy. The conduct of the Energy Review, to date, has not gone far in achieving this. Sir Jonathon Porritt said to us that there “is a school of thought inside the DTI which would have you believe that the consultation around the Energy Review is sufficient in itself to persuade the general public that the debate has been adequately thought through”.²² He went on to say that “by definition they [the DTI] have not touched the general public in the way that you would expect a consultation engagement actually to do”.²³ This suggests to us that there is much more the Government would need to do following the results of its Energy Review. Indeed, the Review really marks only the beginning of its dialogue with the general public on the long-term future of energy policy in the UK.

28. The importance of public confidence was also highlighted to us by the power sector. The Chief Executive of EDF Energy told us that “we should not cut corners about the issues that public opinion wishes to address. Public acceptance is a condition precedent for all potential investors to make their decisions”.²⁴ Energywatch argued that to ensure the Energy Review delivered benefits to consumers it needed to make sure that they saw themselves as an active part of the solution to carbon emissions, therefore engaging in “a transparent dialogue about the costs and benefits of energy supply”.²⁵ It noted too, that a meaningful reduction in carbon emissions from domestic energy would require a “sea change in the engagement of consumers with their own consumption behaviour”. While energywatch’s concern is primarily energy efficiency, these views are equally valid in relation to nuclear power, as indeed they are to renewables.

19 BNFL plc, *Supporting paper on nuclear energy issues*, March 2006

20 Q 47 (Prof Jim Skea)

21 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 7: Public perceptions and community issues*, March 2006

22 Q 139 (Sir Jonathon Porritt)

23 *Ibid.*

24 Q 239 (Mr Vincent de Rivaz)

25 Energywatch, *Response to ‘Our Energy Challenge...’*, 2006

29. The actual process of achieving ‘buy-in’ from the general public for a generation of new nuclear power stations would require action by the Government on a number of fronts, both at a national and local level. For example, as we discuss later in this Report, public acceptance of new nuclear build is widely seen as being conditional on the Government putting in place a long-term solution to the UK’s existing radioactive waste legacy. Further, nuclear power is unlikely to receive public support if the sector is perceived as receiving disproportionate political support from the Government at the expense of other ways of reducing carbon emissions. This cuts across a number of policy areas, including planning and long-term carbon pricing, both of which are discussed in a later section, where we note that all low-carbon technologies should be treated equally.

30. At a local level, public support is required if the nuclear industry is to find suitable sites for a new generation of reactors. Evidence suggests that in areas of the UK where there are already nuclear power stations in operation, there is a wide level of public support for nuclear power because of the local economic benefits it brings in terms of employment. Where existing reactor sites are available, there would have to be a re-opening of negotiations with the local community to assess its willingness to host further new build. If completely new sites were considered for development, then operators would have to engage with communities from scratch in gaining local support for the siting of a nuclear power station in their area. We note here the additional difficulty of having the nuclear industry, as the deliverers of any new nuclear build, leading such public engagement. Since the Government would also have to be involved, this would add to the complexity of the discussions.²⁶

31. Public opinion on new nuclear build is mixed. Where it is favourable, this is contingent on factors such as the UK reaching a long-term solution to its existing radioactive waste legacy, and the assumption that new nuclear power would be within the context of a range of other low-carbon technologies contributing to the energy mix. Of itself, the Energy Review does not represent a sufficient public engagement on the long-term issues of energy policy. With regard to nuclear power, this would require continuing dialogue both at a national level on wider policy issues, and at a local level on, for example, siting issues. Both approaches are vital for building a national consensus on the Government’s energy policy. The Energy Review statement cannot be the Government’s final word.

26 We discuss the issue of siting in more depth in Chapter 3.

3 Constructing and operating nuclear power stations

32. The delivery of a new generation of nuclear reactors would be a complex and time-consuming process. This chapter looks at the broad range of issues that the Government would need to address if it wished new nuclear build to come online before the end of the next decade. It considers a number of areas which have been widely debated in the media over the course of the Energy Review, ranging from the planning and licensing process and the availability of sites, to the choice of reactor technology and the implications for security and proliferation.

Planning and licensing

33. One reason why the Government is conducting its Energy Review now is because it is likely there would be a significant period of time between a potential decision in favour of new nuclear build, and the point when new power stations would actually start generating electricity. This is partly because the construction of power stations takes a number of years. Even the most optimistic estimates for this are in the region of five years.²⁷ Experience in the UK to date has shown it can take much longer, with an average construction period for existing nuclear power stations of almost 11 years.²⁸ In addition to this concern, which in any case would be a matter for the potential construction consortium rather than the Government, there is the issue of the planning and licensing process that precedes construction. This is an area where we received a significant amount of evidence citing the regulatory system as a key inhibitor to any investment in new nuclear build, both at present and in the future.²⁹ At the forefront of the minds of those who would consider investing in new build is the most recent experience, Sizewell B, where it took seven years from a decision in principle to the start of construction. Therefore, in this section we look at the existing structure and process for the planning and licensing system. We then go on to consider how this could potentially be reformed if the Government wished to reduce regulatory risk for investors, before discussing the feasibility of such reforms.

The regulatory process

34. Prior to the start of construction and operation of a new nuclear power station, there are several bodies in the UK from whom approvals must be obtained. The principal authorities include the Nuclear Installations Inspectorate (NII), which is part of the Health and Safety Executive (HSE); the environment regulator (either the Environment Agency in England and Wales, or the Scottish Environment Protection Agency); the Office for Civil Nuclear Security (OCNS); Local Planning Authorities; the Department of Trade and

27 British Nuclear Fuels plc (BNFL), *Supporting paper on nuclear energy issues*, March 2006

28 Fabien A. Roques, William J. Nuttall, David M. Newbery, Richard de Neufville and Stephen Connors, *Nuclear Power: A Hedge against Uncertain Gas and Carbon Prices?*, 2006

29 Appendices 5 (British Energy), 11 (BNFL plc), 12 (Chemical Industries Association), 16 (EDF Energy), 32 (Institution of Electrical Engineers), 38 (Nuclear Industry Association), 47 (RWE npower) and 50 (Shell UK); Centrica, *Response to 'Our Energy Challenge...'*, 2006; CBI, *Response to 'Our Energy Challenge...'*, 2006

Industry (DTI) and, depending on siting, the Scottish Executive. Each of these has a key role to play in the regulatory process.

35. There are a number of consents and approvals that a potential operator would need to seek from these bodies. Of these, key permissions include the nuclear site licence, the Section 36/37 consent and the authorisation to make discharges and disposals of radioactive waste. A site licence is required under the *Nuclear Installations Act 1965*, and is administered by the NII. It looks at three aspects—the reactor design, its siting, and the organisation of the potential licensee.³⁰ Within these three areas, the NII has 36 standard licensing conditions which must be met before a licence can be awarded. These cover a broad range of issues, including safety-related functions such as the handling and storage of nuclear material; incident reporting and emergency arrangements; design, operation and maintenance; and control, supervision and training of staff.³¹

36. The Section 36/37 consent is required under the *Electricity Act 1989*, and stipulates that for any new power station in England and Wales with capacity greater than 50 megawatts, the operator must seek approval from the Secretary of State for Trade and Industry. The Scottish Executive holds similar powers in Scotland. The Local Planning Authorities (LPAs) for the area where a new plant is proposed are statutory consultees under the Act. If the LPA objects to the proposal then the Government has to hold a public inquiry before consent can be given. Even then, the operator must still gain all other relevant consents and approvals before it can proceed.

37. The authorisation to dispose of radioactive waste, including making radioactive discharges, is required under the *Radioactive Substances Act 1993* and is issued by the relevant Environment Agency. The Agencies require that the radioactivity of waste and discharges is minimised. The Agencies consider the design of the plant and how it will be operated, including the management arrangements of the operator. Other environmental and construction waste management will also be needed.

38. Other matters include ‘Justification’, under the *2004 Justification of Practices Involving Ionising Radiation Regulations*, which involves weighing the benefits and detriments of a new nuclear power station so as to ensure that there will be a net benefit from operation. In the case of a new programme of nuclear reactors it is likely that a Strategic Environmental Assessment (SEA) would also be necessary. This would assess the likely effects of a proposed plan or programme on the environment. Although there is no approval associated with such an assessment, it would be used to inform the site selection and public inquiry process. At this stage, it is not clear to us whether the SEA would be nationwide, or site-specific, or whether it would be led by the Government or the developers.

Constraints under the existing system

39. The evidence we received raised questions regarding both the licensing and planning aspects of the existing regulatory process. The chief concern was the length of time required for each. On licensing, it can take around two years for the Nuclear Installations

30 Q 312 (Dr Mike Weightman)

31 Appendix 30 (Health and Safety Executive)

Inspectorate to approve a design for a particular site and organisation. This follows on from a two to three year period during which the detailed design specification is drawn up. This timetable would be for one company's design proposal for a single site. If there were to be a programme of new reactors delivered on a competitive basis, thus requiring assessment of various designs for multiple sites, we would expect this process to take significantly longer. A lengthy period for licensing would increase the regulatory risk faced by any operators and would discourage them from entering into the process in the first place.

40. Similarly on planning consent, the potential for the procedures to take much longer than expected has been highlighted as an important risk. Here, the main area where there would be a likelihood of delay is in the public inquiry process. In the case of Sizewell B this went on for around two years, and largely focused on issues of energy strategy and the reactor technology proposed, rather than local site-specific issues.³² In so doing, the inquiry opened up for debate at a local level, issues that had already been discussed earlier in the process.³³ In addition, two years later when the public inquiry took place for Hinkley Point C, which in the end was not built, many of the same issues of policy, need and economics were debated again.³⁴ It seems clear, then, that the existing licensing and planning regimes are a significant barrier to investment in new nuclear build. Whilst we do not dispute the utmost importance both of ensuring public engagement and confidence in the process, and guaranteeing safety, the feasibility of reforming the system is something to which the Government will have to give serious consideration in weighing up the issues relating to new nuclear build.

How might the system be reformed?

41. We set out below the evidence we received on how the regulatory process could be changed to reduce the time taken for planning and licensing if that were considered desirable. This evidence focused on two specific areas. First was the proposal for the Government to set out clearly its plan and timescale for firms seeking regulatory approval. Secondly, it was proposed that the Nuclear Installations Inspectorate should consider pre-licensing generic reactor designs, and potentially also sites at an early stage.³⁵ With reforms in these areas, the regulatory process would still take up to five years for the first of any programme of new reactors.³⁶ However, it could reduce the risk of the procedures taking significantly longer.

42. Regulatory risk, that is the uncertainty over the timing and outcome of the regulatory process for planning and licensing, is one of the main reasons why investors are currently not willing to enter the sector. As a result, our witnesses argued that, if it were to decide in favour of new nuclear build, the Government would have to set out a 'roadmap', showing

32 CBI, *Response to 'Our Energy Challenge...'*, 2006

33 Q 239 (Dr Paul Golby of E.ON UK)

34 Q 69 (Mr Keith Parker of the Nuclear Industry Association)

35 Appendices 4 (Atomic Energy of Canada Ltd), 5 (British Energy), 11 (BNFL plc), 12 (Chemical Industries Association), 16 (EDF Energy), 38 (Nuclear Industry Association), 47 (RWE npower) and 49 (Scottish Power); Centrica, *Response to 'Our Energy Challenge...'*, 2006; CBI, *Response to 'Our Energy Challenge...'*, 2006

36 Q 74 (Mr Keith Parker of the Nuclear Industry Association)

clearly the process for achieving regulatory approval, which would provide a predictable timescale, thus reducing regulatory and project risk as the project progresses.³⁷ As discussed in the previous Chapter, there would need to be a preceding national debate on the need for a new generation of nuclear power stations, and there would need to be a Strategic Environmental Assessment, which would consider generic issues relating to new build and the basic characteristics of suitable sites for such new build.³⁸ The main aim of such an assessment would be to close off debate on the wider issues relating to new build at an early stage so that the public inquiry, later on, focused instead on local concerns.³⁹ This would prevent a repeat of the Sizewell B experience.

43. The second main area in which the industry is looking to the Government to reform the existing system is through the potential pre-licensing of reactor designs. As we noted earlier, the licensing phase considers the reactor design, its siting, and the organisation of the potential licensee. In the past, these three factors have been considered in conjunction—a defined reactor design, on a specific site, for a particular operator. The Nuclear Installations Inspectorate told us, though, that it could potentially look at the reactor design before considering the site or the organisation. This would be done by considering generic designs put forward by applicants on the basis, too, of a generic site envelope that covered all the likely sites in the UK.⁴⁰ The aim of this would be to assess whether there were any fundamental problems with particular designs, so that when the eventual licence application was made, there would be a much lower risk of delay, thus allowing the licensing process to be completed before any public inquiry. The other potential advantage to this approach is that the licensing for subsequent reactors would take less time because many of the design and siting issues would have been addressed right at the start.⁴¹ The process could also be quicker if subsequent reactors were to use the same design. We discuss the advantages and disadvantages of this approach later on in this Chapter.

44. Two further issues were raised by our witnesses: international collaboration and resourcing. On the first of these, in relation to assisting with the potential pre-licensing of reactor designs, we were told that it may be possible for the NII to make use of information shared with other nations' nuclear regulators. There is a significant amount of safety and design information available from countries such as the United States, Canada, and potentially now France.⁴² The advantage of making use of such resources is that it would not require the UK regulator to 're-invent the wheel' in considering proposed reactor designs.⁴³ On the issue of resources, our witnesses noted that the requirement on regulators to conduct pre-licensing and contribute to environmental assessments would substantially raise their workload. In particular, the NII would find it difficult to cope with licensing generic reactor designs unless its resources were increased.

37 Appendix 16 (EDF Energy)

38 Q 239 (Dr Paul Golby of E.ON UK)

39 Q 69 (Mr Paul Spence of British Energy)

40 Q 312 (Dr Mike Weightman)

41 Centrica, *Response to 'Our Energy Challenge...'*, 2006

42 Q 318 (Dr Mike Weightman); see, for example, *Financial Times*, page 2, 10 June 2006

43 Q 324 (Dr Mike Weightman)

45. All of the proposals discussed above focus on changing the regulatory *process*. Potentially, the Government might also need to consider the current *structure* of nuclear regulation to see if there is scope for greater efficiency there. One suggestion, which we put to the NII and Environment Agency, was whether a nuclear ‘super-regulator’ would help avoid unnecessary overlaps in the regulatory process. Defra has previously considered this issue and concluded against it, on the understanding that there should continue to be close working between the two regulators.⁴⁴ The Director for Civil Nuclear Safety made a salient point to us, though, that the UK’s regulatory framework is at present geared towards an industry that is decommissioning and winding down. Were there to be a programme of new nuclear build, an important consideration should be whether that model of regulation remained the most appropriate.⁴⁵

Feasibility and risks

46. Although both the arguments in favour of regulatory reorganisation and the proposed changes to the system seem rational, we have concerns in relation to the actual feasibility and risks of such reforms. Primary amongst these is the need to maintain public confidence in the regulatory process. Whether justified or not, the issue of nuclear power generates a high degree of public concern, particularly regarding the risks to public safety. Many of those who submitted evidence to us suggesting possible reforms to the system also stated it was essential that public confidence in the process should not be undermined.⁴⁶ For example, the Chief Executive of EDF Energy, Mr Vincent de Rivaz, told us: “we should not cut corners about issues that public opinion wishes to address. Public acceptance is a condition precedent for all potential investors to make their decisions”.⁴⁷ It is not surprising to us that, when the industry talks about streamlining, concerns are raised over the maintenance of public confidence in the rigour of the licensing and planning system. A ‘roadmap’ of the route to licensing may help maintain transparency and hence engagement in the process, but it is difficult to see how it would be enforced in practice. In the event of there being delays, it could be damaging to public confidence were the Government to be seen to be rigidly adhering to a pre-defined timetable, at the expense of allowing debate on issues that are impossible to predict at this stage.

47. We note also that changes to the planning system are typically fraught with difficulty, and evidence suggests that, if anything, since Sizewell B the consent process has become even lengthier.⁴⁸ Previous attempts to streamline the planning system have had limited effects on the length of the process. It should also be noted that the issue of planning approval for new electricity generation cuts across the whole sector—and, indeed, distribution or gas storage—and is therefore not unique to nuclear power. For example, failure to get planning consent has prevented the development of many onshore wind farms in the UK, and even new planning guidance (PPS 22) designed to help the

44 Q 344 (Mr Joe McHugh)

45 Q 411 (Mr Roger Brunt)

46 Appendices 4 (Atomic Energy of Canada Ltd), 5 (British Energy) and 38 (Nuclear Industry Association)

47 Q 239 (Mr Vincent de Rivaz)

48 Hammonds ARUP, *Consenting procedures for new nuclear power in the UK*, 2006

renewables sector is taking time to have an effect. As a result, the Government is considering the wider consents regime as part of its current Energy Review.

48. Another important consideration is that planning consent is a devolved matter. Two of the UK's seven AGRs are in Scotland, at Torness and Hunterston. As we discuss later in this Chapter, there is a possibility that developers of a new fleet of reactors would seek to locate them next to the site of existing reactors. The existence of a different planning regime in Scotland would have implications for the Government's ability to draw-up a 'roadmap' for the regulatory process that it would have the power to enforce. Moreover, if the Scottish Executive were to adhere to a policy against new nuclear build, it would be able to implement this through the planning system. This is one more reason why the Government must build a national consensus for its energy policy to be a success if that policy is to include new nuclear build.

49. The International Atomic Energy Agency (IAEA) has recently completed a review of the basis for the Nuclear Installation Inspectorate's appraisal of reactor designs in advance of any specific proposals for new nuclear build.⁴⁹ The terms of this review included consideration of the NII's readiness to regulate and license any new reactor designs, and to identify areas for improvement to the UK nuclear safety regulatory regime by exchanging knowledge with IAEA experts. Despite the NII having not made a detailed study of any reactor design since Sizewell B in the early 1980s, the IAEA's report was positive. Nevertheless, it made recommendations to the NII that it should clarify the current licensing and approval process for potential applicants, and also that it should consider the resource requirements posed by any new build programme.

50. As part of the Energy Review, the Health and Safety Executive has produced an expert report looking at the health and safety risks arising from recent and potential energy developments.⁵⁰ This includes consideration of a new generation of nuclear power stations and the potential role of pre-licensing assessments of candidate designs. This concludes that a two-stage licensing process, as discussed above, could be completed in roughly three to four and a half years. Generic design acceptance would be the longest part of the process, estimated at between 33 and 42 months, followed by a shorter, site-specific licensing process of 6 to 12 months. However, HSE note that these timescales would be dependent on the availability of resources, the quality and timeliness of the safety submissions received, and the significance of any issues arising, among various other factors. In other words, there is a risk that it could take longer than this.

51. HSE's report also comments that the precedent for pre-licensing in the UK has already been set with the Sizewell B reactor. There, the Nuclear Installations Inspectorate had begun looking at the Pressurised Water Reactor (PWR) as early as 1973, before the then Central Electricity Generating Board made a formal application in 1981, which then took six years to complete. HSE suggest that the reason for the length of time for licensing was partly because of the 'first of a kind' nature of the PWR, but also because the 1979 accident at Three Mile Island nuclear power station, in the United States, led to subsequent changes in the Sizewell B design. In the case of a new build programme in the UK today, we note

49 Appendix 30 (Health and Safety Executive)

50 Health and Safety Executive, *The health and safety risks and regulatory strategy related to energy developments*, June 2006

that pre-licensing would still face many of the ‘first of a kind’ factors, which slowed the process for Sizewell B. Whilst lessons have been learnt from past experience, the timescales suggested by HSE for new nuclear build still look very optimistic.

52. The two year licensing period for Heysham 2 and Torness—the last of the AGR power stations—suggests there is scope, though, for greater efficiency with subsequent reactors, if new nuclear build occurred in sequence. As such, the extent to which the Government can speed up the regulatory process also depends on its willingness to dictate the choice of reactor for any new nuclear power stations. If it stipulates one design for the whole of a potential programme, there is real scope for regulatory efficiencies. However, such an approach would be at odds with the Government’s stated desire for market delivery of any new build.⁵¹ Moreover, if a number of applicants for pre-licensing were to approach the NII with different reactor design proposals, the extent to which the Inspectorate could manage this workload would largely depend on its resourcing. Although the NII would be able to cover additional costs by charging for pre-licensing work, which would also rationalise its workload, its Chief Inspector said to us that they “are finding it difficult to recruit”.⁵² Nevertheless, the NII was confident that it would be able to draw on national and international experience should it need to ‘ramp up’ its resources quickly.⁵³ Its comparatively small size within the industry may make this easier, although if a programme of new build received the go-ahead, it would still be competing with the rest of the industry for what is a diminishing supply of skilled workers.⁵⁴

53. Evidence that we received stated that the current planning and licensing systems are a significant deterrent for investment in new nuclear power stations in the UK. To overcome this problem, the Government would need to take a more managed approach to the entire regulatory process, including resolving the national debate on nuclear power early on, and through the pre-licensing of generic reactor designs. Whilst we accept that the Government should do what it can to manage the regulatory risks faced by potential operators, we have doubts as to the extent to which it will be able to achieve this. Factors militating against success include its past experience with planning reform, the role of the Scottish planning system, the available skills base, and the extent to which the Government would be willing to close down public debate in order to meet any regulatory timetable, and whether such changes would maintain public confidence. Finally, we note that the issue of planning delays applies to the whole of the energy sector, and is not a concern specific to nuclear power.

Finding suitable sites

54. The ease with which a new nuclear power station could get planning consent is largely determined by the proposed location. We have already noted that a Strategic Environmental Assessment would be necessary to identify candidate sites. However, we received a large amount of evidence, during our inquiry, suggesting that one way of finding suitable sites would be to position any new reactors next to existing nuclear locations.

51 See paragraph 71 f below

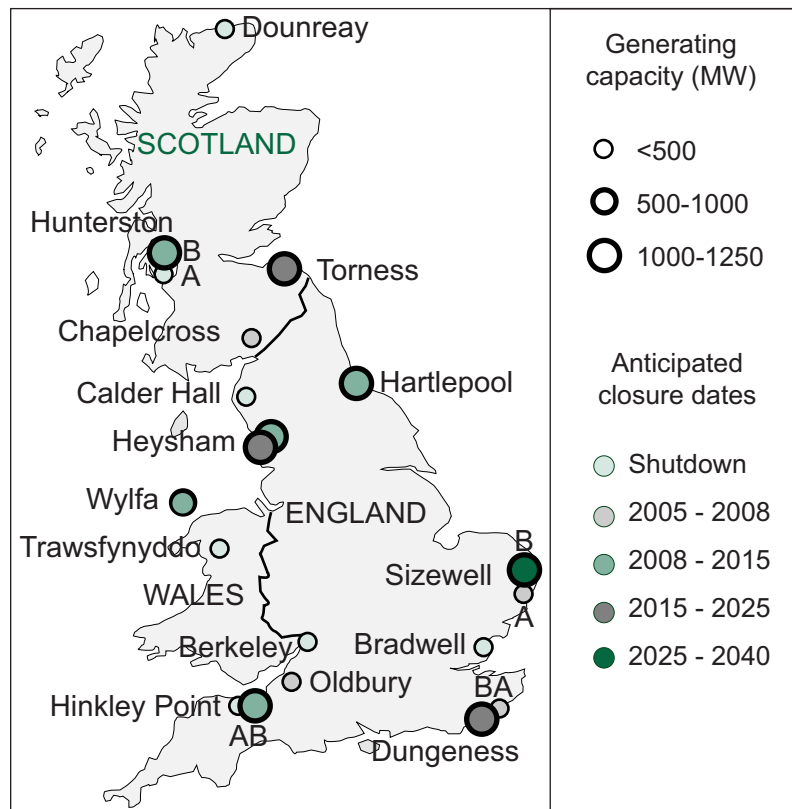
52 Q 330 (Dr Mike Weightman)

53 Q 334 (Dr Mike Weightman)

54 We discuss the issue of skills availability later in this Chapter.

There are a number of sites in the UK which already hold a nuclear licence. In the case of the second generation AGR reactors, these are owned by British Energy. The older Magnox reactor sites, formerly owned by BNFL plc, are now under the custodianship of the Nuclear Decommissioning Authority (although British Energy also owns land at Bradwell). Figure 1 below shows the location of the various sites.

Figure 1: Nuclear reactor sites in Great Britain



Source: BBC Online

55. Overall, there are a number of potential sites for consideration, several of which have a fairly large amount of land available within the perimeter of the existing facilities.⁵⁵ The following sections look at the advantages and disadvantages of this approach, and the consequences of having to look elsewhere.

Advantages of using existing sites

56. From a number of perspectives, there would be potential advantages from using existing sites for a programme of new nuclear reactors. For example, such sites already hold licences from the Nuclear Installations Inspectorate. Although this does not mean that a site licence would be guaranteed for a new reactor, the Inspectorate's prior knowledge of the location would potentially make the licensing process less complicated. Its Chief Inspector told us that: "clearly we understand the sites and the aspects of the sites more than any new site; therefore we would have a better start than if we had to start with a different site".⁵⁶ The Environment Agency agreed with this point, stating that "existing sites

55 Q 348 (Dr Mike Weightman)

56 Q 347 (Dr Mike Weightman)

are well characterised in terms of geography, demographics, situation etc [although] we would not seek to be any less rigorous”.⁵⁷

57. There could also be potential advantages in terms of the planning process that new nuclear build would have to go through for existing sites. As we noted earlier, communities that already have a nuclear power station near to them tend to be more favourably disposed towards nuclear power. This is partly because they are used to it as part of their local environment, but also because it provides employment opportunities.⁵⁸ Whilst there is evidence to support this view, we would note that the lengthy public inquiry for Sizewell B, which was built next to an existing nuclear site, suggests that the use of such sites would not guarantee the easing of planning consent. A major contribution to the length of the Sizewell B inquiry was that it was the first of that kind of reactor design in the UK, as would be the case with any new reactors now.

58. Finally, evidence we received also highlighted the prior existence of grid connections at current nuclear sites as a potential further advantage, saving the need for investment in network upgrades and new connections.⁵⁹ We discuss in more detail the grid implications of new nuclear build later in this Report. We note here, though, that there is potentially limited scope to realising these benefits. Locating new reactors alongside existing operating units may not preclude the need to make grid upgrades down the line. In addition, the Magnox reactors typically have, or had, lower voltage connections to the grid than would be expected for the current designs of nuclear power stations.⁶⁰ Although it is likely to be easier to upgrade an existing line than to build a completely new one, replacing old reactors with new ones would still have an impact on the national electricity grid.

Risks of using existing sites

59. A common feature of most of the UK’s existing nuclear sites is their location on the coast. This allows them to use seawater for cooling. However, there is growing concern about the extent to which these sites will be available in the future, because of the effects that climate change may have on them. The International Panel on Climate Change (IPCC) estimates that sea levels may rise by between 0.15 and 0.95 metres by 2100. This creates a greater risk of flooding due to storm surges as well as increasing concerns of coastal erosion. BNFL plc argue, in their submission to the Energy Review, that such changes could easily be accommodated in the design of a new power station on an existing site through either the positioning of a station above the predicted water level, or through purpose-built sea defences.⁶¹ The chief executive of E.ON UK told us that dealing with rising sea levels is “well within the range of civil engineering capability, but clearly it is a serious problem and would need a lot of detailed work to make sure we got it right”.⁶² This would clearly have cost implications for the plant, though, as the large amounts of cooling

57 *Ibid.*

58 Q 76 (Mr Keith Parker of the Nuclear Energy Association)

59 Q 242 (Mr Vincent de Rivaz of EDF Energy)

60 Appendix 32 (Institution of Electrical Engineers)

61 British Nuclear Fuels plc (BNFL), *Supporting paper on nuclear energy issues*, March 2006

62 Q 243 (Dr Paul Golby of E.ON UK)

water required by the power stations would have to be pumped a higher vertical distance than would otherwise be the case.

60. The Nuclear Installations Inspectorate told us they had not as yet made any assessment of the existing sites, but that, at any rate, it would be incumbent on the licence applicant to demonstrate that they had taken such risks into account and that they would maintain defences to a high standard.⁶³ As one of the Inspectorate’s officials told us: “It is not a matter of saying, ‘You cannot use these sites’, but rather, ‘If you choose this site you will need to defend the site to this standard and bear the costs’”.⁶⁴ At this stage, there is limited evidence available about what the impact of climate change might be on the UK’s existing nuclear sites. A report conducted by Nirex, which looked at this topic in the context of radioactive waste storage, cast some doubt, for example, over the viability of Dungeness and Hinkley Point (currently owned by British Energy) in the long-term.⁶⁵ However, this work was preliminary, and looked 100 years ahead and beyond—a somewhat longer time frame than it would be necessary to consider for a new generation of nuclear reactors, even taking account of decommissioning. We note that the Met Office has recently begun a two-year detailed study on this issue. It will play an important role in assessing the viability of existing sites.

61. An additional concern for us, with regard to using existing sites, is the implications of their current ownership, either by British Energy or by the Nuclear Decommissioning Authority. The power companies told us that they “would look to gain access to those sites at a commercial rate”.⁶⁶ We are unclear, though, as to how they would expect the Government to ensure this, given that these sites are largely privately owned—moreover, half of them are owned by a company that would hope to play a significant role in any programme of new build, and therefore might be unwilling to release them to a potential competitor.

62. Finally, the availability of some sites may also be affected by the possible presence of decommissioning work taking place onsite at the same time. In some instances, the process of decommissioning would have to take place in order to release land for new build. In other areas, sites may not have the capacity to cope with dismantling work being conducted at the same time as construction nearby. These factors will affect the timing at which some sites would become available for any new build.

Looking elsewhere

63. If it transpires that not enough of the UK’s existing nuclear sites were available for a new programme of nuclear reactors, then the Government and industry would have to look elsewhere for suitable locations. This could pose significant additional obstacles to the timely delivery of any build. For example, the public inquiry process would be undertaken within an environment that had potentially no prior experience of nuclear power. As such,

63 Q 349 (Dr Mike Weightman)

64 Q 353 (Mr Les Philpott)

65 Nirex, *Summary note for CoRWM on the impact of rising sea levels on coast sites with radioactive waste stores*, September 2005

66 Q 246 (Dr Paul Golby)

companies would face the challenge of needing to engage with the local community to seek its backing for a power station in its area. Also, long lead times could be necessary for providing a transmission grid connection where one was not already present, and for implementing any required upgrading to the grid infrastructure down the line.⁶⁷ Finally, looking at new locations is likely to come after a Strategic Environmental Assessment process has gone through a lengthy process of determining the viability of the existing nuclear sites. These timing issues would have to be factored into the lead times for the nuclear power stations themselves. The Parliamentary Office of Science and Technology is currently preparing a study on nuclear power station siting criteria, which will be published at the start of the 2006-07 Parliamentary Session.

64. The siting of a potential new generation of reactors in the UK could be aided by locating them next to existing nuclear power stations. There are possible advantages from doing this with regard to public acceptance, licensing and grid access, although none of these is guaranteed. However, the availability of some of these sites may be affected by rising sea levels and coastal erosion, arising from climate change. As a result, more research would have to be carried out on these potential effects before the industry could proceed. In addition, we are unclear as to how the Government would make existing sites available to the nuclear industry, given that many of them are privately owned. There would need to be a potentially difficult commercial negotiation with the current owner—probably British Energy—before development could proceed.

Choosing the right technology

65. The UK's existing nuclear power stations comprise three types of technology. Magnox, the first generation of reactors, were developed during the 1950s and 1960s, born out of the Government's earlier military research programme. As these were very much prototype designs, they are now obsolete, with the remaining UK Magnox reactors due to close in the next five years.⁶⁸ The UK's second generation of nuclear power stations were commissioned between 1976 and 1988. These Advanced Gas-cooled Reactors (AGRs) were subject to significant design problems and cost over-runs. Whilst they are still in operation, under British Energy Group plc, they represent the last generation of UK-designed reactors. The one subsequent addition to the UK's nuclear fleet, Sizewell B, was designed by the American firm, Westinghouse, and employs the widely used Pressurised Water Reactor (PWR) design.⁶⁹ Because there has not been a 'home-grown' reactor in the UK for around 20 years, and given advances in technology abroad, it is certain that any new generation of nuclear power stations in the UK would use a foreign design.⁷⁰ In the following sections we outline the choice of reactors that should be available to potential developers; anticipated future developments in the sector; and factors that would need to be taken into account in choosing a reactor design.

67 We discuss this further in Chapter 6.

68 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 1: An introduction to nuclear power – science, technology and UK policy context*, March 2006

69 *Ibid.*

70 Q 79 (Mr Keith Parker of the Nuclear Industry Association)

Available reactor designs

66. The European and American markets for new nuclear power plants has been stagnant for the last 20 years, with very little new build. Nevertheless, reactor vendors have continued to develop what are known as ‘evolutionary’ designs.⁷¹ These are third generation models, which use existing technical knowledge while adding system simplifications to improve safety performance. As such, there are now four designs that should be sufficiently developed in the coming years to enable potential UK nuclear operators to purchase ‘off the shelf.’⁷² The two most likely options are the AP1000 pressurised water reactor, developed by Westinghouse/BNFL, and the European Pressurised Water Reactor (EPR) offered by the French firm Areva. The AP1000 has a capacity of around 1,100 megawatts and incorporates passive safety systems. These use natural forces, such as gravity or natural circulation, where possible, in safety systems so as to reduce the use of pumps, fans, diesels, or other rotating machinery, thus decreasing the risk of failure of a safety feature for technical reasons. The developers argue that this not only improves safety but also reduces the complexity and therefore the potential capital cost without compromising safety.⁷³ Operators in the United States are currently seeking licensing approval for the AP1000 for stations on six sites. As yet there are no examples of this type of reactor in commercial usage.⁷⁴

67. Areva’s EPR has an output of around 1,600 megawatts and is based on a scaled-up version of existing reactors currently operating in France and Germany. Unlike the AP1000, it uses active safety systems that shut down the reactor in the event of an accident or abnormal operating situation.⁷⁵ The first EPR is now under construction at Olkiluoto in Finland. It was expected to be operational in 2009, although it is already reported to have fallen nine months behind schedule, a year after construction began.⁷⁶ A further demonstration EPR is being constructed in La Flamanville in France.

68. The industry believes that these two reactor designs are ready to seek licensing approval in the UK now.⁷⁷ In addition, there are two further models, which are being actively marketed to potential UK operators. These are Atomic Energy of Canada Ltd’s (AECL) CANDU reactor, predecessor designs of which are operating in Korea,⁷⁸ and General Electric’s Economic Simplified Boiling Water Reactor (ESBWR). However, it is expected that the technology licensing process for both of these designs would take substantially longer than for the two front-runners, therefore reducing the likelihood that they would be selected for any pre-licensing arrangements.⁷⁹ Indeed, neither of the most recent designs has yet been built for commercial use anywhere. Furthermore, of the 24 reactors officially

71 Institute of Physics, *The future of fission power – evolution or revolution?*, 2004

72 Q 20 (Prof Robin Grimes)

73 Institute of Physics, *Op. cit.*

74 British Nuclear Fuels plc (BNFL), *Supporting paper on nuclear energy issues*, March 2006

75 *Ibid.*

76 For example, *The Guardian*, 24 April 2006.

77 Appendix 38 (Nuclear Industry Association)

78 Appendix 4 (Atomic Energy of Canada Ltd)

79 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 1: An introduction to nuclear power – science, technology and UK policy context*, March 2006

under construction around the world, 23 use designs that, for various reasons, it would either not be possible to use in the UK, or would face difficulty competing in our market.⁸⁰ This leaves only the Finnish EPR, which is still under construction, as a recent example from which any potential UK developers would be able to draw lessons.

Future reactor designs

69. The Institute of Physics outlined to us how, in the future, possible ‘revolutionary’ or fourth generation reactor designs will become available. These are High Temperature Gas Reactors (HTRs), which use ceramic, rather than metal, components in the active core. This allows much higher operating temperatures, leading to greater thermal efficiency.⁸¹ In other words, as the Institute’s Professor Gelletly put it to us, this means “one can extract more bang for one’s buck”.⁸² Overall, revolutionary designs could give significant performance improvements over the current evolutionary reactors, using less fuel and producing a lower amount of waste.⁸³ To date, six potential designs have been selected as the focus of a collaborative international research effort, of which the UK is a part. Be that as it may, the first examples of such reactors are not expected to be ready for commercial use for at least 20 years, if not even longer.⁸⁴ This rules out the possibility of using such designs in the UK for any new nuclear build within the next two decades.

Factors to consider

70. One of our witnesses noted that there is comparatively little objective research on the relative advantages and disadvantages of the most viable current reactor technologies.⁸⁵ Part of the reason for this, as noted above, is the dearth of operational experience. This has implications for the extent to which reliance can be placed on any cost estimates cited by the industry.⁸⁶ Moreover, the fact that potential developers in the UK would be among the first in the world to use the evolutionary designs outlined above, must also present certain technical risks. These would have to be borne by the reactor vendor and buyer. That said, the use of international designs should also enable the UK to make use of operational and industrial experience from abroad.⁸⁷

71. Another issue, about which we heard divergent views, is the extent to which the Government should play a role in determining the choice of reactor design for any new nuclear build. If, say, there were to be a fleet of 10 new reactors, then there would be potential advantages from these all using the same technology. This would allow operators to benefit from learning-by-doing, thus reducing costs with each successive reactor.⁸⁸ Such

80 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 8: Economics of nuclear power*, March 2006

81 Institute of Physics, *The future of fission power – evolution or revolution?*, 2004

82 Q 17 (Prof William Gelletly)

83 Q 42 (Prof Robin Grimes)

84 Appendix 33 (Institute of Physics)

85 Q 20 (Prof Robin Grimes)

86 We look at the issue of cost uncertainty in more depth in Chapter 5 of this Report.

87 Q 78 (Mr Paul Spence of British Energy)

88 Q 181 (Prof Keith Palmer)

an approach would also generate only one type of waste, rather than several different types of waste if various reactor designs were used.⁸⁹ A possible disadvantage to this approach could be that it would lock the UK into a particular technology, which would create problems if the wrong technology choice were made at the start. However, we need only look to the UK's experience with its AGR programme to demonstrate the risks of not following a consistent design approach. The cost overruns and delays, which for example led to the construction of Dungeness B taking 18 years, were to a large extent attributed to the use of varying designs and different contractors for each of the seven AGRs.⁹⁰

72. The difficulty we see here is that because the Government would expect the market to deliver any new nuclear build, this leaves open the possibility that competing operators might opt for different reactor designs. The Nuclear Industry Association (NIA) told us that “it did not think that it is for Government to choose which design is built in the UK”.⁹¹ This means that in order to gain the cost benefits from a series of nuclear reactors, the Government would have both to ensure, somehow, that the market settled on a single reactor design, while still allowing the market sufficient flexibility to make the initial choice of design itself. This could pose difficulties if there were a number of consortia vying to build and operate new reactors, particularly in ensuring that there remained effective competition for new build throughout the development of the fleet.

73. Of the two main reactor designs viable for the UK, neither has yet been built anywhere in the world. There will, therefore, be both technical and cost uncertainties associated with any new nuclear plant, the risk of which could be mitigated by using a single reactor design for all new build. However, in a liberalised electricity market with competing consortia, each vying to build one or more new power stations, there is no guarantee that a single reactor design would be chosen for all new build. To a certain extent investment decisions would be influenced by pre-licensing generic designs, as those so licensed would have a significant cost advantage. Moreover, costs will decrease as each reactor of the same design is built.

The supply chain

74. A programme of new nuclear power stations would represent possibly one of the largest and most costly civil engineering undertakings to be attempted in this country. As such, a key question is whether the UK has the capacity, both in terms of skilled workers and the component parts required for the construction of a reactor, and if not, the extent to which it would be able to buy these in from abroad. In the sections below, we look at the scope of the UK's supply chain and where we see potential constraints in the future. We then go on to consider the global supply chain capability and the possible risks therein.

89 Q 40 (Prof Robin Grimes)

90 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 1: An introduction to nuclear power – science, technology and UK policy context*, March 2006

91 Q 77 (Mr Keith Parker)

UK capacity and constraints

75. As noted in the previous section on technology, it is almost certain that the design for any new generation of nuclear reactors in the UK would have to come from a foreign company. An interesting point, raised by the nuclear industry, though, is that a large proportion of the required engineering and construction work would not be directly nuclear-related. The industry estimates that construction of a nuclear power station comprises 55% plant and equipment, 30% civil engineering, and 15% project management and technical support. Of these, it is mainly in the area of plant and equipment that the UK lacks the domestic capability. For example, the civil engineering requirement for construction of a new nuclear power station would only be about 2–3% of national capacity, with the equivalent figure for mechanical and electrical capacity in the range of 4–5%. Overall, the Nuclear Industry Association estimates that the current UK supply chain could provide about 70% of a nuclear plant, and that this figure could reach 80% with sufficient investment in resources and facilities.⁹²

76. However, it is worth noting that the technical capacity assumed by the NIA derives from our present activities in operating nuclear power plants, and in carrying out decommissioning and waste management. While this domestic capacity may exist, it will be for the market to determine where components and labour are supplied from. The extent of UK involvement would depend on the structure of consortia and the choice of reactor design. Some design owners may well have their own supply chain arrangements, hence reducing the scope for UK participation.⁹³ Moreover, it seems unlikely to us that new construction projects would be able easily to draw resources away from other parts of the nuclear sector, where firms are already reportedly competing with each other for skilled employees, and where there is expected to be significant growth in the areas of decommissioning and long-term waste management in the coming years.

77. Concerns about the availability of skilled and experienced staff were expressed in several of the memoranda we received, including those from the Institution of Electrical Engineers and the Institute of Physics.⁹⁴ A number of witnesses also raised it as a serious issue in oral evidence.⁹⁵ Today, the nuclear industry directly employs 50,000 people. Yet, because of the period of time since the UK's last new build programme, a large proportion of this workforce is now approaching retirement. This would not be a problem were it not that the industry is struggling to replace those who are leaving with suitable science graduates. In part, the problem is that the current nuclear industry is not perceived as offering interesting opportunities to new entrants. As Professor Gelletly put it to us, "... nuclear decommissioning is not as sexy as building a new power station. It is one thing to see a bright new future in reducing carbon dioxide emissions and saving the planet, but if it

92 Nuclear Industry Association, *The UK capability to deliver a nuclear power plant*, 2006

93 IBM Business Consulting Services, *An evaluation of the capability and capacity of the UK and global supply chains to support a new nuclear build programme in the UK*, 2005

94 Appendices and 32 (Institution of Electrical Engineers) and 33 (Institute of Physics)

95 Qq 28 (Prof William Gelletly); 29 (Prof Robin Grimes); 92 (Mr Robert Armour); 120 (Sir Jonathon Porritt); and 242 (Dr Paul Golby)

is just a matter of taking a reactor apart and burying bits of it that is not exciting for young people”.⁹⁶

78. The shortage of chemistry, physics and engineering graduates is not a problem unique to the nuclear industry; it is an issue for the whole UK economy. Cogent, the Sector Skills Council, which covers the nuclear, chemical, polymer, and oil and gas sectors, has reported that while the number of higher education students in general has risen by 19% in the past 10 years, those entering and completing courses specific to Cogent have been in decline.⁹⁷ This decrease in demand has led to the closure of courses and, indeed, entire departments. Since 1995, 18 physics departments and 28 chemistry departments across the country have shut. Moreover, of those students that do graduate in relevant courses, only 6.5% presently take up employment in the Cogent sector.⁹⁸

79. Fortunately, the long lead time for nuclear power stations provides an opportunity for the UK further and higher education sectors to respond to the skills needs that a decision in favour of new nuclear build would create. One report suggests that with notice of between two and five years, additional staff could be trained either in-house or through industry training schemes.⁹⁹ The Nuclear Decommissioning Authority (NDA) and the power industry are also considering establishing a nuclear skills academy to promote the skills required for both operation and decommissioning.¹⁰⁰ In addition, a couple of our witnesses gave evidence suggesting that there has been a recent increase in student interest in pursuing nuclear-related course modules.¹⁰¹ While this in no way completely solves the skills shortage problem, it does provide us with cause for optimism. One industry representative said to us that if nuclear power is back on the agenda, then he had “no doubt that we shall be able to attract, train and retain the talents and skills we need”.¹⁰²

80. Some of our witnesses were also cautiously optimistic that UK constraints in the provision of some component parts to nuclear power stations could be overcome if there was confidence in the future of the sector. Professor Grimes, of the UK Energy Research Centre, and Professor Gelletly, of the Institute of Physics, noted that a programme of new build, combined with growing international demand for nuclear power, might well provide the incentives for UK engineering companies to invest in the domestic supply chain.¹⁰³

81. Addressing gaps in the UK’s supply chain would require the co-ordinated participation of industry, academia and the Government. However, the industry has made it clear that for it to have the incentive to invest, both with regard to skills and infrastructure capacity, it will need an understanding of the level of business it is likely to win from any new build programme. This information is as yet unknown, as it would depend on the extent of such

96 Q 28 (Prof William Gelletly)

97 Cogent, *An assessment of current provision for the nuclear industry*, 2006

98 *Ibid.*

99 IBM Business Consulting Services, *An evaluation of the capability and capacity of the UK and global supply chains to support a new nuclear build programme in the UK*, 2005

100 Q 92 (Mr Robert Armour of British Energy)

101 Qq 29 (Dr William Nuttall) and 30 (Prof William Gelletly)

102 Q 242 (Mr Vincent de Rivaz)

103 Qq 23 (Prof Robin Grimes) and 26 (Prof William Gelletly)

a programme, the proposed reactor design, the structure of the construction consortia, and their procurement strategies.¹⁰⁴ This potentially creates a ‘catch-22’ situation, since by the time the UK industry obtains this information it may be too late to make such investments. As a result, the Government would have an important role to play in clearly communicating its long-term position on nuclear power in order to provide the industry with a degree of confidence. It could have difficulty providing sufficient assurance, though, given it would expect a market-driven approach to any new build.

Global capacity and constraints

82. As noted previously, there are a number of areas in which the UK would be reliant on the global supply chain were it to pursue a programme of nuclear new build. These include the fact that there is no UK-based design owner, or capability for the fabrication of the required turbine generators. Generally, evidence suggests that the global market will be able to provide the systems and sub-systems that the UK market is unable to supply, although the global capacity for some key items appears to be limited.¹⁰⁵ For example, potential pinch-points exist with regard to reactor pressure vessels, steam generators, large turbines, and large forgings.¹⁰⁶ The last of these has received particular attention as a possible constraint. The only existing suppliers are in France and Japan, and whilst both are reportedly considering investment in increased capacity, at the moment lead times of up to 10 years could be envisaged in the worst case.¹⁰⁷

83. More generally, there is a risk that if a number of countries place orders for nuclear reactors at the same time as the UK, the design owners may not have the capability to increase their operations. Demand for nuclear power is expected to rise from around 370 gigawatts in 2004 to between roughly 450 and 530 gigawatts by 2025.¹⁰⁸ Although the main developers are confident that they can meet greater demand, the possibility that they might not cannot be ruled out, hence the timing of any orders from the UK would be important if operators were to avoid the possibility of significant delays. At the same time, even a large programme of nuclear new build in the UK might be considered relatively small in the context of global expansion in this sector and, therefore, might not be a priority for potential suppliers, operators or investors.¹⁰⁹ This concern is particularly pertinent where the UK would be dependent on international suppliers. With respect to operators and investors, we take comfort from the interest in possible UK new build expressed to us by Europe’s three main electricity generators, RWE, E.ON and EDF, and these companies’ ability to finance large projects. However, if this interest is to be sustained, these investors would need to be convinced that the UK has a robust long-term energy policy.¹¹⁰

104 IBM Business Consulting Services, *An evaluation of the capability and capacity of the UK and global supply chains to support a new nuclear build programme in the UK*, 2005

105 *Ibid.*

106 Q 79 (Mr Keith Parker of the Nuclear Industry Association)

107 Geological Society, *How to plug the energy gap*, November 2005

108 IBM Business Consulting Services, *Op. cit.*

109 *Ibid.*

110 Appendices 16 (EDF Energy), 22 (E.ON UK) and 47 (RWE npower)

84. The UK's domestic supply chain could meet only a proportion of the skills requirements that a programme of nuclear new build would pose. Although there are considerable concerns with regard to the current shortage of domestic nuclear skills, there are signs of a pick-up in this area. The domestic supply chain could also meet a proportion of the infrastructure requirements of a new build programme. Where there are shortfalls, the global market should be able to fill these gaps, though there are constraints regarding a few important reactor components. The growth in worldwide interest in new nuclear build also means that the relatively small UK market will face fierce competition in accessing skills and plant from other countries. As such, a clear and long-term commitment to nuclear power from the Government would be key both to timely investment in the domestic supply chain and for ensuring the global sector's willingness to engage in the UK market.

Uranium fuel availability

85. The reliable operation of a new fleet of nuclear reactors in the UK would require a stable and secure source of uranium fuel supplies for the next 50 to 60 years. Recent reports in the media have suggested that the availability of uranium could pose a significant constraint on any potential new nuclear build, with prices having risen from \$6.70 per pound in 2001 to \$41.50 per pound today.¹¹¹ In contrast to gas-fired generation, the cost of primary fuel does not bear heavily on the economic attractiveness or otherwise of nuclear power, representing less than 10% of the total cost of generation.¹¹² Nevertheless, it is still the case that the long-term availability of uranium would be a crucial consideration in determining whether new nuclear generation was possible. In this section we look at the current and future demand for uranium, the capacity of the supply side of the market, followed by other developments in the sector, as well as the future role of fuel reprocessing in the UK.

Demand for uranium

86. Rapid economic growth in countries like China and India is fuelling a worldwide expansion in energy demand. As a result, these economies, and others, are increasingly looking to nuclear power to meet their energy needs. The OECD Nuclear Energy Agency and the International Atomic Energy Agency (IAEA) produce an annual 'Red Book' of worldwide uranium resources.¹¹³ Their latest estimates are for global demand for uranium to rise from 67,320 tons per annum at the end of 2004 to between 82,275 and 100,760 tons per annum by 2025. This is based on predicted growth in worldwide nuclear generating capacity during this period from 369 gigawatts to anywhere between 449 and 533 gigawatts. This expansion does, however, mask regional variation in demand growth, with capacity expected to double in East Asia, in contrast to a predicted decline for Western Europe over the same period. The range of growth in uranium demand is difficult to predict with any accuracy because of the level of uncertainty in many countries regarding

111 For example, *The Guardian*, 7 June 2006, page 8 and 18 May 2006, page 7.

112 Q 233 (Mr Vincent de Rivaz)

113 OECD Nuclear Energy Agency & International Atomic Energy Agency, *Uranium 2005: Resources, Production and Demand*, June 2006

the future role of nuclear power. Be that as it may, global demand is unlikely to fall during this period.

Uranium supplies

87. Current media concern regarding the reliability of future uranium supplies stems largely from awareness that there is expected to be a shortfall in the next few years.¹¹⁴ In 2004, world uranium production provided around 60% (40,263 tons) of global requirements (67,450 tons).¹¹⁵ The remainder is met through secondary sources, including inventories built up during the 1970s oil crises, decommissioned warheads, and re-enrichment of depleted uranium tails (a waste product of the uranium enrichment process). However, the availability of these secondary sources is expected to decline in the coming years. Although primary uranium production in 2004 grew 12% on the previous year, to 40,263 tons, and is expected to have reached 41,250 tons in 2005,¹¹⁶ this growth may not be enough to prevent a shortfall in the near future. It is this expected tightening in the market that has contributed to recent price rises.

88. It is difficult for primary uranium supply to expand quickly in response to rising prices because the identification and bringing to production of uranium requires a long lead time, typically in the order of 10 years or more.¹¹⁷ In addition, because secondary sources have been able to contribute so significantly to global supply, there has been little exploration for new sources over the past 30 years.¹¹⁸ Exploration for and development of new mines is also very expensive. This means the industry would need to see sustained high prices and demand in order to create the required incentives to develop new sources of uranium. However, the OECD/IAEA's latest 'Red Book'¹¹⁹ suggests there is already evidence that higher prices are having an effect, with worldwide exploration expenditure in 2004 up 40% on 2002 at \$133 million, and expected to have risen to \$195 million in 2005.

89. Despite short-term concerns about uranium supply, it is in fact a relatively plentiful resource, being as abundant globally as either tin or zinc.¹²⁰ There are about 3.8 million tons of total identified uranium resources recoverable at a cost of less than \$80 per kilo, and approximately 4.7 million tons in total at a cost of less than \$130 per kilo. These levels have risen in recent years as a result of re-evaluations of known resources. Total undiscovered resources on dry land are estimated at around 10 million tons.¹²¹ Uranium is also present in seawater in even greater quantities, although it is for the time being uneconomic to extract.¹²² With the existing world nuclear fleet, well-known uranium reserves would

114 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 8: Uranium Resource Availability*, March 2006

115 OECD Nuclear Energy Agency & International Atomic Energy Agency, *Uranium 2005: Resources, Production and Demand*, June 2006

116 *Ibid.*

117 *Ibid.*

118 Q 5 (Prof Robin Grimes)

119 *Op. cit.*

120 British Nuclear Fuels plc (BNFL), *Supporting paper on nuclear energy issues*, March 2006

121 OECD/IAEA, *Op. cit.*

122 Q 6 (Prof William Gellely)

sustain nuclear generation for about 85 years using current technology. This rises to around 270 years if all known resources are taken into account. These numbers compare favourably with current estimates of the remaining reserves of oil and gas, which are expected to last for respectively 41 and 67 years.¹²³ One concern raised was that, as existing stocks of uranium are used up, new sources could be of a lower grade, thus requiring more energy to extract, refine and enrich it to a level that is usable in a nuclear reactor. This could increase the overall carbon ‘footprint’ of nuclear power.¹²⁴ We discuss this issue further in Chapter 6. Overall, though, all of the witnesses we spoke to were unconcerned about the long-term future quantity of uranium supply.¹²⁵ Given that a potential new generation of UK reactors would not come online until the latter half of the next decade, it is likely that the current short-term capacity constraints in the uranium market will have been overcome by the time any new UK reactor operators would seek to purchase fuel.

Future developments

90. The UK does not have an indigenous primary supply of uranium. While the current industry is able to make use of secondary sources, such as those outlined above, and also employs reprocessed uranium, it is likely that a potential new generation of reactors would be almost entirely reliant on imported fuel. This dependency does not generate the same level of geopolitical concerns as fossil fuels, because in excess of 50% of uranium reserves are located in OECD countries, with Australia, Canada and the United States in possession of most of the world’s stocks.¹²⁶ Figure 2 shows the distribution of reasonably assured uranium resources around the world.

91. Kazakhstan is expected to challenge for prime position in the coming years. In addition, Niger, Russia and Uzbekistan are becoming increasingly important uranium sources. Focus in the uranium market is gradually shifting away from OECD countries.¹²⁷ Nevertheless, Australia is likely to remain one of the primary sources of uranium for the foreseeable future, providing a reliable source of supply for the UK. Kazakhstan is also considered to have a positive relationship with OECD countries and a stable regime that is unlikely to interfere with the uranium industry.¹²⁸ As a result, we do not believe that the sourcing of uranium fuel from abroad should pose a significant concern in considering the merits of new nuclear build.

92. Finally, some of the witnesses we spoke to highlighted how advances in technology should make future reactors more efficient. Fourth generation reactors, or ‘fast-breeders’ may have much higher ‘burn-up’ rates, thus reducing the amount of uranium required to produce a given level of electricity.¹²⁹ Although these types of reactors are still many years from being widely deployed, they could extend the period over which uranium is available

123 Appendix 16 (EDF Energy)

124 Q 125 (Sir Jonathon Porritt)

125 Qq 6 (Prof Robin Grimes); 125 (Sir Jonathon Porritt); and 234 (Mr Vincent de Rivaz)

126 Q 234 (Dr Paul Golby of E.ON UK)

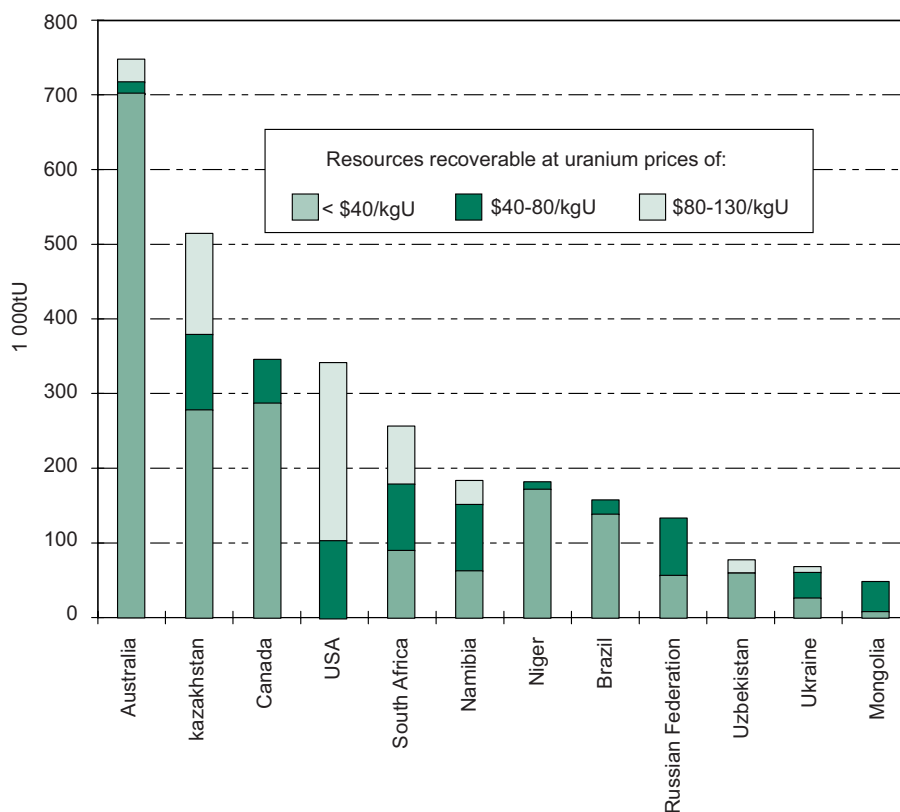
127 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 8: Uranium Resource Availability*, March 2006

128 *Ibid.*

129 Q 17 (Prof William Gellately)

to thousands of years.¹³⁰ However, as noted earlier in this Chapter, such reactors would not be sufficiently developed in time for any new nuclear build in the UK in the next two decades.

Figure 2: Distribution of uranium resources in countries with major resources



Source: OECD/IAEA 'Red Book'

Fuel reprocessing

93. One of the ways in which many countries seek to conserve their uranium supplies is through the reprocessing of spent fuel. After five years in a reactor, spent fuel consists of about 96% unused uranium, 1% plutonium, and 3% highly radioactive waste.¹³¹ Reprocessing enables the extraction of used uranium and plutonium for recycling as reactor fuel. Because 97% of the spent fuel is re-used, this process also acts to keep down the amount of high level waste requiring management. The UK has one of the world's few commercial reprocessing plants at Sellafield, serving both domestic customers, as well as countries including Japan, Germany, Spain and Sweden.

94. Fuel reprocessing has been controversial in the UK for a number of reasons. Because it generates plutonium, historic reprocessing has brought about a stockpile of plutonium. While this poses a concern in terms of proliferation risks, one of the ways in which this stored plutonium could be used is in mixed oxide fuel. We received evidence suggesting that, used in this way, the UK's plutonium would be sufficient to power the full lifetime of

¹³⁰ Qq 42 (Prof William Gelletly) and 236 (Mr Vincent de Rivaz)

¹³¹ Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 5: waste and decommissioning*, March 2006

two nuclear reactors, should that be the Government's desire.¹³² Fuel reprocessing has also been controversial because of its environmental impact. The majority of nuclear discharges into the north east Atlantic are from reprocessing plants, with Sellafield regarded as one of the main culprits. Reprocessing is also very expensive and, given the current price of uranium, is seen as uneconomic. As such, the working assumption of many in the nuclear industry is that, were a new series of nuclear reactors to receive the go ahead, it would be on the basis of spent fuel not being reprocessed. Instead, it would be stored onsite in anticipation of long-term disposal. This decision has implications both for the level of dependency of the UK on the world market for uranium, and the level of waste it would have to manage arising from any new build. It also has consequences for the outlook of the UK's reprocessing industry, and could rule out longer term use of some fourth generation reactors, highlighted above, that would use recycled fuel. We discuss the issue of waste in the next chapter.

95. As regards fuel availability, demand for uranium is set to increase markedly in the future, with greater global energy consumption, particularly in East Asia. In the short-term we have concerns about the availability of fuel supplies as secondary sources, such as commercial inventories, are used up. However, in the long-run we believe increased prices and global demand will help maintain reliable uranium supplies, thus not representing a constraint on any new nuclear build in the UK. This provides some reassurance about fuel availability, as it currently seems unlikely that new nuclear power stations would be in a position to use fuel reprocessing to recycle their nuclear waste back into re-usable uranium.

Security and proliferation

96. 2006 marked the twentieth anniversary of the Chernobyl disaster. The event remains present in the minds of many when the issue of nuclear power is debated. Although the tragedy stemmed from a range of procedural failures and a reactor design that would never have been licensed in the UK,¹³³ the issue of nuclear security has, nevertheless, risen up the public and political agenda in recent years in the wake of the 11 September and 7 July attacks.¹³⁴ In this section we look at the structure of nuclear security regulation in the UK; how it has evolved in recent years; the risks the sector faces; and the potential implications of a new generation of nuclear power stations. We close the Chapter by considering the proliferation issues posed by new build.

Security regulation in the UK

97. The Office for Civil Nuclear Security (OCNS) is the Government's security regulator for the civil nuclear industry. It covers security arrangements for the protection of nuclear and radioactive material on civil nuclear sites and nuclear transports, while also having responsibility for information and personnel security for the sector. For example, all those permanently employed in, or engaged in contract to, the civil nuclear industry have to be

¹³² Appendix 16 (EDF Energy)

¹³³ BNFL plc, *Supporting paper on nuclear energy issues*, 2006

¹³⁴ Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 6: Safety and security*, March 2006; Appendix 35 (Dr David Lowry)

vetted and security cleared by OCNS.¹³⁵ The Office has a relatively small staff of 42. However, its function is supported by the Civil Nuclear Constabulary—an armed police force of about 700.

98. The Office’s procedures have been significantly improved in the wake of the 11 September attacks. The *Anti-Terrorism, Crime and Security Act 2001* gave rise to the *Nuclear Industry Security Regulations 2003*. Under these, every civil nuclear site in the UK is required to have in place a site security plan detailing the physical measures designed to protect that site and the nuclear material it holds. The responsibilities of OCNS inspectors are to ensure compliance with the plans, monitor a schedule of improvements, and conduct inspections where appropriate.¹³⁶ In addition, this year, in the wake of two security breaches at Sizewell B by Greenpeace, unauthorised access to a nuclear site has been made a criminal offence.¹³⁷ Outside OCNS, there are also numerous off-site counter terrorist activities aimed at maintaining the security of the UK’s nuclear sites. These include intelligence gathering, surveillance of suspect individuals, and taking measures at airports to detect and prevent hijackers.¹³⁸

Risks to security

99. Modern nuclear reactors are designed to stringent regulatory standards. The main reason for this, to date, has been to protect them against ‘acts of God’ such as earthquakes, tsunamis and tornados.¹³⁹ While the third generation reactor designs that would be considered for new nuclear build in the UK do not have anti-terrorist features specifically designed-in, there are various aspects to such designs that militate against the risk of a terrorist attack. For example, BNFL note that these reactors have massive reinforced concrete shields, the thickness of which should increase their robustness against an attack, for instance by a hijacked aircraft.¹⁴⁰ Such reactors also employ a ‘defence in depth’ approach, whereby a number of different systems perform the same function so that the safety of the plant does not rely on any single feature.¹⁴¹ Current reactor designs are also relatively small as compared to the targets of 11 September.

100. One of our witnesses described the safety record of the UK’s civil nuclear industry as “second to none”.¹⁴² Indeed, in the sector’s history, there have been no events recorded either with off-site consequences or where all safety measures had been exhausted (the Windscale accident in 1957 occurred at a military reactor).¹⁴³ However, the Sustainable Development Commission noted that recent changes in the *modus operandi* of terrorist

135 Appendix 41 (Office for Civil Nuclear Security)

136 Q 380 (Mr Roger Brunt)

137 Q 391 (Mr Roger Brunt)

138 Parliamentary Office of Science and Technology, *Assessing the risk of terrorist attacks on nuclear facilities*, July 2004

139 Appendix 4 (Atomic Energy of Canada Ltd)

140 BNFL plc, *Op. cit.*

141 Parliamentary Office of Science and Technology, *Op. cit.*

142 Q 56 (Mr Robert Armour of British Energy)

143 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 6: Safety and security*, March 2006

groups make it difficult to predict the nature of any potential future attack.¹⁴⁴ For example, Greenpeace have recently raised concerns regarding the vulnerability of the transportation of spent nuclear fuel in the UK by train.¹⁴⁵ In its evidence to us, we received assurances from OCNS that all transportation of high level waste in the UK took place relatively infrequently, and did so with the maximum of forward planning.¹⁴⁶ Nevertheless, analysts suggest that an attack on a road or rail shipment of radioactive material could be easier to accomplish than one on a fixed installation, although the amount of material would probably be less and would probably be dispersed over a smaller area.¹⁴⁷

The implications of nuclear new build

101. A programme of new reactors in the UK would require an increase in the resourcing of both OCNS and the Civil Nuclear Constabulary. However, unlike the rest of the industry, these bodies would probably not face the same competition for a diminishing supply of skilled workers. Those employed in the security of civil nuclear sites tend to be security experts first and foremost, who then acquire technical training as necessary to carry out their jobs.¹⁴⁸

102. An important consideration for any new nuclear build, highlighted to us by OCNS, would be the need to ensure that the lessons learnt from the previous generations of nuclear power station construction were reflected in whichever site and reactor design was used. This could be a problem, given that most of the companies taking forward new build here would not have had previous experience of building a nuclear power station in the UK. OCNS would be involved throughout the process of licensing and constructing any such power stations. For example, it would have to approve a site security plan and then conduct pre-commissioning inspections to satisfy itself that its standards had been met.

103. One concern that the Office raised with us was the likely workload it would face providing clearance for personnel engaged in a new build programme. Last year OCNS issued just under 18,000 clearances. Its particular worry was with regard to the potentially large number of staff from overseas that would require vetting, and the challenge this might present for ensuring knowledge was not passed onto a third party with malicious intent.¹⁴⁹ To cover the cost of this additional work, the Office would have to increase the amount of its funding from the industry. At present, £2.3 million of OCNS' £2.4 million annual budget comes directly from the sector.

104. New nuclear power stations in the UK would also require material damage and liability insurance, as is the case for every civil nuclear site in the UK. Currently, the *Nuclear Installations Act* sets an upper limit on the amount of insurance that operators are required to have, at £140 million. Liabilities beyond this, in the event of a claim, would have to be met by the Government. This is stipulated under the Paris Convention, to which

144 *Ibid.*

145 Appendix 29 (Greenpeace)

146 Q 415 (Mr Roger Brunt)

147 Parliamentary Office of Science and Technology, *Op. cit.*

148 Q 401 (Mr Roger Brunt)

149 Q 407 (Mr Roger Brunt)

most European countries, including the UK, are signatories.¹⁵⁰ It is likely that these thresholds will rise in future as recent updates to the Paris Convention have increased the liability limit to €700 million. For any new nuclear power stations, the industry would want the Government to ensure continuation of the current international agreements, capping the liability of nuclear operators in the event of major incidents, and allowing them to insure for potential liabilities up to that cap.¹⁵¹ Evidence suggests that, at present, the insurance market appears to have capacity to cover most risks within the proposed limits from 2006, although debate on some detailed issues is continuing.¹⁵²

105. Most of the implications raised above with regard to nuclear new build should not present a concern as regards the viability of any future programme. As such, the security issue comes down to the extent to which further nuclear power stations present an additional risk over and above that which exists already from the UK's current nuclear installations. We do not believe this would be significant.

Proliferation

106. Nuclear proliferation is the dissemination of technical knowledge to potentially hostile states or groups that might in the future enable them to construct nuclear weapons. With Iran's nuclear programme occupying the headlines in 2006, the issue of proliferation remains a consideration when debating the future of the UK's own civil nuclear activities. However, there are safeguards in place to ensure there is very little risk of proliferation resulting from information escaping or being released from either UK sites or workers. The UK is a signatory to the Non-Proliferation Treaty and the Euratom Treaty. International safeguards are also in place to detect and discourage the diversion of nuclear materials to weapons use.¹⁵³

107. If the UK were to go ahead with a new generation of nuclear power stations, it is unlikely this in itself would present a significant increase in the risk of proliferation, assuming OCNs is able to maintain its current standards in vetting procedures. Indeed, this is acknowledged in the Government's Energy Review consultation document.¹⁵⁴ Nevertheless, in its evidence to us, the Sustainable Development Commission noted that the risk associated with the proliferation of nuclear technology around the world remains an extremely important issue.¹⁵⁵ In particular it noted that, if nuclear power is to be part of the UK's solution to climate change, then, under the United Nations framework Convention on Climate Change (UNFCCC), it could be considered a suitable solution for all countries.¹⁵⁶ However, we note that, whatever the UK decides, countries with large nuclear programmes, such as France, Japan and the United States, are likely to continue with their policy of developing nuclear power. Nevertheless, due regard should be given to the

150 BNFL plc, *Op. cit.*

151 Centrica, *Response to 'Our Energy Challenge...'*, 2006

152 Appendix 16 (EDF Energy)

153 Q 57 (Mr Keith Parker of the Nuclear Industry Association)

154 Department of Trade and Industry, *Our energy challenge – securing clean, affordable energy for the long-term*, January 2006

155 Q 166 (Sir Jonathon Porritt)

156 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 6: Safety and security*, March 2006

political message that a decision in favour of new nuclear build in the UK would send to those countries it is seeking to discourage from developing their own nuclear programmes.

108. The importance of security and the risks of proliferation are of the utmost concern to the Government in protecting its citizens. As such, it is vital for the UK civil nuclear industry to adhere to international treaties and uphold the highest regulatory standards. While these considerations should not be neglected in the debate on new nuclear power stations in the UK, we do not believe that such a programme would pose a significant additional security or proliferation risk, although by definition it extends the period of that risk. However, we accept, too, that there are ethical considerations to take account of in this debate, and that the UK's position should not necessarily be determined on the basis of the relative risk any programme would present.

4 Managing decommissioning and long-term waste disposal

109. The UK entered the nuclear age more than half a century ago now. Indeed, Calder Hall in Sellafield was the world's first commercial nuclear power station. It was also one of the world's longest running, having been in operation from 1956 to 2003—a period of almost 47 years. Over this time, the UK has developed not just three generations of nuclear power stations, but also nuclear facilities for research, fuel enrichment and reprocessing, and military-related activities, amongst others. The consequence of this, however, has been the steady accumulation of a significant legacy of radioactive waste. Although radioactivity decreases with time, some of this waste will remain a potential health risk for many thousands of years. A programme of nuclear new build would, inevitably, add to the stock.

110. To date, successive governments have failed to implement a long-term strategy for managing the existing waste, let alone that which would be created by new nuclear power stations. Yet, the financing and delivery of a long-term solution is vital both from an ethical perspective—regardless of a decision on new build—and also if the Government is to gain public support for more nuclear power. This Chapter considers the contribution new nuclear build would make to the UK's waste inventory. It also looks at progress being made to implement a long-term solution for radioactive waste, and how the waste costs from any new build programme would need to be financed.

Adding to the stock

111. Over the course of our inquiry, we took a range of evidence concerning the extent to which the decommissioning and waste considerations of new nuclear build should represent a material concern for the Government. In this section we look at estimates for the UK's current stock of nuclear waste, before going on to examine how much a new generation of nuclear reactors would add to this, as well as other factors to which the Government should give due regard.

The existing waste legacy

112. The pioneering nature of the early nuclear industry in the UK saw large-scale experimentation in a range of areas, such as reprocessing, the development of different types of reactor, weapons research, etc.¹⁵⁷ The resulting waste arising from these activities includes a wide variety of materials, from used equipment and contaminated clothing, to reactor components. It is classified into four types:¹⁵⁸

- High level waste (HLW), which is heat generating and requires stabilisation in glass blocks (known as vitrification). HLW primarily arises from fuel reprocessing.

157 Q 37 (Prof William Gelletly)

158 Committee on Radioactive Waste Management, *What is radioactive waste?*

- Intermediate level waste (ILW) comes in a variety of forms and includes parts of reactors and equipment.
- Low level waste (LLW) includes discarded clothing, equipment and building rubble and can be disposed off through shallow burial.
- Low activity waste, which is the largest category of waste in terms of volume.

113. Nirex's 2004 inventory of conditioned waste, that is waste that has been prepared for packaging and storage, is estimated at around 2.3 million cubic metres (m³).¹⁵⁹ This comprises 1,340 m³ of high level waste; 241,000 m³ of intermediate level waste; and 2,040,000 m³ of low level waste. Although HLW is the smallest by volume, it accounts for about 95% of the radioactivity of all conditioned waste. The inventory includes both current waste, and that estimated to arise in the future from the UK's existing nuclear activities. It shows that only 4% of the conditioned waste total would be avoided if the UK were to cease all nuclear activities today.¹⁶⁰ In addition to the inventory of conditioned waste there is an even larger amount of unconditioned radioactive material that, as yet, is not classified as waste. This includes 93 tonnes of plutonium; 100,000 tonnes of separated uranium; 5,000 tonnes of spent fuel; and roughly 18 million m³ of contaminated land (although this estimate is very uncertain).¹⁶¹ Overall, the UK's existing legacy of nuclear waste represents a complicated and sizeable challenge both to this, and to future generations.

Decommissioning implications of new build

114. Once nuclear reactors have completed their operational life, they enter a lengthy period of decommissioning. This involves the gradual dismantling of the reactor and associated buildings, and the eventual returning of the site to its original state. The process for the UK's existing nuclear power stations, some of which are now beginning decommissioning, is one that will take many decades to complete. The estimated cost of the work for the UK's civil nuclear waste legacy, which is being co-ordinated by the Nuclear Decommissioning Authority, has risen significantly in recent years, and is now believed to be over £60 billion and could rise further in the future.¹⁶² This cost reflects the complexity of the UK's nuclear legacy. Amongst other reasons, it results from the fact that eventual decommissioning was not given much consideration in the design of the UK's early reactors.¹⁶³

115. As decommissioning of the UK's first generation of Magnox reactors, as well as other facilities, gets underway in the UK, the sector is beginning to accumulate experience in the process of handling and dismantling nuclear sites. Around the world to date, 100 commercial reactors have shut down, of which 14 have been completely

159 Nirex, *The viability of a phased geological repository concept for the long-term management of the UK's radioactive waste*, November 2005

160 *Ibid.*

161 *Ibid.*

162 Nuclear Decommissioning Authority, *Strategy 2004-05*

163 Appendix 53 (UK Atomic Energy Authority)

decommissioned.¹⁶⁴ This experience has helped inform the design and development of the current third generation of nuclear reactors. It means that modern power stations should be much easier to decommission once they have reached the end of their operating life. What is more, the nature of the newer designs means that decommissioning and dismantling gives rise to smaller volumes of waste. In its written evidence to us, EDF also noted that two-thirds of the dismantled volume of modern nuclear power stations consists of non-radioactive general building waste.¹⁶⁵ Nevertheless, the Sustainable Development Commission estimates that the decommissioning cost for a new one gigawatt plant would still be in the order of £220 million to £440 million per gigawatt of capacity.¹⁶⁶ BNFL plc estimates costs of between £190 million and £300 million.¹⁶⁷ These ranges suggest that, while experience may lead to greater cost certainty, there would still need to be a considerable allowance for the dismantling and decommissioning costs for any new nuclear build.

Waste arising from new build

116. The radioactive waste that would be created by a new generation of nuclear power stations would be of a similar type to that produced already in the UK's current reactors.¹⁶⁸ Both Nirex and the Committee on Radioactive Waste Management (CoRWM) have made estimates of the potential impact that a fleet of ten Westinghouse AP1000 reactors—enough to provide 25% of UK electricity—would have on the UK's stock of radioactive waste. These are set out in the table below.

Table 1: Waste volume increase for 10 x AP1000 reactors¹⁶⁹

Scenario		Packaged volume (m ³)			
		Spent fuel	HLW	ILW	LLW
Baseline (existing waste legacy)		8,150 (CoRWM) 6,700 (Nirex)	1,290 ¹⁷⁰	353,000	2.48 million
Waste generated by AP1000 x 10	m ³	31,900 (CoRWM) 20,000 (Nirex)	-	9,000	80,000
	% Increase	390% (CoRWM) 300% (Nirex)	0% ¹⁷¹	2.5%	3%

Source: Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 5: waste and decommissioning, March 2006*

164 BNFL plc, *Supporting paper on nuclear energy issues*, 2006

165 Appendix 16 (EDF Energy)

166 Sustainable Development Commission, *The role of nuclear power in a low carbon economy*, March 2005

167 BNFL plc, *Supporting paper on nuclear energy issues*, 2006

168 Q 434 (Prof Gordon MacKerron)

169 Neither the figures for legacy nor new build wastes include depleted uranium that has been or would be generated in the fabrication of fuel.

170 Assumes 460 m³ of high level waste would be returned overseas.

171 To date, most HLW has been generated from fuel reprocessing. If this were to cease, there would be no recorded increase in HLW as this would be bound up within spent fuel.

117. The differences between the CoRWM and Nirex spent fuel figures reflect different assumptions about the packaging of spent fuel. In terms of volume, there would be relatively little percentage increase in the levels of waste across the high, intermediate and low categories, mostly reflecting the UK's large stock of existing waste. However, both CoRWM and Nirex assume, as discussed in the previous Chapter, that reprocessing of spent fuel would not continue for any new build. In the past, the UK has managed its spent fuel levels by reprocessing it into plutonium, uranium and intermediate level and other wastes. Abandoning this approach means the volume of spent fuel requiring disposal would increase dramatically by a factor of three to four. Overall, the increase in the total volume of high and intermediate waste, and spent fuel, would be about 10%. This figure has been widely quoted by the nuclear industry in justification of new build.¹⁷²

118. However, the volume of waste produced is not the only important consideration. An additional concern is the radioactivity level of that waste. The table below, prepared by Nirex, shows a somewhat different story to that told when looking only at volume.

Table 2: Radioactivity increases for a new build of 10 x AP1000 reactors

Scenario	Year	Radioactivity (TBq ¹⁷³)			
		Spent fuel	HLW	ILW	Total
Baseline	2080	6.0 x 10 ⁶	1.4 x 10 ⁷	1.1 x 10 ⁶	2.0 x 10 ⁷
AP1000 x 10 ¹⁷⁴	2090, 10 yrs post removal	1.8 x 10 ⁸ 3000%	-	8.7 x 10 ⁴ 8%	1.8 x 10 ⁸ 900%
	2130, 50 yrs post removal	6.0 x 10 ⁷ 1000%	-	-	6.0 x 10 ⁷ 300%
	2180, 100 yrs post removal	1.8 x 10 ⁷ 300%	-	-	1.8 x 10 ⁷ 90%

Source: Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 5: waste and decommissioning, March 2006*

119. In terms of radioactivity, again the increase is mainly observed in the spent fuel category.¹⁷⁵ As would be expected, levels drop off over time. Overall, the table shows that a programme of new build would increase the total level of radioactivity by a factor of nine over the baseline if spent fuel is removed 10 years after operation ends. Even 100 years on, radioactivity levels would still be nearly twice that which would be the case without any new build. One final measure, which is useful in considering the impact of new nuclear build, is the projected number of canisters of spent fuel and high level waste requiring

172 For example, Appendix 16 (EDF Energy)

173 Becquerel—The activity of a quantity of radioactive material in which one nucleus decays per second. A terabecquerel (TBq) is 10¹² becquerels.

174 This is based on 2001 Inventory data, which has slightly different baseline figures from the 2004 Inventory, cited earlier.

175 Low level waste has been excluded from this table because it represents only a very small proportion of the total radioactivity.

storage. Here, Nirex estimate an 87% increase over the baseline.¹⁷⁶ This figure has implications for the long-term storage of such waste, which we discuss in the next section.

120. Figures as different as a 10% increase in total volume, and an 87% increase in containers requiring long-term storage, as opposed to a 900% increase in total radioactivity pose some difficulty for those wishing to determine the extent to which a new programme of nuclear reactors would add to the long-term waste problem. As Professor MacKerron said to us: “The interesting thing is what is the footprint of that waste relative to existing waste”.¹⁷⁷ He suggested that the answer to that is somewhere between these percentages—they all need to be borne in mind in considering the scale of the issue to be addressed.

121. As chairman of the Committee on Radioactive Waste Management, Professor MacKerron also told us that “new build would need to have its own assessment process”.¹⁷⁸ In Chapter 2 we noted that there is an existing statutory requirement to justify any new radioactive practice. Consequently, the existing legislative framework would require assessment of the creation of new radioactive waste before any new build could be permitted. What is more, Professor MacKerron noted that, while the UK’s existing waste legacy required a long-term solution, consideration of the waste arising from further nuclear power stations was not simply a matter of comparing the additional waste levels against those already in existence. Rather, the decision to create new radioactive waste, *vis-à-vis* the alternatives, should stand alone as an ethical and political question. For instance, the returns from new nuclear power would be appreciated by current generations, yet the consequences in terms of clean-up and legacy waste would have to be dealt with by society for many years long after these benefits had passed.¹⁷⁹ It is the rights and wrongs of issues such as these that the Government must consider in reaching its decision on new build.

122. Regardless of a decision on new nuclear build, the UK has a significant radioactive waste legacy requiring a long-term solution. Advances in technology mean that the decommissioning of new reactors should be cheaper and simpler. The volume of waste generated would also be smaller—10 new reactors would add only 10% to the existing volume of radioactive waste in the UK—although the radioactivity of this waste would be substantially greater. Moreover, in addition to considering the extent to which new build would increase the UK’s future waste problem, the Government must also address the ethics of producing new radioactive waste versus the environmental consequences of not doing so, for example with regard to climate change.

Finding and funding a long-term solution

123. In this section, we look at how the Government’s search for a long-term solution to the waste problem is bound to a decision on new nuclear build. We examine its consistent failure over the years to find a long-term storage facility, and the current work of the Committee on Radioactive Waste Management, which is seeking to bring forward

¹⁷⁶ Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 5: waste and decommissioning*, March 2006

¹⁷⁷ Q 447 (Prof Gordon MacKerron)

¹⁷⁸ Q 445 (Prof Gordon MacKerron)

¹⁷⁹ Q 452 (Prof Gordon MacKerron)

proposals to rectify this. We finish by considering the implications of new build for a long-term storage facility and how this would be financed.

Sorting out the past first

124. In 2000, the Royal Commission on Environmental Pollution published its report *Energy—The Changing Climate*.¹⁸⁰ Its key recommendation, that the Government should put the UK on a path towards a 60% reduction in carbon emissions over the next 50 years was subsequently adopted in the 2003 Energy White Paper. The Commission also concluded that, with regard to the potential contribution of nuclear power to reducing carbon dioxide emissions, “waste will first have to be dealt with to the satisfaction of the scientific community and the general public”.¹⁸¹ The 2003 White Paper also cited the waste problem as needing a solution before thought could be given to any future new nuclear build.

125. Our witnesses were unanimous that the Government’s policy on waste was one of the fundamental issues to be addressed before a decision could be made to produce more waste. The Sustainable Development Commission stated its strong support for the Government’s existing position on the need for a long-term solution,¹⁸² as did the chief executives of E.ON UK and EDF Energy—companies that would probably seek to be involved in any new build programme.¹⁸³ Their view was that a resolution to the problem was required not only from the perspective of helping to gain public acceptance of new nuclear build, but also to reassure potential investors and operators in the sector.¹⁸⁴ The industry believes that society is the ultimate legatee of nuclear waste because of its very long-lived nature, far outlasting the lifespan of any generating company. As a result, the Government would eventually have to accept ownership of, and take responsibility for, the waste produced by a generation of new nuclear power stations.¹⁸⁵ Firms would need assurance on this before they would be prepared to invest in the sector, but it must be clear from the outset that the substantial costs in doing so must be met by the industry and robust methods of ensuring that the funds are available for the length of time required must be in place.

In search of a solution

126. The then government was aware of the need to find long-term storage sites for its radioactive waste right from the point when it began conducting nuclear experiments in the 1940s and 1950s. However, over the span of half a century, successive administrations have made relatively little progress in reaching a satisfactory solution. During that time, high and intermediate level waste has been kept in temporary storage facilities at various sites around the UK. Since 1959, the government has used the Drigg site, located six miles

180 Royal Commission on Environmental Pollution, *Energy – The Changing Climate*, June 2000

181 *Ibid.*

182 Q 118 (Sir Jonathon Porritt)

183 Q 250 (Mr Vincent de Rivaz and Dr Paul Golby)

184 Q 248 (Mr Vincent de Rivaz); Appendix 38 (Nuclear Industry Association)

185 Appendices 16 (EDF Energy) and 22 (E.ON UK)

south of Sellafield in Cumbria, for its low level waste. There, waste is stored in concrete vaults, which are buried underground at fairly shallow depths. Once operations at the site finish, excavations will be covered over and securely sealed, probably for about 300 years, until radiation levels have decayed to background levels. Worldwide, there are about 40 near-surface disposal sites, similar to Drigg, with an additional 30 facilities expected to come into operation over the next 15 years.¹⁸⁶ The Drigg site is, at present, just over half full, with about 800,000 m³ of capacity remaining.¹⁸⁷ As a result, although the volume of low level waste generated by a new fleet of nuclear power stations would be small relative to existing levels, it is likely that an additional site would be needed by the time such waste required storage.

127. In contrast, the Government's progress in finding a storage solution for its intermediate and high level waste has faced significant difficulty and delay over the years. During the 1950s and 1960s existing mines and other underground excavations were investigated as potential sites, though these were met with either local opposition or concern about ground water contamination. During this time, sea dumping was used as a major disposal method for certain wastes. Little progress was made towards a long-term strategy until the Royal Commission on Environmental Pollution looked at the issue in 1976.¹⁸⁸ It identified the lack of a long-term solution for intermediate and high level waste and recommended against further dumping at sea.¹⁸⁹ Out of the Commission's recommendations was born the Nuclear Industry Radioactive Waste Executive, known today as Nirex. It was Nirex that first looked into the potential for a deep repository at Billingham in the north east of England during the 1980s, although it eventually had to withdraw site investigations because of strong local opposition. A subsequent application for an underground laboratory at Sellafield, chosen with the aim of reducing transport costs, was denied planning approval in the early 1990s. Since then, there have been no further site investigations for a long-term storage facility.

The Committee on Radioactive Waste Management

128. Progress towards a permanent radioactive waste solution took a significant step forward in 2003 when, following the Government's 2001 public consultation: *Managing Britain's Radioactive Waste Safely*, the Committee on Radioactive Waste Management (CoRWM) was established. CoRWM is an independent body whose main task is to review the options for managing the UK's radioactive waste legacy, and to recommend the option, or combination of options, that can provide a solution beyond our generation and for thousands of years into the future.¹⁹⁰

129. In its deliberations, CoRWM looked at all the possibilities considered by previous generations, ranging from disposal in space, in ice sheets, and under the seabed. However, in its draft recommendations, published in April 2006, it concluded that the only viable

186 Appendix 16 (EDF Energy)

187 Nuclear Decommissioning Authority, *Low level waste depository at Drigg – Waste and nuclear materials management category summary*, 2005

188 Royal Commission on Environmental Pollution, *Nuclear power and the environment*, 1976

189 Uisdean McL. Michie, *Deep geological disposal of radioactive waste – A historical review of the UK experience*, 1998

190 www.corwm.org.uk

and legal option, given the enormous length of time required for storage, was deep geological disposal in the UK. This would involve the excavation of tunnels or vaults at depths of between 250 and 1,000 metres below ground to a suitable ‘host’ rock, where engineered waste packages would be transferred, surrounded by a suitable buffer material, and, eventually, permanently sealed in.¹⁹¹ Deep geological storage was favoured over the nearest alternative: “a robust continuation of present policy”, i.e. near surface disposal, because of a fear that in the very long-term it is impossible to predict whether future governments would retain institutional control over near-surface sites.¹⁹² Lack of government control would be less of a concern for deep geological disposal.

130. This recommendation, in itself, was not surprising. Other countries, including Finland, Sweden and the United States, are already pursuing the deep disposal route. The significant step forward proposed by CoRWM is the manner in which this solution will be achieved. Past experience has taught that communities react against local proposals for radioactive waste storage being forced upon them. This is why early public engagement in the process of selecting a site is vital if it is to provide a successful outcome. Here, CoRWM has followed the lead taken by Finland and Sweden, where communities competed to host a storage site. Throughout the site selection process they were given the right to withdraw up to a certain point. As the mayor of one of these areas in Sweden told one of our witnesses: “The only way in which we could ever have said yes to this proposal was that until a certain moment we were give an absolute right to say no”.¹⁹³ Although volunteering to host a long-term storage facility for the nation’s radioactive waste may seem like the equivalent of “turkeys voting for Christmas”, the key to this principle of ‘volunteerism’, CoRWM notes, is the assumption that the well-being of the community would be enhanced as a result of being selected.¹⁹⁴ While there would be employment benefits arising from such a facility,¹⁹⁵ the Government would also have to offer some form of local compensation, be it monetary, or in the form of training, infrastructure, or some other benefit.¹⁹⁶ Whilst the Committee are of the view that ‘volunteerism’ is the way forward, we acknowledge that there are difficulties which need to be overcome quickly, not least how we define “community” for the purpose of this process.

131. Estimates suggest that about 30% of the UK may theoretically be considered as having suitable geology for deep disposal.¹⁹⁷ The timescale required to get to a point where a deep geological site would be ready to begin receiving waste would be very long. Professor MacKerron, chair of CoRWM, cited work to us undertaken by Nirex, suggesting that it could be 2040 before a repository were ready. For instance, it would take geologists around ten years to investigate the suitability of a particular site. In reality, it could take much longer to identify a site, since an approach that invited communities to participate and

191 Nirex, *The viability of a phased geological repository concept for the long-term management of the UK’s radioactive waste*, November 2005

192 Q 426 (Prof Gordon MacKerron)

193 Q 438 (Prof Gordon MacKerron)

194 *Ibid.*

195 Q 36 (Prof William Gelletly)

196 Q 436 (Prof Gordon MacKerron)

197 Sustainable Development Commission, *The role of nuclear power in a low carbon economy*, March 2006

negotiate their involvement would be likely, if anything, to lengthen the process.¹⁹⁸ It was clear from the evidence that several sites will have to be investigated at the same time and that even after selection some sites may drop out due to geological problems. These kinds of timescales are not out of line with international experience in identifying suitable sites. In the meantime, CoRWM recommends a staged process of implementation, until a long-term repository is ready, with the safe and secure management of radioactive waste through development of an interim storage programme as an insurance policy against the possibility of a delay or failure in the delivery of a long-term repository.¹⁹⁹

132. The cost of a repository would be large. Nirex has estimated a minimum figure of around £10 billion, covering development work and operating costs. This could rise by up to £3 billion if the repository was designed to accept all categories of waste.²⁰⁰ The actual figure could be even higher than this, given the unique civil engineering challenge that such a facility would represent, and the Government's track record on delivering large infrastructure projects behind schedule and over-budget. What is more, these costs do not take into account the potential impact of waste arising from a programme of new nuclear power stations in the UK. This is the subject of the next section.

The long-term storage of new waste

133. The CoRWM recommendations will be finalised in late July 2006, shortly after the Government is set to announce the results of its Energy Review, although CoRWM has stated that it does not expect its conclusions to change materially from their draft form.²⁰¹ CoRWM is keen for the momentum to be maintained in taking forward its work, and the Government potentially has an incentive to do this if it decides in favour of new nuclear build. However, it is worth noting that CoRWM has stated explicitly that it does not take a position on the merits of further nuclear power stations. Specifically, the chair of CoRWM told us that its "recommendation should not be taken as either a red or a green light for new build".²⁰² As we noted earlier, such a decision needs to be considered on its own merits. It is also noted that CoRWM began work prior to the announcement of the Energy Review and was specifically looking at the disposal of historic waste.

134. Timing would be an important issue were the waste arising from a programme of new power stations to be destined for the same repository as the UK's existing stock. An important part of the potential process of engaging local communities to volunteer as sites for long-term disposal would be that they had a clear understanding of the inventory of waste expected to be deposited. In the case of Finland, the recent decision to build another nuclear power station led to the re-opening of discussions with the communities that were home to the country's existing waste repository, to negotiate their willingness to take the resulting additional waste.²⁰³ The same process would have to take place in the UK if progress towards finding a long-term storage facility had already been made before it was

198 Q 437 (Prof Gordon MacKerron)

199 Committee on Radioactive Waste Management, *Draft Recommendations*, April 2006

200 Q 444 (Prof Gordon MacKerron)

201 Q 431 (Prof Gordon MacKerron)

202 Q 428 (Prof Gordon MacKerron)

203 Q 456 (Prof Gordon MacKerron)

clear how much waste would result from further nuclear power stations. Nirex has already made an assessment of the waste levels arising from new build. For a repository designed to store both spent fuel, and high and intermediate level waste, assuming storage takes place 50 years after spent fuel is removed from reactors, it estimates the facility would need to be 50% larger than if new build did not take place.²⁰⁴ This would naturally have significant implications for the additional cost of such a facility, which would have to borne by the industry.

135. At the start of this section we saw how there is widespread support for the Government's existing policy that it should first find a permanent solution to its waste legacy before proceeding with any new nuclear build. However, we received somewhat differing evidence on how far the Government would need to have gone in achieving this to create confidence that a long-term solution was in place. The Sustainable Development Commission was firmly of the view that there should be no decision on new build until issues such as location, timescale and cost had been fully resolved.²⁰⁵ We have some sympathy with this view given past governments' track record in putting in place a long-term storage facility. The power companies, on the other hand, told us they "would need a very clear view on the policy and framework", but, for example, would not need to know the location of a particular site.²⁰⁶ This point is important in terms of knowing how much information investors would need to have before putting money into new build.

136. Clearly, the more advanced the Government's planning for a long-term repository, the greater will be the certainty of the cost of that solution. Given the current pace of the Energy Review process, the Government appears to be cutting off this possibility. If it decided in favour of a new nuclear programme, it would have to act quickly in taking forward and building on the CoRWM recommendations, for the issue of waste to be resolved by the time investments were being made. This would also be vital for gaining public acceptance of new nuclear build. While we do not believe that this is impossible, the Government would have to prove that it can perform better than previous governments in developing a long-term solution.

Financing the storage of new waste

137. Because the creation of radioactive waste has implications for current and future generations, the principle of 'the polluter pays' seems to us a fair one in financing its costs. This view is shared by the nuclear industry.²⁰⁷ There are essentially two main activities from which future costs would arise: power plant decommissioning and radioactive waste disposal.²⁰⁸ The most practical way of covering these is for monies to be collected over the lifetime of the generation asset through some form of levy. These would be collected by an entity, isolated financially from the operators, and retained in a fund for future use.

204 Source: Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 5: waste and decommissioning*, March 2006

205 Q 118 (Sir Jonathon Porritt)

206 Q 251 (Dr Paul Golby)

207 Q 217 (Prof Keith Palmer); Appendices 5 (British Energy), 16 (EDF Energy), 22 (E.ON UK) and 38 (Nuclear Industry Association)

208 Appendix 22 (E.ON UK)

138. Due to the long time period between the payment of funds and the eventual incurring of costs, there would have to be a number of assumptions made on areas such as the expected waste disposal cost; when the cost would be incurred; and the return realised on funds raised between the date of receipt and the date of incurring the cost.²⁰⁹ We have seen already in this Chapter that while estimates have been placed on the costs of decommissioning and waste disposal for new nuclear reactors, there is still a wide degree of uncertainty attached to these. These estimates would have to be reviewed regularly against the assumptions made in determining the levy, so as to ensure that sufficient funds were being collected. Therefore, the Government would need to create a levy mechanism flexible enough to accommodate changes in these expected costs to ensure a new programme of nuclear reactors could cover their liabilities.

139. An additional factor in determining a levy would be the risk of the operator going out of business or a reactor requiring premature closure prior to sufficient money having been paid into a levy fund. In this case, there would need to be safeguards in place. Options include the provision of formal guarantees by operators and the pooling of decommissioning costs across a number of reactors, amongst other possibilities.²¹⁰

140. The UK's current main nuclear operator, British Energy, has a unique means of covering its waste and decommissioning liabilities which stems from its recent restructuring. Since 2004, the Government has been entitled to two-thirds of the cash flow of the company, convertible into shares, which goes into a Nuclear Liabilities Fund.²¹¹ The Government is able regularly to review the proportion it takes, and, depending on British Energy's profitability, to ensure that it is collecting sufficient funds to cover future costs. Were the lifetime of any of the company's reactors to be extended, this would have implications for the proportion of its cash flow required by the Government to meet the liabilities.

141. There are various examples from abroad, which the Government could draw from in designing a system to cover the future liabilities of a potential generation of new nuclear reactors in the UK. In the United States, operators pay a levy of 0.1 cent per kWh towards the country's waste management programme at Yucca Mountain. In addition, operators have a legal obligation to cover decommissioning costs, which are managed separately through systems that vary between operators. In Finland, the two nuclear operators pay separately into a fund around 10% of the cost of nuclear electricity, as determined by the Finnish Government, which manages the fund to cover both waste and decommissioning costs. A similar approach to levies is used in Sweden, although it has a separate national waste management organisation in place to calculate the fees. Overall while the systems vary, the overarching principle of 'the polluter pays' does not. We believe the Government would do well to learn from international experience in developing a robust financing system if it pursued the new build option.

142. The nuclear industry told us that a fundamental pre-condition for new nuclear build is that the Government puts in place a strategy for the long-term disposal of its

209 Appendix 38 (Nuclear Industry Association)

210 Appendix 16 (EDF Energy)

211 Q 95 (Mr Robert Armour)

existing radioactive waste legacy. This would not only be in accordance with its existing policy, but would be necessary to gain the support of both industry and the public for a programme of new build. However, successive governments' record to date in delivering a long-term solution has been woeful. The Committee on Radioactive Waste Management's recommendations provide an opportunity to put right this situation, although these should in no way be taken as giving a 'green light' for new build. Key to finding a long-term storage site will be the active engagement of local communities under the principle of 'volunteerism', bearing in mind the need to have clear definitions and processes to allow local communities to decide on the issues. With regard to a long-term storage facility, the waste and decommissioning costs arising from any new build would have to be borne by the operator. This poses risks given it is still many years before a repository will be in place, and hence its potential cost is highly uncertain.

5 Financing nuclear new build

143. Unlike in countries such as Germany and Spain, there is no moratorium on new nuclear build in the UK; yet the private sector is currently not willing to enter the market. We have seen already in this Report that factors such as the planning and licensing system (Chapter 3), and the UK's strategy for dealing with its long-term radioactive waste legacy (Chapter 4) are areas that would need to be addressed before the energy sector would contemplate investing in new nuclear generation. Fundamentally, the industry considers it needs a clear statement about the role the Government sees nuclear power playing in the energy mix (Chapter 2). Another crucial factor in any investment decision would be the expected costs and returns to the operator, and hence the policy framework in which these are determined. Here, we consider first the nature of the UK market for electricity and how it affects the economics of nuclear power. We go on to look at what determines the costs of nuclear generation, and how important these are in the investment decision. We then consider the returns to nuclear power—what the industry wants, how this compares with existing incentives, and how the market framework would have to be reformed to bring on new nuclear build.

The UK's electricity market

144. The structure of the UK's electricity market plays a fundamental role in explaining why energy firms are not currently willing to invest in nuclear power. In this section we look at the effect of market liberalisation on the relative economic attractiveness of nuclear power, and also at the role that the market players would have in delivering any new build.

Nuclear power in a liberalised market

145. The UK electricity market is one of the few in the world to have undergone a fairly radical process of liberalisation over the past two decades. Underlying this has been the Government's desire to reduce costs for the consumer. The sector was largely privatised in 1990 with the sale of both main generating companies, Powergen and National Power, and the 12 regional electricity companies. This was followed by the privatisation of the National Grid Company, the two main Scottish generation and supply companies, and British Energy. In conjunction with this, the market for electricity was also liberalised with the creation of a spot market, known as the 'Pool', where prices were based on the marginal generating plant. Judged to be uncompetitive and susceptible to manipulation, the Pool was replaced in 2001 with the New Electricity Trading Arrangements (NETA). The aim of NETA was to bring about a more competitive wholesale electricity market, and place downward pressure on prices. This was achieved in the short-run by encouraging firms to work their generating assets harder, known as 'asset sweating'. At the same time, though, the removal of arrangements under the Pool that ensured the market maintained a level of excess capacity meant that under NETA there was little incentive for firms to invest in generating assets that risked not being used. The result has been, at times, a tightening of the margin between electricity demand and supply in recent years, which has been

reflected in more volatile and rising electricity prices.²¹² In 2005 NETA was replaced by BETTA, which brought the Scottish grids into the system.

146. Within a liberalised electricity market, it is for the private sector to determine what investment it should make in new generating capacity and the technology this should involve. In this context, there are a number of factors that affect the relative attractiveness of nuclear power as an investment option as outlined in a paper by Fabien Roques *et al.*²¹³ One factor is the preference of investors for a short pay-back period. As we have said earlier, the lead times for new nuclear generation can be substantial, even taking account of any reforms to the regulatory process. This does not compare favourably with the equivalent for industry standard combined-cycle gas turbines (CCGTs), which can be as low as two years. In addition, the construction costs for nuclear power stations are several times greater than for gas-fired plants. Whereas the capital cost of nuclear power per megawatt hour of electricity is between 60% and 75% of the total cost, it is around 30% to 40% for gas. Taking into account, too, that the capacity of nuclear power stations at 1,000 megawatts or more is also significantly greater than that for a typical CCGT, this means that the upfront cost to the investor is considerably higher for any new nuclear plant.

147. The longer payback period and the large up-front costs of nuclear power make it a less attractive investment option in a market where prices are volatile. In addition, the absence of buyers offering long term contracts increases investor risk.²¹⁴ The fact that nuclear energy is baseload generation—it cannot be turned on and off to meet demand—is also important as it means that nuclear generators have to be price-takers in the market and therefore may receive lower prices. The experience of British Energy in recent years is evidence of the risks that operating in a liberalised market can pose. The fall in electricity prices following the introduction of NETA was a significant contributory factor in undermining the company's revenues and forcing it to seek Government help in 2002.²¹⁵ Overall, then, any potential new nuclear operator in the UK faces high risks within the current electricity market. Although some of our witnesses argued that market volatility is a factor that all generators have to take account of—nuclear, gas, coal or otherwise—there are particular characteristics of nuclear power, namely its high capital cost and long lead time, that can make it less economic in a liberalised market.²¹⁶

Market players in the UK

148. One of the unintended consequences of liberalising electricity markets in the UK was the consolidation that took place in the sector. Both National Power and Powergen were quick to dispose of some of their generating assets so that they could purchase electricity supply companies. Because retail electricity prices remained fairly stable, primarily because of customer unwillingness to change supplier, such a strategy of vertical integration allowed the main generators to protect themselves against lower wholesale electricity prices

212 Dr Dieter Helm, *A new British energy policy*, November 2005, Social Market Foundation.

213 Fabien A. Roques, William J. Nuttall, David M. Newbery, Richard de Neufville and Stephen Connors, *Nuclear Power: A Hedge against Uncertain Gas and Carbon Prices?* 2006

214 Appendix 45 (Prof Keith Palmer)

215 National Audit Office, *Risk Management: The Nuclear Liabilities of British Energy plc*, February 2004

216 Qq 65 (Mr Spence) and 183 (Prof Keith Palmer)

under NETA. The result today is an industry which is dominated by a few players that possess both generation and retail arms. The three biggest are RWE (formerly National Power), E.ON (formerly Powergen) and EDF. These are followed by Scottish Power, Scottish and Southern Energy, and British Energy. There is an expectation that the industry may consolidate even further in the future.

149. Such a market structure could work in favour of the potential delivery of new nuclear build in the UK. Most of these firms are large enough to absorb the risk of a large investment such as a new power station, and would therefore be able to raise sufficient capital from the City.²¹⁷ These firms would also be likely to work through consortia, thus allowing them to share risks with other parties.²¹⁸ Furthermore, the fact that there is more than one potential player in the market for new build suggests there is greater scope for competition in delivery; although, as noted in Chapter 3, this could be problematic for the Government if it wished to generate cost reductions from learning-by-doing with successive reactors. One potential disadvantage is that listed firms, such as E.ON and RWE could be concerned by negative share price movements, and may not wish to expose large portions of their capital in a project with poor prospects of short-term recovery.²¹⁹ Overall, though, there are market players that are willing to invest in nuclear power in the UK, given the right conditions, as was shown by the evidence we received from the three main firms.²²⁰

150. The UK's liberalised electricity market does not provide favourable conditions for investment in new nuclear build. Nuclear's high capital cost and long lead times act as a disincentive to investors in a market where the focus is on short-term pay-back and where prices in recent years have been uncertain and volatile. However, the structure of the market, dominated by a small number of large firms with the ability to raise sufficient finance, could be conducive to the delivery of new nuclear power stations were the Government to create the appropriate framework.

Assessing the costs

151. Notwithstanding the current structure of the electricity market, the private sector's decision whether or not to invest in new nuclear build will be based on its relative cost compared with other means of generating electricity. There has been much debate in recent years concerning the actual cost of nuclear power and this was a key factor in the Government's delaying a decision on new nuclear build in the 2003 Energy White Paper. In this section we consider the key components to the costs of nuclear power and where the uncertainties lie. We then look at the available evidence on costs, before considering them relative to other forms of generation. Finally we ask to what extent the Government needs to form an understanding of these costs in determining its position on nuclear power.

217 Q 177 (Prof Keith Palmer)

218 Q 185 (Prof Keith Palmer)

219 Appendix 4 (Atomic Energy of Canada Ltd)

220 Appendices 16 (EDF Energy), 22 (E.ON UK) and 47 (RWE npower)

The component costs of nuclear generation

152. As noted in the previous section, one of the key factors that sets nuclear power apart is its high capital cost in comparison to a combined-cycle gas turbine (CCGT). The table below illustrates the approximate distribution of costs between construction, fuel, operations and maintenance, and decommissioning, for nuclear power, CCGT and onshore wind.

Table 3: Representative proportions of electricity generating costs (%)

	Nuclear	Combined Cycle Gas Turbine	Renewable (wind)
Construction or capital (including interest during construction)	60-75	30-40	85-90
Fuel	5-10	50-65	0
Operations and maintenance	8-15	5-10	5-15
Back end	*	0	0

Source: Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 4: The economics of nuclear power, March 2006*. *See paragraph 155 below

153. For nuclear power there are varying degrees of confidence in the estimates for each of these types of costs. Up-front construction costs are the largest component and also the area where there is at present the highest degree of uncertainty. In Chapter 3 we saw how, of the two main reactor designs likely to be short-listed for use in the UK, there is presently no fully operational example of either. The one reactor that is being built (in Finland) is many years from commissioning, and is already behind schedule. Design owners argue that the experience of several decades now means that they are better able to deliver within time and budget.²²¹ However, the UK's own experience of delivering new nuclear power stations has to date been poor. The construction of Sizewell B and the previous AGR programme were both subject to long delays and suffered from cost overruns. As Sir Jonathon Porritt put it to us, "the evidence shows that, historically, cost estimates from the industry have been subject to massive underestimates—inaccuracy of an astonishing kind consistently over a 40, 50 year period".²²²

154. Fuel costs are also subject to some uncertainty, but given the existence of plentiful untapped supplies of uranium, they should not pose a high degree of concern in the long run.²²³ Indeed, the fact that uranium costs make up a comparatively small proportion of the total generating cost means that the price of electricity from nuclear energy is relatively insensitive to fluctuations in the price of fuel.²²⁴ This contrasts starkly with the situation for gas, where a large increase in fuel prices has a significant effect on the overall price of

221 For example, Appendix 4 (Atomic Energy of Canada Ltd)

222 Q 145 (Sir Jonathon Porritt)

223 See Chapter 3

224 Appendix 4 (Atomic Energy of Canada Ltd)

generation, as has been evident in recent years with the more or less parallel movements of the UK electricity and gas markets.

155. There is a fair degree of certainty about operational and maintenance costs, which anyhow constitute a fairly small proportion of the cost of nuclear power. As regards back-end costs, in the case of nuclear these comprise the management of waste and decommissioning. We have found previously how far the Government is from putting in place a long-term storage solution for the UK's radioactive waste legacy. While the decommissioning industry is beginning to understand better the costs of dismantling nuclear power stations through its experience with the current Magnox power stations, without a long-term solution for high-level waste it is impossible to know how much back-end costs would amount to for any new build. Estimates of costs vary considerably, depending on the discounting rate used. One witness suggested to us that the figure could be as low as 2% of the total cost incurred over the life of a nuclear power station.²²⁵ If this is the case, the issue may not be significant, but at this stage no one knows. The Government's policy on reprocessing would also have a bearing on this figure.²²⁶ As we outlined in Chapter 3, reprocessing is significantly more costly than the direct disposal of fuel, and it is widely assumed that nuclear plant operators would be unwilling to continue reprocessing for a new programme of nuclear power stations. The consequence of this, though, is that it would change the type of waste requiring storage.²²⁷

156. Finally, the Sustainable Development Commission has argued that there are other costs associated with nuclear power, such as those arising from safety and security arrangements and providing limited liability guarantees. There are also potential costs to society from the risk of radiation release occurring as a result of an accident of some form, or through proliferation of nuclear technology to nuclear weapons production.²²⁸ In the case of insurance and provision of security, such costs should be borne by the operator, and may not be significant. On the other hand, social issues of safety and proliferation, which we discuss elsewhere in this Report, present ethical rather than economic questions, and therefore require separate consideration by the Government, in the same way as does nuclear energy's potential contribution to preventing climate change.

Current cost estimates

157. Despite the uncertainties regarding the true cost of nuclear power, there have still been various attempts to estimate its overall generating cost. Table 4 is reproduced from BNFL plc's submission to the Government's current Energy Review, and provides a summary of the key findings of some of the recent studies that have looked into the cost of nuclear power.

225 Q 217 (Prof Keith Palmer)

226 Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 4: The economics of nuclear power*, March 2006

227 See paragraph 117 above for a discussion of this point.

228 *Ibid.*

Table 4: Estimates of the generating costs of nuclear power

	MIT (2003) ²²⁹	Performance & Innovation Unit (2002) ²³⁰	University of Chicago (2004) ²³¹	Royal Academy of Engineering (2004) ²³²	French Finance Ministry (2003) ²³³	Lappeenranta University Finland (2003) ²³⁴	OECD (2005) ²³⁵	
Generating cost (p/kWh)	3.9 – 4.0	3.0 – 4.0	3.1 – 3.6	2.26 – 2.44	2.0	1.7	1.3 – 1.9	1.8 – 3.0
Rates of return	11.5%	8% & 15%	12.5%	7.5%	8%	5%	5%	10%
Capital cost per kW	£1150	£1150	£865	£1150	£990	£1330	£610 – 1210	
Load factor	85%	75 – 80%	85%	> 90%	> 90%	> 90%	85%	
Economic life	15 yrs	20 yrs	15 yrs	25 & 40 yrs	35 – 50 yrs	40 yrs	40 yrs	
Construction period	5 yrs	N/K	5 – 7 yrs	5 yrs	5 yrs	5 yrs	4 – 6 yrs	

Source: Supporting paper on nuclear energy issues, from BNFL plc, 2006

158. Estimated generating costs are highlighted above as the most important figures since these determine the economic viability of nuclear power relative to other forms of generation. The table suggests that these can vary by up to a factor of two. To a large extent this stems from the assumptions made in areas such as load factor, lead times and economic life. It also reflects differences in the reactor technologies used, assumptions about learning-by-doing, and the assumed discount rate over time. Because of the international nature of many of the studies quoted, it is hard to demonstrate that the same experience would be replicated in the UK. In reality, there are relatively few studies that use the UK as their base. Two examples—the Performance and Innovation Unit and the Royal Academy of Engineering—are cited above. Another study by Oxera concludes that nuclear power could bring positive returns under a range of scenarios, even taking account of contingencies and development cost overruns.²³⁶ This may provide some comfort if the Government were to pursue the nuclear option, but the fact remains there is a general paucity of data on costs that could be of real use to policy makers.

229 Massachusetts Institute of Technology, *The Future of Nuclear Power*, 2003

230 Performance and Innovation Unit, *The Economics of Nuclear Power*, Energy Review Working Paper, 2002

231 University of Chicago, *The Economic Future of Nuclear Power*, 2004

232 Royal Academy of Engineering, *The Cost of Generating Electricity*, 2004

233 French Ministry of Economy, Finance & Industry, *Reference Costs for Power Generation*, 2003

234 Lappeenranta University of Technology, Finland, *Competitiveness Comparison of the Electricity Production Alternatives*, 2003

235 OECD / NEA / IEA, *Projected Costs of Generating Electricity*, 2005

236 Oxera, *Financing the nuclear option: modelling the cost of new build*, June 2005

159. Many of the witnesses we spoke to also highlighted the level of uncertainty concerning the cost of nuclear power. For example, British Energy told us that “the track record is mixed” regarding the accuracy of previous studies,²³⁷ while the Sustainable Development Commission said that one “should take the opinions of the nuclear industry about future costs with bucket-loads of salt”.²³⁸ Overall, with the current state of knowledge, it is impossible to determine accurately what the cost of electricity generated by new nuclear power stations would be. On the other hand, we acknowledge that the Government will never be able to estimate the cost accurately until the UK has had its own experience of constructing and operating a new nuclear power station.

Costing other forms of generation

160. Coupled with the difficulty in calculating the costs of nuclear is the need for power companies to then compare such estimates against those for other forms of electricity generation to determine which provides the greatest return on investment.²³⁹ In the UK, the price of gas-fired generation has in recent years been used as the benchmark against which the economic viability of other sources are tested. The sector’s ‘dash for gas’ during the 1990s means that today gas can provide up to 40% of the UK’s electricity needs.²⁴⁰ Because a high proportion of the cost of running CCGTs is accounted for by the price of fuel, recent increases in gas prices have contributed significantly to rekindling the debate about nuclear new build. As Professor Palmer put it to us: “the future price of gas is fundamental to the economics of nuclear”.²⁴¹ This is likely to remain so for the foreseeable future as the proportion of gas-fired generation in the energy mix increases. In its evidence to the Environmental Audit Committee, Centrica estimated the generating cost of CCGT at 1.9 to 2.6 pence per kilowatt hour (p/kWh).²⁴² This still compares favourably with most of the figures for nuclear generation, highlighted in Table 2. We are unclear what assumption Centrica have made regarding the price of gas to reach this estimate,²⁴³ however, we note that the current price of gas is around 1.3 pence per kilowatt hour.²⁴⁴

161. Another energy source against which the cost of nuclear power is often compared, primarily because of its roughly equivalent low carbon status, is wind, both onshore and offshore. Those that argue either for or against the nuclear option tend to cite different comparisons in the cost between these two types of generation. While the Sustainable Development Commission was sceptical of the cost estimates for nuclear power, it admitted to us that “there are uncertainties” too with regard to renewables.²⁴⁵ The DTI’s Renewables Innovation Review calculated the range of costs for onshore wind at 3.1–4.0

237 Q 60 (Mr Paul Spence)

238 Q 145 (Sir Jonathon Porritt)

239 Q 175 (Prof Keith Palmer)

240 Department of Trade and Industry, *Digest of United Kingdom energy statistics*, 2005

241 Q 182 (Prof Keith Palmer)

242 Environmental Audit Committee, *Sixth Report of Session 2005-06, Keeping the lights on: Nuclear, Renewables and Climate Change*, HC 584-1, page 43

243 Centrica’s memorandum quotes a figure of 2.7 p/kWh, which is outside the range of its total generating cost.

244 Department of Trade and Industry, *Quarterly Energy Prices*, March 2006. The figure quoted is the average price of gas to electricity producers in the fourth quarter 2005.

245 Q 147 (Sir Jonathon Porritt)

p/kWh and that for offshore wind as 6.0–7.6 p/kWh.²⁴⁶ This suggests onshore wind is roughly comparable in price to nuclear power. However, the renewables industry has a higher degree of confidence of how these costs will fall with time as the technology matures, based on the experience it has gained from operating wind farms over the past few years. The nuclear industry cannot estimate the extent to which it will see such cost reductions, as it currently does not have that level of experience in building third generation reactors.

Should costs matter to the Government?

162. Having examined the extent of existing knowledge on the current cost of nuclear power, and how this compares with other forms of generation, it is worth asking to what extent an accurate assessment of the costs should matter to the Government in formulating a policy on nuclear power. If the Government stated explicitly that it would not provide financial incentives for new build,²⁴⁷ and that any incentives put in place would be technology neutral and market-based, then it would be for the industry to decide whether its cost assessments were accurate enough to risk new investment. As Professor Keith Palmer said to us “at some point people have to put their money where their mouth is”.²⁴⁸

163. In this sense, the cost of nuclear power, or any other technology, should matter to government only if it wishes to implement a policy framework that favours a particular form of generation. Our belief, shared by many of those we spoke to, is that the Government should not try to second guess the market in estimating the costs of each source of energy—gas, nuclear, renewable or otherwise. As Dr Dieter Helm, of New College, Oxford, said to us, this “assumes a level of information and understanding and an immunity to lobbying which has never been witnessed before in an energy policy”.²⁴⁹ **Instead the Government should set a policy framework that treats each source of energy fairly, letting the market determine the generation mix, based on its own view about the relative risks and costs. Here, ‘fair’ treatment includes areas considered in this Report, particularly the need for a political consensus, a rational and long term carbon allocation, and the planning system. It should also cover the way in which different forms of generation are rewarded in the market. This is the subject of the next section.**

164. **There is a high degree of uncertainty surrounding the cost of nuclear power because of a lack of data relevant to the UK. That which exists suggests nuclear energy may be economically viable in a scenario where gas prices remain high, but we do not feel this is a sufficient basis on which to draw robust conclusions. However, if the Government wishes the market to deliver new nuclear build, we recommend that it should be for the market to decide to what extent it has confidence in its own cost estimates in deciding whether or not to invest. The Government should make it clear that all the costs of building, operating and decommissioning new nuclear power stations will fall to the private sector investors who build those stations. These costs are a concern for investors—not the Government or the taxpayer. The role of Government,**

246 Department of Trade and Industry, *Renewables Innovation Review*, 2003

247 For example, *Financial Times*, 12 June 2006, page 1

248 Q 182 (Prof Keith Palmer)

249 Q 271 (Dr Dieter Helm)

in the first instance, should be to ensure that all sources of generation are treated ‘fairly’ within the market.

Creating the returns

165. Whilst it is primarily for the industry to assess the relative cost of nuclear power, *vis-à-vis* other forms of generation, the remaining piece of the jigsaw in determining any investment decision in the electricity sector is an assessment of the expected returns. It is in this domain that we believe the Government has the most important role to play since it defines the overarching policy framework, which in turn determines the revenues received by generators. In this section we look at what the electricity sector is asking from the Government in the context of its energy policy objectives. We then consider the effectiveness of existing policy instruments before discussing what reforms would need to be considered, not just to facilitate new nuclear build, but for low-carbon electricity in general.

What the industry wants

166. The Government’s 2003 Energy White Paper set out four overarching objectives to its energy policy. These were:

- To put ourselves on a path to cut the UK’s carbon dioxide emissions by some 60% by about 2050, with real progress by 2020;
- To maintain the reliability of energy supplies;
- To promote competitive markets in the UK and beyond, helping to raise the rate of sustainable economic growth and to improve our productivity; and
- To ensure that every home is adequately and affordably heated.

167. The White Paper explicitly acknowledged for the first time the need to take account of climate change concerns in shaping energy policy. However, it was the poor performance against each of these objectives over the last three years that prompted the Government to begin another Energy Review in 2006.²⁵⁰ Today the focus of debate, rightly or wrongly, has also shifted, reflecting growing concern about the UK’s increasing dependence on gas if the current generation of nuclear power stations is not replaced. This is against a backdrop of mounting evidence that carbon dioxide emissions have begun to rise again in recent years. We consider the role of nuclear power with regard to security of supply later. Here, we focus on the response of the energy sector to the Government’s objective to reduce carbon emissions.

168. Nuclear power is considered a low (though not zero) carbon energy source in the same way that renewables are viewed as such: they are both currently considered to contribute to reducing carbon emissions in that they offset fossil-fuel based electricity.²⁵¹ If

²⁵⁰ Department of Trade and Industry, *Our Energy Challenge – Securing clean, affordable energy for the long-term*, 2006

²⁵¹ Chapter 6 examines in more depth the relative extent to which with both forms of generation are actually low carbon.

the Government's objective is to reduce emissions, it must establish a policy framework that rewards low carbon emitters relative to users of fossil fuels. In other words, it must provide the framework that determines a 'price for carbon'. Under a purely market-based approach, investors will always opt for fossil fuel-based generation because it offers the greatest returns. Creating the incentives, then, for low carbon technologies requires some form of government intervention through carbon pricing.

169. In the evidence we received, there was a consistent line of argument in favour of two overarching principles that should inform government action to reduce carbon emissions from the energy sector through carbon pricing. First, it should provide a 'level playing field' for all technologies so that low carbon technologies are treated equally, therefore avoiding 'picking winners'. Secondly, it should provide a measure of long-term certainty in order to give the sector sufficient incentive to invest in low carbon generation. Both these principles apply as much to renewable energy, or carbon capture and storage, as they do to nuclear power.

170. A number of our witnesses argued for a 'level playing field' whereby generators are rewarded equally according to the extent that they offset carbon dioxide emissions. The Environment Agency told us that it "would advise introducing technology neutral support mechanisms to incentivise carbon reduction".²⁵² In his evidence, Professor Keith Palmer said to us that "if the Government and the country take seriously the need to abate carbon ... we should have a policy that gives a premium in the electricity market to whatever generating sources produce electricity but not carbon".²⁵³ **We agree that if the Government were to support nuclear power on the basis of its contribution to reducing emissions, then it would need to do this within a policy framework that rewarded low carbon technologies.**

171. However, not 'picking winners' is not a sufficient principle on its own to create the incentives for low carbon generation. Repayment for investment in electricity capacity occurs over a number of years. This means that it is not enough for the Government to establish a framework for low carbon technologies without providing some assurance that such a system would be in place for a sufficient time to allow operators to receive a return on their investment. When we asked the nuclear industry how long they would expect such certainty to be, they suggested a "15- to 20-year forward look".²⁵⁴ Evidence from the renewables sector suggests an equivalent timeframe is required. This was the reason why the targets for the Renewables Obligation were extended to 2015 last year, and why the Government has guaranteed that the scheme's support, which roughly doubles the value of electricity from eligible renewables, will remain in place until 2027.

172. The nuclear industry told us it believed that, within the context of such long-term carbon pricing, it could deliver new nuclear build, and that it could do so without financial support from the Government. Indeed, the industry stated to us categorically that it was not asking for hand-outs from the taxpayer.²⁵⁵ If there were a decision in favour of nuclear

252 Appendix 20 (Environment Agency)

253 Q 194 (Prof Keith Palmer); see also Q 298 (Dr Dieter Helm)

254 Q 62 (Mr Paul Spence)

255 Q 100 (Mr Paul Spence)

new build, we believe such an approach would need to be considered, providing equal treatment to all forms of low carbon technology, and as a consequence allowing the market largely to determine the precise energy mix.

Current instruments for reducing carbon emissions

173. As part of its Climate Change Programme the Government has in place a plethora of different economic instruments aimed at reducing the UK's carbon dioxide emissions. This broad range of policy initiatives has been described as “muddled, overlapping and confused”.²⁵⁶ The situation is not helped by the fact that responsibility for energy and climate change policy is shared across DTI, Defra and HM Treasury.²⁵⁷ The two current main instruments that attempt to place a price on carbon are the Climate Change Levy and the European Union Emissions Trading Scheme (EU ETS). However, as they stand, neither gives sufficient incentives to finance nuclear power: the Climate Change Levy fails to treat nuclear power as a low carbon technology and the EU ETS fails to provide a stable long-term price of carbon, or, indeed, a mechanism to determine a price.

174. Introduced in 2001, the Climate Change Levy (CCL) is a tax on the business use of energy, the idea being to encourage firms to be more energy efficient. It applies to both electricity and gas as well as a number of other energy inputs used by firms. However, while renewable energy is exempt from the scheme, this is not the case for nuclear power. This discrepancy was flagged as an issue in both the written and oral evidence that we received.²⁵⁸ **Our predecessor Committee argued on several occasions that the CCL was neither a straightforward carbon tax, nor, because of the complexity of the Climate Change Agreement arrangements, was it a very effective means of encouraging energy efficiency. They felt it detracted from the effort to provide a long-term market-based costing of carbon emissions. So do we.**

175. The European Union Emissions Trading Scheme (EU ETS) came into force in January 2005. Within the scheme, Member States agree national caps on the emissions from their main carbon-emitting industrial sectors. Companies are allocated allowances, each of which represents a tonne of carbon dioxide. Emissions trading allows companies to emit in excess of their allocation of allowances by purchasing further allowances from the market. In the same way, companies that emit less than their allocation can sell on their surplus allowances. In this way, the scheme allows governments to set targets for emissions reductions, while leaving it to the market to determine the most efficient way of achieving those targets.²⁵⁹

176. Phase 1 of the EU ETS sets national allocation plans for cuts in emissions for the period 2005–08. Governments are currently undertaking negotiations for Phase 2, which will cover 2008–12. Currently, the situation is uncertain regarding a potential Phase 3 because the Kyoto Protocol expires at the end of 2012 and there is as yet no international

256 Helm, Dieter, *A new British energy policy*, November 2005

257 Q 299 (Dr Dieter Helm)

258 CBI, *Response to 'Our Energy Challenge...'*, 2006; Appendix 4 (Atomic Energy of Canada Ltd); Q 7 (Dr William Nuttall), (Prof William Gelletly) and (Prof Jim Skea)

259 <http://www.defra.gov.uk/environment/climatechange/trading/index.htm>

agreement over what will follow it.²⁶⁰ The short period over which emissions reductions are set, and hence over which firms may have some idea of the price of carbon, was widely cited in our evidence as a primary reason why the EU ETS does not provide incentives for new nuclear build.²⁶¹ This is especially the case given that any potential new build would not come online until the end of the next decade, well into any possible Phase 3. As Dr Dieter Helm said to us, “we have no idea what the carbon regime is beyond 2012 and we do not yet know what the Emissions Trading Scheme looks like from 2008–12. I cannot think of any serious technology on the carbon front which is interested very much in what happens before 2012”.²⁶² Not only does the EU ETS fail to give long-term certainty, but the price of carbon it provides is also highly volatile and unpredictable.²⁶³ Earlier this year the carbon price dropped suddenly to a third of its value, as a result of an excessive allocation of allowances in another Member State. Although the price has recovered since then, EDF said to us that such volatility “is dangerous” and therefore a major disincentive to invest.²⁶⁴ Given these considerations, it is not surprising that the scheme is considered as doing “little more than optimising for minimum carbon emissions across the existing plant portfolio”.²⁶⁵

177. However, as the RSPB noted in its submission, the performance of the EU ETS to date is “a problem of policy delivery, not of policy”.²⁶⁶ The scheme is in its infancy and the EU is still going through the trial period of Phase 1. Dieter Helm pointed out in his evidence to us that “it is the most ambitious emissions trading system in the world. Nobody has done anything on this scale”.²⁶⁷ Indeed, many of the witnesses we spoke to felt the UK should continue to work with the other Member States, learning lessons from the first phase, and working towards establishing a global scheme post-2012.²⁶⁸ The priority for Phase 2 should be to ensure that national emissions caps are set fairly across countries and sectors, and to introduce mechanisms that avoid carbon prices which will put the future sustainability of the scheme at risk.²⁶⁹

178. At the same time, though, it must be acknowledged that, with 25 Member States negotiating future phases of the EU ETS, it may not be possible for the Government to influence other countries to agree a scheme that provides the long-term stable incentives for low-carbon electricity generation to meet its own objectives. What is more, if the Government wishes to encourage such sources to come forward now, it cannot wait for the next set of negotiations in several years’ time for any potential Phase 3. In other words, while still working to develop and advance the EU ETS, it would also have to consider making its own arrangements to provide a long-term stable price for carbon that could

260 Appendix 42 (Ofgem)

261 Qq 64 (Mr Robert Armour); Q199 (Prof Keith Palmer) and 255 (Mr Vincent de Rivaz); Appendices 1 (ABB Ltd), 4 (Atomic Energy of Canada Ltd), 11 (BNFL plc) and 42 (Ofgem)

262 Q 277 (Dr Dieter Helm)

263 Q7 (Prof Jim Skea); Q 199 (Prof Keith Palmer)

264 Q 255 (Mr Vincent de Rivaz)

265 Appendix 55 (Mr Nigel Yaxley)

266 Appendix 46 (Royal Society for the Protection of Birds)

267 Q 301 (Dr Dieter Helm)

268 Qq 202 (Prof Keith Palmer); 301 (Dr Dieter Helm); 256 (Mr Vincent de Rivaz); and 152 (Sir Jonathon Porritt)

269 Appendices 22 (E.ON UK) and 42 (Ofgem)

later be grafted onto an agreed European scheme.²⁷⁰ Such a line of action for the Government to take would involve political risks, were collective action on climate change to collapse in the future, and also given there is very little international experience of countries adopting any form of long-term carbon pricing. The one example our inquiry found was that of Germany, where emissions permits are granted for up to 18 years where an operator wishes to replace old, low efficiency plant with benchmark state-of-the-art technology. This policy is currently encouraging investment in high efficiency coal capacity.²⁷¹

Approaches to long-term carbon pricing

179. We took evidence on various approaches the Government could adopt if it wished to put in place its own policy for long-term carbon pricing. One example advocated to us by Dieter Helm, and which has gathered wider support,²⁷² was the concept of contracting for reductions in carbon dioxide emissions.²⁷³ Here, the Government would auction off contracts for the supply of emissions reductions over a long time horizon of, say, 15 to 20 years. Such contracts could comprise any proportion of the Government's targeted cut in emissions, depending on the extent to which it wished to tie itself to its 2050 target. Contracts would be let by a two-stage auction in which first interested parties would bid for the kind of contract they would like to receive, before moving onto a second stage where the actual auction took place. As noted by Ofgem, the cost of such an approach need not be significant. At a current traded price of carbon of roughly £65 per tonne, contracts to reduce UK emissions by 10 million tonnes, or 6% of the UK total (as it stood in 1990), would cost around £650 million per annum.²⁷⁴ These funds could be found by the Government through the auctioning of some of the EU ETS allowances, which it currently gives the electricity sector for free. Alternatively, it could simply levy a windfall tax on the allowances given to generators to cover the cost.²⁷⁵ This would be justified given that at current prices the value of allowances that the Government has said it will allocate to generators could be around £12 billion.²⁷⁶ Indeed, it seems that the Government has accepted this principle through its recent decision to auction allowances in Phase 2 of the scheme.

180. Such an approach is predicated on the assumption that the Government is really committed to its objective to reduce carbon emissions.²⁷⁷ If it is, then there are potential advantages to a contracting approach. First, the Government would not be forced to 'pick winners' as all forms of low carbon electricity generation would be able to bid for contracts. Onshore and offshore wind operators require roughly the same pay-off period as nuclear

270 Appendix 22 (E.ON UK); Q 255 (Mr Vincent de Rivaz)

271 Appendix 55 (Mr Nigel Yaxley); Q 64 (Mr Paul Spence)

272 For example, Ofgem, *Our energy challenge – Ofgem's response to the Government's Energy Review consultation*, May 2006; Appendix 20 (Environment Agency)

273 Appendix 31 (Dr Dieter Helm); Helm, Dieter and Hepburn, Cameron, *Carbon contracts and energy policy: An outline proposal*, October 2005

274 Ofgem, *Op. cit.*

275 Q 494 (Alistair Buchanan)

276 Ofgem, *Op. cit.*

277 Q 276 (Dr Dieter Helm)

generators would. Second, policy risk is moved from the private to the public sector, which is arguably in a better position to manage it. Third, a two-stage auction would reveal to the Government more information about the actual costs of different types of low-carbon generation.²⁷⁸ Fourth, it would provide a bridge for investors between the period up to 2012 and the longer term.²⁷⁹ Fifth, it would ensure the Government does not protect the private sector from the performance risk of building new generation plant to time and budget, because it would honour a contract only once the power station was commissioned and offsetting emissions. Finally, the Government could potentially cover some of the cost of such contracts by selling them on within a potential Phase 3 of a future EU or global emissions trading scheme. As such, this would also give the Government a significant incentive to ensure that the EU ETS succeeds and advances from its current state.²⁸⁰

181. There are nevertheless some potential disadvantages to a carbon contract approach. A purely technology-blind mechanism would be based on the existing economics of low-carbon generation, and would not necessarily provide the incentives for research and development of options that are not viable today, but may well be some time in the future, such as marine renewables. In this case, some form of R&D support from the Government would have to exist alongside a carbon contract mechanism.²⁸¹ In addition, carbon contracts would require the Government to accurately estimate baseline carbon emissions, against which to assess the emissions offset. This has been a problem in respect of Phase 1 of the EU ETS. It would also require HM Treasury to cover the cost of such contracts, until it was in a position to trade them internationally. Finally, with relatively few potential bidders for large carbon contracts, at least from the nuclear sector, however an auction is designed, there could be a risk of collusion by those bidding in order to achieve a higher value contract. In this case, the Government would have to design any auction in such a way as to extract as much information from the private sector as possible to ensure it was getting a good deal.

182. We put it to Dieter Helm that a carbon tax might be an easier way of achieving the same objective of reducing carbon emissions. He noted that as international agreements tended to be struck in quantities, a quantity-based mechanism would more efficiently achieve such aims than an indirect pricing approach.²⁸² In addition, with a carbon tax there is the risk that it simply becomes an instrument of fiscal policy rather than an effective incentive for technology-neutral low-carbon generation. As a consequence, the industry could end up playing a game of attempting to second guess politicians rather than the market.²⁸³

183. Another approach, suggested by the Policy Studies Institute as an alternative to carbon contracts, would be for the Government to guarantee over a 10-year period the price of

278 Q 283 (Dr Dieter Helm)

279 Q 285 (Dr Dieter Helm)

280 Q 286 (Dr Dieter Helm)

281 Environmental Audit Committee, *Sixth Report of Session 2005-06, Keeping the lights on: Nuclear, Renewables and Climate Change*, HC 584-1, para. 134

282 Q 279 (Dr Dieter Helm)

283 Q 280 (Dr Dieter Helm)

tranches of low or zero carbon generation coming on stream from 2016.²⁸⁴ In this situation, as with carbon contracts, the Government would take bids for prices for the supply of low-carbon electricity. In doing so, it would agree the number of contracts it felt necessary to contribute to its 2050 emissions target. Because all forms of low-carbon generation, renewables, nuclear, carbon storage, etc, would be eligible to bid, prior to this process there would have to be a programme of work to overcome issues surrounding the planning system and grid access so that all technologies were able to compete fairly. However, while this approach may be simpler than carbon contracts to implement, it would present greater difficulties for the Government in determining the extent to which it was achieving carbon reductions. Fixing prices leaves uncapped the potential cost to the Government since this would be determined by the amount of electricity generated. Furthermore, the Government has prior experience of offering fixed price contracts to low-carbon generators through the Non-Fossil Fuel Obligation (NFFO), which was put in place to provide incentives for renewable energy. NFFO failed to bring forward a large amount of new generation because companies bid for contracts at too low a price, and were subsequently not able to fulfil them.²⁸⁵

184. Another possibility for supporting low-carbon generation could be to imitate the current Renewables Obligation (RO) by creating a separate ‘nuclear obligation’. The RO is a traded certificate scheme, funded by electricity consumers, that requires all electricity suppliers to purchase a growing proportion of their electricity from renewable sources. The disadvantage to this approach is that it would not be a technology-neutral scheme, as it would treat nuclear separately from other sources of low-carbon electricity. In the case of the RO this has been justified on the basis that it is designed to encourage innovation in the renewables sector so that different technologies may become more cost-effective in the future.²⁸⁶ It is arguable that an established technology like nuclear fission does not need such help. Moreover, the RO has been inefficient in achieving the purpose for which it was established. While there may be evidence that it has provided support to make onshore wind economically viable, to date the bulk of renewables generation supported under the RO comes from land-fill gas and co-firing biomass in coal-fired power stations, neither of which requires further large-scale technological development. Experience from the RO has also shown that this kind of mechanism can be very costly for the consumer and does not necessarily guarantee that new generation will be brought on stream.²⁸⁷

185. The nuclear industry believes that some form of stable long-term carbon pricing is the only means by which new nuclear build could be funded. We think that a technology-neutral form of long-term carbon pricing is essential if the Government is to achieve its objectives of reducing carbon emissions and allowing the market to determine the precise energy mix. This applies whether the Government decides for or against new nuclear build. The current EU ETS does not provide an adequate mechanism. There are various ways in which the Government could provide a long-term price for carbon, including carbon contracts and fixed price guarantees. Of these,

284 Ekins, Paul, *An Alternative to Carbon Contracts*, 2005, Policy Studies Institute

285 National Audit Office, *Renewable Energy*, February 2005

286 Q 149 (Sir Jonathon Porritt)

287 National Audit Office, *Renewable Energy*, February 2005

we are attracted by the proposal of auctioning long-term contracts for future reductions in carbon emissions as a means of creating the incentives for investment in all low carbon technologies. We note that the Government is already beginning to accept the principle of this through the auctioning of allocations in Phase 2 of the EU ETS.

6 Wider policy concerns

186. The Government cannot consider the particular issues that apply to nuclear new build without taking account of its wider implications for other policy areas. Those which are of particular concern to us, and which are the subject of this chapter, are: the extent to which nuclear power can contribute to making the UK a low-carbon economy; its contribution to securing electricity supply; its possible effects on other areas of energy policy, such as renewables and energy efficiency; and the implications it presents for upgrading the grid network. All of these factors weigh heavily on the case either for or against nuclear power, and require due regard by the Government.

Reducing carbon dioxide emissions

187. The contribution that nuclear power makes to reducing the UK's carbon emissions is one of the main justifications given for supporting it as part of the energy mix. However, there has been debate surrounding the extent to which nuclear energy can really be considered a 'low-carbon' technology. In this section we examine whether or not this is true, and consequently, the extent to which nuclear power has a role to play in reducing emissions.

Is nuclear power low carbon?

188. Nuclear energy has been referred to by some as a 'zero carbon' source of electricity. Whilst it is correct to say that the use of uranium as a fuel does not emit carbon dioxide in the same way as fossil fuels, there are, nonetheless, a number of activities that go into producing nuclear power that, depending on the energy mix on which they are based, do result in carbon emissions. This was pointed out to us in both written and oral evidence.²⁸⁸ For example, uranium ore mining, manufacturing the concrete and steel for the construction of the station, waste activities and plant decommissioning are all essential activities over the lifetime of a nuclear power station, which require energy to carry out. Figure 3 shows the results of a study estimating the emissions from the Torness nuclear power station in Scotland, across the various parts of the production cycle. It shows that the most polluting part of the fuel and plant cycle is the extraction of uranium, which is more significant than the actual construction and decommissioning of the power station.

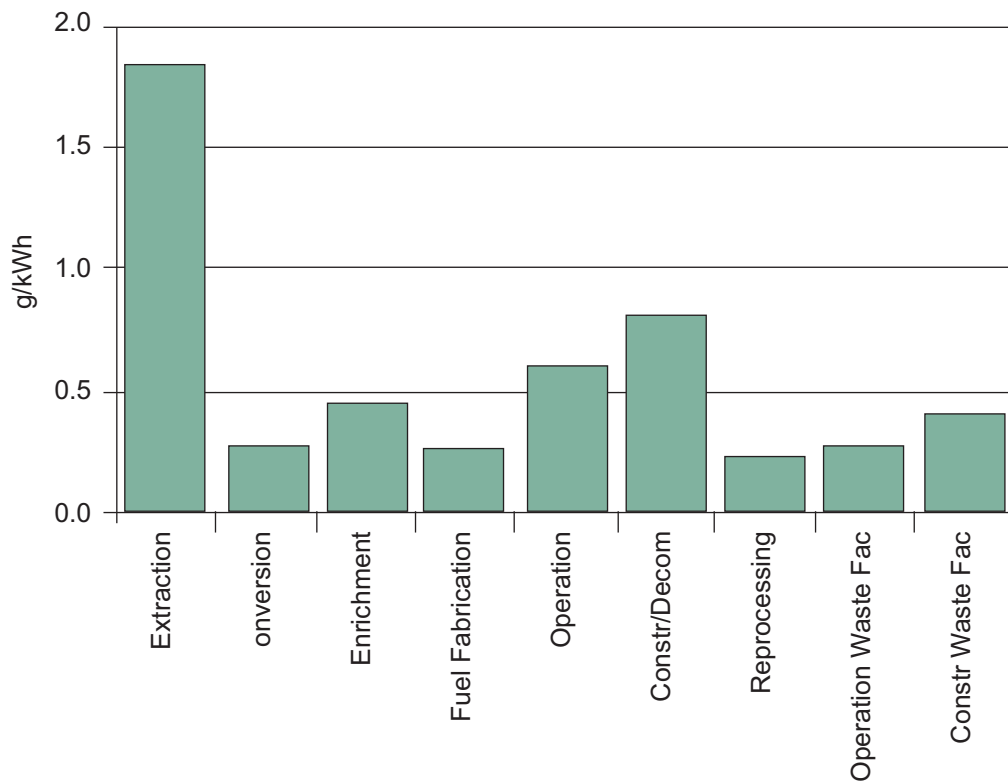
189. In reality, no source of electricity generation can currently be considered genuinely zero carbon, because of the energy costs required in building, operating and decommissioning the power plant.²⁸⁹ This is as true for renewable energy as it is for nuclear power, and will continue to be the case so long as the energy base on which such activities take place has an element of fossil-fuel powered generation within it. Various studies have attempted to compare the carbon status of different electricity sources. Figure 4 shows a comparison for what are considered low carbon technologies. For each technology, a high and low estimate is provided. This reflects the different sources of data, which have looked at different technologies, and made different assumptions, within each type of generation.

288 For example, Q 111 (Sir Jonathon Porritt); Appendices 16 (EDF Energy) and 27 (Friends of the Earth)

289 Q 2 (Prof William Gellely)

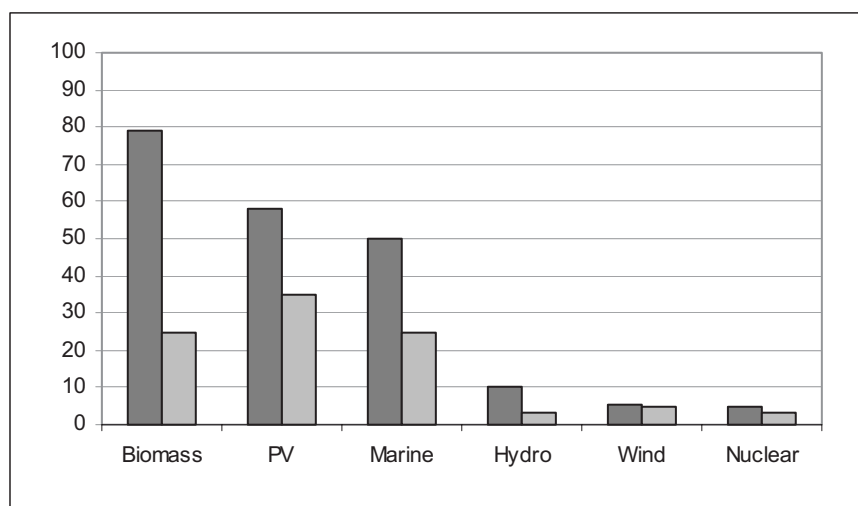
The chart shows hydroelectricity, wind and nuclear as the lowest emitters. Photovoltaics and marine renewables require a relatively larger amount of energy in their manufacture, while the harvest and transport of fuel raises the energy cost for biomass. Figure 5 puts the results for low carbon technologies in context with a comparison against the estimated lifetime emissions from coal and gas-fired plant.

Figure 3: Carbon emissions across the lifetime of a nuclear power station



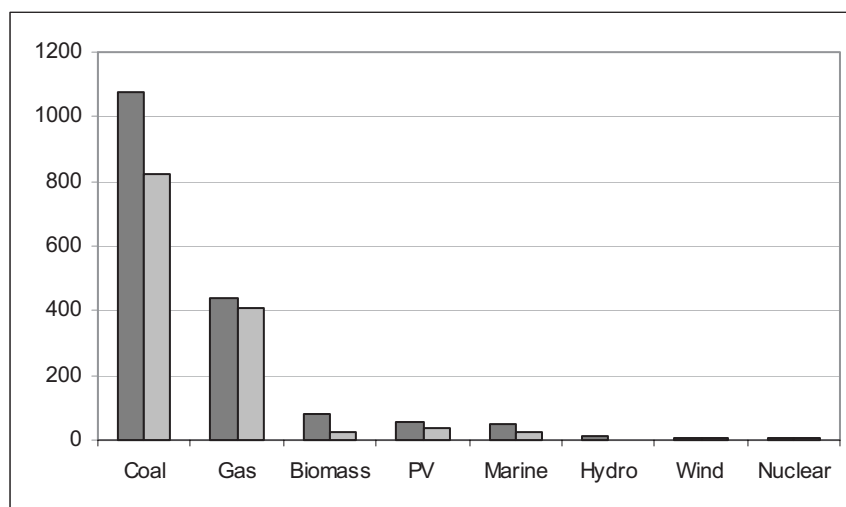
Source: AEA Technology, 'Carbon footprint of the nuclear fuels cycle – a study for British Energy', March 2006

Figure 4: Comparison of high and low lifetime carbon emissions for low carbon technologies (grams of carbon dioxide per kilowatt hour, g/kWh)



Source: Parliamentary Office of Science and Technology, 'Carbon footprint of different electricity sources', July 2006

Figure 5: Comparison of high and low lifetime carbon emissions for all technologies (grams of carbon dioxide per kilowatt hour, g/kWh)



Source: Parliamentary Office of Science and Technology, 'Carbon footprint of different electricity sources', July 2006

190. Although it is important to note that each of the estimates in these charts is based on different academic studies, there is no denying the huge difference between the carbon emissions of wind and nuclear power on the one hand, and coal and gas-fired generation on the other. There has been some concern raised that, as mining for uranium exhausts existing 'high grade' ores, greater energy will have to be expended on mining and subsequently enriching lower grade ores.²⁹⁰ This may be the case, but as noted earlier in this Report, current evidence on future uranium supplies is optimistic. Even if the optimism about high grade ores is misplaced, the resulting emissions from mining would have to be of an order of magnitude greater than they are now to have any bearing on the overall conclusion that nuclear power is a low carbon technology, comparable with renewable energy. The potential future need to resort to lower grade uranium ores is an example of 'diminishing returns'. It is arguable that an analogous situation could apply for renewable sources of electricity. For example, with onshore wind, the first turbines would be built at the best sites. Subsequent turbines would be built at less optimal sites and, as a result, their carbon emissions per unit of electricity generated would also probably be higher.

The impact of nuclear power on reducing emissions

191. Given that nuclear power can be considered a low carbon energy source, the extent to which it offsets emissions is dependent on the technology it is assumed to displace. The usual assumption is that this would be gas-fired generation, largely because of the low cost and the relative ease with which gas-fired stations can be built. The Sustainable Development Commission estimated that the UK's current fleet of nuclear reactors offsets between 8 and 20 million tons of carbon—equivalent to 5 and 12.6% of UK emissions—depending on whether you assume it to displace gas or coal-fired generation.²⁹¹ Indeed,

²⁹⁰ www.stormsmith.nl

²⁹¹ Sustainable Development Commission, *The role of nuclear power in a low carbon economy, Paper 2: Reducing CO₂ emissions – nuclear and the alternatives*, March 2006

Ofgem note in their submission to the Energy Review, that with about 20% of UK nuclear capacity due to close by 2010, without replacement, other generating capacity will have to reduce emissions by at least 2 million tons of carbon just to keep them at their current levels.²⁹²

192. The Sustainable Development Commission has conducted further analysis on the extent to which new nuclear build may offset carbon emissions in the future.²⁹³ It estimates that a 10 gigawatt programme of new reactors built over a period up to 2034 would reduce future UK emissions by about 4%, assuming that gas-fired generation is displaced. Similarly, a larger 20 gigawatt programme would reduce emissions by about 8%. The Commission concludes that “whilst these cuts are certainly substantial, they are not a panacea solution to the challenges of a low carbon future”.²⁹⁴

193. The Commission’s analysis shows the scale of the challenge that the Government faces if it is to meet its objective of a 60% reduction in carbon emissions by 2050. It argues that this makes nuclear a relatively unimportant contributor to tackling climate change. Several of our witnesses disagreed with this view. The chief executive of EDF Energy asked: “The question is: with what technology do we replace the existing nuclear fleet? If we replace it by coal or gas it is clear that the targets for CO₂ emissions will not be achieved”.²⁹⁵ Professor Keith Palmer told us: “I promise you that only one thing will replace it if we do not have new nuclear: a lot more gas-fired power stations”.²⁹⁶ The difference in opinions here is based on varying assumptions about what will take the place of current nuclear generation once it reaches the end of its operating life. If the Government were to do nothing, then clearly gas or possibly coal-fired generation would fill the gap. However, very significant progress on renewable energy or energy efficiency could also achieve this. After a number of years of development, renewable energy currently contributes about 2% of UK energy needs as opposed to about 8% for nuclear power.²⁹⁷ This suggests that just to stand still in terms of carbon emissions, there would have to be a massive increase in renewables. This is not impossible, but there are a number of constraints that would have to be overcome to make progress towards making it possible.²⁹⁸ If the Government is to be credible about achieving its carbon objectives, it has to address the issue of what will be the most cost-effective and practicable source of reducing carbon emissions, in considering the pros and cons of nuclear power.

194. There are some carbon emissions associated with the life-cycle of nuclear power stations, as there are with some renewable sources of electricity generation. However, nuclear power can still be considered a low carbon energy source on a par with hydroelectricity and wind power. The contribution nuclear power can make to the carbon reductions required to meet the Government’s 2050 objective is relatively small. However, this reflects the scale of the challenge faced and the fact that electricity

292 Ofgem, *Our energy challenge – Ofgem’s response to the Government’s Energy Review consultation*, May 2006

293 *Op. cit.*

294 *Ibid.* para. 1, page 30

295 Q 226 (Mr Vincent de Rivaz)

296 Q 213 (Prof Keith Palmer)

297 Department of Trade and Industry, *Digest of United Kingdom energy statistics*, 2005

298 See for example, Department of Trade and Industry, *Renewables Innovation Review*, 2005

generation, though significant, is only one source of carbon emissions: space heating and transport emissions are of at least equal importance. The extent to which this should matter to the Government, with regard to nuclear power, depends on its determination to create a low carbon economy, and whether it believes other low carbon technologies or energy efficiency can fill the gap left by closing nuclear plant, which otherwise would almost certainly be filled by gas-fired generation.

Other approaches to reducing emissions

195. The media's coverage of the Energy Review has focused, rightly or wrongly, on the issue of nuclear power. However, as the previous section highlighted, further nuclear power could not, on its own, meet the Government's objectives for carbon reduction—this would require a package of measures, including further expansion of renewable energy and greater energy efficiency. Yet, over the course of our inquiry, we received evidence arguing that a policy decision in favour of nuclear power could detract from efforts in these areas.²⁹⁹ This section examines these concerns.

Renewables

196. The Government has a target to achieve 20% of the UK's electricity generation from renewable sources by 2020. To this end, it has established the Renewables Obligation (RO) as a dedicated support scheme for the development of renewable capacity that would not otherwise be economically viable under normal market conditions. It is a traded certificate scheme with increasing targets for renewable generation, rising to just over 15% in 2016. The mechanism effectively doubles the price generators get for their electricity. Because the RO effectively operates as a self-contained market for renewable energy within the electricity market, it is unlikely that a policy in favour of nuclear power would affect the incentives of developers to bring forward future renewable generation, at least up until 2016, when the RO targets stop increasing. The way in which the mechanism is designed means that, if developers stopped investing in new renewable capacity, this would increase the returns for those who already operated renewable capacity. In such a situation, so long as the RO remained in place, rational investors should still have the incentive to build further new capacity.

197. However, new nuclear build could nonetheless pose risks to the renewable sector. The Sustainable Development Commission notes that relatively little money (roughly £30 million) is being spent by the DTI on microgeneration capital grants.³⁰⁰ Indeed, since the last Energy Review, the DTI has actually cut its R&D budget for renewables. This highlights the danger that even though there may still be an economic incentive for the market to invest in renewable energy through the Renewables Obligation, this does not mitigate the risk of political support for renewables diminishing. If investment in R&D drops off, then this would reduce the likelihood of future innovation in certain types of renewables, such as wave and tidal energy, which are not yet commercially viable. Finally, if the Government did decide in favour of new nuclear build, as discussed earlier, we would expect this to be backed by a move towards technology-blind long-term carbon pricing. Such a framework

299 Appendices 2 (Airtricity), 20 (Environment Agency) and 46 (Royal Society for the Protection of Birds)

300 Sustainable Development Commission, *The role of nuclear power in a low carbon economy*, March 2006

would, arguably, have to supersede the Renewables Obligation if the approach were to be truly technology-neutral. However, such a fundamental change to the means by which the renewables sector is currently supported could undermine future investment.

Energy efficiency

198. **The impact of potential new nuclear build on progress with energy efficiency is less clear. The Sustainable Development Commission argued that further nuclear power would send out a message to energy consumers that the Government has plugged the ‘energy gap’. In so doing, this might reduce the incentives to cut electricity demand.³⁰¹ Whilst we agree that this is a risk, we note that the promotion of energy efficiency should take place through separate policy instruments that seek to raise consumers’ awareness of the carbon impact of their energy consumption, and also, for example, through regulation of building standards. In addition, we note the need to take action on energy efficiency across the whole of the energy sector, including in the transport and heating sectors—not just for electricity.³⁰²**

199. **The general public is unlikely to support new nuclear power stations unless they are part of a wider strategy that also encourages renewable energy and energy efficiency. There is a risk that a Government focus on new nuclear build would distract from efforts in these two areas. To prevent this, it would have to ensure that nuclear power did not receive preferential treatment, either in the planning system, or in a long-term carbon pricing mechanism. It would also have to demonstrate a genuine political commitment to these two means of reducing carbon emissions in building a long-term national consensus for its energy policy.**

Providing grid capacity

200. Any new nuclear build will require direct connection to the UK’s electricity transmission network, which is owned and operated by National Grid. Both the siting and size of a programme of new reactors would have an impact on the grid network, requiring investment in upgrades to the system. In this section we look at the extent to which new nuclear build would ‘lock’ the UK into a centralised grid network, and what the implications are of the timing and siting of new nuclear power stations.

A centralised grid network?

201. The UK’s current electricity grid network is essentially ‘hierarchical’.³⁰³ Almost all electricity flows from conventional large power generation into the transmission network, and then into largely passive distribution networks, operated by the local supply companies. This would be the case, too, for any new nuclear build. Increasingly, though, smaller scale generation, such as certain renewables, is being connected directly to the distribution networks. In the future, too, expansion of microgeneration could see electricity

301 *Ibid.*

302 Energywatch, *Response to ‘Our Energy Challenge...’*, 2006; Appendix 3 (Association for the Conservation of Energy)

303 Appendix 1 (ABB Ltd)

flowing back up through the system from households. This is known as decentralised generation.

202. The expansion of this different type of generation poses a challenge for Ofgem and National Grid because the electricity network has traditionally been designed for electricity to flow in one direction. The Sustainable Development Commission argued to us that if the Government decided to pursue a programme of new nuclear build, this would represent a continuation of the approach to date of electricity distribution being centralised. In so doing, this would 'lock' the UK into the same system for the next 50 or so years, reducing the likelihood that grid investments would be made that encouraged the connection of microgeneration and other forms of decentralised electricity. Whilst we agree that this would be a risk if the UK was to pursue a very large programme of new nuclear build, such as that which France has followed, other evidence we received suggests that, for a smaller programme, this would not lock the UK into a centralised network.³⁰⁴ Indeed, the current transmission network pricing structure rewards decentralised generation because it does not entail the investment in grid upgrading that is required for larger power plant located far from the point of consumption.³⁰⁵

Connecting new nuclear build

203. The location of any new nuclear power plant would have a direct bearing on the cost of connecting it to the grid. As we discussed earlier in this Report, there is a possibility that new plant could be built next to existing nuclear power stations, or on the site of fully decommissioned plant. One of the reasons given for this is that such sites would already have the infrastructure in place to connect up a new power station. However, in their evidence to us, Ofgem pointed out that the ability to do this would depend on a number of issues. For example, if there was an existing nuclear power station onsite, an additional 1,000 or more megawatts of capacity from a new station would still require upgrading of the transmission network further down the line. Even where a new nuclear power station was taking over the connection of an old one, if the generating capacity of the previous station was significantly less this could entail upgrading to the grid network.³⁰⁶

204. National Grid has estimated the potential cost of upgrading the transmission network for a new nuclear programme at between £850 million and £1.4 billion, depending on its scope and the availability of sites.³⁰⁷ These costs would have to be met by the developers and could bear heavily on the economic viability of certain sites, especially where there is no current infrastructure in place, or where generation is based some distance from consumption. A further concern is the long lead time required for any grid upgrades because of the need for these to receive planning consent. Ofgem noted the example of the upgrade to the North York line, which was 25 miles long, and took the best part of 12 years to pass through the planning process in the 1990s.³⁰⁸ This issue is already a concern for the

304 For example, Appendix 32 (Institution of Electrical Engineers); Q 457 (Prof Gordon MacKerron)

305 Q 501 (Mr Steve Smith of Ofgem)

306 Q 503 (Mr Steve Smith)

307 Q 139 (Mr Cocks) in Trade and Industry Committee, oral evidence on *Increasing UK dependence on gas and coal imports*, HC 1123 of Session 2005-06 (henceforward 'oral evidence on gas and coal')

308 Q 507 (Mr Alistair Buchanan)

renewables industry.³⁰⁹ The long lead times for nuclear power should make this less of a concern for the nuclear sector, although decisions on the required grid investment would need to be taken well in advance to prevent future hold-ups.

205. The UK has a centralised electricity grid network, although growth in renewable energy and, in the future, microgeneration are beginning to challenge this approach. We were told by National Grid that a new nuclear programme aimed at doing no more than replacing existing capacity would not act to prevent the further development of decentralised generation. The siting of new nuclear plant, whether near existing nuclear sites or not, will affect the level of investment required in upgrading the transmission network, which could be in the range of £850 million to £1.4 billion—these are costs that will have to be met by developers, thus influencing their investment decision.

Securing electricity supply

206. Concern about future security of electricity supply, given the UK's increasing dependency on gas imports, and the likely future increase in gas-fired generation, is one of the main reasons why the Government chose to hold another energy review so soon after the last one. As we have set out in this Report, we do not believe that the way to energy security is for the Government to fix the proportion of the energy mix that should come from particular technologies. Rather, it should ensure a level playing field for existing technologies, while supporting innovation in new ones. In this section we look at the potential risk of there being an 'energy gap' in the future electricity market, and the extent to which the market will be able to manage this.

Will there be an 'energy gap'?

207. The Government's Energy Review states that with possible nuclear and coal plant closure over the coming years, potentially 20 gigawatts of generating capacity may need replacing in the next ten years. This represents about 30% of current electricity demand.³¹⁰ One of the concerns raised during our inquiry was that new nuclear build would not come online in time to fill this gap. The most optimistic predictions for new build are for a first power station to begin generating in 2017 at the absolute earliest. In the meantime, the gap would probably have to be filled by gas-fired generation, therefore increasing the UK's dependency on gas imports.

208. The Energy Review consultation document states that "potential lifetime extensions could serve to extend the period over which closures of nuclear plants take place".³¹¹ The current AGR power stations, operated by British Energy, were originally built with an accounting life of 25 years. As operating experience has built up, the life of each station has been extended for each of seven AGRs, with the most recent, for Dungeness B, announced in September 2005. Table 5 shows the current position on station lifetimes across the British Energy fleet.

309 See for example, National Audit Office, *Renewable Energy*, February 2005

310 Department of Trade and Industry, *Our energy challenge – securing clean, affordable energy for the long-term*, January 2006, page 40.

311 *Ibid.* page 39

Table 5: The current position on British Energy's nuclear power station lifetimes (all AGRs except Sizewell B)

Station	Capacity (megawatts)	Scheduled closure date	Current lifetime	Life extensions already declared	Date of next NII Periodic Safety Review
Hinkley Point B	1,220	2011	35 yrs	10 yrs	Jan 2007
Hunterston B	1,190	2011	35 yrs	10 yrs	Jan 2007
Hartlepool	1,210	2014	30 yrs	5 yrs	Jan 2009
Heysham 1	1,150	2014	30 yrs	5 yrs	Jan 2009
Dungeness B	1,110	2018	35 yrs	10 yrs	Jan 2008
Heysham 2	1,250	2023	35 yrs	10 yrs	Jan 2010
Torness	1,250	2023	35 yrs	10 yrs	Jan 2010
Sizewell B	1,188	2035	40 yrs	0 yrs	Jan 2015

Source: British Energy

209. British Energy can re-assess the lifetime of its reactors in the run-up to their scheduled closure dates. In so doing, it considers the robustness of the reactors' graphite cores to further operation, as well as a number of other technical factors. It must seek approval from the Nuclear Decommissioning Authority for any extension, as this would have implications for the future liabilities of the plant (which the NDA has ultimate responsibility for), although this approval has to be granted if British Energy can prove that an extension would have a positive net present value. This process must conclude at least three years before the planned date of decommissioning. Independently of this, the Nuclear Installations Inspectorate operates a routine schedule of Periodic Safety Reviews (PSR) for each reactor every ten years. This looks at the safety case needed to continue licensed operation. For each of British Energy's reactors, the date of the next PSR is given in Table 3. The outcome of these reviews will inform the company's assessment of the scope for further lifetime extensions.³¹²

210. British Energy told us that its aspiration is to maximise the operating life of its fleet. To this end, in June 2006 it announced that it had begun the technical evaluations to support life extensions for Hinkley Point B and Hunterston B, which are the two stations scheduled soonest for decommissioning. This work will conclude in March 2008. In their letter to us, British Energy said they "cannot make judgements about further life extension until this work is done". They went on to say that: "Ten-year life extensions may be possible for some stations, but we may find some station lives cannot be extended this long, and some may not be extended at all".³¹³

³¹² Appendix 10 (British Energy)

³¹³ *Ibid.*

211. Ofgem also highlighted the possibility of further lifetime extensions to the existing nuclear power stations in their oral evidence to us.³¹⁴ They went on to discuss the same issue in relation to coal-fired generation, noting that capital expenditure in the sector would potentially extend the lifetime of some of the power plant that DTI are currently assuming will close in the coming years. Ofgem’s Chief Executive, Mr Alistair Buchanan commented on this that he thought “the forward looking analysis has not been broad enough and it has not been forward looking enough in order to have this kind of debate ... as to what is likely to happen in the next ten to 20 years”.³¹⁵

212. This situation concerns us, as the apparent urgency of the current Energy Review seems to be predicated on the assumption that the country faces an imminent crisis. We agree that some generating capacity, such as the remaining Magnox power stations, will certainly be decommissioned in the coming years, and that the replacement of this poses a challenge for the market. However, whilst we acknowledge that it would not be sensible to presume lifetime extensions for all of the remaining nuclear fleet, equally it would not be prudent for the Government to make long-term policy decisions on the future energy mix in haste, and without full consideration of the evidence, simply because it has assumed that this capacity will certainly not be available. Indeed the fact that British Energy has begun to evaluate possible extensions for two of its reactors suggests the company believes there is a chance that they will carry on operating. We consider that a full and proper assessment of the projected future generating capacity should have been conducted to inform debate before the Government undertook its Review.

Providing capacity

213. In recent years, National Grid has continually reported reserve margins of 21 to 23%.³¹⁶ To date, this has been generally viewed as a sensible margin in terms of the grid’s “ability to keep the lights on”.³¹⁷ However, a number of factors may affect this view going forward. For example, if in the future, the market moves to a different balance of flexible versus inflexible plant, this will have to be reflected in the costs of the balancing system.³¹⁸ Because of the intermittency of wind power, the large projected increases in wind generation in coming years will require an increase in back-up capacity from elsewhere, to be brought into service on low-wind days. Also National Grid points out that its current system is set up to withstand the instantaneous loss of 1,320 megawatts of power. If new nuclear plant is built that is larger than this level—which is a definite possibility—then additional system operator costs would have to be incurred to secure against the loss of a larger station. National Grid estimate this to be in the region of £50 million to £80 million.

214. Factors such as these could, in future, push up the required capacity margin for the market, at a time when plant closures are potentially decreasing it (although, as noted earlier, it is unclear by how much). In their evidence, National Grid speculated that “they

314 Q 474 (Mr Alistair Buchanan)

315 *Ibid.*

316 Q 482 (Mr Alistair Buchanan)

317 Q 131 (Mr Murray) in oral evidence on gas and coal

318 National Grid, *Response to DTI Energy Review Consultation*, April 2006

would look to see whether some sort of capacity payments mechanism ... could encourage people to bring generation forward so that we can protect the margin”, and hence electricity customers from volatile prices.³¹⁹ Dr Dieter Helm gave evidence to us suggesting the same. Whilst he acknowledged that the previous capacity arrangements were poorly designed under the Electricity Pool trading arrangements, he argued strongly that the current market did not provide an incentive for generators to invest in excess capacity.³²⁰ We put this view to Ofgem, who argued equally strongly that this is not the case. They pointed to evidence that 40% of current capacity has been built since privatisation of the industry in 1990. They also noted that power companies would not have an incentive to create a crisis in the electricity market by failing to invest in new capacity, as this would only lead to political and regulatory intervention in the industry that could otherwise have been avoided.³²¹

215. The issue of a capacity market is somewhat tangential to the arguments for or against nuclear power, although clearly an additional form of price certainty, which such a system would provide, would give greater clarity on the returns to all forms of generation, including nuclear power. As such, we would argue that the Government and Ofgem should continue to monitor the capacity margin and the market’s response to changes in it over time, to determine whether intervention may be needed in the future.

216. There is a possibility that a proportion of the UK’s existing nuclear power stations may receive life extensions over the coming years. If this is the case, then the potential ‘energy gap’ faced by the Government will not be as severe as that which the current Energy Review assumes. Whilst we accept that the long lead time on nuclear build requires a decision soon if new capacity were to come on stream before the end of the next decade, we question the haste with which the Government is seeking to conclude its current Review, especially given the short timeframe it has allowed for consideration of certain key pieces of evidence. Changes in the energy mix, such as increased wind power and potential new nuclear build, will in the future increase reserve capacity requirements. Developments in this area will require close monitoring by the Government and Ofgem as, if there is any sign of market failure, a swift policy response—perhaps in the form of some capacity payment—will be necessary.

319 Q 131 (Mr Murray) in oral evidence on gas and coal

320 Q 287 (Dr Dieter Helm)

321 Q 484 (Mr Alistair Buchanan)

Conclusions and recommendations

Overview

1. We believe that, in determining its policy on the future of nuclear energy, there are a number of issues that the Government needs to address. Our inquiry has sought to examine these to provide a comprehensive overview of the matters for debate, and to highlight those we believe are absolutely crucial. In so doing, we have not sought to reach a conclusion either for or against new nuclear build, but to reach definitive conclusions on those issues where the evidence base allows us to do so. (Paragraph 3)
2. Most of the technical objections to nuclear power, such as the availability of fuel and the carbon profile of nuclear power stations, have answers. Political issues, such as security and proliferation, are matters of judgement. There are other questions, however, that are both technical and political in nature, such as waste management. The purpose of this Report is to help focus debate on the issues that really need to be discussed and not those that have definitive answers. (Paragraph 4)
3. If the Government really wishes to meet its objectives for carbon emissions and energy security, its policy must sustain those technologies it wishes to be part of the energy mix. However, we do not believe that the way to energy security is for the Government to fix the proportion of the energy mix that should come from particular technologies. Rather, it should ensure a fair competitive environment for existing technologies, while supporting innovation in new ones. A policy designed to enable the construction of new nuclear power stations would be credible only if it was based on four key elements:
 - A broad national consensus on the role of nuclear power, that has both cross-party political support and wider public backing;
 - A carbon-pricing framework that provides long-term incentives for investment in all low carbon technologies;
 - A long-term storage solution in place for the UK's existing radioactive waste legacy; and
 - A review of the planning and licensing system to reduce the lead time for construction. (Paragraph 5)
4. Two of these areas require action for the successful implementation of energy policy, regardless of a decision on nuclear power. The planning system and carbon pricing are as much issues for renewable energy and the future of fossil fuel plants as they are for nuclear. Moreover, it would be necessary to ensure any decision in favour of new nuclear build would not undermine efforts elsewhere, such as in energy efficiency. (Paragraph 6)
5. In addition, there are issues which the Government and Parliament must consider that have a strong ethical dimension and will ultimately require a political judgment. These include:

- Whether, as a country, we should create new radioactive waste, which subsequent generations will have to manage;
 - Whether the UK's nuclear policy poses internal security risks and undermines efforts to prevent proliferation; and
 - The extent to which the UK needs to demonstrate leadership in reducing carbon emissions, given the modest contribution it can make relative to the rest of the world. (Paragraph 7)
6. Finally, our Report highlights issues surrounding nuclear power, where there has been debate, or where, underpinned by the principles outlined above, the market and the Government should be able to find a solution. Among our conclusions are that:
- Although new reactors may be able to use existing sites, this cannot be guaranteed. Further research would be needed to identify alternative sites;
 - There are reactor technologies that could seek licensing in the UK now, although we would be amongst the first in the world to use them;
 - Constraints in the domestic skills capacity could be overcome with sufficient investment and use of international resources;
 - Constraints in infrastructure capacity could be overcome with sufficient investment, although there are concerns regarding certain reactor components;
 - There should be sufficient uranium supplies to meet any future UK demand;
 - Financing the management of decommissioning and waste storage is possible, provided a system for charging the industry is in place from the start;
 - The UK has the market players willing to deliver a programme of new build, although the current electricity market does not provide favourable conditions for them to do so;
 - Nuclear power is a low carbon source of electricity, comparable to renewable energy; and
 - There is a clear understanding that the costs of developing new nuclear power stations, including subsequent decommissioning and waste disposal, would be met by the private sector developers of each station. (Paragraph 8)
7. Finally, we are concerned about the manner in which this Energy Review has been conducted. Throughout the process, the Government has hinted strongly that it has already made its mind up on nuclear power. The last review took three years to complete, yet this one has been conducted in the space of six months, and has focused primarily on the electricity sector, at the expense of consideration of transport and heating—both equally important sources of carbon emissions in the UK. This has not been an Energy Review, but an Electricity Review. (Paragraph 9)
8. What is more, it is clear to us that the outcome of the Energy Review has largely been determined before adequate consideration could possibly have been taken of

important evidence that should inform the Government's policy decision. This includes the Committee on Radioactive Waste Management's final report and recommendations for the long-term storage of the UK's high level radioactive waste, expected at the end of July 2006; and the Health and Safety Executive's recently published expert report, which includes analysis of the potential for pre-licensing of nuclear reactors. Further, there has been insufficient analysis of the extent of the 'energy gap' the UK faces, for example, given the potential for further lifetime extensions of some of the existing nuclear fleet. All of these areas bear crucially on the key principles we have highlighted above. (Paragraph 10)

Building a national consensus

9. A clear government commitment to the future role of nuclear power, based on a broad cross-party political consensus, would be necessary for the power industry to be willing to invest in a new programme of reactors. However, market delivery of new build, and the absence of public subsidy and guarantees, would constrain the Government's ability to determine the scope of any new programme. What is more, the way in which it has conducted its Energy Review to date suggests that the Government will have to work hard if it is to gain cross-party and wider public support for its policy decisions. (Paragraph 23)
10. Public opinion on new nuclear build is mixed. Where it is favourable, this is contingent on factors such as the UK reaching a long-term solution to its existing radioactive waste legacy, and the assumption that new nuclear power would be within the context of a range of other low-carbon technologies contributing to the energy mix. Of itself, the Energy Review does not represent a sufficient public engagement on the long-term issues of energy policy. With regard to nuclear power, this would require continuing dialogue both at a national level on wider policy issues, and at a local level on, for example, siting issues. Both approaches are vital for building a national consensus on the Government's energy policy. The Energy Review statement cannot be the Government's final word. (Paragraph 31)

Planning and licensing

11. Evidence that we received stated that the current planning and licensing systems are a significant deterrent for investment in new nuclear power stations in the UK. To overcome this problem, the Government would need to take a more managed approach to the entire regulatory process, including resolving the national debate on nuclear power early on, and through the pre-licensing of generic reactor designs. Whilst we accept that the Government should do what it can to manage the regulatory risks faced by potential operators, we have doubts as to the extent to which it will be able to achieve this. Factors militating against success include its past experience with planning reform, the role of the Scottish planning system, the available skills base, and the extent to which the Government would be willing to close down public debate in order to meet any regulatory timetable, and whether such changes would maintain public confidence. Finally, we note that the issue of planning delays applies to the whole of the energy sector, and is not a concern specific to nuclear power. (Paragraph 53)

Finding suitable sites

12. The siting of a potential new generation of reactors in the UK could be aided by locating them next to existing nuclear power stations. There are possible advantages from doing this with regard to public acceptance, licensing and grid access, although none of these is guaranteed. However, the availability of some of these sites may be affected by rising sea levels and coastal erosion, arising from climate change. As a result, more research would have to be carried out on these potential effects before the industry could proceed. In addition, we are unclear as to how the Government would make existing sites available to the nuclear industry, given that many of them are privately owned. There would need to be a potentially difficult commercial negotiation with the current owner—probably British Energy—before development could proceed. (Paragraph 64)

Choosing the right technology

13. Of the two main reactor designs viable for the UK, neither has yet been built anywhere in the world. There will, therefore, be both technical and cost uncertainties associated with any new nuclear plant, the risk of which could be mitigated by using a single reactor design for all new build. However, in a liberalised electricity market with competing consortia, each vying to build one or more new power stations, there is no guarantee that a single reactor design would be chosen for all new build. To a certain extent investment decisions would be influenced by pre-licensing generic designs, as those so licensed would have a significant cost advantage. Moreover, costs will decrease as each reactor of the same design is built. (Paragraph 73)

Accessing skills and plant

14. The UK's domestic supply chain could meet only a proportion of the skills requirements that a programme of nuclear new build would pose. Although there are considerable concerns with regard to the current shortage of domestic nuclear skills, there are signs of a pick-up in this area. The domestic supply chain could also meet a proportion of the infrastructure requirements of a new build programme. Where there are shortfalls, the global market should be able to fill these gaps, though there are constraints regarding a few important reactor components. The growth in worldwide interest in new nuclear build also means that the relatively small UK market will face fierce competition in accessing skills and plant from other countries. As such, a clear and long-term commitment to nuclear power from the Government would be key both to timely investment in the domestic supply chain and for ensuring the global sector's willingness to engage in the UK market. (Paragraph 84)

Fuel availability

15. As regards fuel availability, demand for uranium is set to increase markedly in the future, with greater global energy consumption, particularly in East Asia. In the short-term we have concerns about the availability of fuel supplies as secondary sources, such as commercial inventories, are used up. However, in the long-run we believe increased prices and global demand will help maintain reliable uranium

supplies, thus not representing a constraint on any new nuclear build in the UK. This provides some reassurance about fuel availability, as it currently seems unlikely that new nuclear power stations would be in a position to use fuel reprocessing to recycle their nuclear waste back into re-usable uranium. (Paragraph 95)

Security and proliferation

16. The importance of security and the risks of proliferation are of the utmost concern to the Government in protecting its citizens. As such, it is vital for the UK civil nuclear industry to adhere to international treaties and uphold the highest regulatory standards. While these considerations should not be neglected in the debate on new nuclear power stations in the UK, we do not believe that such a programme would pose a significant additional security or proliferation risk, although by definition it extends the period of that risk. However, we accept, too, that there are ethical considerations to take account of in this debate, and that the UK's position should not necessarily be determined on the basis of the relative risk any programme would present. (Paragraph 108)

Managing decommissioning and long-term waste disposal

17. Regardless of a decision on new nuclear build, the UK has a significant radioactive waste legacy requiring a long-term solution. Advances in technology mean that the decommissioning of new reactors should be cheaper and simpler. The volume of waste generated would also be smaller—10 new reactors would add only 10% to the existing volume of radioactive waste in the UK—although the radioactivity of this waste would be substantially greater. Moreover, in addition to considering the extent to which new build would increase the UK's future waste problem, the Government must also address the ethics of producing new radioactive waste versus the environmental consequences of not doing so, for example with regard to climate change. (Paragraph 122)
18. Clearly, the more advanced the Government's planning for a long-term repository, the greater will be the certainty of the cost of that solution. Given the current pace of the Energy Review process, the Government appears to be cutting off this possibility. If it decided in favour of a new nuclear programme, it would have to act quickly in taking forward and building on the CoRWM recommendations, for the issue of waste to be resolved by the time investments were being made. This would also be vital for gaining public acceptance of new nuclear build. While we do not believe that this is impossible, the Government would have to prove that it can perform better than previous governments in developing a long-term solution. (Paragraph 136)
19. The nuclear industry told us that a fundamental pre-condition for new nuclear build is that the Government puts in place a strategy for the long-term disposal of its existing radioactive waste legacy. This would not only be in accordance with its existing policy, but would be necessary to gain the support of both industry and the public for a programme of new build. However, successive governments' record to date in delivering a long-term solution has been woeful. The Committee on Radioactive Waste Management's recommendations provide an opportunity to put right this situation, although these should in no way be taken as giving a 'green light'

for new build. Key to finding a long-term storage site will be the active engagement of local communities under the principle of ‘volunteerism’, bearing in mind the need to have clear definitions and processes to allow local communities to decide on the issues. With regard to a long-term storage facility, the waste and decommissioning costs arising from any new build would have to be borne by the operator. This poses risks given it is still many years before a repository will be in place, and hence its potential cost is highly uncertain. (Paragraph 142)

Financing nuclear new build

20. The UK’s liberalised electricity market does not provide favourable conditions for investment in new nuclear build. Nuclear’s high capital cost and long lead times act as a disincentive to investors in a market where the focus is on short-term pay-back and where prices in recent years have been uncertain and volatile. However, the structure of the market, dominated by a small number of large firms with the ability to raise sufficient finance, could be conducive to the delivery of new nuclear power stations were the Government to create the appropriate framework. (Paragraph 150)
21. The Government should set a policy framework that treats each source of energy fairly, letting the market determine the generation mix, based on its own view about the relative risks and costs. Here, ‘fair’ treatment includes areas considered in this Report, particularly the need for a political consensus, a rational and long term carbon allocation, and the planning system. It should also cover the way in which different forms of generation are rewarded in the market. (Paragraph 163)
22. There is a high degree of uncertainty surrounding the cost of nuclear power because of a lack of data relevant to the UK. That which exists suggests nuclear energy may be economically viable in a scenario where gas prices remain high, but we do not feel this is a sufficient basis on which to draw robust conclusions. However, if the Government wishes the market to deliver new nuclear build, we recommend that it should be for the market to decide to what extent it has confidence in its own cost estimates in deciding whether or not to invest. The Government should make it clear that all the costs of building, operating and decommissioning new nuclear power stations will fall to the private sector investors who build those stations. These costs are a concern for investors—not the Government or the taxpayer. The role of Government, in the first instance, should be to ensure that all sources of generation are treated ‘fairly’ within the market. (Paragraph 164)

Pricing carbon emissions

23. If the Government were to support nuclear power on the basis of its contribution to reducing emissions, then it would need to do this within a policy framework that rewarded low carbon technologies. (Paragraph 170)
24. Our predecessor Committee argued on several occasions that the CCL was neither a straightforward carbon tax, nor, because of the complexity of the Climate Change Agreement arrangements, was it a very effective means of encouraging energy efficiency. They felt it detracted from the effort to provide a long-term market-based costing of carbon emissions. So do we. (Paragraph 174)

25. The nuclear industry believes that some form of stable long-term carbon pricing is the only means by which new nuclear build could be funded. We think that a technology-neutral form of long-term carbon pricing is essential if the Government is to achieve its objectives of reducing carbon emissions and allowing the market to determine the precise energy mix. This applies whether the Government decides for or against new nuclear build. The current EU ETS does not provide an adequate mechanism. There are various ways in which the Government could provide a long-term price for carbon, including carbon contracts and fixed price guarantees. Of these, we are attracted by the proposal of auctioning long-term contracts for future reductions in carbon emissions as a means of creating the incentives for investment in all low carbon technologies. We note that the Government is already beginning to accept the principle of this through the auctioning of allocations in Phase 2 of the EU ETS. (Paragraph 185)

Is nuclear power low carbon?

26. There are some carbon emissions associated with the life-cycle of nuclear power stations, as there are with some renewable sources of electricity generation. However, nuclear power can still be considered a low carbon energy source on a par with hydroelectricity and wind power. The contribution nuclear power can make to the carbon reductions required to meet the Government's 2050 objective is relatively small. However, this reflects the scale of the challenge faced and the fact that electricity generation, though significant, is only one source of carbon emissions: space heating and transport emissions are of at least equal importance. The extent to which this should matter to the Government, with regard to nuclear power, depends on its determination to create a low carbon economy, and whether it believes other low carbon technologies or energy efficiency can fill the gap left by closing nuclear plant, which otherwise would almost certainly be filled by gas-fired generation. (Paragraph 194)

Nuclear power v. energy efficiency and renewable power

27. The Sustainable Development Commission argued that further nuclear power would send out a message to energy consumers that the Government has plugged the 'energy gap'. In so doing, this might reduce the incentives to cut electricity demand. Whilst we agree that this is a risk, we note that the promotion of energy efficiency should take place through separate policy instruments that seek to raise consumers' awareness of the carbon impact of their energy consumption, and also, for example, through regulation of building standards. In addition, we note the need to take action on energy efficiency across the whole of the energy sector, including in the transport and heating sectors—not just for electricity. The general public is unlikely to support new nuclear power stations unless they are part of a wider strategy that also encourages renewable energy and energy efficiency. There is a risk that a Government focus on new nuclear build would distract from efforts in these two areas. To prevent this, it would have to ensure that nuclear power did not receive preferential treatment, either in the planning system, or in a long-term carbon pricing mechanism. It would also have to demonstrate a genuine political

commitment to these two means of reducing carbon emissions in building a long-term national consensus for its energy policy. (Paragraphs 198 and 199)

Impact on the electricity grid

28. The UK has a centralised electricity grid network, although growth in renewable energy and, in the future, microgeneration are beginning to challenge this approach. We were told by National Grid that a new nuclear programme aimed at doing no more than replacing existing capacity would not act to prevent the further development of decentralised generation. The siting of new nuclear plant, whether near existing nuclear sites or not, will affect the level of investment required in upgrading the transmission network, which could be in the range of £850 million to £1.4 billion—these are costs that will have to be met by developers, thus influencing their investment decision. (Paragraph 205)

Will there be an ‘energy gap’?

29. The apparent urgency of the current Energy Review seems to be predicated on the assumption that the country faces an imminent crisis. We agree that some generating capacity, such as the remaining Magnox power stations, will certainly be decommissioned in the coming years, and that the replacement of this poses a challenge for the market. However, whilst we acknowledge that it would not be sensible to presume lifetime extensions for all of the remaining nuclear fleet, equally it would not be prudent for the Government to make long-term policy decisions on the future energy mix in haste, and without full consideration of the evidence, simply because it has assumed that this capacity will certainly not be available. Indeed the fact that British Energy has begun to evaluate possible extensions for two of its reactors suggests the company believes there is a chance that they will carry on operating. We consider that a full and proper assessment of the projected future generating capacity should have been conducted to inform debate before the Government undertook its Review. (Paragraph 212)
30. There is a possibility that a proportion of the UK’s existing nuclear power stations may receive life extensions over the coming years. If this is the case, then the potential ‘energy gap’ faced by the Government will not be as severe as that which the current Energy Review assumes. Whilst we accept that the long lead time on nuclear build requires a decision soon if new capacity were to come on stream before the end of the next decade, we question the haste with which the Government is seeking to conclude its current Review, especially given the short timeframe it has allowed for consideration of certain key pieces of evidence. Changes in the energy mix, such as increased wind power and potential new nuclear build, will in the future increase reserve capacity requirements. Developments in this area will require close monitoring by the Government and Ofgem as, if there is any sign of market failure, a swift policy response—perhaps in the form of some capacity payment—will be necessary. (Paragraph 216)

Formal minutes

Tuesday 4 July 2006

Members present:

Mr Peter Luff, in the Chair

Roger Berry	Miss Julie Kirkbride
Mr Brian Binley	Judy Mallaber
Mr Peter Bone	Anne Moffat
Mr Michael Clapham	Mr Mike Weir
Mrs Claire Curtis-Thomas	Mr Anthony Wright
Mr Lindsay Hoyle	

Draft Report (New Nuclear? Examining the issues), proposed by the Chairman, brought up and read.

Ordered, That the Chairman's draft Report be read a second time, paragraph by paragraph.

Paragraphs 1 to 216 read and agreed to.

Resolved, That the Report be the Fourth Report of the Committee to the House.

Ordered, That embargoed copies of the Report be made available in accordance with the provisions of Standing Order No. 134.

Ordered, That the Appendices to the Minutes of Evidence taken before the Committee be reported to the House.

[Adjourned till Monday 10 July at 2.00pm]

List of witnesses

Monday 6 February 2006

Rt Hon Alan Johnson MP, Mr Paul McIntyre, Dr Daron Walker and Mr Richard Abel,
Department for Trade and Industry Ev 1

Tuesday 16 May 2006

Professor Jim Skea and Professor Robin Grimes, **UK Energy Research Centre** and Dr
William Nuttall and Professor William Gelletly, **Institute of Physics** Ev 14

Mr Keith Parker and Mr Simon James, **Nuclear Industry Association** and Mr Robert
Armour and Mr Paul Spence, **British Energy** Ev 24

Tuesday 23 May 2006

Sir Jonathon Porritt and Ms Sara Eppel, **Sustainable Development Commission** Ev 33

Tuesday 6 June 2006

Professor Keith Palmer, N M Rothschild Ev 46

Dr Paul Golby and Mr Colin Scoins, **E.ON UK** and Mr Vincent de Rivaz and Mr Denis
Linford, **EDF Energy** Ev 55

Tuesday 13 June 2006

Dr Dieter Helm Ev 63

Mr Clive Bates and Mr Joe McHugh, **Environment Agency** and Dr Mike Weightman
and Mr Les Philpott, **Health and Safety Executive** Ev 71

Monday 19 June 2006

Mr Roger Brunt, CBE and Mr Bryan Reeves, **Office for Civil Nuclear Security** Ev 81

Professor Gordon MacKerron, **Committee on Radioactive Waste Management** Ev 90

Tuesday 20 June 2006

Mr Alistair Buchanan and Mr Steve Smith, **Ofgem** Ev 98

List of written evidence

The written evidence is published as a separate volume, HC 1443

1	ABB Ltd	Ev 1
2	Airtricity	Ev 4
3	Association for the Conservation of Energy	Ev 7
4	Atomic Energy of Canada Ltd AECL	Ev 14
5	British Energy	Ev 21
6	British Energy	Ev 28
7	British Energy	Ev 30
8	British Energy	Ev 31
9	British Energy	Ev 32
10	British Energy	Ev 32
11	British Nuclear Fuels plc	Ev 35
12	Chemical Industries Association	Ev 40
13	Coal Authority	Ev 42
14	Coalpro	Ev 44
15	Coalpro	Ev 45
16	EDF Energy	Ev 54
17	EDF Energy	Ev 64
18	Energy Information Centre Ltd	Ev 65
19	Energy Saving Trust	Ev 69
20	Environment Agency	Ev 69
21	Environment Agency	Ev 75
22	E.ON UK	Ev 76
23	E.ON UK	Ev 81
24	E.ON UK	Ev 82
25	E.ON UK	Ev 84
26	ExxonMobil International Ltd	Ev 85
27	Friends of the Earth	Ev 88
28	GML Limited	Ev 95
29	Greenpeace	Ev 100
30	Health and Safety Executive	Ev 100
31	Dr Dieter Helm	Ev 113
32	Institution of Electrical Engineers	Ev 115
33	Institute of Physics	Ev 119
34	Melissa Lindsay	Ev 122
35	Dr David Lowry	Ev 122
36	Micropower Council	Ev 140
37	National Grid	Ev 142
38	Nuclear Industry Association	Ev 152
39	Nuclear Industry Association	Ev 158
40	Nuclear Industry Association	Ev 159
41	Office for Civil Nuclear Security	Ev 161

42	Ofgem	Ev 162
43	Ofgem	Ev 164
44	Ofgem	Ev 165
45	Professor Keith Palmer	Ev 166
46	Royal Society for the Protection of Birds	Ev 172
47	RWE npower	Ev 175
48	RWE npower	Ev 178
49	Scottish Power	Ev 179
50	Shell UK	Ev 180
51	Ambassador Keith C. Smith (ret'd)	Ev 183
52	Professor Jonathan Stern	Ev 187
53	United Kingdom Atomic Energy Authority UKAEA	Ev 193
54	UK Coal	Ev 196
55	Nigel Yaxley	Ev 201
56	RWE npower	Ev 202

Oral evidence

Taken before the Trade and Industry Committee

on Monday 6 February 2006

Members present:

Peter Luff, in the Chair

Roger Berry	Judy Mallaber
Mr Michael Clapham	Rob Marris
Mrs Claire Curtis-Thomas	Mr Lindsay Hoyle
Mark Hunter	Mr Mike Weir
Miss Julie Kirkbride	Mr Anthony Wright

Witnesses: **Rt Hon Alan Johnson**, a Member of the House, Secretary of State for Trade and Industry, **Mr Paul McIntyre**, Head of Energy Review Team, **Dr Daron Walker**, Energy Policy Project Director and **Mr Richard Abel**, Domestic Energy Markets, Department of Trade and Industry, gave evidence.

Q1 Chairman: Welcome to this initial session in the Committee's inquiry into scrutiny of the energy review. May I ask you to begin by introducing your colleagues for the record?

Alan Johnson: I certainly shall and it is a great pleasure to be here. On my far left is Richard Abel from the Domestic Energy Markets, on my left here is Paul McIntyre who is heading up the energy review team and on my right is Daron Walker, Project Director on energy.

Q2 Chairman: Thank you very much indeed. As you know this is primarily about the energy review process itself, *Our Energy Challenge*, though some topical events have also occurred over the weekend which will feature in our questioning. Why do we need this review? Did the 2003 review not duck the issues?

Alan Johnson: I was going to make a couple of comments for the record at the start, but the 2003 review did not duck the issues. The 2003 energy review in itself said that all these issues needed to be kept under close scrutiny and, actually, if you read parts of it, said that there may be a need for fresh documentation as we go along. What the Energy White Paper did in 2003 was rightly concentrate on building up a renewables market, which was non-existent at the time, and concentrating on energy efficiency. If they had done anything other than leave the door ajar on nuclear—did not close it, did not open it—all the focus would have been there rather than on renewables. Now the situation has changed even in that short time span: North Sea gas is running out more quickly than we expected; new technology has advanced more dramatically than we expected, particularly on clean coal technologies like carbon capture and storage; we also have a geopolitical situation around the world where security of supply is perhaps more of an issue now for all countries, not just the UK, than it was a few years ago.

Q3 Chairman: You had something you wanted to say by way of introduction.

Alan Johnson: Just a brief statement in opening. In November the Prime Minister and I asked Malcolm Wicks to lead a review of UK energy policy. On 23 January we launched a public consultation, the start of a wide-ranging and thorough energy review. The review will look at what further measures might be needed to tackle climate change and ensure secure and affordable energy supplies in the UK for the long term. The review is based firmly within the market framework and policy goals set down by the 2003 Energy White Paper, namely: to put ourselves on a path to cut the UK's carbon dioxide emissions by some 60% by around 2050, with real progress by 2020; to maintain the reliability of energy supplies; to promote competitive markets in the UK and beyond; and to ensure that every home is adequately and affordably heated. The challenge we face is starker than ever. Climate change is a reality which no country can now ignore. North Sea gas production has declined faster than previously projected and we are now a net importer of gas; we shall become a regular net importer of oil by around 2010. Our transition to being a net importer comes at a time of heightened concerns about energy security around the world. By 2020 the UK is likely to see decommissioning of coal and nuclear plants which contribute around 30% of our generating capacity and projected prices for long-term fossil fuels are now higher than they were at the time of the 2003 energy review. So the time is ripe to review our progress against the four energy policy goals that I have mentioned and, if necessary, to take steps to ensure we stay on track. There are no foregone conclusions in this review and we know there is no single solution. The review is not about the short term. However, I do recognise the need for learning lessons from this winter as we assess risks for the long term and the need for any further action. May I say that I very much welcome this Committee's very useful and constructive recent reports on fuel prices and security of gas supply? We are at the early stages of the review, but I look forward to the Committee's help and advice in addressing the important questions being examined.

Q4 Chairman: And we were grateful for the very constructive response you made to our first report on gas; thank you very much indeed for that as well. What your initial answer to my opening question suggests is that this is indeed not a review really about energy efficiency and renewables, it is actually focusing on the nuclear question, is it not?

Alan Johnson: No, and I am sorry my response gave that impression. No, it is not focusing on nuclear. Indeed, we have gone to great pains to say, exhaustively, that this is not focusing on nuclear. The whole team and where it has been drawn from, in terms of representatives including from the Department for Transport, Defra, and ODPM, is looking at our energy policy *per se*. It is not a review of nuclear. Nuclear is a part of our review.

Q5 Chairman: Let us look at that team. This review is being conducted by an inter-departmental group of civil servants based largely, if not exclusively, in the DTI. Is that right?

Alan Johnson: Yes.

Q6 Chairman: The 2003 Energy White Paper was a much more extensive process, with lengthy consultation, committees of experts, a much more open and time-consuming process. Why do you think a team of civil servants, for whom I have the highest personal regard of course, working to a much tighter timetable can do as good a job as that last process?

Alan Johnson: Because it is not a 2006 Energy White Paper. It is a review, building on lots of the analysis and the information that guided the 2003 White Paper, lots of analysis which has come since. We are not trying to recreate the 2003 White Paper. Indeed, as I said in my opening statement, we are taking forward the policy which was set out in 2003 and it is useful to have a review to look at that again and, yes, whereas in 2003 we could leave the door ajar on nuclear, I believe that now, as part of this review, we have to decide whether to close it or open it.

Q7 Chairman: What will the output be from this new process? What will you actually do at the end of it?

Alan Johnson: Produce proposals.

Q8 Chairman: In what form?

Alan Johnson: I do not know what form yet. We said in 2003 that if we were to go down the nuclear route, we would publish another White Paper, so if we were going to go down that route, we would need to keep to that promise that we made in 2003. If we are not going down that route, then there will not be a need for a White Paper in that context. We should have to see the result of the review and it is a very sensible process to take. Let us see what conclusions emerge, what proposals we shall be making and let us then decide whether that needs to have a White Paper, Green Paper, another form of consultation.

Q9 Chairman: But your aim will be a statement to Parliament before the summer recess?

Alan Johnson: Our aim would be to conclude this by the end of summer, which in parliamentary terms can stretch to about January of the following year.

Q10 Chairman: Seriously?

Alan Johnson: We very seriously want to keep to late summer.

Q11 Chairman: So it may well be October before Parliament has a chance to look at this?

Alan Johnson: We are going to try to keep very focused on this. We want this to conclude by the late summer.

Q12 Chairman: I was quite struck by the list of other government reviews running in parallel to this review process. They are listed on pages 14 and 15 of the review document. How can you take the conclusions of all these various reviews on some very important issues—on climate change, energy efficiency, carbon capture and storage, land-use planning, radioactive waste management and so on and so on—into full account during this relatively short timescale for such a big consultation exercise?

Alan Johnson: Well we can and those other reviews are very necessary in doing different things. For example, we had the energy efficiency innovation review that Defra ran last year. As a result of that, and stemming from the 2003 White Paper, we are due to produce a report on micro-generation in April, which we shall do. We have the Stern review, which is not looking, as we are looking, at the domestic situation for the UK, it is looking at the whole international situation and the economics of climate change on an international basis. The Stern review will be working very closely with what we are doing, so there will be cross-pollination, so to speak. One of the other reviews is the HSE review specifically commissioned by this review to look at various aspects of energy and to help to inform our review. As for the final point about the Committee on Radioactive Waste Management, CoRWM, which is due to report finally around June or July, they are due to produce their emerging conclusions, not just an interim report, but their emerging conclusions around about March/April and that will be a very important contribution to this review. There is not any duplication going on here and certainly the reason why we have drawn this review team so widely is so that we can keep in touch with all the other developments.

Q13 Chairman: We shall see how successful you are in achieving that objective. One last process question from me before we get to questions of more substance. I was quite struck by the last sentence of the document, annex C "... a more complete presentation of and consultation on DTI projections, including fossil fuel prices assumptions, will be published shortly". Now what is "shortly" and is this not absolutely a central key piece of knowledge which we need to reach judgments on the review process?

6 February 2006 Department of Trade and Industry

Mr McIntyre: May I answer that? The summary is actually in annex C and the fuller report, which I hope we shall produce from the DTI later this month, will be built around these same numbers; so the essential numbers are already here.

Chairman: Right; so no significant changes to the numbers in annex C are anticipated, just more detail.

Q14 Rob Marris: As you will be aware, the whole question of energy is very, very broad. The consultation document, somewhat frighteningly for me, says "... even if we had a completely carbon-free generation mix but took no measures in other sectors, we would fall short of our 2050 target", that is the target to cut CO₂ emissions by 60%. You said today that this energy review is "not focusing on nuclear" and you also said "we are looking at energy policy *per se*". On a rough calculation, a third of the consultation document is on one relatively narrow area, albeit very important, which is the generation of electricity; not just electricity but the generation of it. That would suggest to some of us that there is quite a focus on the possibility of nuclear there, if a third of your document is on one smallish area. What is your response to that?

Alan Johnson: You would be wrong in drawing that assumption. If you look at chapter three, we say an awful lot there about transport and heat, which are the other two elements of this. Yes, a preponderance of the document is around electricity generation, but that is a major aspect here; not that transport and heat are not as important, they are mentioned in the document and they are a part of this review. In electricity generation, it is not just about nuclear, it is about the objectives we set in 2003, it is about climate change in particular and it is about security of supply.

Q15 Rob Marris: But you are talking about one chapter, chapter three on space heating and transport, both of which use roughly a third of our energy and there is some space heating by electricity, but most of it is not. Do you not think there is an imbalance in the consultation document on this?

Alan Johnson: There are three chapters and if that covers a third, then that is just about right.

Q16 Rob Marris: So you are satisfied the balance is right?

Alan Johnson: Yes.

Q17 Chairman: I just want to be absolutely clear on this, because I do have a concern that industry may be asked to pay too much of the burden in climate change issues; the domestic sector and transport sector have huge contributions to make as well. They will be a firm feature of your conclusion.

Alan Johnson: A very large feature, yes.

Chairman: Thank you very much indeed. We now turn to the question of gas.

Q18 Mr Hoyle: Obviously, as you will quite rightly expect, consumers feel hard done by at the moment. They feel that they have taken a caning over gas

prices and, to be quite honest, they are shell-shocked, if the press are to be believed, at a further 25% increase. Critics will say that the gas industry has let them down with their failure to invest in the long-term energy needs of the UK and some would ask why the Government has not intervened to ensure that that took place.

Alan Johnson: First of all, there is speculation about gas price increases and it is certainly the case that the increases in the wholesale gas prices are likely to feed through in some respect to retail. That is not just a problem here, it is a problem in every other European Union country and it is a much wider problem as well. Gas prices in Germany have increased by 75% over the last year. Are domestic customers entitled to be concerned about this? Of course they are. Of course they are entitled to be concerned, but are they entitled to draw the conclusion that Government ought to intervene or that in some way we are not being well served by the market? I should not agree with those last two comments. First of all, in terms of government intervention, the review is looking long term. I have not met anybody in terms of short-term issues who has suggested that the Government ought to step into the market. There are people who have said the Government should do more in terms of storage capacity, they should do more to deal with that aspect of rising price increases which are not due to the tightness of the gas supply in this country and that is right. However, 50% of the price of gas is due to the doubling of the price of oil and not many people think that the UK Government have an intervention here that could have resolved that. The majority of customers recognise that actually the market has been good. In terms of domestic gas prices, I believe we are still at the level in real terms of gas prices in 1988 and we are certainly below domestic gas prices in the rest of Europe where they have not had the same level of liberalisation. Domestic customers need to understand more perhaps; we need to do more and Ofgem need to do more to explain the benefits of the market, that is that they can change suppliers. Ofgem put out a news release recently to show the kind of savings which can be made, on average £46 per consumer per year, through changing their supplier and making that market work for them. You are absolutely right about the concern about prices, but to put that in a context of saying we should be better off if we went back to state-owned monopolies would not be a sensible conclusion.

Q19 Mr Hoyle: That is not what we are saying. What we are actually asking is whether the Government should have forced companies to invest in the long-term energy needs of consumers in this country. That is the problem: it is their failure which has also ensured that prices have gone up. We all know that when maintenance has taken place on rigs, it all seems to have taken place at the same time in order to force the price up, in order that the loser at the end of the day was the consumer. Unfortunately, whether we like it or not, we do know that British Gas have refused to comment on whether it is

correct that a 25% increase is coming. It is that worry and quite rightly, as you say, it is important that we ensure we have warm homes, but we shall not be able to have warm homes with price rises like this. That is the great worry for the public out there. I just wonder what the Government can do to force the issue to ensure that we do plan for long-term energy needs, but also, more importantly, that we have long-term price structures in place. Being so self-sufficient in gas and allowing so much gas to go into electricity generation has been the failure and the householders, the consumers and industry have come second in gas needs and therefore the price has gone up substantially. That is presumably part of the issue that we have to face up to in the review.

Alan Johnson: Yes, it is for the long term, but I just repeat that prices have been historically low, incredibly low, and domestic consumers have really benefited from that and so have industrial consumers. In terms of why we are in the situation we are this particular winter, about 50% of the price is because gas prices are tied to oil prices. There is no law of gravity that connects them.

Q20 Mr Hoyle: Should they be separated?

Alan Johnson: They should be separated and liberalisation will separate them by a natural process. Another 25% of that increase is probably caused by the point you made: not enough foresight to see that we would need more facilities for gas this particular year. That was not done deliberately. We have debated this in Parliament. All of the experts said that the UK Continental Shelf would run down, we should become a net importer of gas by 2006 and it happened much earlier than anybody predicted. It would have been foolish to build great storage capacities when we had reserves. Norway has no storage capacity because it has reserves and they certainly did get it wrong; everybody got it wrong. I do not think there was anything deliberate in that to drive up prices.

Q21 Mr Hoyle: When can we look forward to the decoupling between oil and gas and quite rightly because we both know that is half the problem causing the price to be so high? Do you see that short term or long term?

Alan Johnson: Medium term I hope.

Q22 Miss Kirkbride: You just said that by shopping around consumers could save £46 a year off their bill. Given that average family household bills are going to be around £1,000, would that really show a great level of competition?

Alan Johnson: Actually I am not sure whether that is £46 per year or £46 per month; it may well be monthly. I am going by the Ofgem press release, so we will get back to you on that.

Q23 Chairman: Quite a big difference; £500 or £40 is quite a big difference.

Alan Johnson: The point Ofgem are making is that there are potential savings to be made by shopping around and we became used, in this country, certainly I speak from my own experience, to one

supplier and you think that is the only supplier you can ever have and although there has been a liberalised market for a long time, people still tend not to take advantage of that in terms of getting a better deal on prices. The £46 is annual.

Q24 Miss Kirkbride: So not a lot to be done by shopping around.

Alan Johnson: It is a saving.

Q25 Roger Berry: In the consultation document we are told that to meet our fuel poverty targets 1.1 million households will need to be removed from fuel poverty by 2010 through a policy intervention. That is only four years away. What policy intervention do you have in mind?

Alan Johnson: This is one of the most worrying aspects of rising prices, because we have taken four million out of fuel poverty and because prices are going up it is bound to slip back. The Chancellor announced in his Pre-Budget Report an additional £300 million to tackle fuel poverty which, together with the other available resources that were announced in the spending review of 2004 means there is over £800 million available. The kinds of market interventions or the kinds of support we can give are: the winter fuel allowance, which the Chancellor also announced would be there for the rest of this Parliament; initiatives like the Energy Retail Association's Home Heat Helpline which gives vulnerable customers a one-stop shop to which they can go to get advice on energy efficiency measures, payment advice, benefit entitlements, which would also help of course; the Warm Front campaign and other associated initiatives where there is a huge benefit in somebody visiting somebody's home, not always pensioners. There is a point about other vulnerable groups as well which I know this Committee made in their last report, but for pensioners in particular, the Pension Service will go to pay a visit and at the same time as sorting out entitlement to pension credit or savings credit and other benefits, they will also ensure that they have insulation in their home, that they have facilities to make the heating that they do have go further and that has been enormously successful. We need to do more of that. We need to get to more people through those kinds of initiatives. That is the kind of policy intervention.

Q26 Roger Berry: The Committee has drawn attention to the fact that there are non-pensioner households which are vulnerable in terms of fuel poverty and households with disabled or ill members and in your response to our last Committee report, you did accept the Committee's recommendation that tackling fuel poverty in households containing someone who is disabled is a very important element. Could I tempt you to go slightly beyond that and at least make a commitment to consider the possibility that winter fuel payments may, in specific circumstances, be a very effective way of helping those who are under 60 who suffer from high fuel prices, particularly disabled people?

6 February 2006 Department of Trade and Industry

Alan Johnson: What we pointed out in our response was that fuel poverty would be an important area for the review, particularly the aspect which you have raised, which is vulnerable groups such as the disabled. We have seen the statistics change dramatically for families with children and the elderly. It is disabled people that we need to concentrate on and we said we would look at that in the review.

Q27 Mark Hunter: You will be aware that a lot of concern has been expressed over the hike in energy prices, both those which have already happened and indeed those forecast to happen. One of the key areas of concern is how it impacts on fuel poverty particularly for older people. You will probably have read this morning in the national press the comments of the Director General of Age Concern, who pointed out that older people and those on fixed incomes are hit hardest by energy price increases. He said that the choice facing many older people is likely to be between heating and eating. What would your comment be on that? Do you think that is scaremongering or do you think that is accurate?

Alan Johnson: No, I do not and that is why when we came into government in 1997 and we found five million people in fuel poverty making that choice between eating and heating, we made it an absolute priority. We have taken 4.1 million out of fuel poverty and that is a great achievement but, because the definition of fuel poverty is that you are spending 10% or more of your income on fuel, then rising prices are bound to bring more people into fuel poverty and a figure of one million is not unrealistic. We have to redouble our efforts. That is why Gordon Brown made his announcement in the Pre-Budget Report about extra resources being available. That is why we now have more than £800 million available. That is why with the winter fuel allowance, £200 for the over-60s, £300 for the over-80-year-olds, the Warm Front scheme and other initiatives, we need to redouble our efforts to ensure that these most vulnerable domestic consumers receive help and support.

Q28 Mark Hunter: Do you think those measures will be adequate, if the forecasts are to be believed and average households will be facing energy bills of £1,000 a year?

Alan Johnson: We have to have adequate measures available; that is what we are committed to.

Q29 Mr Clapham: Just following on the questions that Lindsay was asking, one of the things that the energy review is concerned with of course is ensuring that we have efficient supplies of energy and what further the Government can do to determine that. It seems that much of the information which is being put out to consultation is really placing the focus of reliance merely on gas imports. Are there any other adjustments that you can see being made to the market framework of the gas market, that are going to be necessary and essential to ensure reliance?

Alan Johnson: Yes and they follow on with our forecast of what is going to happen on gas. What we are saying here is a mixture of EU directives focusing on emissions from coal-fired power stations, together with the decommissioning of nuclear power stations means that by 2020 we shall have lost 30% of our energy supply from those areas, from coal and nuclear. That would mean, if they were replaced by gas, that we would be reliant to the tune of around 80% on imports for our gas. So the questions we pose and the questions we ask during this consultation are: given the geopolitical situation around the world, given that we shall not be able to take that from our own resources, from the UK Continental Shelf—which puts us in exactly the same position as other G7 countries except Canada: there is nothing new, indeed we were a net importer until 1998 and we have only been a net exporter between 1998 and 2003—given that that is the situation, given some of the developments in the world, is that satisfactory, are we comfortable with that? That brings us on to the issue of diversity because for security of supply you need to look to see how diverse your energy mix is. For instance coal, which you may or may not be particularly interested in—I am just making a guess here—can have a bit of resurgence here. It would have been nowhere in the mix, because to get to 60% reduction in emissions by 2050, coal, with twice the CO₂ emissions of natural gas, would have been nowhere in the mix but clean-coal technology now adds a whole new dimension to this debate. That is why coal is going to be a central issue as part of the whole energy mix in this review.

Q30 Mr Clapham: So other adjustments do need to be made. Given that there are some concerns about the amount of gas that we do burn off in power stations, we are talking in terms of 40%, is it possible that you may, within the context of the review, look at ring-fencing the various proportions of energy mix into the market?

Alan Johnson: It is a question you have asked me before on the floor of the House. The review will come out with the conclusions that it comes out with. I find it difficult to comprehend that there would be a strict ring-fencing around each particular part, because that would interfere with a properly functioning market. That is obviously going to be the contribution from Barnsley West to the review and we shall look at it, but I just find it difficult to think that it will be there in our final recommendations.

Q31 Mr Clapham: So will it all be down to the market?

Alan Johnson: All down to the market, but with the very important caveat that we do things like the Renewables Obligation. The Renewables Obligation says that electricity generators must generate 15% of electricity by 2015 from renewables. Government can push policy, particularly on climate change, in the areas that it wants to push it towards. That is a different thing completely from putting our size 16 hobnail boots in and stepping into the market as we have seen in some other countries. There is a very

good example, which you ought to have a look at, I think it was Toronto, it was an area of Canada that famously interfered in the market six years ago and they are living to regret it because of the results.

Q32 Mr Wright: We are all very fine, according to this document, up until 2015 when we are talking about the ten-year plan. What really has not been looked at is what happens after 2015. Chart 13 on p 36 quite clearly shows that with the supply increasing, after 2015 it starts to decline. By 2020 we are going to be reliant on 90% of our gas coming from other areas. What projections have been made after 2015?

Alan Johnson: There are projections. There are two things about this diagram. This is about gas. First of all, demand there is based on demand as we see things at the moment with the Renewables Obligation, with nuclear being gradually decommissioned *et cetera*. It also does not take enough account of energy efficiency. This is a really big issue about how we can concentrate on energy efficiency to tackle a major part of this problem. Within that caveat, that is the first thing, that demand level may or may not come about, and it is very much for the review to look at 2010 and beyond. On the other issue, I do not know whether we have projections beyond 2015. We must have projections beyond 2015 but just before Paul says something about that, the point you will notice here is, if you draw a line up from 2005–06 up to the line, that you will see our problems this winter and you will see how gas from the Netherlands in particular and the LNG imports into Milford Haven *et cetera* make the situation much better after next winter. We have another tight winter next year. It is precisely because of an unclear picture further down the route that we are setting up the energy review, but whether we have projections beyond 2015, I am not sure.

Mr McIntyre: We have done some projections up to 2020 and they are reflected in other bits of the document, a number of scenarios for the energy mix up to 2020. During the review one of the things we shall want to do is extrapolate forward up to 2050, so we also have some basis for looking at that longer-term period as well.

Q33 Mr Wright: In response to this, obviously we are looking at the question of the infrastructure needs to bring this gas ashore for our use. You mention within the report possible significant non-commercial barriers to infrastructure development or operation. What do you have in mind there?

Alan Johnson: Planning and planning consents, which was projected by one commentator as being the major reason why we have a problem this year. I do not think that is right. As far as we can find out, only one planning consent has been refused that would have added 3% to our gas supply this winter. For the future, and certainly when you look at issues like renewables and the transmission system and how it gets into the national grid, you need to look at planning. There is the Barker review which was

announced in the Pre-Budget Report, to which we have added the dimension of energy. That is the major issue that we are considering.

Q34 Mr Wright: Is that a short-term issue that you have a problem?

Alan Johnson: It is a short-term issue and there might be other ways to tackle it in the short term. However, given that this review is about the long term, feeding on the result of the Barker review, we should like to see how we can deal with some of those issues, if we can deal with them. They are some of the issues that companies and businesses, renewables businesses in particular, have said to us are a major barrier.

Q35 Mr Wright: Just very briefly on the question of the gas. You mentioned the problems that we have up until next year. Is it not going to be a problem that we may well create a dash for gas straight after 2006–2007?

Alan Johnson: I do not think there will be a problem about a dash for gas. Our problem at the moment is having gas to dash to; it is having the supply system right so we can get the equilibrium right as we demonstrated in that chart. Dash to gas was a particular phase; we have tried to encourage a dash to renewables and we are now up to 4%; 2004 was a record year. When we get the figures for 2005, it will be better still. If we can get some of these transmission problems sorted out and some of the barriers, we can improve on that even further. It depends how you define a dash for gas, but, as I said in answer to the previous question on whether we should be comfortable with 80% reliance on gas, the answer would probably be no, not comfortable.

Q36 Mr Wright: You mentioned the question of the storage facilities that we have. Did you say 90%?

Alan Johnson: I am not sure what storage facilities we have now in percentage terms.

Q37 Mr Wright: The ones which are being planned and actively developed. The report says “if they all went ahead”. What would be the “if” within that concern which you have?

Alan Johnson: There are always “events, dear boy, events” waiting around the corner on these things. However, if everything goes to plan, we have the new LNG terminal at the Isle of Grain now, we have doubled the capacity of the Belgium/GB gas Interconnector—and the fact that it is not coming through as well as might is being examined by the European Commission—we have a new storage facility at Humbly Grove in Hampshire, we have three projects expected to be commissioned in 2006, one of which is very close to my constituency, the Langed pipeline importing Norwegian gas to Easington, the further upgrade to the existing connector and the very important BBL line connecting with the Netherlands. It goes back to what we were just talking about. They have to get specific planning permission, that all has to go ahead and there are commercial considerations which could affect storage projects. These are not

6 February 2006 Department of Trade and Industry

government-run, centrally determined Stalinist facilities going up around the country; it depends upon the commercial climate. That is the kind of caveat, that is the big “if”, but certainly nothing has happened that has led us to expect that these will not ahead as planned.

Q38 Mr Wright: So you are reasonably confident that they will.

Alan Johnson: Yes, we are

Q39 Chairman: There is a requirement on oil companies for a strategic reserve of oil, is there not? There is no such requirement in the gas area, is that correct?

Alan Johnson: There is no requirement for gas, no.

Q40 Chairman: Is that something you are considering as part of this review?

Alan Johnson: It is something that was raised with us, because that is the case in America. I believe they have a strategic gas reserve, so we have said that the review ought to look at that.

Q41 Roger Berry: On the question of the projections in chart 13, how good has the DTI been at projecting supply and demand in the past?

Alan Johnson: Excellent, I should like to say.

Q42 Roger Berry: Sadly the premise here of course is that you underestimated how rapidly we should become net importers. That is the kicking-off point for much of this consultation. On the margins of error on chart 13—it is a serious question—are we talking about plus or minus 15% for each of them, or 5% or what? I am just curious.

Alan Johnson: We were not far out on demand and we were not far out on what would come in from the Belgium/GB Interconnector which we worked very hard on. We realised the need to get liquid natural gas in. The one area there which went down more quickly than we expected was the UK Continental Shelf. In terms of other projections that we have made before that we might be embarrassed by . . .

Mr McIntyre: Just on that one, outside commentators were making rather similar projections to the Government earlier in the decade. I am not sure that we were very far out of line in terms of the projections we were making about when we would become a net gas importer.

Q43 Roger Berry: I wanted to ask about the European markets. The consultation document points out that one factor in recent price rises has been our interaction with Europe and it gives the European Commission quote about serious malfunctioning of markets in Europe and we have heard all of this before. We have in the UK realised that there is an issue here about inadequate liberalisation in Europe. The document goes on to talk about the lack of liberalisation and also implications for the UK’s reliability of supply. We had the UK presidency for six months. From

reading the consultation document, the only thing I can spot that came out of that was a thorough debate at the Energy Council. Am I being unkind?

Alan Johnson: Yes.

Q44 Roger Berry: In which case I should love to be corrected, because I want to be fair to everyone all the time.

Alan Johnson: When there is a situation that other EU Member States are not putting EU policy into practice, it takes more than six months to sort that out. What happened at the Energy Council in December was that Malcolm Wicks raised this at the Energy Council from the chair, all 25 Member States agreed. The first problem would have been if there had been an argument about the need for liberalisation. There was not. They all agreed. We had a Commission and a Commissioner who were particularly vehement about tackling this problem and, as a result, we have three inquiries going on. We have the big one, that is the inquiry by the Commission into the situation in the rest of the European Union as to why they are not being liberalised as quickly as they should be. We have the inquiry into the reasons why gas was not flowing through to the UK, which could have had a price of 180p per therm when we hit the huge peak just before Christmas, why it was not arriving. That is another cause of an inquiry and there is another investigation which the EC has agreed to initiate into whether abusive behaviour or distortions in the European market may be causing short-term volatility in the UK gas market. So those three areas were as a result of us raising this issue very firmly during our presidency. It will take time, just like liberalisation of other markets in the EU has taken time.

Q45 Roger Berry: The obvious question is: do you believe that there is the political will to deliver on gas market liberalisation in Europe or are these three ways of kicking it into the long grass? Is your candid assessment that things will happen and if so, what kind of timescale are we talking about?

Alan Johnson: It is my candid assessment that things will happen and they will happen pretty quickly and they will happen much more quickly after the events over Christmas with Gazprom. Forty per cent of Germany’s gas supply comes from Russia. Europe as a whole, I am not sure of the statistics, has a big dependency. We do not have any dependency on Russian gas at the moment. In terms of the trauma that went round about security of supply and about the things that could happen in the European Union, breaking up large state-owned monopolies which are used as political tools has to be a major, major priority of the European Union.

Q46 Chairman: You were optimistic about a timescale for that in the earlier section of your answer. When do you think we shall see a significant step in the right direction?

Alan Johnson: I hope that by the time that Neelie Kroes, the Commissioner, finishes her report that will lead to some short-term measures.

Q47 Chairman: Which is expected when?

Alan Johnson: This year; I am not sure when.

Q48 Chairman: I rather feel we have heard all about European gas market liberalisation before; it is a tough nut to crack and I hope your optimism is not misplaced. Let us just look at this geophysical security of gas question. When you woke up and heard about Gazprom's behaviour in relation to the Ukraine, what was your first reaction? What did you think?

Alan Johnson: Where is Malcolm Wicks's phone number? Actually, for the reasons I have just described, this was not a bad shock wave to send through the world because the Prime Minister had said at Hampton Court last November, when we hosted the European heads of state, that we ought to have an EU energy policy, which Chirac agreed with and which is now something which is gaining momentum. That includes an EU liberalised market as part of that EU energy policy. That would have helped to galvanise anyone who was sceptical about that. It was worrying, because it could have led to a very serious political situation and you can see how, if you look to other parts of the world, the Middle East in particular, never mind security of supply, security of the world can be flattened by disputes over energy. It is very worrying.

Q49 Chairman: One of the major questions in your review document, which this Committee will concentrate on over the next few weeks, is views on the implications of increased dependence on gas imports. You have given us some clues there, but is there anything in particular that you would like this Committee to look at? What are you thinking of? The document is quite coy in this area and does not say very much.

Alan Johnson: You do not need me to make suggestions, because I know you are already looking at this: it is this geopolitical question. Where are the oil reserves? Where are the gas reserves? Can we be sanguine about the future if . . . ? A large amount of our gas will come from countries which are perfectly stable like the Netherlands and Norway, but these are issues which have grown in importance.

Q50 Chairman: What happens when Gazprom buys a major British energy company? What does that do?

Alan Johnson: Gazprom have not bought a major British energy company. We are in a position where there has not been any bid. If there were a bid, we have very robust competition policy in this country.

Q51 Chairman: Which is based entirely on competition and not public interest.

Alan Johnson: It is, but then government ministers have a role if there is a threat to the security of the state. Those three mechanisms will be called into place if any bid is made by any company to take over one of our major gas suppliers.

Chairman: There are too many hypotheticals here for me to pursue so I shall not. I shall move to the question of the Emissions Trading Scheme.

Q52 Mr Clapham: We were talking earlier about the impact that carbon prices can have, for example, on reductions initiatives. That, in its turn, impacts onto the market mix or it can impact onto the market mix. In terms of the current European Commission review of the EU carbons trading emissions policy, could you say a little about the UK Government's input?

Alan Johnson: Yes. We shall put forward our suggested cap for Phase 2 by June 2006, which is the European deadline. The point we would make is that under Phase 1 we showed leadership as we have shown on these climate change issues and environmental issues for a long time in international policy as well as European and domestic policy. We decided we should bring the cap down by 6 million tonnes of carbon. It was notable that not many other countries in the European Union followed our lead. This has created a concern for British businesses which are saying we have now made ourselves uncompetitive, for the right reasons, and it has to be tackled, but we must not make the UK uncompetitive. Everybody has to act in the same way. We have to reduce EU emissions as a contribution to tackling environmental climate change. The point I am making is that we are not rushing in this time in the second phase. We are going to wait and see what other European Union countries intend to do.

Q53 Mr Clapham: The competitive question is very important. Is there anything more that we could do to influence the EU to do more to ensure that others comply as we did with Phase 1?

Alan Johnson: Yes. This is another reason for an EU energy policy where you would have an EU Emissions Trading Scheme which had a cap which was agreed right across Europe and every country made the same contribution, or every country that could make a contribution, made the contribution. We do not have that. What we do have is that every European Union Member State has signed up to Kyoto because we all signed up to it together and there are many European Union Member States who are not, as we are, in the happy position of having met the Kyoto targets. Many of the major European Union countries, of course, are members of the G8 which agreed last year in Gleneagles to a whole series of efforts to tackle climate change. Margaret Beckett had a remarkable success in Montreal before Christmas. It did not get the coverage it deserved actually, because it was just before Hong Kong, but there was a real breakthrough there on 2012 and beyond. For all these reasons, the political pressure can be put on other Member States to make a better contribution perhaps in Phase 2 than they did in Phase 1.

Q54 Judy Mallaber: You are giving yourself four months to sort out this row that has been reported in the media over the last week between yourselves and Defra on the size of the emissions cuts that should be imposed on large industrial customers under Phase 2. It has been all over the newspapers. Maybe you could tell us something about that. What

6 February 2006 Department of Trade and Industry

would be the effect on the price of carbon if the DTI got its way? You were sounding much more cautious earlier. What would be the effect on the price of carbon if Defra got its way, or is there no decision?

Alan Johnson: I know you are going to be very disappointed about this, but there really is no row between DTI and Defra; there really is not. In relation to the climate change programme review where we are looking to get back on track for a 20% reduction by 2010, this is obviously a feature of this, but there is no disagreement between government departments. There is no disagreement that we ought to ensure that UK businesses are not affected adversely. If they are, they will up sticks and move to a country which is outside the European Union, never mind outside the UK, and will be emitting as much as they like. Everyone recognises that and everyone is working to get this balance right. In terms of the original question about Phase 2, we shall not go in gung-ho. We were right to do that in Phase 1 to set an example and show some leadership and in Phase 2 we shall be a bit more circumspect. That is a view shared right across Government.

Q55 Judy Mallaber: What would the effect be on the price of carbon of that balance you are trying to strike?

Alan Johnson: I shall tell you that when you have another meeting when we have actually put forward our Phase 2 proposals.

Q56 Judy Mallaber: Let me try to push you a bit further then. You are saying there is no disagreement with Defra, but the suggestion is that one side of the argument was that industry could sustain deeper emissions cuts. If there were deeper cuts, would that actually make the nuclear option more attractive because of the implications for the price of carbon?

Alan Johnson: It is not really about the nuclear option. The nuclear option and the review are focused on 2010 and beyond and well beyond 2020. We are looking first of all at a Phase 2 that will run from 2008 to 2012 and we are also looking at a Phase 2 figure that has to go forward in June of this year. It is not being looked at in the context of nuclear. It has been looked at in the context of whether business is right in saying that a competitive disadvantage has grown up on energy. Companies make long-term business decisions about where to invest and the fact is, with Phase 1 and what British businesses did to bring down carbon emissions, that has to put them at a competitive disadvantage and we have to ensure that there is a proper balance here and there is no disagreement across government about that.

Q57 Judy Mallaber: Do you not think that wherever the final decision rests on that is going to influence the relative attractiveness of different forms of energy and therefore influence that debate about that balance between different energy sources?

Alan Johnson: Well it will. I am just separating it from the energy review. There is no way that the climate change programme review has anything to say about nuclear or which particular path to go down because it is focused on 2010.

Q58 Chairman: I could not help overhearing a *sotto voce* comment from my colleague, Lindsay Hoyle, which said "No row but a difference of opinion then". Are you really saying that there is complete unanimity between Defra and the DTI on the cap? If there is, you could tell us what it is now, could you not?

Alan Johnson: There are always differences of opinion; I am not saying there is not a difference of opinion. I am saying there is a difference of opinion on this between DTI and Defra, but differences of opinion obviously occur. We should not be announcing a cap now anyway because we all agree that we shall put our cap forward very late in the day when we have seen what other European Union Member States are offering. That is not a disagreement.

Q59 Chairman: That makes sense and I accept that. I am a bit surprised by your lack of emphasis on the importance of the Emissions Trading Scheme second phase in determining commercial decisions. We are going to move on to a few questions on coal and nuclear now in our concluding section, but surely you can expect commercial organisations to make estimates of the price of carbon fuels, because they have access to the same kind of analysis as you have and your document is helpful here and we are promised more detail later by your officials. They cannot guess what the Government are going to do when setting the price of carbon. Is it not the case that even the second round of ETS has an appallingly short planning horizon, people making major decisions on coal stations, never mind nuclear stations? Is it not an absolutely key part of this energy review that governments set the price of carbon?

Alan Johnson: Yes, is the answer to that and you raise a very important point. The first point is that we shall only get a projection of the price of carbon when all the EU Member States have agreed to what they will do under Phase 2. The second point is that I do not want anything I have said to undermine the importance of the Emissions Trading Scheme. Cap and trade is the big idea. Businesses like that much better, for instance, than taxation as a policy. The idea came from Chicago originally and you see what is happening now with voluntary cap and trade schemes. It is really something that will have an enormous influence on the future of this planet. I do not want to undermine the Emissions Trading Scheme; that is the last thing I want to do. We are arguing that air transport fuel ought to be part of the Emissions Trading Scheme. The one simple point I am making is UK competitiveness vis-à-vis the rest of the EU and the timing of when we go forward with the cap on Phase 2, having seen what happened in Phase 1. It is not in anyway saying that emissions trading is now less important and that we are resiling

from it in some way. The last point you make is crucial because businesses say over and over again that they want long-term certainty. One of the reasons why we are having this review—and Phase 2 will take us to 2012 which is where Kyoto takes us to and you are quite right that it is not very long—is so we can stretch beyond there and we can get a long-term horizon. We have done it domestically: 60% by 2050. There needs to be a real international acceptance of the need to set these long-term targets, to have measures to work towards them and to give business the certainty that they need.

Q60 Judy Mallaber: A while back you were very positive in your evidence on the possibility of a resurgence in coal and in your opening you talked about a carbon-capture/clean-coal technology. Obviously you have not made any final decisions yet, you will say it is all part of the energy review, but what is your thinking at the moment about the Government's commitment to the future of the UK coal industry and the work that needs to be done on clean-coal technology?

Alan Johnson: As far as the UK coal industry is concerned, we have put something like £60 million into helping the UK coal industry. The reason I say coal has become much more interesting is because as the price of gas has gone up, coal has become much more competitive. At the same time, you have the carbon sequestration technology which has come along. In a much wider sense than our review, we did a deal last year when we went to China on the EU/UK summit which is the first step to sharing technology with China who will never build tons of wind farms and who believe that developed countries lecturing them about the need to get their carbon emissions under control is just a way to stop their growth. They are suspicious of that but they understand the problems of the environment. So you come along with something like clean-coal technology and it opens up a whole new prospect there. That is why I say coal. Would it be British coal? The figures suggest at the moment that we are getting 31.6 million tonnes of our coal from Australia and South Africa, 18 million from the UK, so there is obviously still an attraction in importing coal from abroad as it is cheaper. What comes out of this review in relation to coal is one thing. The ramifications for UK coal are something completely different and we shall have to wait for the review to see what emerges, but coal is going to be a central feature of that review.

Q61 Judy Mallaber: I do also have, within my constituency, which is built on coal, continuing pleas from those who are campaigning against opencast mining with a concern that that might get back into the equation and change the criteria which we strengthened against environmental damage through just scooping off the surface of the environment. Is that an area that you are looking at in the review or not?

Alan Johnson: It is, yes. Opencast mining is one of the aspects that we should have to look at. It is not just about deep mines: it is about opencast mining as well.

Q62 Mr Clapham: You made the point earlier about my interest in coal and I have always believed that coal can play a very significant part in the economy, particularly as burned in new clean-coal technology units. It is compatible with renewables if it is burned cleanly and a number of people are now coming round to that particular view. What are we doing at the present time, for example, to incentivise the generators to invest in what may be the first phase of clean-coal technology and that is super-critical boilers with carbon capture?

Alan Johnson: The first thing we have to do is get a proper demonstration model which might be set up with the BP Miller site on carbon capture and storage and a number of other demonstration sites. We have set aside some money to help this process along until we get the full picture here. I understand that carbon capture and storage can reduce CO₂ emissions by 80%, which still leaves 20% but is obviously a huge step forward. Not quite renewables in terms of cleanliness, but the first thing to do is invest in the technology and the science to get a proper demonstration model that we can then take further and that is what we are doing.

Q63 Mr Clapham: Coal burn is much more flexible. Take, for example, nuclear stations: in go the rods, out comes the electricity, it has to be taken down the line. The one thing about coal units is that they are much more flexible and can be turned on and off as demand comes on and, in that context, fitting new clean-coal technology means that there is a much more reliable source. Is that something that you will be looking at as well in the review, how different mixes have the potential for that greater flexibility?

Alan Johnson: Yes, because it meets security of supply, it meets the challenge on carbon emissions and it also would be an aspect of affordability that we need to look at. I do not know whether we have looked at anything specific on the specific technology that Mike mentions.

Chairman: I know you are anxious to get away Secretary of State, but there is one whole section on nuclear before we let you go. Could you write to us on that particular point possibly?

Q64 Mr Hoyle: Mick Clapham has touched on the energy mix and I just wonder whether you have a vision. I know you are a man of vision; you are always saying what is going to happen in the future. Under your vision, how do you see the energy mix coming out? Would you think 30% coal, 30% nuclear, 20% gas and 20% renewables? What mix do you have in mind?

Alan Johnson: I do not have any mix in mind and I have a vision on many things but I have not had a vision on this, unless one comes to me. We are not starting off on that basis; we are not starting off on the basis of "Wouldn't it be nice to get?" the point about ring-fencing that Mick Clapham made. We

6 February 2006 Department of Trade and Industry

are going to have the review. We are going to get all the information, get all the contributions that people want to make to this, look at the whole thing in the round and then I might form a vision or a view about what the proper mix should be. Diversity is the key issue.

Q65 Miss Kirkbride: It seems to me that you have been a bit schizophrenic today about energy policy. On the one hand the gas market is for the market to decide and on the other hand you were taking credit for the renewable target of 15% which is very much driven by the Government and very welcome. You have rightly said that we cannot possibly have 80% of our electricity supplied by gas because of the vulnerability that would lead to. In the exchanges we have just had it is obvious that carbon capture is not there yet today or even for the immediate tomorrow. Does nuclear not have to be part of that mix?

Alan Johnson: It does not have to be. I should draw a line between interfering in the market and helping a sector that was non-existent, but perhaps should have been. If we had got into wind farms and wind turbines in the 1980s when the Danes got into it, we could have had a market there, but there was no market at the time of the energy review and creating a market from nothing, given the importance of climate change, was very important. The Renewables Obligation was perfectly justifiable in that respect. There is a difference between that and our clod-hopping into the market on prices and everything else. In terms of whether nuclear has to be part of the equation, no, it does not have to be part of the equation. We do not start from saying we are going to do this review but nuclear has to be part of the equation otherwise the professional cynics, who have said that this is all pre-determined, would be right. They are not right. The only decision we have made on nuclear, as the Prime Minister has said, is that it is time to make a decision because of the long tail between making a decision and having a nuclear power station. If nuclear is to be part of the mix, it is very much for the market to decide that, but the market, quite rightly, would be saying they need signals from the Government if they are going to go down that route. If you look at it from the point of view of climate change, security of supply, affordability and you look at energy in the round, nuclear does not have to be part of the solution.

Q66 Miss Kirkbride: But this Government have already failed to meet their target; CO₂ emissions have gone up since the Government came to power despite the fact that you said that you did not want them to do so. How can we possibly continue at the level of economic activity that we have today and keep carbon emissions under control unless we have nuclear?

Alan Johnson: That is a question for the review.

Q67 Miss Kirkbride: You must have a view on that? It is not possibly surely, is it?

Alan Johnson: I do not actually have a view on this. I have never been particularly pro- or anti-nuclear. The reason why we are having the review is to

answer that very question. Does it need to be part of the mix? Is it an essential to be part of the mix? The issues that the Energy White Paper looked at in 2003 about affordability and about waste, toxic waste, are a very important consideration which we shall be looking at.

Q68 Miss Kirkbride: The Government had a review of energy just two years ago, knowing that the amount of energy produced by the nuclear sector was going to drop from around 19% today to 7% in 2020 and did not refer to this at all. We cannot re-commission the Magnox; we cannot extend the life of the Magnox reactors. We are facing quite a serious crisis now and it is very hard to see, given the competition for energy resources across the world, how we are going to meet that demand here unless we go nuclear like pretty much all the rest of the developed world is.

Alan Johnson: My view is shared by the shadow trade and industry spokesman who I saw in an interview on Saturday, who was saying precisely the same thing. There is no reason why there cannot be a solution to this, when we have looked at all of this, that says actually nuclear will not be part of this equation. I can see a lot of reasons, a lot of arguments why that should not be a conclusion reached, but it is still perfectly possible to reach that conclusion. We do not start from the basis of saying that we are having this review because it is quite clear to us that we have to have nuclear new build and the review is about how to implement that. That is not the purpose of the review.

Q69 Miss Kirkbride: So are you saying that we can finish this energy review, not re-commission any nuclear reactors and still meet our climate change aspirations?

Alan Johnson: If we did, we would say, this was now Government concluding that in our long-term energy policy nuclear would have no role. That is the difference. By the end of this review, we shall either be opening the door to nuclear new build or we shall be closing it. We shall either be Germany or we shall be France.

Q70 Mark Hunter: I want to probe a little bit further on this issue of nuclear power because obviously it is very central to the whole energy review which is ongoing at the moment. I am pleased that the minister has commented and in fact given reassurances that no decisions have yet been made on this. As he says, there are many cynics, professional and otherwise, out there who feel otherwise. What would you say to the point that many who are opposed to nuclear power are advancing that the Government's priority ought to be to clean up the nuclear waste which already exists in our nuclear power stations around the country before any thought at all is given to an expansion of nuclear power?

Alan Johnson: Sceptics would have been a better word than cynics; professional sceptics on this. It is a very important point. That was the big issue in 2003, it is the big issue now. We set up the Nuclear

Decommissioning Agency. Previous governments of all persuasions ought to be wearing sackcloth and ashes for just not doing anything about this issue of nuclear waste. There are big tubs of it and tanks of it hanging around. The Nuclear Decommissioning Agency, which must be welcomed by everyone, which was set up at the beginning of last year and the money, something like £50 billion that will go into this, shows that cleaning up toxic waste is an absolute priority. The argument of course that we are in the middle of from the pro-nuclear and anti-nuclear lobby is how much we would add to that, whether new technology now makes it safer, whether the waste would be much easier to get rid of, whether, if we continue with fission, we shall then be in the realms of fusion where we will not have the problems of waste. These are big issues that we have to grapple with on the review but whatever comes out of this review, we have to tackle the problem of nuclear waste.

Q71 Mark Hunter: On a slightly different timetable but still to do with nuclear power, do you think we can have any confidence in the claims which are currently being made for how nuclear power could contribute in the future, given some of the claims that were made for it in the past like, for example, ultimately it will be too cheap to meter?

Alan Johnson: We have to learn from that experience and the amount of money that governments of all persuasions spent on nuclear research *et cetera*. Yes, that has to be a consideration, but we have to start from where we are now and where we are now is that we need to get a 60% reduction in CO₂ emissions by 2050. We have a situation where the more wind farms, the more wave power, the more sea power we use, the more renewables we produce we do not actually increase the level of CO₂ emissions, whilst a very important source of clean energy—that is nuclear, clean in the sense of CO₂ emissions—is actually declining. If you look at what has happened in Finland and the debate they had there, an awful lot of environmentalists are now feeling differently about the pros and cons of nuclear. They changed their minds over the last five or 10 years. If you come at this with a fresh mind and you are not in any of the camps digging trenches and you look at it objectively, that is the best way to come to a conclusion and that is the position I am in.

Q72 Rob Marris: You just talked about nuclear being clean in the sense of CO₂ emissions. Are you going to be looking at the energy cost in fossil fuel of building nuclear power stations, for example, all the fossil fuel you have to use to mine uranium and then pour concrete for nuclear power stations and so on?

Alan Johnson: Yes.

Q73 Rob Marris: You would accept that nuclear is not entirely clean in terms of CO₂ emissions taken in the round?

Alan Johnson: Yes. If you build anything as big as a nuclear power station, there are going to be CO₂ emissions.

Q74 Rob Marris: In terms of security of supply and uranium, if there is a big trend around the world to go nuclear as it were in terms of power generation, then are you going to look at the question of security supply of uranium because high quality uranium in stable countries is going to run out pretty quickly? Then we shall be down to looking at low quality uranium with a higher energy extraction cost from unstable parts of the world. Are you going to take that into account?

Alan Johnson: Absolutely.

Q75 Rob Marris: You talked about the door being opened and the door being closed and so on, whether we are France or whether we are Germany. Can you set the framework here? Could a power generator today apply to run a nuclear power station, a new one, to build and run one in the United Kingdom under current legislation?

Alan Johnson: Yes. They are not queuing up to do it, but yes.

Q76 Rob Marris: Are there any such applications that you have heard about?

Alan Johnson: No.

Q77 Rob Marris: Would that say something to you about market forces?

Alan Johnson: One of your colleagues chaired a committee of the Environmental Audit Select Committee which spent a long time on this and I can see the argument that there is not a queue of entrepreneurs waiting. What potential investors would say, having seen what has happened, Germany pledging to close every nuclear power station, France being gung-ho on nuclear energy, having seen the 2003 White Paper as being equivocal, the door was ajar and could close, is that they see no point. They need a clearer signal from Government. They are not going to get a signal from Government that says "Here is a big open chequebook from the taxpayer". It is up to them to put the money in and put the investment in, but it is fair to say it is so long term that they need a signal.

Q78 Rob Marris: As part of that signal do you envisage, just talking about the framework for nuclear power generation, we could have a situation where the Government would not be effectively the insurer of last resort, either as regards a meltdown of a nuclear power station and the meltdown of the operating company financially as a result, or in terms of disposal of nuclear waste? Surely, the Government would then have to be the insurer of last resort, which is not necessarily a bad thing but does take us a step away from the market forces to which you referred.

Alan Johnson: On the last issue of toxic waste, Government cannot duck that responsibility; we have ducked it for too long and we cannot duck it now. In terms of the actual cost of building nuclear power stations, we do not intend to provide any of that, it is up to the market.

6 February 2006 Department of Trade and Industry

Q79 Rob Marris: I am just talking about a framework here, I am not trying to push you one way or the other because you are not going to say, but would you then see that the Government would step away from nuclear power generation completely and say "Oh well, if your operating company goes bust and you leave all that nuclear detritus around, we shall have nothing to do with it and we shall not be the insurer of last resort"? Or do you think the Government would, in that situation, then spend taxpayers' money perhaps on cleaning up the mess?

Alan Johnson: Those are issues for the review.

Chairman: These are fascinating questions which we are right to ask, but we shall not get many answers. We shall have to get you back at the end of this process and push you even harder.

Q80 Mr Hoyle: People are saying that this is an energy debate which is open, no decisions have been taken, yet some people will ask why you are selling Westinghouse if it is an open debate and nuclear could have a future, or whether you are selling it because nuclear has no future. That is what people will be asking and why are we selling it at this stage and not waiting until the end of the energy review?

Alan Johnson: If we were to go down the nuclear new build route, owning Westinghouse would cause us more problems because for the Government, who are producing the review, actually owning a major company causes more problems.

Q81 Mr Hoyle: Are you going to sell everything else off as well?

Alan Johnson: The main reason about Westinghouse is that we want a good return for the taxpayer. Should we own Westinghouse? British Nuclear

Fuels did a review a couple of years ago which suggested we should not. Westinghouse are now involved in building four nuclear power stations in China which are by no means certain to make a profit. There is a big risk involved and we do not think the British taxpayer should be paying for that risk. Although we had to consider the points you have made very carefully, whether it is the right time to sell, whether we shall get a good price, we have just met Toshiba today and it looks like a very good price for the British taxpayer.

Q82 Mr Hoyle: Is it £8 billion?

Alan Johnson: I do not think we can say that, can we? I think we had a press conference this morning, so it is probably out.

Q83 Mr Hoyle: If I follow the logic of what you say, that you should not own it because it really does complicate the issue and does put you in the wrong position, does that mean that BNFL is going for sale? Does that mean that atomic energy is now going?

Alan Johnson: No, that is another complete question. The whole focus of all of those groups now is on decommissioning. It is all focused on decommissioning and cleaning up the mess that we have inherited.

Chairman: Secretary of State there are many other questions we should like to ask you; some we shall actually put in writing to you and seek written answers to. I apologise to colleagues who did not get their supplementary questions in. We think this is possibly the most important question facing your department over the next few months and years. It is a subject to which we shall return on many occasions and we are very grateful to you for your time with us this afternoon. Thank you very much.

Letter from the Rt Hon Alan Johnson MP, Secretary of State for Trade and Industry to Peter Luff MP, Chairman of the Trade and Industry Select Committee

I appeared before the Select Committee yesterday to talk about the Energy Review. I would like to take this opportunity to expand upon the information I provided with regard to savings available from switching energy supplier.

The figure of £46 I mentioned was the average annual saving if a British Gas standard credit customer switched their gas supply to a different supplier. Further annual savings of £22 on average are possible if the same customer switched their electricity supply from the incumbent supplier to another supplier. Furthermore, if the customer was to then switch to paying their bills for both fuels from standard credit to direct debit a further annual saving of £32 is possible. It is therefore the case that a customer who has not previously switched can save on average £100 annually on their energy bills. These are the average levels of bill reduction and in many cases greater savings will be possible if a consumer spends more time shopping around. Maximum savings possible by switching supplier and payment method are of the order of £200, representing a reduction of around a quarter in an annual bill.

There is still huge potential for switching supplier, with more than half of gas and electricity customers still with British Gas or their incumbent electricity supplier. We are continuing to encourage switching where appropriate and are working with energywatch and Ofgem to ensure that switching supplier is as straightforward as possible.

Alan Johnson

8 February 2006

Tuesday 16 May 2006

Members present:

Peter Luff, in the Chair

Roger Berry	Mr Lindsay Hoyle
Mr Brian Binley	Mark Hunter
Mr Peter Bone	Judy Mallaber
Mr Michael Clapham	Anne Moffat
Mrs Claire Curtis-Thomas	Mr Mike Weir

Witnesses: **Professor Jim Skea**, Research Director, UK Energy Research Centre, **Professor Robin Grimes**, (Department of Material Physics, Imperial College), UK Energy Research Centre, **Dr William Nuttall**, (Judge Business School and Engineering Department, University of Cambridge), Institute of Physics, and **Professor William Gelletly**, (Centre for Nuclear and Radiation Physics, University of Surrey), Institute of Physics, gave evidence.

Q1 Chairman: Gentlemen, welcome to the first evidence session of the Select Committee's investigation into the energy review and the issues relating to nuclear new build. As always, I ask you to begin by introducing yourselves for the record.

Professor Gelletly: My name is Bill Gelletly. Today I represent the Institute of Physics. I am a professor of physics at the University of Surrey. My research interests lie in the basic properties of atomic nuclei.

Dr Nuttall: I am William Nuttall and this morning I too represent the Institute of Physics. I am a senior lecturer and course director for the MPhil and technology policy at the University of Cambridge which is offered out of Judge Business School in collaboration with the engineering department and as part of the Cambridge-MIT Institute. That was how it was initiated.

Professor Skea: I am Jim Skea, research director for the UK Energy Research Centre which is funded by three research councils and has responsibility for helping to coordinate academic energy research in the UK.

Professor Grimes: I am Robin Grimes from the department of materials at Imperial College. I am the principal investigator of the Research Council's project Keeping the Nuclear Option Open and one of the lead investigators in the EPSRC's nuclear engineering doctorate.

Q2 Chairman: We have two evidence sessions this morning, the first of which is with you. This looks more at the technical, scientific and factual issues; the second session will look more at the commercial issues with the industry itself. Inevitably there is overlap between the two, which is the intention. We have not received a memorandum from the UK Energy Research Centre, which we would have welcomed. I hope that we may be able to put it right subsequently. We shall go through a number of issues in detail and come back to them with our second group of witnesses in a similar format. There are three specific issues which the Government particularly addresses in its own energy review document and on which we have little evidence: the carbon profile of nuclear power and whether it is really carbon-neutral; the availability of the required raw materials like uranium; and the comparative

cost of generation. These are three very important issues for this Committee. We are not asking detailed questions on these matters this morning primarily for the reason of time, but is there anything that you would like to say initially about the carbon profile, uranium availability and comparative cost? If not, I would welcome a response from you in writing afterwards.

Professor Gelletly: Briefly, no source of energy will be totally carbon neutral. It costs energy to build things, make things, mine things et cetera. Whether one is talking about windmills, photovoltaic cells, nuclear build or whatever, nothing is carbon neutral.

Q3 Chairman: Are you aware of any good and authoritative scientific research on the carbon profile of the nuclear option?

Professor Gelletly: I cannot give detailed figures, but it is certainly not carbon neutral. There is carbon usage in terms of mining et cetera.

Dr Nuttall: I should like to pick up the economic question. In my opinion, nuclear new build is probably economically viable without any state support. Levelised cost studies indicate that it is an attractive generation option. More sophisticated analysis reveals difficulties but I would suggest that these are more problems for our energy policy than they are for nuclear power.

Q4 Chairman: We shall be looking at some of those issues, for example the incentives required to build, in our first section of questions.

Professor Skea: On the question of the carbon profile, we have not done any work on it ourselves, but I am aware of a European Union project which did a comprehensive life cycle analysis of all forms of energy generation. I am sure that the nuclear side is covered there, and carbon would be a component of that. We could certainly point the Committee to that piece of work.¹

Q5 Chairman: That would be very welcome. What about the availability of uranium?

¹ Note by witness: printed as Appendix 57.

16 May 2006 UKERC and Institute of Physics

Professor Grimes: I can come to that, but perhaps I may first deal with the question of the relative carbon footprint. It is absolutely true that there is no way of generating capacity that does not involve some generation of carbon, but what matters are the relative amounts. I know some numbers as well, although Professor Skea probably knows them better. As to uranium supply, there is a good deal in the media at the moment about the fact that we do not have enough uranium, but that has to be considered in the context of when we actually looked for any uranium. We have not done any mining exploration for uranium deposits for over 30 years. If we were in the same position with oil we would just about have run out of it at this point. Clearly, we have not; we have found lots of other reserves. I feel strongly that if we went out to look for it we would certainly find it.

Q6 Mr Weir: We hear a lot about uranium being made available by Australia and Canada which are obviously stable democracies, but we are also told that a good deal of uranium may be found in less stable areas and could give rise to problems in the future. Do you have any information on where we are likely to find more uranium if we go down the nuclear route?

Professor Grimes: It is quite clear that if we looked again in Canada and Australia we would find more uranium. That is thought to be the case. I do not have the numbers with me. At the moment, there is a vast amount of uranium in Canada and Australia. I can never remember which has the larger reserves but one is significantly larger than the other. Other countries, one of which I believe is Uzbekistan or somewhere in that region, also have significant amounts of uranium but nothing like as large as those in Australia and Canada, and I think we would find a good deal more there. I do not see that as a big issue.²

Dr Nuttall: It is important to remember the energy density of the raw material yellow cake U308 which is easily stored. That reality gives us good short- to medium-term energy security compared with the storage of other fuels for our energy system. In the long to very long term, even if we did find it difficult to source new uranium a range of technological options within the domain of nuclear power could be brought to bear.

Professor Gelletly: If one is talking of the very long term, there is also a great deal of uranium in sea water. At the moment such extraction is not commercially attractive but the Japanese are working on chemical processes to extract uranium from sea water. One would then have an almost

unlimited supply. That is in the very long term and it would require research and development before one could do it.

Q7 Chairman: Let us move on to an issue at which Dr Nuttall was hinting: the creation of incentives. If nuclear power is to be built in this country it needs knowledge of certain things, one of them being the price of carbon. Do you have a view on the workings of the climate change levy and EU emission trading scheme?

Dr Nuttall: As a personal comment, I think that we should do these things because they are good energy policy, not because they help nuclear power. Some of the instances of good energy policy, however, would likely have the consequence of favouring nuclear power. For instance, I would regard the climate change levy as a rather strange energy tax. I believe that it is motivated by the desire to reduce emissions of carbon dioxide; if so, surely it would be better to replace it with a UK-based carbon tax.

Professor Gelletly: I found it astonishing that such a tax was introduced. It does not make any sense to me. One excludes domestic fuel which is a very large fraction of our energy usage; one also excludes road transport. Of course, that is already heavily taxed but one still should not exclude it from a carbon tax. One excludes renewables which is a good idea. But it is not sensible to tax energy rather than to tax carbon, because that is the one thing that one wants to cut. The two things on which we appear to rely—gas and coal—are simply polluting the atmosphere without paying the penalty that the polluter should normally pay.

Professor Skea: One matter that we flagged up in our evidence to the energy review was the inconsistency between exempting renewable energy from the climate change levy but not nuclear power. If the stated purpose of the levy is to reduce emissions of carbon dioxide that is something that might be addressed. The other important instrument is the European emissions trading scheme. We would be very sceptical that at the moment that is providing the kind of incentives that would be needed to support nuclear power. The first reason is that probably the levels established in the market have been too low but, secondly, the volatility and unpredictability of the price in the market does not help a capital-intensive sector like nuclear power.

Q8 Chairman: The allocations do not look very far ahead in terms of time, do they?

Professor Skea: They do not give the long-term consistency which would be essential.

Q9 Chairman: The other question is what the Government has to do to provide reassurance that in such a long-term investment as nuclear the policy environment will be stable, beneficial and benign. How with a liberalised energy market can the Government provide that kind of commitment, leaving the private sector inevitably with risk?

Professor Skea: That is certainly an area where we have looked at the experience of other countries that are now going ahead with nuclear power. I do not

² *Note by witness:* Australia has the world's largest uranium reserves (estimates vary between 30% and 40% of total known) and accounts for slightly more than a fifth of the world's total production. Canada is the largest exporter of uranium ore (as it has ores of exceptionally high grade) producing approximately a third of the world's total (with reserves of at least 10%). Other countries that have significant deposits include Kazakhstan, Niger, South Africa, Namibia, Uzbekistan, Brazil, the Russian Federation and the USA.

think that the lessons can be transferred directly because of the difference between their institutions and ours. For example, in the case of the Finnish reactor that is going ahead, the establishment of long-term stable contracts for the sale of power from nuclear energy has been absolutely critical in pushing forward the issue. I do not think that it is just a question of the price of electricity; it is also the risk environment in which investments might be made. I am looking across at the US example and the Energy Policy Act which came out last year. The existence of a production tax credit made available for nuclear as well as renewables has probably been an important factor in pushing things forward. The other aspect in the US has been the kind of guarantees that the Administration has made against the regulatory risks associated with investment in nuclear power so that for the first six reactors that come through the Federal Government is guaranteeing, as it were, the financial risks associated with the regulatory process.

Dr Nuttall: I can send to the Committee a paper recently accepted by the *Energy Journal* and developed by my student Fabien Roques in collaboration with colleagues at Cambridge and MIT. That has looked basically at the stability of the price difference in this country between electricity and natural gas. This analysis leads one to observe that private electricity companies can pass through any fuel price volatility risks on natural gas to end user consumers. The risk is borne by ordinary domestic users and businesses who in the unbundled electricity market really have no say in which generation technologies are adopted. I can provide the Committee with that paper.

Professor Gelletly: But, surely, the most important things are: a stable long-term policy; a clear decision to allow nuclear build and to support it; to have a clear policy about radioactive waste; and to help persuade the public in a logical way to counter the many emotional arguments which are raised against nuclear power. It is that stability that any commercial enterprise needs. If one is running a business one needs stability and a platform on which to build, not a policy that changes every couple of years. It appears that energy policy in the UK has changed every few years. The contrast is with France which since 1974 has had a very steady policy based on a standardised reactor system. Because of it France now has cheap electricity, and it is done largely, as far as I can see, on a commercial basis.

Mr Bone: I understand that all private companies would love to have an atmosphere of stability and long-term price guarantees, but it does not work like that in commercial terms. You are coming from the point of view that nuclear is the obvious way forward and there are all of these horrible emotional arguments against it. Equally, if there is a general review going on it might be said that nuclear is wrong. I am not sure that we should take some of those statements as read.

Q10 Chairman: There are two separate issues: the commercial and regulatory risk.

Professor Gelletly: Maybe I should correct part of what you said. Personally, I do not care whether or not we build new reactors. What I do care about is whether the lights will go out et cetera and there is security of supply. Rather than have someone turn off a gas pipeline at a whim or as a terrorist act, I would rather have a secure system and, at the same time, one which polluted as little as possible. As far as the building of reactors is concerned, I do not have any personal interest.

Chairman: I think Mr Bone made a statement rather than asked a question. We will become sidetracked if we do that too often.

Q11 Mr Hoyle: Obviously, we could take you on in relation to getting the timing right. If we look at previous examples, we know that it took 14 years to move from planning consent to actual construction of Sizewell B. In the event of planning permission, can anything be done to take inefficiencies out of the system? Do you know where the bottlenecks are? What can the Government do to overcome those problems? Obviously, that is without the likes of Swampy becoming involved when planning permission is given. One has to get through the planning consent process but also ensure that the public has the right to object.

Professor Gelletly: Of course the public has the right to object and one must not have undue haste in which one does not consider local planning issues properly. It would help a great deal to have pre-authorisation from the regulators and have them involved in looking at possible reactor designs at a very early stage so that when we have the public inquiry process we try to make sure that it is done within strict time limits. One can still have proper consideration of these issues and not let them run on for ever, as we did effectively with Sizewell B.

Professor Grimes: If one compares Sizewell B, which took a terribly long time, with the next reactor, Hinkley Point C, which obviously was not built, in the case of the latter the issues were understood. The Hinkley Point C inquiry was much quicker. The other matter that needs to be addressed is pre-licensing. The idea is that instead of doing everything sequentially we should try to understand the types of reactor design being considered and whether or not we accept those types and designs as safe and then we can do things in a parallel fashion. That would change the timing very greatly.

Q12 Mr Hoyle: Do you believe that one would need full planning consent on an existing site? One would argue that it was a replacement. Would that ease the process?

Professor Skea: I do not know enough about planning law to understand that issue, but the point I should like to make is that this problem is not unique to nuclear power. The record for public inquiries is the one for Terminal 5. That took four years simply for the inquiry itself. That is a generic problem. I am waiting with interest the results of the Barker Review of land use planning from the

 16 May 2006 UKERC and Institute of Physics

Treasury. I do not think that the solutions to this problem are specific to nuclear power; they go much wider.

Q13 Chairman: An announcement is to be made later today by the Secretary of State on the question of planning regulations regarding gas storage, using such power as he has to speed up planning applications in that area.

Dr Nuttall: I am by no means any kind of planning expert, but I should like to share with you how I view these issues. As to the construction period and engineering for nuclear power, I hope the Committee realises that that is only of the order of four years and is not a major obstacle on timing for that time in the future when we might turn on a new nuclear power station. What I am struck by is the need not only to implement good policy for planning and safety, which would take some years, but in today's reality to work out what good policy should be. That is the spirit of your question. I suspect that what we have to do is develop good policy, implement it and then build. I was, however, initially surprised in 2003 by the statement in the White Paper that there would be a need for a second White Paper on nuclear power. I think that a White Paper would be a route to good policy, but I do put out the idea that we might build nuclear power plants under today's regulatory powers.

Q14 Mr Hoyle: There is a suggestion that if one were to get planning permission now by the time one started the process and put in the application it would take until 2020 to get a replacement. Is there an example where international collaboration can take place to streamline the process, or will that not be possible because these are now becoming privately-owned companies and, therefore, knowledge is no longer shared because they do not want to give advantage to a competitor within the market? Is there any possibility of international collaboration or is the process slowed down because these private companies are competing against each other?

Dr Nuttall: The international dimension is more complex than that. International collaboration may be a route to a solution, but the days of the CEGB are long gone. What we have today in the United Kingdom are reactor technologies that are sourced from international companies none of which essentially is British. We have at least four electricity companies operating in Britain with experience of nuclear power: British Energy, EDF, RWE and E.On. Yet, how valuable is that experience as companies with an international pedigree face issues of nuclear generation in Britain? Clearly, the British companies understand how we do things here, so I think that your question is well made. Forgive me but I cannot answer it.

Q15 Mr Hoyle: Which of those companies do you think will be the first to put in a planning application?

Professor Gelletly: I would have thought that Westinghouse and Framatome et cetera would want to be there. If one looks at the Finnish case, they voted to build in 2002 and they expect to operate in 2009. I do not see why we cannot do the same. They went through a very careful process of consulting the communities about where the reactor would be built et cetera. I really do not see why we need to take quite so long with the safeguards that the public demands.

Dr Nuttall: With colleagues from the University of Lancaster, City University and elsewhere we have made a request to the Engineering Physical Sciences Research Council to investigate some of these licensing issues within the British regulatory regime that face international companies. What we must remember is that in the days of the CEGB it had design authority. In the scenario I put forward who holds the design authority during construction and later during operations? Is it going to be a company like Westinghouse Toshiba or a company like EDF or EON, or will it be AMEC-NNC or Bechtel? Does it transition at various points? These are quite complex questions that I do not see much in public circulation. In the old days the answer would have been the CEGB.

Professor Skea: To add to that, I think the Finnish example is instructive. A period of just over two years elapsed from a decision in principle to go for nuclear power to the point where ground clearing of the site started. The key point is the number of discussions that took place outside and before the formal processes between the different actors involved. One of the interesting issues that may arise in the UK because of our competitive environment is the capacity of the system to deal with multiple licence applications for different reactor designs, whether the Nuclear Installations Inspectorate has the capacity to carry forward these processes and how it will prioritise its work under that circumstance.

Q16 Mr Binley: It has taken three years to get planning permission for an extension to a football stadium in Northampton, so I understand that particular problem. Are you saying that this issue is a major problem and one that really needs to be addressed?

Professor Skea: Yes.

Professor Gelletly: Yes.

Q17 Mrs Curtis-Thomas: The Institute of Physics has produced a report on fission power, differentiating between potentially evolutionary and revolutionary reactor designs. What are the advantages and disadvantages of these?

Professor Gelletly: The evolutionary designs are very much based on our 40 years' experience of operating reactors. They have evolved from that and are based very heavily on that experience. For instance, if we take as an example the AP1000, which is one of Westinghouse's reactors, it is very much based on the many PWRs that it has built in the past. It is a much simplified system and relies on passive safety; in other words, the operator has to do very little and

it uses natural processes to make sure that the reactor core is cooled if there is a mishap of any kind. Evolutionary types are like that. If one looks further ahead there are possible revolutionary designs. If we take as an example a high-temperature gas-cooled reactor, the reason for wanting a very high temperature reactor is that thermodynamic efficiency is much better at higher temperatures so one can extract more bang for one's buck, so to speak. One gets much more out of the fuel by running at high temperatures. One could not do that very well in the past because one needed gas turbines rather than a heat exchanger.

Q18 Mrs Curtis-Thomas: If we wanted to build a new reactor very quickly would we go for technology that was tried and tested within the UK or to some off-the-shelf design that had been tried and tested in other countries which we would bring to market much quicker?

Professor Gelletly: As a personal opinion, one would have to go for a evolutionary design.

Q19 Mrs Curtis-Thomas: Are they tried and tested?

Professor Gelletly: They are based very heavily on tried and tested technology in the current fleets of PWRs that exist round the world.

Q20 Mrs Curtis-Thomas: So, it is not necessarily indigenous to the UK but from around the world?

Professor Gelletly: Yes.

Professor Grimes: There are basically four designs of reactor that we can effectively buy off the shelf at the moment. I think that your question is a very good one. I do not know of a very good study, apart from the one you just mentioned, that considers all of these in a transparent manner. That is something which needs to be done. To my mind, there is quite a difference between the General Electric boiling water reactor and the AP1000, which are two American designs. Although they are partly evolutionary they also include some passive systems, which means that if things ever did go wrong—they certainly should not—the reactor responds to that in a passive manner and prevents things getting worse. But there are two other designs. There is an Atomic Energy of Canada Ltd design and also the EPR reactor which is being produced in Finland. They are a little more evolutionary with fewer of these passive features built into them. Even though there are questions as to those four reactors that we can buy off the shelf, questions need to be answered and balances need to be struck against the costs and the passive nature of these reactors.

Professor Gelletly: There are perhaps other decisions which relate to the choice to be made. One thing one needs to decide at an early stage is whether one is to reprocess fuel—in other words, to create mixed oxide fuel et cetera—or is it simply a once-through process that uses only enriched uranium.

Q21 Mrs Curtis-Thomas: If one were looking for a comparative analysis between the different technologies currently available would one find a paper on it?

Professor Gelletly: We have only the one from the Institute of Physics. There may be other papers but that is the only one of which we are aware.

Professor Grimes: Obviously, this is something that needs to be considered. There are also issues to do with the differences in the four reactor designs that I mentioned. From where does one source some of the large pieces of kit?

Dr Nuttall: At the risk of being self-serving, my book *Nuclear Renaissance* deals with some of the technology.

Q22 Chairman: I think that is the first book plug we have had!

Dr Nuttall: I mention it only in response to a direct question.

Professor Skea: I reviewed it and can thoroughly recommend it.

Q23 Mrs Curtis-Thomas: The report of the Geological Society *How to Plug the Energy Gap* raises concern regarding the capacity of the international supply chain to meet potential UK demand for nuclear plant components. What do you think is the likelihood of new build being constrained because of the shortage of nuclear plant components? If there is such a risk, will we have to pay above the going rate in order to remain within the tight timescales that we have already discussed this morning?

Professor Grimes: I think that there is a risk there. We have not built reactors for a very long time. The world has not built many reactors for a very long time. Some of the companies particularly in the UK that used to produce the large pieces of kit required for reactors do not exist or are not doing that any more. I believe that this is a possible opportunity for UK industry, because if a number of countries like the United States build new reactors there will be a serious market for these things. We are talking about such things as the reactor pressure vessel which requires a large forging to produce. It must then be heat-treated. There are really only two places in the world that can do that and they are in shipyards in Korea and Japan, but there is no reason why we cannot invest in that sort of technology in the UK. The problem will arise if the order books with France, the United States and so on all fill up with orders for similar types of reactors. We will not be able to produce enough of them without new industries.

Q24 Mrs Curtis-Thomas: Has the UKERC looked at the various timetables of different countries in terms of acquisition of nuclear capacity in order to inform objectively the comments which have just been made?

Professor Skea: No, we have not.

Q25 Mrs Curtis-Thomas: Do you think it is worthwhile doing?

Professor Skea: Yes.

Dr Nuttall: I see this much more as a global market of engineering components, so there will be British engineering firms servicing the needs of new build

 16 May 2006 UKERC and Institute of Physics

programmes in other countries. In trying to interpret your question, I am thinking whether this is a question of industrial policy. It should not be. This is a matter of energy policy. Whether or not we should support our steel industry to build pressure vessels is a rather old-fashioned question. The question is whether we are confident that we can source what we need in order to build reliably and economically. I do not see it as a British issue.

Q26 Mrs Curtis-Thomas: But what I have heard this morning is that there is not confidence that we can source when we need to do so without significant cost disadvantage. I presume that the rationale behind the Westinghouse and Toshiba merger was to look at nuclear production or equipment manufacture as well as a number of other things. Those decisions are being made, and it is very important to us that we understand the cost consequences of lack of supply.

Dr Nuttall: Yes.

Professor Gelletly: If I was running an engineering company and I thought that there would be opportunities for, let us say, 10 units in the UK and, at the same time, international opportunities, it would become worthwhile to tool up to try to do such things. If it is a one-off one is much less likely to do it. Clearly, we will run into real cost disadvantages by having to buy everything from abroad.

Q27 Chairman: It is perhaps worth clarifying that what we are trying to do in these evidence sessions is to understand all the issues that need to be addressed before making the decision to go nuclear. There are differences of opinion round this table about the merits of nuclear power. What you have just done is to highlight one of the real issues: is there enough capacity in the international industry to build all the nuclear power stations that might be demanded in the international economy? That is the bottom line issue that must be addressed.

Professor Grimes: Absolutely.

Q28 Mr Clapham: I turn to the issue of skills. I notice that there is a difference of opinion in our panel. When I look at the NIA paper it is much more confident that we have the R&D skills in the UK to be able to support an expansion of nuclear energy, but the Institute of Physics tends to believe there are likely to be some problems there. What is the position? Do we have the R&D base to be able really to support an expansion of nuclear energy?

Professor Gelletly: At this moment we probably still do, but one must accept that because of the UK industry's history we have an ageing population. There are many more people like me than there are young people coming out of universities. The problem is whether we shall be able to replenish the stock. Certainly, in recent years we have not been producing sufficient physical science/engineering graduates who would want to go into this industry. Let us face the fact that nuclear decommissioning is not as sexy as building new power stations. It is one thing to see a bright new future in reducing carbon

dioxide emissions and saving the planet, but if it is just a matter of taking a reactor apart and burying bits of it, that is not exciting for young people. This is an area where it is in any event very difficult to get young people in the UK to go into physical sciences and engineering. If out of that diminishing pool of students you need to attract quite a large fraction in order to populate NII, NNC, BNFL, Nexia Solutions, AWE and the National Health Service—the NHS also uses a large number of people with nuclear skills—that is quite a large task. At the same time, in general universities—which also need money to keep their courses going and pay their staff—have not run a lot of these courses because there has not been a huge demand from students.

Q29 Mr Clapham: So, there is a skills blockage at the present time?

Professor Gelletly: Potentially, there is and we are addressing it.

Professor Grimes: It depends on the route we adopt. It is true that we no longer have the necessary people if we want to go out and design our own reactor system, as with Magnox and AGR. If one is talking, however, about buying a design off the shelf a lot of the engineering that goes into it is not unique to nuclear. We have the people and skills, particularly in the field of civil engineering, to build the things in the first place. We do lack skills in specific areas. We lack apprentice-type people in a generic form, which basically agrees with what you are saying. There are also very specific areas in the nuclear field which we lack. For example, at the moment we do not have enough people to facilitate the development of safety cases to say whether or not this particular reactor would be a useful design and could be licensed. Although we have a skills shortage it is not overwhelming. There are particular areas of research that we are starting to plug with the research councils that I mentioned right at the beginning. You are seeing a change in the university environment at the moment. There are increasing amounts of research in this area which over the next three years or so will start to develop the very specialist people who will be needed, but we are not doing enough yet.

Dr Nuttall: I am starting to come across anecdotal evidence that young people are reading the newspapers, watching television and realising that nuclear is not dead and, therefore, are signing up for nuclear modules and courses. There seems to be a rapid growth in student interest, coupled with very welcome initiatives, such as NTEC which is led out of Manchester and various other things, all of which help to meet demand. I would argue that perhaps in total they are insufficient but nonetheless they are helpful. But the area which causes one most concern is the faculty in order to teach these students. Many people who have valuable knowledge are now retired. Thankfully, they are still with us but are retired. There is a worrying age profile of university people. I also mention the very highly skilled. I do not want to overstate it because Professor Grimes rightly mentioned that the real concern is at the lowest skill level. But I think it is important to

address the issue of PhD-level people. The reason I mention it is that we might think in terms of working on very attractive and challenging science for five to 10 years, say, with a PhD and post-doc before doing more applied things, for example decommissioning. One can imagine certain research and development programmes which perhaps do not succeed in providing the best waste management policy, if it is in the waste area, and which are not the best academic blue skies research project but which are a good hybrid. That is an interesting and possibly applicable Pasteur's quadrant approach, to use the jargon, to address two needs: research and development for this temporary period as people pass into their careers.

Q30 Mr Clapham: To seek clarification on this important question, Dr Nuttall and Professor Grimes appear to be saying that because of the increased interest in nuclear we are attracting students into the universities, particularly at specialist level?

Dr Nuttall: No. To be clear, I do not believe that there are any undergraduate degrees in nuclear engineering in the United Kingdom. We are talking about modules within other courses and students signing up to do an elective module. That will not solve the skills challenge, but I think it is a small point of optimism.

Professor Gelletly: Most of the training takes place at the postgraduate level, either at MSc or PhD level. There is evidence of a small increase in interest, but it would be foolish to regard it as an upsurge. We are really struggling to produce enough physics, chemistry and engineering graduates generally. Many of the courses which still survive in the nuclear area have done so only because foreign students have taken them in the past. First, at school level we need to create a lot more interest in physics and chemistry so that then students go on to physical sciences and engineering; and, secondly, students need some confidence that there is a career in this area before they go on to a more specialised course.

Q31 Mr Clapham: What you are saying is that if government makes up its mind that there is to be an expansion of the nuclear sector it will have to intervene to ensure that the UK has the kind of skills required?

Dr Nuttall: The capacity to deliver.

Professor Gelletly: To be fair to government, or whoever is making the policy, another part of the DTI is already trying to make efforts to improve the uptake of physics, chemistry and mathematics in schools. Ultimately, that is where the real problem lies. There are not enough young people taking these subjects at school and then wanting to go on to develop them into a career, and that is a disaster more generally and has nothing to do with nuclear power.

Professor Grimes: It is not unique to nuclear. I think that we have bottomed-out; we are starting to move up the slope again, but it is not clear how quickly we are doing it.

Professor Gelletly: I would love to agree with that but I am not absolutely sure it is true.

Q32 Mrs Curtis-Thomas: Has the UKERC undertaken an audit of the skills needed in nuclear energy in the short, medium and long term?

Professor Skea: Our executive director, John Lockhead, is a member of the energy research partnership and is leading one of the work streams within that on skills needs. It is taking place in association with other people in the academic and business sectors.

Q33 Mrs Curtis-Thomas: You are looking at your skill capacity both in terms of your operational needs in the short, medium and long term and your professional needs?

Professor Skea: That is the topic that is being addressed through the energy research partnership.³

Mrs Curtis-Thomas: I should like to have the terms of reference of that particular inquiry and also its relationship with its own Sector Skills Council and how the needs have been articulated through that council.

Chairman: We can have it afterwards. I should like to move to an area which another committee is also looking at: waste management.

Q34 Mr Weir: One of the great problems of nuclear has always been what to do with the waste. Whatever Nirex proposed as a solution inevitably met with huge public resistance. CoRWM has been looking at this. Can you tell us whether its recent recommendations have met your expectations?

Professor Gelletly: The draft recommendations were very much what I expected that particular committee to produce. The strengths of the draft recommendations are, I think, two: one is that after its deliberations it finally came up with the solution that every other inquiry that has ever looked at it has arrived at: deep geological disposal in the long term. But I think the greater strength of its recommendations is its views about how the public and community should become involved in decisions about the siting of a repository et cetera. Although it begins right up front by saying that geological disposal is what we should do I think its recommendations are weak in that they hedge them around with all sorts of qualifications instead of really telling us that what is needed is a solid decision to go for geological disposal and a managed system which goes all the way from taking the fuel out of the reactor, to placing it in temporary storage in wet

³ *Note by witness:* The UKERC does not have a specific remit from the research councils which fund its operations to assess skills needs. However, UKERC's Executive Director, John Loughhead is a member of the Energy Research Partnership (ERP), co-chaired by the Chief Scientific Adviser Sir David King and Paul Golby, Chief Executive of E.ON UK. ERP is running a workstream on *High Level Skills Development*, led by John Loughhead and Sue Ion, Vice-President of the Royal Academy of Engineering. The objective of this workstream is to identify whether, and if so which, skills shortages exist in the energy sector. We understand that this, and other workstreams, are intended to report by February-March 2007. Information about ERP can be found at: www.energyresearchpartnership.co.uk.

 16 May 2006 UKERC and Institute of Physics

ponds, then placing it in dry storage over long periods and, finally, deep geological disposal. Given the make-up of that committee it does not go into detail on the nature of that disposal, and it would be a waste of time if it did. What is really needed now is what it says at the end, that a body independent of government has to be set up to manage that policy. There needs to be a clear-cut policy as to what waste we shall put into the ground eventually. Will it include plutonium, for instance? That body should then interact very closely with the communities at the possible sites where we can store it. Geologically, there are plenty of places in the UK where we can store it. Kent would be rather good.

Q35 Mr Weir: CoRWM also gives a timescale of something like 50 years before there is permanent deep disposal. Given the timescales involved, do you think that the Government has to deal with the question of waste prior to making a decision on whether or not to go for new nuclear build?

Professor Gelletly: Yes, I think so. Quite independently of new nuclear build, we should finally be grasping this nettle. We have talked about it long enough and we know what the solution is, so we should set up this body and start the process going and make a decision on it.

Q36 Mr Weir: You mentioned earlier the Finnish experience of persuading the local community to accept deep disposal. I am interested in how Finland managed to do that given the experience both in the UK and United States whenever this has been raised.

Professor Gelletly: We always went about it in the wrong way. Essentially, we were trying to command people and say, "We are going to bury the waste in your area." Naturally, there is huge opposition. Potentially, I think that there are communities which would welcome a repository in the area where they live. One can easily see incentives. First, there is work if nothing else. If one is to dig a very big hole one has to service it et cetera. Consequently, I think that there are incentives. The Finnish experience was very much that. There was a dialogue with the local communities. They had a veto but they were persuaded in significant numbers that this was the right place to build it and they were happy that it should go ahead and be built. I should add one point about the CoRWM recommendations. They say that they are neutral about new build. One question that they should answer is: if this is a system which will take the legacy wastes, which are much larger than anything we would get from new build over the next 60 years, surely they should answer whether, if there was new build, the same kinds of facilities could be used to store or dispose of that waste as well.

Q37 Mr Weir: I look forward to your trying to persuade the people of Kent that that is a proper place for a nuclear dump. You mentioned new build. In the paper from the Institute of Physics it is said that new stations would add no more than 10% to

existing legacy waste. But it seems that this will be higher level radioactive waste, if I understand it correctly. Is that so?

Professor Gelletly: No. I think that the volume we would be adding to the high-level or total legacy waste would be relatively small and would be of the order of 10%. One has to remember that the history of this whole matter in the United Kingdom started effectively with a whole series of large-scale experiments in reprocessing, the building of different types of reactors et cetera. Because of the military involvement, too, we have a huge volume of legacy waste.

Q38 Mr Weir: That does not quite answer the question. It is said that a greater proportion of the waste would be of higher radioactivity requiring special and expensive handling and disposal. As I understand it, much of the legacy waste is perhaps low-level waste whereas much of the new waste would be of higher radioactivity. Is that correct?

Professor Gelletly: Yes; a bigger proportion of the new waste would be higher-level waste.

Q39 Mr Weir: Would that require a different storage regime from the existing legacy waste?

Professor Gelletly: That is a question which is not settled by CoRWM and that is why we really need to have a detailed examination of possible storage sites and whether we store all the waste, intermediate level and high-level waste, in the same facility or whether we need separate facilities for them. Those are details which CoRWM will not really pronounce upon.

Dr Nuttall: I have to hand a comment sent to me by Nirex UK that estimating the percentage increase in the radioactivity from waste produced by new reactors is complex as the increase is dependent on a number of assumptions; for example, higher burn-up for fuels in the reactors would lead to higher specific activities, so while the comment about the 10% by volume is clear there is an issue about higher-level waste.

Q40 Mr Weir: Does it not also depend on the type of reactor that you build? I understand that some fast breeders will use up more of the waste than other reactors.

Professor Grimes: The types of off-the-shelf reactors that we have been talking about already are all basically the same as Sizewell B. Therefore, the type of waste that we are getting from Sizewell B is pretty similar to the types of waste that we would create in an immediate new build, if there is to be one. One of the problems with which CoRWM has been trying to get to grips is the fact that we have these different types of legacy waste and what is also known as orphan wastes: small amounts of very specific and different types of waste from all of the different experiments we have made. One of the keys, if we went down the nuclear new build route, would be to settle on a design and build a number of these different reactors so that we had one type of waste to

deal with and so did not have a mass of different wastes. That would make the whole process much easier to deal with.

Q41 Mr Weir: Is there a working example of a fast breeder reactor that would use up the waste and could be built in the UK? Is that still at an experimental phase?

Professor Grimes: The technology for fast-breeder reactors has been taken to a point where those reactors can create electricity in a useful manner. It is somewhat more expensive than a conventional thermal reactor at this point, which is why I do not think we will go down that route immediately.

Q42 Mr Weir: But it would produce less waste in the long term?

Professor Grimes: It would produce less waste in the long term because the burn up of the fuel is much higher. However, the sort of reactors that we would immediately build would be the so-called generation III, or perhaps generation III+, type time. The sort of fast-breeder reactors are really still confined to the generation IV situation. You are thinking, I believe, of at least another five or 10 years further on in time. It also involves the issue—these problems are so knotty—of how much uranium one has, because if one goes to much higher burn-ups with fast reactors one uses much less of one's uranium inventory in the first place. There are a lot of reasons why one may want to think about going down the fast reactor route but that will not be done in the near term.

Q43 Mr Weir: Is it not the case that if one goes down the existing reactor route the chances of ever moving on to fast breeders are fairly minute given the number of stations that would be built in the first instance?

Professor Gelletly: Not really. I do not see why you come to that conclusion.

Q44 Mr Weir: You say that we will be building between five and 10 stations relatively quickly. Have I correctly understood that it will be some time in the future before the fast breeder reactor becomes economic?

Professor Gelletly: Yes.

Q45 Mr Weir: Then it seems that you are putting your eggs into one basket.

Professor Gelletly: These reactors have a 60-year lifetime, approximately, and one will still want to produce electricity at the end of that period. It seems to me unlikely that one will not want to do that.

Q46 Chairman: Five years is quite a long time for politician; 60 years is almost impossible.

Professor Gelletly: I was assuming that you were men and women of particular vision.

Dr Nuttall: With vision comes complexity. I think that the main message is already coming through which is the long timescales associated with your question. I am sure that as we move towards phased geological disposal the doors will be open to such a facility for many decades. I note that CoRWM is

interested in research and development for new ideas. If you are particularly interested in fast reactors as a waste management option I commend a European Commission-funded research programme known as Red-Impact that is under way now. That looks at fast reactors and accelerator-driven systems as possible routes for the management of the back end of the fuel cycle. But I return to the idea that these are technological options for several decades into the future that may never be needed. We may conclude that we should do direct disposal of spent fuel, just as Sweden does and other countries, like the United States, are looking at. I end my comment by saying that in my opinion nuclear waste is not remotely as big an issue or threat as carbon dioxide waste. The public and policymakers should really recognise that. Carbon dioxide waste needs action now, whereas nuclear waste has important long-term issues but to my mind is a less pressing problem.

Q47 Judy Mallaber: The research centre in response to the energy review consultation argued that public confidence in any decision on nuclear build is critical. We have been hearing that polling suggests there is growing support for retaining the nuclear element in our future energy policy, but I am conscious in my own constituency of how, regardless of what Dr Nuttall just said, having had a long-standing campaign against Rolls-Royce's marine department dumping low-level nuclear waste in the constituency, just the word "nuclear" stirs huge fears within people. It is still a substantial issue. There is a perception around at the moment that the current energy review is all signed, sealed and settled and it is just a mechanism for the Government to rubber-stamp a decision that has already been taken to keep nuclear build. What do you think the Government needs to do to restore confidence in that policymaking process and for people to think that whatever decision comes out at the end of it is the appropriate one?

Professor Skeat: The research councils supported work by Professor Nick Pidgeon at the University of East Anglia on the whole issue of public confidence. The message that emerged from it was that, broadly speaking, people were not enthusiastic about nuclear power but there was perhaps an increasing acceptance of it at the purely national level if, first, there was a clearly established need and investment was being made to deal with the problem of climate change, and, secondly, if it was part of a portfolio of other options that perhaps included renewables and energy efficiency. One would get perhaps a grudging acceptance by the majority of people in the population at large. The question raises an important issue. I do not think that what happens in the country at large is the only factor that matters; what matters is what happens in the local communities and the individual areas of the country which would be affected by nuclear investment. I do not think there is any clear picture at the local level about that, because if it is a question of coming into the area and dumping waste without any economic benefits quite naturally people may be opposed to it. On the other hand, in the localities where there are

16 May 2006 UKERC and Institute of Physics

existing nuclear power stations that are making an economic contribution to those areas the level of support tends to be higher. One of the matters that we need to understand better is that it is all very well to do national polling but the key question is: how will things play out in individual communities?

Professor Gelletly: It is a bit like the debate on whether or not to join the euro. If one does not make the case the only arguments to be heard are those against it, and largely that is what we have in the field of nuclear power. If the Government decides to make a decision that there can be new nuclear build and commercial interests want to do it one has to make the case. The case is very much as Professor Skea said. We are faced with really serious problems in terms of climate change. I do not think there is any doubt now that people believe that climate change will occur unless we do something about carbon dioxide emissions. At the same time, I think that if there is a policy of building standard reactors of the new type over a period it will be found that the costs will be lower than for other forms of electricity generation. In addition, security of supply will be very important.

Q48 Judy Mallaber: I believe that people can understand those other factors, but are you saying that they are irrational to be scared about nuclear power and my constituents are mad to worry about such issues when they see it affecting their area?

Professor Gelletly: They are not mad to worry about many different things. They should worry about climate change, the regulation of chemical factories and additives in food. All of those things are worries and should be regulated, but there is a rational case for many of these things and that case must be made as well. It is linked to emotive issues such as if the lights go out and the sea level rises. If the ice caps melt completely it will rise 80 metres and we will be sitting here under water, and so on. There are, therefore, very strong arguments as to why one may want to go down this route.

Dr Nuttall: I think that the Finnish example gives us cause for possible optimism. I know that Finland is a very different country from the United Kingdom; it has a very different history. But it leads me to be optimistic in a small way, in that I can imagine communities for various reasons volunteering to have new nuclear power plants in their neighbourhoods. Equally, others would choose not to. I see this as being related potentially to the siting decision. One may have a set of potential sites that are technically suitable and engineers and scientists say that they would be good places but the local population, frankly, does not want them. My personal preference is that we should not force technology on such a community, and the Finnish example gives us cause to see that progress can be made in that regard. I think that many people intuitively regard nuclear power as being associated with authoritarianism and the history of naval propulsion and the bomb. The heritage of nuclear power gives them good cause to make those mental links. But, looking to the future, I perceive nuclear

power more as a force to preserve our liberal democratic society with the lifestyles that we have now.

Q49 Anne Moffat: There is also the link between health and the amount of nuclear waste which we never hear about. I want to ask about capacity and the politics of this. First, what percentage of generating capacity do you think we need from nuclear, and how many new plants would that mean?

Professor Gelletly: That is quite a difficult question to answer. I would have thought that the minimum we should be aiming at is the replacement of the capacity that we shall lose by the early 2020s. Personally, I think that the French example is a much better one; they have a much higher percentage. They have had a steady policy for a very long time and they are benefiting from it enormously. They are selling 10% of their electricity to Italy and the UK. That seems a very good deal to the French public.

Professor Skea: I would hesitate to put a precise number on this. If one thought that nuclear power was a good thing and the right answer there would be no reason to stop at replacement or, for example, at 20%. I do not think there is any particular need to do it. The reason I would hesitate to put a number on it is that the nuclear industry worldwide has improved its performance very substantially over the past 10 to 15 years. One of the reasons for that is that it has been increasingly exposed to competition. If one set a specific number for nuclear power it would take away from those incentives to perform against competing technologies. Although it is a bit unfashionable at the moment, I would celebrate some of the things that have happened as a result of competition over the past decade or so.

Professor Grimes: The types of reactors that we have been talking about have a much higher capacity than the old Magnox and AGR reactors that would be replaced. Further, we have suffered from the fact that we were almost the first to build commercial power stations. Magnox reactors were not terribly efficient; they were very marginal and expensive to build. The sort of reactors that we would be replacing them with would be that much more efficient and produce much less waste. If we just sited the new reactors on existing licensed nuclear sites, which helps the whole process along, we would not have to stop at 20%, if that was what the Government wanted.

Q50 Anne Moffat: I have a problem with the gun being held to our head. I think that it is time we bit the bullet and made a decision, because security of supply is the priority here. Do you think that the Government has the ability and confidence to bite that bullet and go for at least a big element of nuclear in the new energy mix for the future?

Professor Gelletly: One answer to that is that I hope this issue is big enough that it is non-partisan. Of course, the Government in some sense has to carry the can and make the decision, but I feel that this is a non-partisan issue. Energy policy is so important

16 May 2006 UKERC and Institute of Physics

that I hope that in the end all of you—you will have different views—will come to a consensus that is in the interests of the UK.

Professor Skea: There is a great deal of uncertainty in electricity markets at the moment and that is holding up investment. I think that the big challenge following the energy review is to develop certainty. One of my biggest fears as a result of that energy review is that that certainty does not emerge. I would be cautious about the number of ducks in a row that need to be set up to move forward and give confidence. We have talked about planning, licensing, carbon incentives and stable electricity markets. A lot of work is to be done to make this happen and to give the market the confidence that it needs.

Q51 Chairman: All of those issues are cross-sectoral; they do not affect just nuclear but other parts of the energy market.

Professor Skea: Yes.

Q52 Anne Moffat: If we think of the ducks that could be lined up, one is devolution in Scotland. The Scottish Parliament has rights over planning legislation. It already has a policy because of a coalition that it will not have any new build nuclear until the waste management situation is sorted out. In my view, that is an absolute nonsense. How can we hold up the future of energy for the UK and the international community on an issue like that? That is just one of the problems we face.

Professor Gelletly: I think that the reason is very simple. As CoRWM has said, you have to persuade the public and communities involved. I do not think that that need take a tremendously long time. The decision in principle for geological disposal can now be made in very short order. In terms of the Scottish situation I think that that obstacle will be out of the way quite quickly.

Q53 Roger Berry: Dr Nuttall, your comment about choice of site for new build was interesting. Do I understand that your policy prescription for

government, therefore, is that it should welcome new build but that the choice of sites should be subject to veto by local residents?

Dr Nuttall: No. I put it more as a question than a proposed solution. I think that it is worth thinking about. I am not an expert on the issue of planning, but I think that in relation to the balance of trust the Finnish experience on deep geological disposal is quite remarkable in that the community had the power of veto and yet did not exercise it. The issue of perceived authoritarianism where something is being forced on a reluctant host community has an unfortunate association with nuclear energy and harks back to the past. I do not believe that it need be that way. I think that a community can see the benefits of being the host for a power station or some other nuclear facility and may choose to welcome it. I am not entirely pessimistic about it.

Q54 Judy Mallaber: Are you suggesting that the only people who need to be convinced are those who have the site nearby, because all my constituents and others will say “Remember Chernobyl and other blow-outs across the world”? That may or may not be rational; the technology may or may not have moved on, but how do you respond to that? It will not simply be the communities where the nuclear sites and disposal sites are situated?

Professor Gelletly: One has to persuade the public more generally, but in addition communities which will host either a waste disposal facility or a reactor have to be very heavily engaged in the process right from the beginning. That is the message that comes across from CoRWM. That committee was set up with a majority of social scientists just for this purpose. The message that it gives us is that people have to be involved on the ground right from the beginning and they have to be persuaded that it is in their interests to do it.

Chairman: We have covered a lot of ground. We could go on for a lot longer but we have further witnesses to hear, so we must bring this session to a conclusion. I am most grateful to you for your time and trouble and for the various bits of information that you have promised to provide in writing after this meeting.

Witnesses: **Mr Keith Parker**, Chief Executive and **Mr Simon James**, Communications Manager, Nuclear Industry Association, **Mr Robert Armour**, Company Secretary and General Counsel and **Mr Paul Spence**, Head of Strategy, British Energy, gave evidence.

Q55 Chairman: Gentlemen, welcome to this portion of our evidence session this morning on issues relating to nuclear new build. As usual, I ask you to begin by introducing yourselves for the record.

Mr Parker: My name is Keith Parker, chief executive of the Nuclear Industry Association. On my left is Simon James, communications manager for NIA. We are accompanied by colleagues from British Energy.

Mr Armour: My name is Robert Armour, general counsel for British Energy, and can I introduce Paul Spence who is head of strategy.

Q56 Chairman: As you heard me say during the previous evidence session—I think you were in the room—in this section we want to concentrate on the commercial issues. I shall turn to my colleague Roger Berry very shortly to start that process. There are a few issues that I do not think we have

16 May 2006 Nuclear Industry Association and British Energy

discussed at sufficient length so far on which you may have views. One in particular is the safety and security issue which is obviously a matter of great public concern. Your written evidence did not have a great deal to say about that. You may want to comment on it now or provide us with further written information. Policymakers have also been concerned with questions of proliferation. That is also a matter on which you may have views. There is one technical issue in particular which I have discussed with Mr Armour in the past and is a matter of concern to a Member of the Committee who cannot be here today; namely, what happens if something does go wrong. Who is the insurer of last resort, because a nuclear incident can be very expensive? How does the private sector cope with that? That is a matter on which Mr Armour will want to comment in addition to the other two issues, either verbally now or in a later written submission.

Mr Armour: Starting with the issue of safety and security, I am happy to give you more information on the industry's record. We start as a very heavily regulated industry. We are regulated on environmental grounds; we are regulated by the NII on nuclear safety; and we are regulated on security by the Office of Civil Nuclear Security. We have about 20 regulators who overlook our business. The safety record of the industry in the UK is, I think, second to none in the sector. I think that the nuclear industry has had a very good record over the period. The same also applies to the security record in terms of looking after our sites. You may or may not get evidence from the director of civil nuclear security who also comments that he believes we have a sound and effective system in the UK. I could go on in detail but I think it is easier to put that in the note. As to insurance, nuclear installations and operators have strict liability for anything that results from their operations. That is established by international treaty. The UK is a participant of both the Brussels and Vienna conventions that regulate and channel that liability. It also sets different levels of insurance to be borne by the operator and ultimately, in the event of international issues, to be channelled and borne by the state. Effectively, the insurance level is set on the operator, in many cases by the capacity of the insurance industry out there. There are a variety of insurances that by statute the operator is required to have in place. Periodically, that is updated. The UK is contemplating raising the insurance levels on operators in line with international practice.

Q57 Chairman: The cost of dealing with a major incident would be beyond the capacity of a private sector company, or possibly the insurance market?

Mr Armour: In many cases the containment and design of the station means that we would not expect any consequences to be other than to the plant on the site. Therefore, for virtually all of the foreseeable reactor incidents that we are talking about we believe that the insurance with which we operate will be adequate to cover that. But, clearly, if one

looks at something like Chernobyl, which was an international incident, there are established mechanisms for dealing with that internationally.

Mr Parker: On the question of proliferation, there is an international safeguards regime to detect and discourage the diversion of nuclear materials to weapons use. It is administered by the International Atomic Energy Agency and all UK facilities are subject to that regime. I think there is confidence that there will not be diversion of nuclear materials from the UK, but obviously it is a sensitive issue with Iran currently in the news. The reassurance is that the regime exists and is robustly administered by the IAEA.

Q58 Roger Berry: Thank you for both written submissions. I should like to raise the question of cost and its implications for policy. I notice that, as always, when it comes to the costs of nuclear power there is a wide range of estimates. They are very sensitive to capital cost assumptions, discount rates, the price of fossil fuels and so on. British Energy in its submission argues that nuclear can be cost-competitive with other forms of base load generation. One of the issues it raises is the assumption made about the cost of carbon. To what extent does your assessment about the cost competitiveness of nuclear depend on policies about factoring the price of carbon into energy generation? How important is that particular variable?

Mr Spence: As you say, the cost-competitiveness of nuclear against any other form of generation depends on the relative perceived risk of that nuclear project and the upfront capital costs. Those are the two big determinants of how much the long-run nuclear power would cost to produce. One then sets against that the relative cost of the other technologies, which then comes down to forming a judgment about the likely cost of the fuel in those other technologies and the potential for the cost of carbon to be borne by them if they are carbon-emitting technologies. Given the present regime, we observe very volatile fossil fuel and carbon prices. That makes it difficult for any private sector investor to take a decision to invest in heavy capital plant, be it nuclear or fossil. We recommend and believe that a stronger long-term signal about the cost and value of carbon would be a helpful mechanism to reduce the uncertainties that the private sector would need to deal with and to allow a sensible decision to be taken.

Mr Armour: That is not just important for nuclear; it is also important for renewables and all forms of low carbon electricity production.

Mr Parker: It would also accord with the Government's objective to reduce carbon emissions. It seems a desirable mechanism to have a long-term and stable value for carbon.

Q59 Roger Berry: Various studies are referred to in your two written submissions when dealing with the costs of nuclear energy. Do the studies include the cost of waste disposal and decommissioning?

Mr Spence: All of them include allowance for the cost of taking down the station and long-run storage of what comes out the back end.

Q60 Roger Berry: Have previous studies on the cost of nuclear energy been fairly accurate in relation to predicting capital cost and the cost of waste disposal and decommissioning?

Mr Spence: To be quite honest, the track record is mixed.

Q61 Roger Berry: I would like you to be quite honest, please!

Mr Spence: One can find plenty of studies out there which have under-estimated the costs associated both with generation and the back-end. All we can say is that we believe the studies we have quoted are based on sensible and conservative projections which take account of the best real world knowledge, not simply what might happen in the future.

Q62 Roger Berry: You have talked about the importance of long-term stability. If you are to plan for the future obviously it is helpful to have some stability in terms of expectations and so on. But over what period of time do you expect government to be able reasonably to maintain a consistent incentive structure and price for carbon emissions, and so on? What are you looking for?

Mr Spence: In an ideal world one would love a regime that endured for the full life of the plant, which, as you heard earlier, would be about 60 years. We recognise that it is not an ideal world. It should be for as long as possible. I recommend a 15 to 20-year forward look as the sort of period that the private sector would have regard to when considering assurance for the funding of any plant, whether it is nuclear or coal.

Q63 Roger Berry: How credible do you think that is given that governments could change every four years or less?

Mr Spence: Industry deals with that uncertainty all the time. All the time the oil and utility industries have to make a judgment about the likelihood that the world will change with a switch in political regime. All one can do is deal with what is there at the moment and the degree of apparent support for that particular arrangement.

Roger Berry: But those other industries are investing in new plant; you are not.

Q64 Chairman: My understanding is that the German Government is giving precisely these long-term guarantees to the new coal plants being established in that country, irrespective of whether theoretically ETS allows them to do that. Is that your understanding?

Mr Spence: I have heard that about Germany. I do not have the details.

Mr Armour: Clearly, in the current situation where the carbon market has lost two-thirds of its value in the past three weeks there is uncertainty as to what limits will be set in 2008. There is no scheme or

arrangement beyond 2012, so there is a disconnect in the context of the need for an energy policy that gives the right mix by 2050 and investment that is looking at a 20, 30 or 60-year horizon.

Q65 Roger Berry: Another problem is the volatility of the electricity market in terms of prices. Do you think that the current electricity trading regime is sympathetic to UK new build, or do you believe that the balance between the long-term needs and short-term adjustments to the market necessitates a change in the electricity trading regime?

Mr Spence: We would preface our views on this by saying that NETA was clearly set up in a world somewhat different from today's. It was a world of over-capacity, relatively abundant fossil fuel and low fossil fuel prices. Today's reality is different on a number of fronts. We need to find a regime that will encourage timely investment in any sort of generating technology. This is not a nuclear-specific point. We would question whether or not that means looking at the fit of the arrangements. I do not know whether a long-term carbon signal on its own is sufficient to do that or whether it needs a more fundamental look at the total electricity market. However, my experience both within British Energy and, previously, as a consultant to the utility and oil industries is that very few, if any, companies make decisions about their investments on the basis of the short-term spot market; they decide on the basis of a longer-term view of the fundamental dynamics, whatever the market. Whilst, therefore, we see a lot of volatility with NETA I believe that the backdrop to the decisions that the private sector will make is the question of long-run carbon and fossil fuel prices.

Q66 Roger Berry: There are market fluctuations certainly in this area. You say either that you will leave this to the market and judgments will have to be made by potential investors, who will have to adopt a view about long-term values, variables et cetera, or that you believe in the free market but it is so anarchic out there that you want government to lay down price signals and affect the market arrangements. Which is it? You were suggesting, I think, that it could be left to investors to adopt their own views about what happens in the long term. Is that the case?

Mr Spence: Our view is that government needs to set a framework that sends a signal about what policy outcomes it wishes to achieve, whether those are low carbon, security of supply or perhaps diversity of generation. If those are the things that government wishes to achieve we recommend that it tests the existing market against those objectives and decides whether the market will deliver those to them, and at the moment I am not sure that it would.

Mr Parker: I should like to reinforce that point. Clearly, there is no planned investment in generating capacity in the current market, but there is an urgent need for that investment to come forward quickly, because we face a generating gap within the next 10 to 20 years as existing coal and nuclear stations come

16 May 2006 Nuclear Industry Association and British Energy

off the system. At the moment, nothing is coming forward to replace them, so we face potential energy supply interruptions in 10 or 15 years' time.

Q67 Roger Berry: What kind of signal do you want? Do you want a signal from government which says, "We are nuclear neutral. If you want to do new nuclear build, fine; we have no problem with that, but you go and do it. You observe the market. You are entrepreneurs, so just go out there and do the business. We will not block it"? Alternatively, do you want that plus a signal from government which says, "We will give you some planning directions on the kind of mix we want. We will start to give you target prices and change the electricity trading regime to provide greater security"? I am not clear what you think is the role of government in all this?

Mr Parker: I repeat what Mr Spence said. It is a matter of creating the framework.

Q68 Roger Berry: What is the framework?

Mr Parker: It is the identification of the desirable outcomes of the energy policy, and the Government has already said quite clearly that future security of energy supply and reduced carbon emissions are desirable outcomes of energy policy. What I am saying is that the current policy or market does not necessarily deliver those outcomes, so it is perhaps for government to create the framework in which there is some certainty, for example about the long-term value for carbon which would have the effect of reducing emissions.

Mr Armour: NETA was very focused on the economics of generation. If government wants to achieve diversity in terms of a balanced mix which gives us robustness against shocks and a low carbon outcome the signals must be factored into it. Something like the carbon trading scheme was a way of factoring in the low carbon issue.

Q69 Mr Hoyle: Obviously, I want to talk about getting the timing right. People say that unless we have nuclear power the lights will go out, but the big issue is that we know it could be five years before you get the go-ahead for a new nuclear plant. Is there anything that you believe could be done to streamline applications? We must also ensure that the public has the right to object and is not compromised. Do you have any solution?

Mr Parker: You are right about the timing. We heard earlier about the length of time taken by the Sizewell B inquiry. Issues about policy, need, economics and safety, as well as local impact and environmental matters, were discussed at great length. Two years later one had the Hinckley Point C public inquiry. Although it was shorter it considered a good number of the same issues: policy, need, economics and safety. Our view is that there is scope for streamlining some of those decisions. Policy, for example, should not in our view be decided at a public inquiry. It is not the function of a public inquiry to debate it; it is for the Government and Parliament to decide policy. I think that there was a misapprehension among a number of people who participated in those inquiries that they were

having some influence on government policy whereas they were just to advise the Secretary of State on the issues.

Mr Spence: There is a potential for a five-year process upfront for the planning and licensing of design. As Mr Parker said, the first thing we recommend is that any process has a sensible upfront debate about national policy but once that is formed it should not be re-debated repeatedly in any subsequent local inquiries. Our second recommendation is that licensing and the process for assuring the safety of any particular design should take place, again with proper scrutiny, by a regulator with public involvement, but that it should take place once and should not be re-debated in any local inquiries. We recommend that the local component of inquiry focuses on the issues specific to a particular potential site and the impact on the communities in those locales. As part of that, the Government has a number of proposals under the major infrastructure planning regulations that could be put into force and help to make this happen in a more efficient and streamlined fashion without undermining the ability of the public to play a role.

Q70 Mr Hoyle: Obviously, regulatory bodies—the Health and Safety Executive and so on—must have an input. Do you believe there is a way of reforming, or possibly merging, those views in order to speed up the process, or would it compromise the rights of the people who live in an area where the proposed project may go ahead?

Mr Spence: Again, we have not made suggestions about the best way for government to choose to organise itself.

Q71 Mr Hoyle: Some would argue that the Environment Agency and Health and Safety Executive are part of the government. They are agencies that protect the public. I do not quite see them as being "the government"; otherwise, they could end up being the voice of government?

Mr Spence: We would recommend that the Environment Agency and the Health and Safety Executive agree the protocol to cover the specific issues and one of them takes the lead in an area and does the work needed to cover both needs so we are not faced with a situation in which both feel the need to examine the same issue from subtly different angles in series and thus prolong the time and increase the cost for the same outcome.

Q72 Mr Hoyle: If we said that with the existing process it could take up to five years, how long do you believe would be the right timescale? Would it be two years, three years or four years? What do you expect it to be?

Mr James: I am not sure it is helpful to time-limit it.

Q73 Mr Hoyle: What do you think is a fair assessment of the time needed?

Mr James: One of the problems lies in merging into what are essentially three different areas that need public examination. The first issue is national policy. Second, is the generic reactor type safe? Thirdly, is it

safe on that site and is it acceptable to public opinion? To try to curtail artificially any of those debates would be unhelpful because it would not give the public a sense that they are confident in the process. What we should try to avoid is circulating those arguments so that every time we look at a local issue we are looking again at all the national issues. For instance, if one is looking at safety systems in a reactor core, those will be the same regardless of the site on which the reactor is situated. To look at the same systems again would be very unhelpful. To try to put a time limit on it would probably be unhelpful, but to look at these matters in parallel as separate issues would be particularly helpful both to allow these stations to be built but also to create greater public confidence that these are safe systems and it is the right way forward.

Q74 Mr Hoyle: We started off by saying that in the past these inquiries had taken five years. Surely, you are not saying that in future you would expect to see it taking five years. Therefore, you would expect it to be shorter. You must have some timescale in mind; otherwise, we could end up with no electricity in the country?

Mr Parker: In a way, five years is our best estimate. In the past it has sometimes been considerably longer than that, and that is what we are trying to avoid. If new nuclear is needed or is regarded as being desirable in terms of its contribution to diversity and the reduction of emissions we need a degree of streamlining to ensure that projects can progress at a reasonable rate. If there is not a degree of certainty or predictability in planning and licensing what will happen is that investors simply will not put their money into new nuclear, which in our view would be unfortunate.

Mr Armour: The Committee might find it interesting to note the French timescales. The French have announced that they are to build a new reactor at Flamanville. They have been through a public consultation process and have now announced the timescales for the planning process. These are expedited compared with the UK. We do not suggest that you adopt those processes, but they are much more defined and disposed to try to achieve an outcome and build something than we have here. Major infrastructure projects generally, whether it be grid lines, nuclear stations or whatever, do find a major barrier in getting over the planning hurdle in a sensible fashion. That is something which the review needs to look at.

Q75 Mr Hoyle: If there is a site where emissions already occur would you choose to build there with the existing permission where the public might not be allowed to have an input into that new build?

Mr Armour: I think we would require new permissions for a new site. Clearly, there are certain issues that go into the choice of sites, whether they be grid connection, land suitability, seismic capability or whatever. Many of the existing sites were chosen because they were favourable for that purpose, but for any station we would have to go through a new process.

Q76 Chairman: Typically, do you find that where you are on an existing site the local community is better or less well disposed towards nuclear?

Mr Parker: Generally, they are better disposed towards nuclear; it is part of their local environment and it provides economic benefits, and the closer people are to nuclear the more well disposed towards it they seem to be.

Q77 Mr Binley: My personal background is business, particularly entrepreneurial business. I may be misreading this, but I gain the impression that the industry is on the defensive; it has lost some confidence and has not got it back. Let us assume that you have total confidence today. What would be your choice of reactor technology for the new series of nuclear power stations? Why would you choose them? How would the sector react to the Government choosing a preferred design to give economies of scale, bearing in mind what we were told earlier about the four different designs and the difference between evolutionary and new stuff and so forth?

Mr Parker: I do not think that it is for government to choose which design is built in the UK. I agree with what our predecessors said this morning. The most likely ones will be evolutionary-type generation III designs which have evolved from existing well-trying technology, perhaps based on PWR designs or the CANDU, or the boiling water reactor. We have built a PWR in the UK and so we have operational experience of it. There are evolutionary PWR designs which will be available to us.

Q78 Mr Binley: Can you comment on the question of confidence? It seems to me that the times they are a-changing. Do you agree? Do you believe that it is time to go on the front foot a bit more?

Mr Armour: If we have conveyed lack of confidence it is an attempt not to create the impression of arrogance, of which we have in the past sometimes been accused. We are trying at this point to be somewhat more measured and balanced in that sense.

Mr Spence: I should like to expand on the points made by Mr Parker about particular reactor designs. There are a number of very strong candidates among internationally accepted designs. Our view is that the important consideration is that the UK finds a way to be able to adopt those international designs and to be connected with the operating and industrial experience that will come from having stations similar to those being used elsewhere in the world rather than being in a technological cul-de-sac, which is arguably where we are with the AGR and Magnox fleet today.

Q79 Mr Binley: I do advise you not to be quite so downbeat. I think that you have a better story to tell. To what extent will the UK have to rely on foreign technology for the construction of a new series of nuclear power stations? What risk might that pose? You might also comment—this is totally outside my sphere but I am being cheeky—on what the

16 May 2006 Nuclear Industry Association and British Energy

Government might be able to do to help you about the length of time taken, should the decision be made to proceed with a new series?

Mr Parker: As to the degree to which we have been reliant on foreign designs, it was pointed out this morning that we would not be building a UK-designed reactor. I think that is quite clear. Therefore, we shall have to look for overseas designs to source our choice. There are a number of acceptable designs available to us. It is interesting to consider the extent to which the UK industry will be involved. We have looked at the existing capability within the UK industry and are confident that a very large amount of the work, say 70 to 80%, required to build the new reactors can be done on the basis of existing capability. Given the lead times for new reactors, that capability can be enhanced. As you heard this morning, there are some pinch points where we no longer have the manufacturing capability, for example in relation to reactor pressure vessels, steam generators, large turbines and large forgings. As Professor Grimes has said and a number of companies in the industry have indicated, if there is confidence in the developing international and domestic markets for new nuclear power stations the capability to build some of these large items can be revived. In many cases the facilities still exist, because we did have this capability a few years ago. They could be revived with sufficient investment but also with sufficient confidence in the future.

Q80 Judy Mallaber: I note that in the memorandum from the Institute of Physics there is reference to the revolutionary new types of station as being more efficient and safer than evolutionary ones. You have talked only about evolutionary stations. Does that mean you are throwing out any idea of better types of nuclear power stations?

Mr Parker: No. I think it is a matter of timing. There have been great advances in technology in the past 20 years or so since we last ordered a nuclear power station. Therefore, the new stations that are available will certainly be more efficient. They contain advanced passive safety systems, or at least some of them do. But there is another generation beyond that and research is going on into what are termed generation IV reactors.

Q81 Judy Mallaber: That is the generation after the next one?

Mr Parker: That would be the generation beyond the evolutionary designs which are available now.

Q82 Mrs Curtis-Thomas: Mr Parker, you said that 70 to 80% of the build could be done here. Would you like to break that down? What can be done here?

Mr Parker: Certainly, all of the civil engineering work and construction of the station can be done here.

Q83 Mrs Curtis-Thomas: Does that take into account the other major construction projects which need to be undertaken in the next 15 years in the UK?

Mr Parker: Yes. We have looked at that. The large construction project that is on most people's minds is the 2012 Olympics.

Q84 Mrs Curtis-Thomas: That accounts for only 4% of the construction build in the south-east of England alone?

Mr Parker: Yes, but given the long lead times with nuclear new build that work would probably occur after that particular date. One can see it as providing an extension, if you like, for the construction capability rather than it being in conflict with it.

Q85 Mrs Curtis-Thomas: When you say you have looked at it, does that mean you have produced a paper?

Mr Parker: Yes, we have, and we can supply it.

Chairman: The Committee has a broader interest in the capacity of the construction industry, so that would be helpful.

Q86 Mrs Curtis-Thomas: Therefore, the construction capacity is indigenous to the UK?

Mr Parker: Yes.

Q87 Mrs Curtis-Thomas: What about the hardware, the equipment itself?

Mr Parker: Most of the plant and equipment could be provided by the UK. With a little more investment, something like 60% of the plant and equipment could be provided by the UK.

Q88 Mrs Curtis-Thomas: You said that the capability can be revived. The implication is that it is currently in mothballs, or do you mean there is existing capacity but it needs to be expanded? If so, who will fund it?

Mr Parker: The existing capacity is available. While there has been no nuclear new build of generating stations a lot of work has been going on in the nuclear field to support nuclear decommissioning, waste management, life extensions and the maintenance of existing nuclear power stations. Therefore, there is a significant level of existing skills within the UK on the nuclear side which can be enhanced to cope with a new build programme, as our report concludes. As was said earlier, a lot of the work on nuclear power stations is not nuclear-specific; it is similar to work required by large infrastructure projects elsewhere. We have the capability for that.

Q89 Mrs Curtis-Thomas: Will you let us have that report?

Mr Parker: Yes.

Q90 Mrs Curtis-Thomas: We heard earlier this morning about operator skills and the skills of professional staff. Does the UK have a large enough pool of skilled people to meet the demand, if we have a decision in favour of nuclear build?

Mr Parker: I would agree with what was said this morning. Generally, the skills are there. The age profile is perhaps of concern. If there is confidence in a revived nuclear industry then it should attract new people to the sector.

Q91 Mrs Curtis-Thomas: Mr Parker, you know as well as I do that in order to get the type of academic provision to produce the type of skilled staff needed, both in the professional and vocational capacity, the universities and FE colleges require a five-year lead time to do it. Are you confident that you have articulated the needs to those academic providers so they can be ready to respond to demand when it actually takes place?

Mr Parker: Yes. Certainly, in the past couple of years or so there has been a significant movement in the provision of new courses in universities. The University of Lancaster only this week has announced a new master of nuclear engineering course, because it foresees the need for new qualified nuclear engineers.

Q92 Mrs Curtis-Thomas: Do you know how much capacity there is in the UK FE and HE provision for nuclear courses and examinations?

Mr Parker: A study is being conducted by the Sectors Skills Council, Cogent, which covers the nuclear sector. That has looked at the provision. We can provide you with the figures from that report; I do not have them immediately to hand.

Mr Armour: The industry has been working with Cogent. NDA and the industry are looking at setting up a nuclear skills academy looking at the skills required for both operation and decommissioning. We have been doing quite a lot to increase the flow through in terms of operator skills on stations like the PWR. As with the rest of industry, we face a shortage of good quality graduates and technicians coming forward. That is a generic issue which confronts the UK. This sector of industry is certainly trying to increase that.

Q93 Mrs Curtis-Thomas: Do you think that the Sectors Skills Council is doing a good job for you?

Mr Armour: We have seen a huge improvement in terms of what has happened in the past two or three years with the merger of the nuclear industry into Cogent and the focus moving forward. That has not necessarily come through; there is, as you say, a lead time.

Q94 Mrs Curtis-Thomas: Has the Government's response to the Sector Skills Council requirements come up to your expectation? As representatives of employers are you doing all you can to ensure that you offer training opportunities to people who are interested in working in this area?

Mr Armour: As a company we have concentrated in many cases on trying to build our operational skills base. Much of that is done in-house because there has not been an outside course to do that. We have seen the right moves coming out of Cogent which we will be working with to try to improve the situation. I do not think we will get to a situation where the UK

has the capacity and skill to do the design, but we would buy a new reactor from an established international design. The issue is whether we have the right skills and we are developing them to run it and, going forward, to decommission it. That is what we have been concentrating on with the Sector Skills Council.

Mr Parker: More generally, the industry is closely involved with Cogent. We provide advice and information to Cogent through a nuclear employers' group which is part of NIA's remit.

Mrs Curtis-Thomas: I hope that you are helping it with its representations to the Government because, after all, it funds HE and FE provision which needs to deliver on your behalf.

Chairman: You need not answer that rhetorical question.

Q95 Mark Hunter: I should like to turn to waste management issues. There is a strong argument that new nuclear generators should be responsible for paying for the disposal of waste. Indeed, only recently the European Commission has made it clear that funding arrangements for the NDA should apply only to the historical liabilities that are now being tackled. How should the disposal of future nuclear waste be paid for in your opinion? Can you outline the current process for funding the UK's existing nuclear liabilities?

Mr Armour: There are a number of international models, some of which we mention in our submission. If you look at what happens in the US, Canada, Finland, Sweden and Spain, there is a variety of mechanisms for building up the funding over life. That is important in the context of new build in giving a developer a degree of certainty and, equally, building up funding over the life as the output of the station comes forward. Historically, the funding has been provided by operators building up funds over the life of the station. In our particular case, British Energy achieved a settlement with government back in 2004. That took historic wastes from a previous period and transferred them to the NDA in return for a proportion of our cash flow going forward. The Government currently is entitled to two-thirds of the cash flow of the company convertible into shares. At the current share price we believe that that will exceed the value of the waste streams that the Government has taken over.

Q96 Mark Hunter: Do you think that the approach should differ for the new nuclear build?

Mr Armour: I think that, going forward, probably something similar to the established mechanisms overseas would be the sensible and understood way forward. Effectively, a levy is paid as the electricity is produced and that builds up the fund over time.

Q97 Mark Hunter: You are probably aware that the Committee on Radioactive Waste Management has recently published its draft recommendations on the long-term management of the UK's nuclear waste legacy. That committee has suggested deep-level storage. What are your views on this? Do you think that the Government and industry have the capacity

16 May 2006 Nuclear Industry Association and British Energy

to pursue an agenda for long-term waste management and new nuclear build at one and the same time?

Mr Parker: We welcomed the CoRWM process, because it was clear from previous experience that we needed a more transparent and open process that involved widespread consultation and looked at all the options. We are not particularly surprised by the conclusion at which CoRWM has arrived. As Professor Gelletly said this morning, almost all studies which have looked at the issue have come to the same conclusion. There is a question of timing. What we are advocating now is that once CoRWM formally reports to government in July of this year the latter would need to respond to the committee's findings fairly quickly and then set in train, if you like, the loop back towards the recommended option of deep disposal, involving transparent procedures for site identification and selection. If that clear policy direction is in place I think that it will improve the case for new nuclear build, particularly in terms of public confidence. We can then proceed with the new nuclear build applications given the right circumstances. I suspect that the actual building of a repository for waste would be much further down the line than new nuclear stations, and CoRWM itself has said that it may well be 20 years or so before we get to that point. Again, I believe that the skills would be available to deal with that.

Q98 Mark Hunter: You believe that there is capacity for both to proceed at the same time?

Mr Armour: Not only the capacity, but it is also important that we move forward. We have a legacy in the UK and we must tackle it. I think it is time that we did. It is very good that at the end of an extended process CoRWM has come out with a degree of consensus on deep repositories as the way forward. I think that the UK should now catch up with the rest of the world and try to move forward on that.

Q99 Mark Hunter: That takes me to my final question which is to do with experience in the United States. As you will know, the US Government is speeding up the licensing and planning procedures and providing funds for utility companies to prepare for licences to undertake engineering studies and to develop cost estimates. The taxpayer is also funding a production tax credit, loan guarantees and insurance for licensing delays. Despite all that support, the US Government's programme for nuclear build will produce only 6,000 megawatts of capacity, which is equivalent to 60% of British Energy's current nuclear fleet. Would it take a similar programme of support in the UK to encourage the same amount of new build? If so, what is your approximation of how much that would cost the UK taxpayer?

Mr Spence: Clearly, we look around the world and see the parallels in different markets. One sees the US moving ahead with a programme which we believe is set in the context of the way that the US industry is structured and the utility companies there receive the cash for the power that is produced. As I understand it, the number of stations going through

the consent process is more than those which would receive the production tax credit, so if all of those go through it will deliver more than the 6,000 megawatts of capacity in the US. It is just the first 6,000 megawatts in that market which will receive the tax credits. I would be happy to send something to the Committee just to detail our understanding of the way the incentives are structured in the US. But in terms of the question whether that is what it would take for the UK, it comes back to the design of the right arrangements to fit the way the market is structured. The UK market is not designed in the same way as the US market. We believe that it needs to be something that fits with the way that NETA is structured. There are lessons from the US, Finland and France about different aspects of what they have chosen to do. We think that the Government should look at all of those and use that to construct something that makes sense for the industry here.

Mr Armour: In a nutshell, pre-licensing, putting some certainty into the process of taking forward a particular design and greater certainty about the carbon signal would help in the UK context in dealing with the planning process and bring things forward.

Q100 Mark Hunter: Could you deal with the cost issue which I mentioned in the latter part of the question? If there is a similar programme of support in the UK to encourage the same amount of new build, how much is it likely to cost the UK taxpayer?
Mr Spence: We are not talking about subsidies.

Q101 Chairman: That is very helpful. You have just said that the nuclear industry needs three things from government, given that we do not build these stations any more: a change in planning; a change in carbon; and pre-licensing.

Mr Spence: Perhaps I may add a fourth one which we take for granted; that is, CoRWM moving forward and, therefore, a route on waste management.

Q102 Chairman: None of that has any direct cost to the taxpayer except for the civil servants' time involved in taking it forward?

Mr Spence: Explicitly, we are not looking for a subsidy.

Q103 Mr Bone: I come to this with an inclination towards nuclear power. I am concerned if for public confidence reasons the industry dismisses any objections as being emotive and extremist. I wonder whether your very good comment about not appearing to be arrogant is part of the solution to that in building public confidence.

Mr Armour: I think that more than most we rely on public confidence for our licence to operate. That is very much why we think it is important to go through a process of open dialogue, whether it is the planning or licensing process. There is a tendency to repeat those rather than have legitimate debate. We welcome what has happened with CoRWM which is a matter of learning from the past. There has to be

engagement, but equally one has to come to an understanding at some point, deal with things and move forward.

Q104 Mr Bone: Another issue related to public confidence is that the energy review by the Government is supposed to be an open one. I am much minded to listen to all the debates and hear where we should go forward on energy. The media is presenting this as a done deal and the Government will come down heavily on the side of the nuclear industry. In the past there have been examples where this Government has made up its mind and gone through a process of review or consultation. That is a concern to me in the area of public confidence. Do you share that concern—or perhaps you know whether or not it is a done deal?

Mr Armour: We hear the Government making very clear statements that it is nuclear neutral, and it is probably making the right statements. There is not a single solution to this problem; we need a balance if we are to tackle security of supply, sustainability, global warming and affordability. Against the environment in which we find ourselves we need no one solution. Nuclear is not all of that, but equally it would be daft to ignore the only proven large-scale generation type one has that is low carbon. I believe, therefore, that it has to be part of the ongoing mix.

Mr Parker: One also sees the public reflecting that view. We do regular polling. When the question is put, “Would you advocate a mix of generating sources including renewables and nuclear to provide security and reduce emissions?” about 63% of the population will agree with that particular proposition. We are also seeing a growing awareness among the public of the dangers of climate change and the risks to the security of energy supplies. Again, that influences the way in which they look at issues like nuclear; they are beginning to see that it has some benefits in terms of addressing those concerns.

Q105 Mr Bone: Both evidence sessions today have been very useful. I would be very interested in your view about the idea that communities should be

given the option of vetoing the building of a nuclear power plant. If that was possible it would give enormous public confidence to the whole process.

Mr Armour: Perhaps one should distinguish two aspects here. I think that the original question was asked in the context of a long-term repository which might be there for thousands of years. In that context should a local community have to sign up to it? The interesting example is perhaps the Finnish one where in the latter stages four communities were competing and it came down to two finalists and one choice, in return for compensation. The community which was chosen in the west of Finland also has the nuclear station. We have seen that replicated overseas. Getting a community to sign up for a very long-term arrangement is important. If one is talking of a power station that is there for 60 years, equally there must be benefits for the local community and it must go through the planning system. Do I think we should give vetoes to this or any other major infrastructure project, for example if one similarly regarded power lines? At the moment there is huge controversy in Scotland over the question of power line upgrading. There must be a balance in the planning system between national need and the interests of the local community. It should take those together, but ultimately we must find a way through that does not create planning paralysis. In the context of nuclear waste we have a legacy in the UK and a solution must be found for it. It should be possible to do that by consensus, but ultimately we have to find a way through.

Q106 Chairman: The planning issue hangs above almost every aspect of the energy debate, as we shall see in perhaps an hour or so when the Secretary of State makes an announcement on gas storage. Microgeneration faces huge planning issues. It seems to me it is planning, planning, planning.

Mr Parker: And not doing, Chairman!

Chairman: Thank you very much indeed, gentlemen. We are very grateful to you for your time and trouble. I think that we will be hearing from the sceptics next week.

Tuesday 23 May 2006

Members present:

Peter Luff, in the Chair

Roger Berry
Mr Peter Bone
Mr Michael Clapham
Mr Lindsay Hoyle

Miss Julie Kirkbride
Anne Moffat
Mr Anthony Wright

Witnesses: **Sir Jonathon Porritt**, Chairman, and **Ms Sara Eppel**, Director of Policy, Sustainable Development Commission, gave evidence.

Q107 Chairman: Sir Jonathon, Sara, welcome to this second evidence session in the Committee's inquiry into the issues concerning nuclear new build. As usual can I begin by asking you to introduce yourselves in the context of this particular session?

Sir Jonathon Porritt: Thank you very much, Chairman. I am Jonathon Porritt, I am the Chairman of the Sustainable Development Commission, which is the Government's principal advisory body on all sustainable development issues, including, obviously, energy issues, and on my left is Sara Eppel, who is the Commission's Director of Policy.

Q108 Chairman: In paragraph 4.1 of part five of your commentary *Is Nuclear The Answer*, you write, "Acting on the assumption that the current Review . . . is indeed a genuinely impartial process, dispassionately reviewing the evidence available to Ministers, (including our own research) rather than rationalising a pre-determined decision with a tokenistic consultation exercise thrown in for good measure, we strongly recommend . . .". Do you think that assumption is still valid?

Sir Jonathon Porritt: I hope so. I am less confident that it is as valid as I was some time ago, and I think the way in which the Government is handling the process around the Energy Review is not clever. It is allowing an awful lot of people to assume that that assumption was wrong and that this is, indeed, an exercise in rubber-stamping decisions that have been taken at a higher level without the proper scrutiny of all the evidence being brought forward in the right kind of way. It is still important for us, the Sustainable Development Commission, to press for a process that is properly transparent, is as rigorous as I think the general public and MPs will require it to be and, should there be any falling short on that score, then the Government will be its own worst enemy because of it.

Q109 Chairman: It is worth recording, is it not, that the Prime Minister's comments at the CBI dinner last week referred to nuclear power, renewables and energy efficiency as all being aggressively on the agenda, and he has been quoted in isolation in relation to nuclear power?

Sir Jonathon Porritt: Which is equally wrong. To be absolutely fair to the way in which that quote was offered to the CBI, those three things were offered in equal measure. It is pretty startling, of course, for

many people to imagine that energy efficiency and renewables need to be put back on a government agenda with a vengeance. Everyone assumed that was the purpose of the 2003 Energy White Paper, and to have the Prime Minister acknowledging that perhaps there was not as much purpose behind the process since 2003 is very disturbing, and I think the phraseology around "with a vengeance" has more to do with bad American films than with proper government.

Q110 Chairman: You still feel it is worth having this evidence session?

Sir Jonathon Porritt: Definitely, because I know there are an awful lot of people out there who are seriously interested in the evidence, and the Commission feels it has made an important contribution to that in the way that we have surfaced arguments for and against a nuclear contribution to our future energy supply.

Q111 Chairman: What the Committee is seeking to do—and, frankly, there is not agreement around this table, I think, about nuclear power yet, that may emerge later in our process—is to identify all the issues and try to understand the facts. I have to say, I found your document *The role of nuclear power in a low carbon economy*, the position paper, a remarkably useful source, and I congratulate you on it. Can we start ticking off some of the issues. One of the things I would like to get your verbal comments on is the carbon status of nuclear. It is one of the issues that is often raised. You have in this document said how difficult it is in many senses to see the end costs—decommissioning and waste-disposal—but how significant do you think that those issues are in relation to the construction and fuel cycle issues and what would you yourself describe as the carbon status of nuclear power?

Sir Jonathon Porritt: We spent a lot of time looking at this, because it has been matter of considerable concern to us that protagonists of the nuclear option choose, in our opinion inaccurately, to describe nuclear as "zero carbon" as a source of electricity. That is either deliberately misleading or just ignorant, because it is not zero carbon. We have suggested all the way through that this should be described as a low carbon source of electricity generation, because when you do track the carbon emissions released directly and indirectly through the fuel cycle, all the way from the mining

of uranium through to waste-disposal and decommissioning, it is clear that there are substantial quantities of CO₂ emitted in that process. However, we would have no objection to people continuing to describe nuclear as a low-carbon way of generating electricity, because that is actually what it is, especially when compared directly to the fossil fuel sources which it will be substituted for.

Q112 Chairman: 4.4 tonnes of carbon for new build nuclear power, compared with 243 for coal and 97 for gas?

Sir Jonathon Porritt: Indeed; those are the figures that we quoted in our research.

Q113 Chairman: You are saying low carbon but not zero carbon, effectively?

Sir Jonathon Porritt: Yes.

Q114 Roger Berry: Nuclear is being presented by its protagonists as being a major option in terms of tackling climate change. Your estimates of the effect of replacing existing nuclear power stations and that replacement of nuclear power stations, as it happens, was the way the Prime Minister phrased that option at the CBI meeting?

Sir Jonathon Porritt: Yes.

Q115 Roger Berry: Replacement would, you argue, displace 4% of carbon dioxide emissions. Given the target is that we displace 60% by 2050, would you care to comment on how significant nuclear might be in achieving that objective, even if everything else was non-problematic?

Sir Jonathon Porritt: Given the scale of this challenge, I do not think anybody should look at any contribution and dismiss it just because it is small. Actually, we are going to need to be doing so many things to meet those targets that you have to have a very strong rationale to choose to forgo any contribution that might be made to those targets. The fact that it is much lower than people think it to be, and the way you hear the protagonists talk about the contribution to abating climate change is, in our opinion, again misleading and unhelpful in this debate, although it is considerably lower than you might imagine, it is still significant, and to pretend that it is not does not, in my opinion, help to provide a balanced argument about the strengths that nuclear has to offer in this debate. As you can see, the 4% is small, because people forget that we are only talking here about 8% of this country's total energy needs. It makes, therefore, no impact whatsoever on transportation issues, on use of heat in our economy, in our houses, and it only touches that part of electricity generation through a 10 gigawatt problem replacing the existing nuclear power programme with a new power programme of that scale, that is 18, 19% of electricity generation today. So, almost by definition, it is going to be a lot smaller than people think it is.

Q116 Roger Berry: As you say, nevertheless, any contribution to the use of carbon emissions has got to be seriously considered, as, indeed, presumably

the timescale in which this displacement of carbon emissions can be secured. Obviously, there is a lead time before new nuclear power stations could come online, typically about 10 years in total. To what extent do we need to make reductions in carbon emissions now, before, obviously, nuclear build can be possible, in order to make a significant contribution to reduce the impact on the environment? How urgent is it, from your point of view, to make significant carbon-reducing actions earlier on rather than later?

Sir Jonathon Porritt: I think for us that was an enormous concern. Having acknowledged that a new nuclear programme could make an important contribution to this, you then have to look at the reasons why that contribution may not warrant all the disadvantages and the risks that come with any nuclear programme. In that respect the timing of this is absolutely critical, because even if you take the most ambitious and optimistic assessment for when we might start generating electricity through a new programme—and I think the most optimistic estimates that we saw were 2017, 2018, pretty much at the earliest—that period of time between where we are now and the very earliest where the first substitute new reactor would come on-stream is precisely the time when we need to be making these massive contributions on CO₂ abatement and investment in renewables, combined heat and power and so on. Then, if you look at the build rate of, say, a gigawatt a year over the next 10 years, which it would need to be, you are not maximising, you are not getting the full benefit of a 10 gigawatt replacement programme until well into the middle of the 2020s: 2025, 2027, whatever it might be. So, again, frankly, if we have not done what we need to do by 2020 around these investments in energy efficiency, renewables, CHP, clean-up use of fossil fuels, in our opinion, it is probably not going to make much difference how much nuclear you bring forward at that stage, because if the rest of the world is as dilatory about investments in those things as we would be by then, it is going to be a pretty grim picture that we are facing at that stage.

Q117 Mr Clapham: Sir Jonathon, given what you have just said about the impact on the climate of carbon emissions and bearing in mind the enormous output from China, America, India, did you look at whether, for example, clean coal technology with the new boilers that Mitsui Babcock are producing, which has one on carbon capture, would have been an alternative that might just impact onto the climate scene much quicker than, for example, the nuclear option or, indeed, bringing on renewables, which we must do anyway?

Sir Jonathon Porritt: We did look at that. We have some nervousness about the use of the phrase “clean coal”, just as we do about “zero-carbon nuclear”, because the idea of coal ever being strictly clean in a real sense is a big leap of the imagination, which is why we talk about cleaner use of fossil fuels. There is not any doubt in our mind that we need to be pressing very hard on further research and development around aspects of cleaner use of coal

23 May 2006 Sustainable Development Commission

and gas in particular, including carbon capture and storage. There are some very important advantages to be gained if we could press for a CCS (carbon capture and storage) component in any energy mix, and we have talked about those advantages in our report but, at the same time, we felt it was important to flag up that we are a long way from knowing enough about that technology and about what the implications are going to be for the world before simply plumping for this as being the way out of the climate change trap, as it were. I hope that we reflected the balance of the views of the commissioners there, which was, "Yes, we have got to get on with this", and we ought to be making, in our opinion, more investments into the prototypes necessary to look at this and into some of the research and development opportunities, and governments should be getting behind that as well as the private sector. There is much more money coming now from the private sector, but it is important for government as well, because that will certainly be part of the mix. It allows us to emit or use fossil fuels to a greater extent than we would otherwise be permitted to use them, because we are getting that fraction of fossil fuel usage without the carbon externality, if it all works. So, it is clearly part of the picture but, again, caution about excessively exaggerated claims too early in the piece, and it comes at a cost. Our figures estimate it anywhere between £30–100 a tonne of carbon abated and sequestered. When you start adding that to your generation costs, you are beginning to look at a pretty steep disincentive for CCS at that level.

Q118 Mr Clapham: Returning to the questions on nuclear waste, the waste costs and decommissioning costs are very, very substantial, and you do make the point in your report that the new reactors will not produce as much waste. Nevertheless, I understand that the waste that will be produced will be of a higher level of radioactivity, and that means that it has to be dealt with in an altogether different way than the high volume of medium and low risk that is currently generated. There is bound to be, therefore, a greater cost with the new generators or the new design generators that have been looked at, but do you feel that the waste management issue is one that must be dealt with and understood before we are able to move, if there is a desire to move, with a nuclear programme?

Sir Jonathon Porritt: Indeed. We have argued very strongly that the Government's existing formal policy in this area that there should be no further investment in nuclear power unless and until there is a clear resolution to the issue of disposal of nuclear waste is the correct policy. I do not see that clear resolution being available to this Government at the moment. The CoRWM Report has indicated something which I suspect most people probably were aware of already, which is that the only safe, or the safest, route to disposal of high-level nuclear waste is a deep burial depository, and the other thing that they told us is that that is going to come at a very considerable cost. If you look at the estimates in Finland and Sweden, for instance, you can see just

how big that cost is. So, that is existing government policy, and I believe the Government ought to remain true to that policy until it has followed through on the CoRWM interim report and a final report later this summer and has then started to negotiate with the UK electorate, with citizens in the UK, what this actually means for people in the UK. How are we going to do it moving from the recommendations that we need a deep depository for this to a decision as to where that is going to go in what timescale at what cost is a very different thing. We would argue strongly that there should be no decision about any new nuclear programme until all of those issues are fully resolved and have every reason to believe that was government policy.

Q119 Mr Clapham: Given that you have referred to it as being a substantial cost, could you put a figure on that? Did you look at what the costs may well be of a deep depository?

Sir Jonathon Porritt: We only surfaced the costs as we could get them from the work that is being done at the moment in Sweden and in Finland; and I think we did come up with an estimate in the end, but I am bluffed if I can remember what it was. I am really sorry. We looked a bit more at the decommissioning costs, of course. The information that the Nuclear Decommissioning Authority has released into the public domain recently gives us a bit of a firmer steer on that, and we are obviously talking there of up to £70 billion, in their own figures, for decommissioning across the entire nuclear state, of course, some of which is not civil nuclear power, it is the non-generating bit of the nuclear estate, and so we know that decommissioning is going to earn a huge amount of money. It has to be said that when the economists get onto these huge figures, these tens of billions of pounds, and they persuade you that these can be discounted out over the lifetime of the reactor—so you need to factor it in per kilowatt hour, and then you look at the additional extra bit on the per kilowatt hour cost, and then it comes down to something that looks very reassuringly small—we are pretty suspicious about some of the techniques that are used to persuade the public that these are not that substantive a set of additional costs, and, as you will have seen throughout our report on the economics of nuclear power, advised very considerable caution indeed about accepting anybody's estimates as to what a new generation, new reactor design is likely to cost in the future, and I am sure we will come back to that.

Q120 Mr Clapham: The figures that you referred to that you have just put your hand on, is there any chance of us being provided with those? It would help in the debate.

Sir Jonathon Porritt: Of course. Absolutely.

Q121 Mr Clapham: Thank you. Turning again to our scientific base, do you feel we have got the capacity to deal, on the one hand, with decommissioning and waste and, on the other hand, with new build?

Sir Jonathon Porritt: One of the big issues that we surfaced in doing this research was the issue about capacity, and even very enthusiastic advocates for nuclear acknowledge that there are some extremely serious capacity issues. As I understand it, those capacity issues are already being felt with the new reactor in Finland where they are finding it difficult to recruit in the numbers of qualified staff that they need to carry out different functions in their construction programme. If you think about what a 10 gigawatt replacement programme would look like and the capacity needed to do that, coupled with a commitment to engage in the decommissioning challenge that we face in this country and move forward on a waste-management strategy rather than just allow the problem, as it were, to fester, just sitting there without any idea what we are going to do about it, this is a huge set of skills which would be required for the UK Government to move forward on all three fronts at the same time.

Q122 Mr Hoyle: Is there any circumstance, Sir Jonathon, in which you might see yourself supporting nuclear power in the UK?

Sir Jonathon Porritt: What we have said, and we have tried to be absolutely upfront about this, is that we are advisers to the UK Government and did not feel it was appropriate for us to make judgments about whether nuclear might be appropriate to other governments elsewhere in the world, and on one occasion we somewhat jokingly said that were I the Chairman of the Sustainable Development Commission in France, the job of persuading the French President that they did not need any more nuclear power but could simply decommission all their existing reactors and move to alternatives in France, that would be a pretty steep advocacy challenge, if I could put it like that. We also looked at what is necessary in China, in India, and we acknowledge that different circumstances in different countries may well persuade the governments of those countries that nuclear is an important part of their mix. That is a long preamble to us saying that we have done the detailed analysis on the issues here in the UK and came out, at the end of that analysis, strongly of the opinion that new nuclear was not necessary for the UK to meet its over-arching energy objectives. Can I imagine any set of circumstances in which nuclear would be necessary in the UK? It is difficult, because there are those who say that if we continue to prevaricate on efficiency, renewables, CHP and so on, we might see a gap opening up so precipitously in front of us that we would by default have to bring in nuclear as the only means of bridging the gap. The truth is that that gap will only open up over time and, once we are aware of how big the gap is, because of our inaction on all of those different areas, it would be too late for nuclear to make the contribution that it would be required to make at that stage. It is difficult for me, as Chairman of the Commission, to see those set of circumstances, but I have to reflect the views of the Commission, the commissioners here, because some commissioners did not come out with an outright: "No, it is not appropriate for the UK", they came

out with a statement saying, "This is not appropriate for the UK now, in the knowledge that we have about the challenge that we face today", but also said that there might be a set of circumstances in the future where they would be persuaded that nuclear was a necessary part of the mix.

Q123 Mr Hoyle: There seems to be a bit of hypocrisy here, because we are quite happy to take nuclear power from France, which is 60 miles away (the nearest reactor), and I do not see how we balance that off either when we talk about prices. Yet, at the same time, we are encouraging the interconnector, which was meant to operate both ways. It certainly works one way, and that is about sending nuclear power to the UK—nuclear electric generation—and to the Channel Islands, which are totally dependent.

Sir Jonathon Porritt: Yes, and we flag that in our report. The one thing that I hope we have really succeeded in doing is saying that this argument is not helped by people who ignore the realities of our current situation or are so passionately pro- or anti- that they obscure the degree to which we are currently dependent on nuclear, not just our own but on that that comes from France, and on the very substantial consequences of opting to remain non-nuclear for the future. We have said time after time, if government decides that it can meet these challenges without nuclear, it is still an absolutely huge challenge to achieve the carbon savings and the security of supply issues without nuclear. It is a massive challenge. We have not tried to undersell that at any point; we have tried to be very upfront about how big an issue that is going to be for the Government.

Q124 Chairman: You state at page 19, paragraph 3.22 of your main position paper, "The UK's renewable resources are some of the best in the world, and could provide all the UK's electricity over the longer term." Is that the view of the Commission?

Sir Jonathon Porritt: Yes, it is, but I have to qualify it instantly by saying that it could only meet all of our electricity needs at a very considerable financial burden. The research papers that we looked at in this respect are able to demonstrate the theoretical capacity for nuclear, the realistic capacity, if you like, in terms of when you start factoring in some of the issues regarding siting, planning, grid connections and so on, and then, thirdly, is it realistic financially as well as realistic in all those logistical and infrastructure terms, and so on? When you factor in financial realism, which is obviously to be a very important point for the taxpayers of this country, then the figure falls away from a theoretical 100% resource back to something much closer to the figures that we have quoted there, which is around 65% of total electricity generation at the moment; but even that (and we do make this point very clear) comes at a considerably higher cost than people are paying for their electricity today.

Q125 Chairman: This commendably objective paper *The role of nuclear power in a low carbon economy* is a bit different from your interpretation of it, it is a little more journalistic in its style, and I note that the Commission has broadly seven environmentalists, five people I cannot quite define, two industrialists, and the vote at the end on alternative positions to nuclear power seems roughly to reflect the composition of the Commission. Did you just reinforce your own prejudices during the conduct of the inquiry? Did anyone change their minds on important issues?

Sir Jonathon Porritt: I must, first of all, correct a misapprehension about the make-up of the Sustainable Development Commission. We do not have seven environmentalists actually. In fact, some people have criticised the Commission for not having enough environmentalists as fully paid up environmentalists, because most of our commissioners, in fact, reflect different sectors, whether it is education, or health, or concerns about work issues, economic issues, and so on. It is true that two of the business people on the Commission felt that nuclear would be a necessary part of the mix for the UK in the future; two other business people on the Commission did not. I would not want you to paint all of our business representatives on the Commission into the pro-nuclear box and all these kind of zealous greenies into the anti-nuclear box, because it really was not quite like that. We did not carry out a before and after exercise, as in vote now and 15 months later vote again, but I can genuinely reassure you that a lot of commissioners, if they were sitting next to me here, would tell you that a lot of their views about nuclear power changed during the course of this inquiry, because, as the research emerged and as we were able to dig deeper into some of these things, what is inevitably a set of prejudices that you bring with you to any engagement in a debate of this kind were tested very hard indeed, and I can speak for that personally. I was pretty convinced before we started this inquiry that the issue about availability of uranium, so resource issues around uranium as well as resource issues around oil and gas in the future, was a massively problematic issue for the nuclear industry to have to cope with. The research we did indicated that that is not really the case; that actually if you look at availability of supplies over the next few decades, it is likely that those supplies will be sufficient for considerable expansion in the global nuclear industry. That comes with two caveats: (1) is the uranium that is being brought on there of a high enough grade to ensure that you are not emitting vast amounts of carbon by having to purify, enrich that uranium to the level that is required for burning in a reactor, and (2) we do not really know because there has not been a lot of prospecting for uranium over the last 20 years and those countries that have already very advanced uranium mining facilities have not needed to expand those facilities very much because the nuclear industry has basically been on hold. But it is true that, if you talk to the Australian Government, or the Canadian Government, let alone the Government of Kazakhstan, you will hear

some extremely optimistic assessments of availability of high-grade ore for the foreseeable future. So, that issue for me changed as we researched, and I think genuinely the secretariat would confirm that individual commissioners pretty much all changed certain positions as we went through the process.

Q126 Chairman: As Jeremy Paxman would have said, "Well anticipated, Porritt", because that was one of my questions for you later on uranium supply, but you have dealt with that one. Thank you very much. Is it fair to say that what swung it for many of you is your enthusiasm for microgeneration—and we look forward to your report on microgeneration, which you are due to produce shortly—which argues against a centralised grid. The trouble with nuclear is it locks you into a centralised grid for the foreseeable future?

Sir Jonathon Porritt: We spent a lot of time analysing and then reflecting on a number of different opportunity costs, areas of opportunity cost, if you pursued a nuclear replacement programme. Some of those opportunity costs would come forward in terms of straight availability of capital to invest in renewables at the same time as investing in a major new nuclear programme; some of the opportunity cost comes in flexibility in terms of the lock-in factor, but if you go for a 10 gigawatt nuclear programme, let alone a 20 gigawatt programme, you are pretty much locked into the infrastructure needed to deliver that electricity into our economy, into the grid, for the next 50 years. What that almost certainly means is that the necessary investment in upgrading our grid in this country would be geared to a very, in our opinion, old approach to electricity distribution through a central grid-based system. At that point we did look at the opportunity costs of lock-in. We looked at what would happen if we could not bring forward more opportunities through decentralised energy systems which we believed were going to work much better, for a host of different reasons, and I think you probably do not want to go into those today, but we did feel that if you pre-empted the possibility of major new investments in decentralised energy supply and use systems, then that would cost this country very severely in terms of the opportunity costs for the future.

Q127 Chairman: But similar considerations would apply to new build in coal with carbon capture and storage as well?

Sir Jonathon Porritt: It does, indeed, if you are going for a very large plant. The one area where it does not really apply is for smaller scale gas-fired plants, particularly if you are talking about combined heat and power for use in inner city areas where you can take the heat and use that for district heating schemes of that kind; but then you have got much more flexibility, because plant size can come right down from the massive plants that we are talking about at the moment.

Q128 Miss Kirkbride: You mentioned a minute ago security of supply, not just with regard to uranium, which is a slightly different issue, but, obviously, given that so much of our supply is based on fossil fuels at the moment, which we used to supply ourselves but which will now have to come from other parts of the world which are politically challenging, I just wondered where that was factored into your deliberations on nuclear: because no matter what progress we make on renewables, albeit the 100% progress that you are talking about looks like a long way off, whatever progress we make on being more efficient, we are still going to have to burn fossil fuels for a very long time, are we not, and they are going to be coming from places that we are not very comfortable with. Is that right?

Sir Jonathon Porritt: I feel quite comfortable about Norway personally. I do not think our security of supply is massively threatened by Norway and Norway's investment in new infrastructure is going to be hugely significant for us over at least the next 30–40 years. When we talk about security of supply around gas, people instantly leap to President Putin and Russia, but that is not actually the full picture in terms of the places from which we resource this gas, and, do not forget, as we move towards diversified sourcing, we will have more coming into this country by other means, not necessarily dependent on the pipelines through to Russia, so it is not quite as grim a picture as us with Putin's hand around our neck in the way that is sometimes portrayed. However, I am not going to disagree with the broad thrust of your argument because it is true that, even if we got really serious about efficiency and did what many experts believe is now possible, which is to reduce total energy consumption in this country by 50% over the course of the next 20–25 years, and even if we began to bring renewables forward at scale, made sure that all those offshore wind farms were coming on-stream in the time period allowed for, that we had a really serious biomass programme in this country instead of a pathetic imitation of a serious programme that we have got at the moment, if we really got serious about microgeneration and all the rest of it, it still does not totally account for all the energy that we need in the interim period; so, yes, we will continue to use fossil fuels. Our estimate was that the amount that we would need if we did all of those things is at a scale where we would not be imperilled by having to depend on just one supply in all circumstances and, therefore, causing considerable anxiety if for geopolitical reasons that monopoly supplier chose to punish the UK by either charging more or discontinuing supply in those circumstances.

Q129 Miss Kirkbride: Is your 50% reduction of energy use compatible with economic growth? Where does economic growth fit into the 50% reduction?

Sir Jonathon Porritt: It is certainly compatible in our mind with economic growth, because we are persuaded that the only way in which nation states are going to be able to grow their economies in the future is if they achieve these massive increases in

energy and resource efficiency. I do not know where this Committee sits on this issue, but we will see further oscillation in the price of fossil fuels, there is no question about that, but, whichever way you cut it, we are never going to go back to fossil fuels and where they were two or three years ago ever, and I do not think anybody in the industry thinks that we will either. We are looking at an increased cost for industry, an increased cost for the private consumer from energy consumption, which means that the smarter we get about reducing energy use, the better off we will be, both in competitive terms for the economy as a whole and, in personal terms, for our use of energy in our homes, our cars, if we have cars, and so on. Our read is that far from energy efficiency being a threat to competitiveness, we would argue precisely the opposite, which is those countries that get serious about energy resource efficiency will be the most competitive countries in the future and those that do not will be punished for that failure to accept a new reality about energy supply and cost.

Q130 Miss Kirkbride: Where does the fuel reprocessing argument feature in your deliberations and the UK's approach to that?

Sir Jonathon Porritt: The issue about reprocessing is obviously a very big one, because it goes to the heart of the volumes of nuclear waste that we would have to deal with. The assumption that we have made in our assessment of waste arising from a replacement programme are based on a simultaneous assumption that reprocessing would cease. There may be some who disagree with that and think that we will continue with a reprocessing industry in the UK. We genuinely think that is very unlikely, for cost reasons alone, and, therefore, made the assumption that we would not have reprocessing. Without reprocessing spent fuel needs to be classified as high-level nuclear waste, which means that the volumes of nuclear waste which would then need to be disposed of through a new nuclear programme rise substantially, and I think the figures we gave were that they would rise by at least 300% as a consequence of spent fuel needing to be disposed of as high-level waste. That is a very big issue for a waste management strategy for this country, and that is why when we say that, if the Government claims they have got a clear resolution to nuclear waste issues in this country, you look at a question like that—are we going to continue with reprocessing or are we not—and it has a massive bearing on the costs of a nuclear power programme and on some of the liabilities going forward in the future, those liabilities either being borne by a private sector generator or company, whatever it might be, or being borne by the taxpayer through a government decision. Those are massive issues that do need to be looked at as part and parcel of this approach to a proper waste management strategy.

Q131 Miss Kirkbride: Why are we not going to do it any more? You said cost.

Sir Jonathon Porritt: Because the economics of reprocessing are extremely parlous. Many people in the nuclear industry do not believe that they are

23 May 2006 Sustainable Development Commission

really viable in any serious sense. We have had huge difficulties technically, as you know, with our reprocessing plant here in the UK and, unless something dramatically different was to materialise in the use of that technology, it does not seem to us that it is going to be a viable part, if we have one, of a nuclear supply chain.

Q132 Dr Wright: In terms of the environmental landscape issues and in terms of what the Government would desire, i.e. to use some of the existing nuclear power station sites to upgrade and probably renew, they are all mainly on the coastline, and, obviously, with coastal erosion and sea-level rises there is risk to that particular element. If this is going to be the case and the Government have to revisit the criteria that is going to be laid down, would this pose a significant risk to the Government to try to fast-track some of the planning processes and obviously extend the time that it is going to take to build the nuclear power stations?

Sir Jonathon Porritt: I think there are two issues there. One is whether or not we are going to face a set of new considerations because of climate change and increased sea-level affecting existing nuclear sites, many of which are, indeed, on our coasts. We did not do a detailed appraisal of what the increased risk would be at those sites, and what would happen if you simply went for the existing sites would certainly need to be part of any strategic consideration. I cannot comment with authority on that from the research that we did ourselves, but it is pretty clear that some of those sites are going to be very vulnerable and would probably not be available to government for a new nuclear reactor on the same site as where the existing reactors are today. That, I think, is a very big issue which would have to be addressed head-on. The second point, which was more about whether or not the Government is trying to short-cut planning and consenting processes, licensing processes, to get approval for a new reactor programme faster than would otherwise be the case, is a hugely significant concern that we have, because we are of the opinion that, were government to be seen to be short-circuiting the proper planning and licensing processes for an expedited route to a new nuclear programme, nothing could be more calculated to raise public concern and anger than that single decision. That does not mean to say that we are automatically saying that every planning process has to be as long as the Sizewell B process, whatever it might be. The planning process needs to be as thorough and rigorous as it needs to be to ensure that the right decision is taken with the right degree of public assurance. A fast-track sounds to me like the wrong kind of approach to that; so we would both need a national process, and we are completely convinced on the Commission that you would still need to go for a local planning inquiry for any particular site earmarked for a new reactor. We do not believe that you could do without that.

Q133 Dr Wright: In terms of the question of the wind turbines, quite clearly they cause an element of concern, certainly when you talk about land-based

turbines. Up in Cumbria, for instance, an application was turned down and on the east coast, in my constituency, we have the largest offshore wind farm and no objections to that. It certainly has a nice impact as far as I am concerned. However, I can understand that there are going to be significant concerns for a mass of wind turbines through the countryside and will cause concern as well as far as planning is concerned. Do you not consider that wind turbines are going to cause problems for the Government as well, in terms of landscape issues?

Sir Jonathon Porritt: Yes. We acknowledge that this is a matter of considerable concern. If you look at the actual figures regarding planning applications and the percentage of applications that are going through the system, it certainly ought to be of concern to the DTI and to government because a very large number are still being turned down. We have, therefore, always argued that it is going to be more politically acceptable for government to source more of its wind offshore than onshore, simply because the controversies associated with offshore applications and licenses are less than the controversies associated with onshore, although there are still big issues with the offshore planning process as well. The downside to that, of course, is that offshore wind is considerably more expensive than onshore wind, which is why we remain committed to a substantial and ambitious onshore wind programme as a critical part of our overall renewable energy mix and are less tolerant of some of those protectionist voices than others are. When we are accosted by people saying what a blot on the landscape it might be, we are tempted to remind them that if climate change turns out to be as grave an issue as many people believe it to be anyway, the impact on their view and the impact on biodiversity in the UK will be so irrelevant to them that they will barely believe that they made such points at the time. I suppose we are talking about proportionality. If climate change is as serious as we are now told it is by our Chief Scientist and by most independent experts, then excessively sensitive concerns about landscape are inimical to a sustainable energy system for the UK.

Q134 Mr Hoyle: I am interested in turbines. Obviously—you are quite right—people believe the environmental impact is too great on land, the argument being that we ought to go for more offshore. What worries me is not so much that, but what percentage of the time are they actually generating, because there is obviously a down-time when there are so many out of a fleet, or whatever, but also low wind causes a problem but high wind is a great problem where they cannot generate electricity either. How efficient are they in reality? Is it 50% of the time, 40%, 80%? I am not quite sure. Nobody has actually given us a figure on down-time.

Sir Jonathon Porritt: We would very happily send you the report that we did on wind power last year, which does give detailed answers to those questions about intermittency, about reliability and all the rest of it, because it is a very important issue and not one to be brushed aside, but nothing like as big a block

on including wind as a major component, the foundation for renewable energy strategy, as people sometimes make out, and (a tiny aside) the public opinion against wind power is noisy, brash and all over the place, but if you actually look at the surveys of people who live in the vicinity of wind farms, therefore are most immediately connected with them, you will see incredibly strong levels of public support for wind farms anywhere in the UK that has got a wind farm in that vicinity; so we should not get this out of proportion either.

Q135 Chairman: Do you believe the opposition to wind farms is actually fuelled actively by the nuclear lobby as well?

Sir Jonathon Porritt: I have no evidence to that effect, but I cannot deny that such a suspicion has passed through my mind.

Q136 Chairman: If you write in it will be adopted here certainly.

Sir Jonathon Porritt: Almost as guardedly as I have just expressed my answer to you, Chairman.

Q137 Anne Moffat: I certainly find that public support where there are nuclear power stations is very pro-nuclear power stations. The same thing could apply if we had a power station in our constituency, Stromness and East Lothian. I want to go back to planning. You seem to be answering our questions very comprehensively before we get the chance to ask them, so rather than wait, I thought I would jump in now. I am sure you are aware of the political dimension of devolution in Scotland and how they have power over planning permission for any new build for nuclear. How do you think that is going to affect the process? Do you think we should be UK-wide imposing new build nuclear in Scotland and Wales if Scotland and Wales do not want it?

Sir Jonathon Porritt: Obviously an enormously sensitive issue. We did not go into this in depth in our report, but, as we understood it, the actual decision about this is not a devolved power, as such, but Scotland clearly would have a power, through section 36 of the relevant Act, to ensure that no nuclear power stations were built in Scotland. That obviously makes the politics, the party politics, around nuclear power pretty sensitive. I am not sure I am the best person to comment on that in reality. We feel that the arguments that have been raised about nuclear, whether it is in England, Wales or Scotland, are the same and to a certain extent there are particular national issues vis-à-vis Wales and Scotland over and above the issues regarding the UK as a whole, but, by and large, the arguments either for or against are the same.

Q138 Anne Moffat: The electricity generation, the percentage, is far higher in Scotland than it is in the UK.

Sir Jonathon Porritt: Of course. Indeed.

Q139 Anne Moffat: The other thing I wanted to ask you about was a point you make in your paper about your contributions in engaging with the public. Do

you think that we have engaged adequately with the public on the Energy Review or do you think we need to do an awful lot more, certainly in terms of new build nuclear?

Sir Jonathon Porritt: Our engagement with the DTI at the moment around the Energy Review is not just about the substance of the decision about what the right mix is for the long-term energy needs of this country, but it is very much about that issue about process. There is a school of thought inside DTI which would have you believe that the consultation around this Energy Review is sufficient in itself to persuade the general public that the debate has been adequately thought through and adequately had in this country. We fundamentally disagree with that. The consultation processes around this Energy Review have been extremely partial in many respects, selected audiences, small groups of people. By definition they have not touched the general public in the way that you would expect a consultation engagement process actually to do, and there are massive concerns in our mind if the Government says, "We have done all the consultation as well as the analysis, and so we are moving straight to a decision." One of the strongest recommendations we have made to the Prime Minister around this issue is that, even if they come to a conclusion that they are minded to bring forward a replacement nuclear programme of 10 gigawatts, they should not move instantly to that as a firm decision, they should then engage with the general public about that intention as part and parcel of a much fuller engagement process.

Q140 Anne Moffat: How would you envisage that process?

Sir Jonathon Porritt: We have all sorts of ideas as to how that might be done, and indeed we have looked at some of the new techniques the Government itself is using, some of the consultations around health issues, for instance, around pensions, and so on. There are all sorts of ways in which the Government could have an extremely vibrant and active engagement with the general public, which we believe is a pre-condition for a responsible decision-making process in such a controversial area.

Q141 Anne Moffat: Have you got stuff that you could give us on that?

Sir Jonathon Porritt: Yes, indeed, we have.

Q142 Anne Moffat: Finally, you mention security and the possibility of terrorist attacks. Do you want to say any more about that other than what is already in your paper?

Sir Jonathon Porritt: Not really. We did look at that, because it is a very big issue, and it certainly looms much larger in people's minds than the politicians, I suspect, would like, but understandably it looms large in people's minds.

Q143 Anne Moffat: Do you not see that there is a new build that we could build in more secure technology and whatever?

Sir Jonathon Porritt: The interesting thing about the nuclear industry is that there has always been a trade-off between cost and safety, and, if you go back historically, you can see how public demand for and regulators' demand for increased safety barriers of different kinds inside the reactor design, inside the containment process, is the thing that led to accelerating costs for every single nuclear reactor. So, you have got a direct trade-off between safety features and cost, and the same is true if you are talking about securing the facility as a whole against the threat of nuclear attack. In order to give the level of security that people would expect, that will undoubtedly impact on cost, not just in terms of the construction but ongoing security measures which would be necessary to ensure that every single nuclear facility in this country was properly protected against the threat of some terrorist incursion or other. That is an ongoing cost, not a one-off cost in construction. There are many other ways that terrorists might choose to get into a nuclear reactor, other than flying a fully-laden jumbo jet into it, which is the only one that people can think of at the moment. I do not think that is sensible. Terrorists tend not to wait for permission to try something they have already tried in the past, and there will be all sorts of new ways in which they might seek to impact on any country's nuclear programme, through waste facilities, for instance, as well as the reactors, through the transport of nuclear fuel or nuclear waste, through a variety of different things, which I hope the security services in this country are fully focused on but they certainly raise pretty scary scenarios.

Q144 Chairman: Your position is that a catastrophic incident to draw public attention often focuses on things like an airliner, and I notice what you say on page 14 of your summary document: "Modern reactor designs have substantial containment buildings which are unlikely to be breached even by crashing a commercial airliner." In other words, you dismiss—you do not dismiss, that is an exaggeration—you play down those fears. You are more concerned about the smaller more and unpredictable incidents?

Sir Jonathon Porritt: Exactly.

Q145 Roger Berry: Could you turn to the costs of nuclear power. Leaving aside waste, decommissioning, safety issues, and so on, what is interesting is that in your position paper you say that there is not sufficiently reliable information to be able to estimate what the costs of nuclear might be. Last week we had in the nuclear industry, who had various estimates of the costs, understandably a range of costs, but clearly, perhaps, to demonstrate that, in their view, nuclear was cheaper than the key alternatives. Why is it that the nuclear industry thinks it is possible to come up with estimates of costs for new build and your Commission thinks that is not possible?

Sir Jonathon Porritt: I do not want to sound too cynical, but it may just be that they have a vested interest in demonstrating competitive and low cost

for new nuclear build. The one thing that we said with absolute certainty in our paper on the cost of nuclear power is that you should take the opinions of the nuclear industry about future costs with bucket-loads of salt. The evidence shows that, historically, cost estimates from the industry have been subject to massive underestimates, inaccuracy of an astonishing kind consistently over a 40, 50-year period. You might be of a mind here to believe the nuclear industry has moved into a zone of completely impeccable authoritative costing estimates. I wish you well in that position. We are not of that opinion and, indeed, the research paper that we brought forward on cost says very, very clearly that until we can begin to get some more independent cost estimates into this discussion about the costs of nuclear power, *caveat emptor* on anything coming from the nuclear industry is the first and most important rule.

Q146 Roger Berry: To what extent is a part of the problem also that people tend to be talking about two main potential designs for new build that have yet to be produced? We are not buying off-the-shelf nuclear power stations, and that presumably makes the task of estimating cost that much more difficult?

Sir Jonathon Porritt: It does, indeed. The industry actually does not deny that. It just says that they have already got the designs to the point where they can give a body such as yours an authoritative estimate of what those costs will entail. We are not persuaded by that argument.

Q147 Roger Berry: However, are there not equally important cost uncertainties in relation to renewables, to achieving efficiencies, and so on and so forth? Is not the whole energy area full of real difficulties estimating true costs of various strategies?

Sir Jonathon Porritt: There are uncertainties.

Q148 Roger Berry: Wind farms, tidal power, whatever it might be?

Sir Jonathon Porritt: Yes. It is funny that you should mention that one. There are, indeed, considerable uncertainties about many renewable technologies, and again it is foolish to underestimate those; but the truth is that when you look at the cost curves of maturing renewable technologies, particularly wind, you can get a greater degree of confidence about cost estimates for an industry like that than you could by looking at estimates for a completely new nuclear design. The other issue that renewables are not subject to in terms of costs uncertainty is all the extraneous elements, if you like, that need to be included in any proper costing of nuclear. I am not sure that any government would have a proper estimate of the costs of nuclear power until it had decided what it was going to do about the wastes arising from that generation process. That is a long way down the track. We do not know at the moment what the costs arising from a nuclear waste strategy of this kind are going to look like. They have clearly got to be included in the generating cost, the pence per kilowatt hour cost, of nuclear. Renewables do

not suffer from that, because you can look at the decommissioning costs of a wind turbine right now, you can make that estimate right now, you can look at what is entailed in the afterlife of every renewable energy technology, and you do not have any factors as significant and as problematic as that.

Q149 Roger Berry: Free marketeers would say the problem is carbon. You have a proper carbon pricing structure established by governments, there are no subsidies whatsoever to any form of energy source, let the market get on with it. Would that solve the problem?

Sir Jonathon Porritt: It is a seductive position and it is not one that we necessarily dissent from in principle, because actually we do believe that market-based instruments for managing carbon in the economy is the right way to go, and we believe that trading systems is the best mechanism for getting to that point. The problem about moving from that position to the position that says that you should treat renewables and nuclear in exactly the same way is that we see nuclear as a highly developed technology over 50 years which has largely been supported through massive use of public money to bring on new technologies, new designs, whereas many renewables are still underdeveloped, still at a stage where large-scale public investment is warranted in terms of the public benefits which would flow from that investment in innovation downstream. So, it is a kind of apples and pears comparison at this stage, and it is not so much on the carbon issue that you should be seeking to distinguish public support for renewables verses public support for nuclear, it is much more on the innovation and the need to bring on technologies in the field of renewable technology in general in a way that probably will not happen without some public support or other.

Chairman: I am going to bring Peter Bone in because you have moved to the territory that he wants to ask questions about.

Q150 Mr Bone: Your gentle rubbishing of the nuclear industry's pricing I thought might be a little contradictory, due to the fact that it said it has established technologies and so, therefore, it would be a little bit easier to predict the cost. Can I go back to something the industry said to us in the evidence session, and it surprised me a little bit. It is to do with pounds, shillings and pence. It is about new build. They say they can do it without any taxpayer subsidy as long as you have a proper carbon-pricing policy. Are they right or wrong?

Sir Jonathon Porritt: When you say the industry says that, which industry voice are you listening to because, as we understand it, there are contradictory opinions about the degree to which the generators, the nuclear industry, can bring forward a new programme without a subsidy? I have heard different voices in the industry say, on the one hand, "We will not be able to justify large-scale investments here without a guaranteed price over 40 years", which, by any standards, strikes me as a pretty strong pitch for a major subsidy of one kind

or another and, on the other hand, I have heard some of the more bullish voices, particularly in the generating companies, saying, "No, if you look at what is happening in Finland, for instance, and you look at elsewhere in the world, we think we can bring forward a new programme without any subsidy whatsoever".

Q151 Chairman: Last week the Nuclear Industry Association told us they needed four things from Government (I think these are the four): a policy on waste; a planning policy to be clarified; pre-licensing of reactors to simplify that issue; and certainty about carbon costs. With that they said they would need no public subsidy. That was the official view last week from the Nuclear Industry Association.

Sir Jonathon Porritt: Certainty about the carbon costs, I do not suppose they elaborated on carbon cost?

Q152 Mr Bone: I think I can give backup on this point. It is all right being free marketeers and private enterprises and all that, but then you want the guarantee for carbon pricing for about forty years, which really negates that. Can I move away from that. What would you see as an effective carbon Emissions Trading Scheme, and how would it operate?

Sir Jonathon Porritt: We believe the European Emissions Trading Scheme is a good scheme, it has got off to a pretty rocky start, but nobody should be surprised that that start has been difficult for all sorts of reasons. The most important reason is that no trading scheme of that kind, which is basically a cap and trade scheme, will work properly until you get the cap in. The thing that has made all these prototypes work, all these models that are being used—there is a sulphur dioxide scheme in the United States and so on—is that the cap is transparent, it is mapped out over time, and people who therefore need to manage their carbon emissions can see precisely where the price will be going in terms of the available carbon credits at that time. Without a cap process, and without governments taking that very seriously through their national allocation plans, we do not believe the Emissions Trading Scheme can ever work properly. We would be extremely disturbed, as would the UK Government, were the current difficulties around the ETS and around the problems that have surfaced recently through very dodgy national allocation plans—let us be absolutely honest about it—to lead some people to say, "We can do without a trading scheme of this kind". It is really important on a global basis that the scheme which the European Union is experimenting with now can serve as a model for a post-2012 global trading scheme which we still believe is the best way to move the debate forward.

Q153 Mr Bone: Can I move you on to something which I think your Commissioner said. If I am right, you have argued against the inclusion of nuclear

23 May 2006 Sustainable Development Commission

within an expanded Renewables Obligation because of the role the Renewables Obligation plays in developing renewable technology. Is that right?

Sir Jonathon Porritt: That is correct. That is how the Government has designed the Renewables Obligation at the moment. It is there to serve an innovation forcing function as well as support for renewables as a contribution to our total electricity mix. It is quite clearly there in the way the RO is designed.

Q154 Mr Bone: Can you really argue that with onshore wind and, what I would call, biomass landfill gas which are the main beneficiaries? Would you really apply that vis-à-vis nuclear if we had an effective carbon pricing policy?

Sir Jonathon Porritt: You might now at this stage. Do not forget that when the Renewables Obligation came in there was still a lot of uncertainty about even onshore wind. You may now have some reason to argue that is no longer technology and development, that is now proven mature technology. There are still major problems about offshore which still need to be worked through. There are major problems, of course, about interconnectors and getting the electricity from offshore onshore, but that is another issue. On the biomass thing, I would have to disagree with you. This is an industry which is fumbling towards any sense of what it can really deliver technologically. I am very involved as a board member of the South West Regional Development Agency, and we had a presentation a month or so ago, looking at the range of different technologies available in the area of biomass and bio-fuels. We are going to see some extraordinary experimentation, new development, new technologies and new ideas coming forward to meet this challenge, some of which will succeed, many of which will fail. From that perspective, it is not a mature industry, it is an industry where the need for new innovation, and new thoughts about technology, is still absolutely critical.

Q155 Mr Bone: That is very interesting because in my constituency there are allegedly plans for a £30 million biomass plant with a wind farm as well. I am very interested to pursue that. Did you say stumbling or fumbling towards biomass?

Sir Jonathon Porritt: Either will do.

Q156 Chairman: This question of carbon trading to me is fascinating in the whole debate. Yes, the cost of nuclear is very important, but it is important for the renewables sector, for coal and for gas, everyone needs certainty in this area, do they not?

Sir Jonathon Porritt: They do.

Q157 Chairman: Be a politician for a minute rather than an environmentalist. What realistic prospect is there of getting Europe to agree on a long-term scheme, never mind the world?

Sir Jonathon Porritt: I do not think you should be too downhearted about this.

Q158 Chairman: Good.

Sir Jonathon Porritt: I genuinely think Europe has got mandatory targets under the Kyoto Protocol. People forget that mandatory targets come with sanctions and we do not need them. The European Union has no other big picture mechanism for securing its Kyoto target other than the ETS. People in the Commission realise that we may not have got this off to the best possible start but we certainly better get it back on track now from 2008 onwards otherwise we are going to miss our targets by a mile.

Chairman: I certainly strongly agree with these paragraphs you have in your document on this scheme.

Q159 Mr Clapham: Sir Jonathon, can I go back to a point that you made when you and the Chairman were having a discussion about how nuclear might lock us into a situation where it would detract effort from being used elsewhere. Within that discussion it seemed that you were looking at both nuclear and the coal economy as being very centralised, very given to that locking mechanism, when indeed there is much more flexibility in the coal economy than, for example, there is in the nuclear generating economy. Once you generate electricity from a nuclear station it has to flow down the line. The thing about a coal station—and I am thinking here in terms of clean coal burn—is that it is much more flexible, and you can see that, for example, by looking at last winter where, although coal produced about 33% of overall electricity in this country, throughout some of the peak periods in winter we were producing 50% of our electricity from coal. It is a much more flexible option. It seems to me that if we are saying that nuclear would be too rigid, bearing in mind that as we move to renewables and the Government having set its targets for 20% by 2020, we need the backup of a stable source of energy but one which is flexible. It seems that within that scenario coal fits the scene much better than nuclear, for example.

Sir Jonathon Porritt: I think that is well argued. We may be mixing two interpretations of flexibility here. In terms of baseload generation, bringing it on and taking it off, as it were, at any one point, I think what you say about coal is absolutely right. I suppose what we are talking about in terms of flexibility is decentralised local area networks for electricity distribution, so much more for flexibility in the distance between the point of generation and the point of use. In that respect, coal is problematic because I do not know—you probably know the answer to this question—what the minimum size of a new coal-fired power station would be to make it viable. I would imagine, given all the logistics of getting the coal to the plant and all the rest of it, that you probably would not be looking at less than a gigawatt, which means it is not in the same category as gas where you can have much, much smaller generating facilities in the middle of cities, as they have in Copenhagen and elsewhere in Europe, because getting the gas to the plant is much easier and taking the heat from the plant out into the surrounding district makes a great deal more sense.

The problem about the clean coal argument, if I may, is for coal to claim that it is going to be able to offer a clean option for the future of humankind, it is going to have to demonstrate that it can use all the heat which is generated in the combustion of the coal as well as the electricity. It has got to get average efficiencies up from 35 to 80% per tonne which goes into a power station because without that any claim to cleanliness, let alone genuine sustainability, is deeply suspect.

Q160 Mr Clapham: They are low at the present time, as you say, 35%, but some of the new boilers would get it up towards 50%.

Sir Jonathon Porritt: You are still not using heat.

Q161 Mr Clapham: Given the enormous problem that we face in China and India, the transfer of that technology would certainly be one that would help us reduce the carbon bubble around the world quicker.

Sir Jonathon Porritt: I am not taking you on about this. I think there are very strong and important arguments to be raised about the potential use of coal in a more sustainable energy mix. They do pose massive technical and infrastructure issues which the industry is going to have to deal with to make that claim in a big, bold way.

Q162 Mr Clapham: Coming back to my script, and looking at nuclear versus renewables, is it really for you an either/or question? Has it got to be one or the other, or do you feel that one could have an economy which is much more diverse with nuclear coal, et cetera, and still have the stimulus to invest in new renewable energy?

Sir Jonathon Porritt: Again, I think I have to be fair to the diversity of views on the Commission here. Some commissioners felt that it would be possible to have a both/and approach to this, renewables efficiency, CHP, and a nuclear programme coming forward simultaneously. The majority of commissioners felt that it was an either/or situation, not a both/and opportunity. The reason why they felt that was because we have studied with great interest the lack of attention that this Government has paid to securing a sustainable energy future for the UK over the last four years. We, amongst others, have commented very critically about the failure to follow through on the 2003 Energy White Paper. We are not persuaded that this is a Government which will have sufficient political skills, leadership skills, to keep the focus absolutely tightly on the Energy White Paper mix, as I prefer them described, and a new nuclear component. If I may end with one point which often gets left off here. Whatever the set of technologies we bring forward, for both the supply and demand end of it, a sustainable energy future depends upon far higher levels of engagement by ordinary citizens, by the people who, at the end of the day, use that energy for the services they require in their lives. We are very concerned about any scenario for the future which continues to leave people the passive recipients of energy that comes cruising down the wires, they do not have to give a

second thought to where it comes from and they just get on and continue with their lives without any real interest in those whole issues. A sustainable energy future is one in which the individual citizen is going to be fully engaged in understanding the way in which that energy was generated, the way in which it is being used and the responsibilities that we have as individuals to minimise any environmental impact accruing from those two things. For that reason alone we felt nuclear would detract from that systematic engagement challenge of the general population.

Q163 Mr Clapham: You see a decentralised system as being critical to engage the community?

Sir Jonathon Porritt: It is absolutely critical.

Q164 Chairman: What you want to do is turn off the nuclear option, have the threat of the lights going out, and then force people to focus on energy efficiency and microgeneration?

Sir Jonathon Porritt: I think that would be a very regrettable way of achieving higher levels of awareness, if you do not mind me saying. Indeed, since you are quizzing me a little bit on this one, we have said that in terms of our existing nuclear reactors it makes no sense to decommission them any earlier than they need to be decommissioned. If we can extend their life in a way that is both financially viable and absolutely safe from the perspective of the nuclear regulatory bodies, then it would be very bizarre to decommission prematurely rather than allow the full lifetime of that reactor to be worked through. We are not for precipitate unthought out closure of the nuclear programme because we have some inherent belief that nuclear is wicked, we are for a rational approach to our existing nuclear programme and a rational decision-making process about whether or not we need a new nuclear programme.

Q165 Chairman: Do you fear that the Government would relax if it took a nuclear option?

Sir Jonathon Porritt: We do.

Q166 Chairman: The issue of proliferation is a matter of great importance and one we should address. Given that there are widespread nuclear programmes elsewhere in the world, particularly in the US, India and Finland are beginning, is it something we should worry about? Is it a marginal issue or is it something we should be focused on as a Committee?

Sir Jonathon Porritt: Again, we put ourselves in a difficult position here by restricting our comments primarily to the UK scene. That allowed us to say that the operating record of the nuclear industry in the UK is a good one in reality, and people need to accept that. There is no reason why it would not continue to be a good one with a new nuclear programme. However, you could not make the same optimistic assumptions about the operating record of nuclear power in some other countries. Therefore, from our perspective, the risks associated with a

23 May 2006 Sustainable Development Commission

proliferation of nuclear technology around the world is an extremely important issue. We did not feel we were the right organisation to look into that.

Q167 Chairman: Thank you. I understand that. What we are trying to do is bring all the issues together. We have a full checklist, and your document has gone a remarkable way in that direction and I am really very appreciative of it. An issue that worries me is global warming, the raising of seawater temperatures. We heard reports last summer that France had to turn off some of its nuclear reactors because it could not cool them and the water was too hot. Is that an issue we should be worried about?

Sir Jonathon Porritt: I do not know. I do not think we looked at the specific issue about whether average water temperatures would rise so high that they could no longer carry out the basic water-cooling function. We did not look at it. I am sorry, Chairman, we have failed you on that score.

Q168 Mr Wright: In November last year, you told our colleagues on the Environmental Audit Committee, “that it would be a catastrophe and extremely foolish” for the Government to take a position on nuclear prior to the actual results of the Energy Review. What are your views on the Prime Minister’s recent pronouncements about the importance of nuclear power?

Sir Jonathon Porritt: The Prime Minister stayed just the right side of the line as regards the position that the Government may be in. He did not say that the Government has made a decision yet, he very carefully fell short of doing that, and I am extremely glad that he did. I think many people would be outraged and so cynical about a government process if they felt that this was all just a sham. It is hugely important for this country that this is not a sham. The way in which this Energy Review is presented to the people of the UK and the way in which the Government processes it to make a decision are critically important parts of this whole very complicated and very controversial area of public policy. In our opinion, to play fast and loose with that would be genuinely scandalous. We are just, as it were, hanging on by our fingernails hoping that this is still a very genuine process. We will not be able to answer that question finally until we see the way the evidence is presented in the Energy Review. The issue about scrupulous balance in any recommendation brought forward is that that balance emerges from the evidence, not from a set of preconceptions or approaches.

Q169 Mr Wright: At the present time you are quite happy with the due process being put through as it should be?

Sir Jonathon Porritt: Quite happy is a difficult phrase for me to associate myself with completely because it might be misconstrued. We remain persuaded that the Government is taking this process seriously and the Prime Minister’s mind is still sufficiently open to ensure that it is a genuine process.

Q170 Chairman: Do you know what role the Deputy Prime Minister is playing in the Energy Review now? It is not clear to me, but maybe he is playing a role.

Sir Jonathon Porritt: It is not clear to me either, Chairman.

Q171 Chairman: Do you share my concern that the Government is quite thinly spread? We have an Energy Minister, Malcolm Wicks, who I have very high regard for, who I saw was debating Sunday trading during the Westminster Hall debate earlier. It used to be a whole Department of Energy, but now we have a part-time Energy Minister with just a change of Secretary of State and that is it. It is a bit worrying, is it not?

Sir Jonathon Porritt: I think it would be fair to say that the resource which the DTI made available to carry out this review has been substantial. We have not seen any lack of official resource in terms of the analytical capabilities and all the rest of it. I do not think we would express concern that this is being done in a shoddy and improper way. I guess there will always be one Energy Minister who ultimately will be the fall guy for bringing forward the recommendations, first to the Secretary of State and then through to the Prime Minister. Certainly in the meetings we have had with Malcolm Wicks—I have to be honest about this—we have found very serious engagement, a considerable interest in the complexity of the issues, and an open-mindedness which has persuaded us that there is still a lot of thinking going on in the Department. We have not yet had a chance to meet the new Secretary of State.

Q172 Chairman: That is a very constructive note on which to end the session. Is there anything else you wish to say, Sir Jonathon?

Sir Jonathon Porritt: No, thank you.

Q173 Chairman: Thank you very much. If anything strikes you after that you want to let us know about, please drop us a note.

Sir Jonathon Porritt: I think we made a note of three things we are going to send you, so I will certainly make sure we do that.

Chairman: We look forward to the Microgeneration Report. Thank you.

Tuesday 6 June 2006

Members present:

Peter Luff, in the Chair

Roger Berry
Mr Brian Binley
Mr Michael Clapham
Mr Lindsay Hoyle
Mark Hunter

Miss Julie Kirkbride
Judy Mallaber
Mr Mike Weir
Mr Anthony Wright

Witness: **Professor Keith Palmer**, N M Rothschild, gave evidence.

Q174 Chairman: Professor Palmer, welcome to this evidence session on nuclear new build. I am very grateful to you for coming before the Committee to answer questions. Perhaps I may begin by asking you to introduce yourself for the record.

Professor Palmer: Thank you for the invitation, Chairman. I have spent something like 20 years with one of the leading investment banks in London where I headed up the energy finance practice. I was involved in the financing of many different types of technologies, including renewables and conventional. I did some work with British Energy and so I have some familiarity with nuclear. Of course, there has not been any nuclear build and so, like everybody else, I have not financed one of those. Since 2002 I decided to make a career change. I am a part-time academic and part-time business adviser. A significant part of my time is spent advising UK regulators. I advise Ofgem, the electricity and gas regulator, Ofwat, the water regulator, and the ORR, the Office of Rail Regulation.

Q175 Chairman: The first million-dollar question—I do not know how many million it is—is: will the City invest in nuclear? Can we foresee the very heavy upfront capital costs with sufficient certainty, particularly as the two main competing reactor designs which we understand would be under consideration, were there to be a new build programme in the UK, have not yet been built anywhere in the world?

Professor Palmer: If people give a categorical answer to that in simple words it would be misleading. The situation I have set out in the paper¹, which I believe was circulated to some Members, is that it is a complicated jigsaw puzzle where one must know several things in order to know the answer to the question. One must know the cost of the competing supplies of energy. Nuclear will be economic if it is cheaper overall than the alternatives, including conventional generation, gas-fired combined cycle plant being the cheapest conventional generation in this country for the foreseeable future. Within that equation one must also know what value one puts upon not emitting lots of carbon into the environment.

Q176 Chairman: All of these are issues to which we will return in detail.

Professor Palmer: I am sure they are, but the important point I try to make in the paper that was circulated is that whether nuclear stacks up economically depends fundamentally upon how much we as a society are prepared to pay to have a non-carbon-emitting technology to replace a carbon-emitting one. At certain prices for carbon avoidance nuclear can certainly be financed by the City.

Q177 Chairman: It may help the Committee to know that your paper was not circulated but summarised in the papers ahead of the questions for this session. Can we be certain about the capital costs? I have seen wildly different assumptions about the risk, for example, and therefore the discount rate that applies to construction.

Professor Palmer: The capital costs themselves are not at all unmanageable. One needs to be aware that all investments in energy tend to be very capital-intensive. The companies that raise and deploy the capital through the City are very large ones which usually have a track record of accomplishment in providing the sorts of plant that they are accustomed to building. It is true that there are new generations of nuclear on the table, some of which have never been built and some of which have been built only once and not completed, but it is also true that they are developments of existing designs of a type of plant that has been built a good number of times in many parts of the world. I do not believe that the financial markets see the technology risks as peculiarly great or difficult to handle.

Q178 Chairman: But I have seen capital cost estimates which fluctuate wildly by two or three times from the lowest assumption to the highest, depending on the discount factor, decommissioning costs and the assumed level of capacity at which the plant operates, never mind the regulatory risk of things changing during the lifetime of the plant. Are you confident that the market can deal with all those risks and deliver investment in new nuclear build, if it needs to do so?

Professor Palmer: It is not the cost risk in nuclear that is the problem for the City.

Q179 Mr Clapham: Perhaps I may ask a question related to the ones put by the Chairman. In terms of build throughout the world, are you aware of any

¹ App 45

6 June 2006 Professor Keith Palmer

state that has built nuclear power stations without the support of either central or regional government?

Professor Palmer: The United Kingdom is a very unusual place; it is one of the very few countries of the world which has a market in electricity. That creates an environment that is a little different from everywhere else. It has been the custom and practice in most parts of the world for all of the risks involved in generation of nuclear, or anything else, effectively to be absorbed either by the taxpayer through explicit subsidies and support or cost-plus arrangements which place all of the risks onto the customer. In the United Kingdom it is now the policy to have a market which forces the cost and performance risks of plant onto the private sector. The question is whether governments need to put in place arrangements to moderate the risks that are in some sense almost unique to the United Kingdom because it has created a market environment. I do not believe that a strict comparison with other places is directly helpful.

Q180 Mr Hoyle: Presumably, one can ensure cost certainty if one is using the same design of new build all the way through. Do you think that process could be undermined if different firms carried out different new build?

Professor Palmer: I suppose that the first question for the Government and country is whether they are to have new nuclear plants. If so, will they have more than one? If the answer is that there will be more than one the question is whether one has competing consortia or one group that unfolds a sequence of similar plants over time. I do not believe that the question about risk-shedding through design and build contracts is the most important aspect in answering that. I think that the markets will expect the builders of these plants to be able to deliver to a fairly certain price. But there will always be some aspects of the price in a nuclear station which it will not be possible to fix because the Nuclear Inspectorate has a degree of involvement, quite rightly, that makes fixing certain costs a little tricky, but I think that in any event using design and build to share with the producers some of the risks of building these things will be common, whichever way we go forward.

Q181 Mr Hoyle: Do you expect to see similar off-the-shelf designs that keep the price in check?

Professor Palmer: Yes. I think that because it helps to keep the price in check, it is also the logical way to do business, because we all know that the first plant incurs cost that is not incurred by successor plants. The more one can roll out a series of similar technology, the more one gains from learning by doing and reduces cost over time, which benefits everybody.

Q182 Mr Hoyle: Is there any particular shelf that you would expect to look at first?

Professor Palmer: No. There are a couple of well known leading designs in the marketplace and I know that they are all vying for an opportunity, if a

decision is taken, to make their offers. But the proof of the pudding is, as you suggest, whether they are prepared to start taking some price risk on their offers. At the moment, the conflicting numbers that one hears are all just talk and at some point people have to put their money where their mouth is.

Q183 Mr Hoyle: To what extent do you believe the price of gas will determine the viability of nuclear new build? Can gas prices be predicted for the lifetime of a nuclear power station?

Professor Palmer: The future price of gas is fundamental to the economics of nuclear. I started by saying that what drives the economics of nuclear is that it must be competitive with combined cycle gas-fired plant. Even at the very elevated gas prices at the moment combined cycle gas plant is so efficient that before account is taken of the cost of the carbon that it puts into the atmosphere it is still a very inexpensive form of generation, and that should not be overlooked. Clearly, nobody can predict what the price of gas will be for the next 40 days, much less the next 40 years which is the life of a nuclear power station, but, frankly, that is just one of the uncertainties that everybody in the energy business deals with all the time. Oil and gas prices have always been volatile and more or less impossible to predict. People make judgments. If the question is whether one can finance these things because of that degree of uncertainty, the answer has already been given because lots of plants have been built in a market context in the United Kingdom where there has been great uncertainty about fuel prices. We cannot predict it but people make their best judgment and take some risks. If one gets it wrong one's plant may not be as economic as one had hoped, but these are not unusual risks for people who are in the business of funding energy investments.

Q184 Mr Hoyle: Obviously, price is important. How important is security of supply?

Professor Palmer: Security of supply is extremely important, but the way one addresses it is by having a diverse means of accessing supplies. As the United Kingdom becomes more dependent on gas imports it is building LNG terminals and more pipelines to Norway, where there are huge supplies of gas, and making interconnections with the continent to connect us to arguably more risky markets in southern Europe, North Africa and to the east. For me, the security of supply issue is about diversity of supply of gas, as well as not becoming overly dependent upon it.

Q185 Chairman: Perhaps I may put a question to which I think I know the answer. For the record, you talked about the huge risks involved in any energy investment given the uncertainties in the market. If one of our next witnesses—the industry is to come next—decided to make a massive investment in nuclear and there was an unexpected change in technology and world supplies and electricity prices collapsed and that investment effectively bankrupted those companies, what would happen to the nuclear power plants?

6 June 2006 Professor Keith Palmer

Professor Palmer: I deal with that in two ways. Before I deal with the actual question you ask, rather like a good politician perhaps I may answer a slightly different one. We need to put the question in context. You talk about it going wrong and bankrupting the company. The first big nuclear power station that is built will be an investment of several billion pounds sterling and that cost will be shared between a number of parties because such plants are always built on a consortium basis. No party will be picking up the whole of that investment. Ask your next witnesses what their balance sheet values are and you will see that they are companies which can absorb this risk. Indeed, one of the reasons they are so large is that they need to be able to absorb the very considerable risks in their business. It would not bankrupt them at all. Let us assume that that was not the case. One would need to have in place regulatory arrangements that ensured continuity of the use of the services from the nuclear power station, even if the party who happened to own it had lost all his money and had gone off to the sun to retire. There are lots of examples in the United Kingdom of regulatory arrangements called special administration which are mechanisms to ensure that the public interest is protected if the owner of an essential asset goes bankrupt. They cannot take the asset away; they have to transfer it to somebody else who will run it. I think that an important part of the Government's policies is to ensure, first, that that is not ever likely to happen but, if it did, that there is a process to protect the public interest.

Q186 Miss Kirkbride: You referred to the regulatory process and what might need to be done. You talked about the public interest being protected by the regulatory process so that a power plant is not lost if it becomes unviable for the operator. Is there anything else that you want to add as to what needs to be done from that perspective? Equally, does any regulatory process need to be undertaken or changed from what is there at the moment to give investors the confidence to invest from the perspective of their balance sheet?

Professor Palmer: If we are talking about regulation of the producer who is building and running plant, I do not think a great deal needs to be done. The Nuclear Inspectorate has extremely specific and wide-ranging powers to check every single step of the construction of a power plant to ensure that it is being done properly and, after it is commissioned, to go in at any time to ensure that if something is not being done right it is fixed. I think that in its behaviour in relation to British Energy, it has shown itself to be a fierce mob. One of the risks that the markets will have to face if they are being asked to fund nuclear is that the activities of the Nuclear Inspectorate cause the construction to be much longer than expected or more costly because the Inspectorate requires changes to the design during that stage. Those are very real risks but I believe that they are understood by financiers. There is an understanding that the Nuclear Inspectorate must do those things, and I believe that people will go along with them. There is not a great deal more.

There is stuff to do with planning on which I am not an expert, but from the financing perspective the risks in relation to planning are out of the way by the time the big bucks have to be raised. They are a big problem for the companies in trying to progress development. They are not a huge problem for me in trying to raise the funds, because I would expect people to hand over large sums of money only at the point the planning had already been resolved. My short answer is: not a lot.

Q187 Miss Kirkbride: That was to be the next question. Everyone is speculating that because of the concerns about nuclear power, planning will be the big nightmare and it can become very uncertain with public inquiries and so on. You were somewhat dismissive of the planning problem. Do you think that companies will not be put off by it? They are not looking to the Government to have some sort of guarantee that everything can be put on hold until the big moment comes. Are you quite relaxed about these matters?

Professor Palmer: You must ask them about that. One has a planning process and one progresses the design of the power station in parallel. One funds it to the extent that one needs external finance that does not come off the company's own balance sheet only at the point where a lot of the uncertainties at the front end, which would include planning, have been resolved. I am certainly not saying that planning is not an important issue but that it is not a constraint on raising the funding if that is done at the point where those problems have been dealt with. The only other obvious point I make about planning is that if it were decided that new nuclear should be built at existing nuclear sites presumably those issues would be very much mitigated.

Q188 Miss Kirkbride: Do you think that that would apply also to licensing?

Professor Palmer: I do not think that it would, for licensing. It might help a little bit because some aspects of the safety environment and so forth would already have been addressed at the existing sites. To the extent there were new design aspects—the new stations would have them—I would expect some additional things to have to be done anyway, wherever the site was located.

Q189 Chairman: But planning and licensing issues are fundamentally ones that affect the company's decision whether or not to seek funds, but not access to funds?

Professor Palmer: I should have put the point that well myself.

Q190 Mark Hunter: Is the fact that several different government departments have a role to play—DTI, Defra and DCLG, formerly the ODPM—in bringing forward new nuclear build a matter of concern? Are there any issues about consistency of approach that may cause you and others concerns?

Professor Palmer: Several government departments being involved is always a bit of a nuisance. It would be wrong to think that there is anything particularly

6 June 2006 Professor Keith Palmer

unique in the nuclear area in relation to that. In just about every major investment that is undertaken and financed by the City several departments are involved. I have hardly ever been involved in government when the Treasury has not been at the table. There is always the lead department and, in this case, several other departments would have important responsibilities. It is something that makes progress more cumbersome than one would like, but that is life. I do not think that it is material particularly either to nuclear or to a decision to spend the time trying to get through this process. These companies have a strategic long-term interest in seeing new nuclear built and they will stick at it.

Q191 Mark Hunter: Given the involvement of the different departments, do you think it has been helpful that the Prime Minister has himself made comments in support of a nuclear option at this stage?

Professor Palmer: I am sure you will understand if I do not comment.

Q192 Mr Weir: It has been suggested that the current structure of the electricity market provides a disincentive to consider long-term factors. In the press at the weekend there was a suggestion that the nuclear industry was looking for a guaranteed price for some years ahead before it would go ahead with any nuclear new build. Do you think there have to be changes in the market to provide long-term certainty for any new nuclear build?

Professor Palmer: That is not something that is easy to answer in one short sentence. We evolved a new competitive electricity market in the late 1980s and early 1990s. It evolved into the New Electricity Trading Arrangements (NETA) a few years ago. It is doing a pretty good job of getting a balance between serving consumers by forcing prices down, which is what markets are supposed to do, and dealing with the volatility that inevitably comes with markets and the increased risks. It raises questions about the ability to finance future generation capacity, which we must all have if the lights are not to go out. I do not think this is a question that is related entirely to nuclear; it relates to all new generating plant. There are huge uncertainties now reflected in our electricity market that do not exist to anything like the same extent on the continent. There is great uncertainty about gas prices. Should we or should we not build another gas plant? It is a difficult decision because of the volatility of the marketplace. Nuclear is a similar but larger problem because of the greater upfront capital sums and the longer life of the plant. We are talking about a 40-year life for a nuclear plant, and possibly more. Is there a structural problem with the electricity market? I do not think anybody really knows. My best guess is that if we do not fundamentally change the NETA rules but provide some certainty about the carbon premium, which is a separate matter, probably these things can be built. There are, however, some things that can be done to reduce uncertainty in the market, not just nuclear but across the board, for all new generating capacity of whatever type and reduce the risks of not getting

the right amount of new generation when we need it. Unless you want me to, I do not particularly want to go into what those might be, but there is a debate among experts about whether further evolution in the electricity trading arrangements is a price that we ought to be paying to get more certainty about security of future supply.

Q193 Mr Weir: If nuclear is looking for some guarantees for the long term, how does that impact upon Ofgem's principal duty to engender competition, which was the whole object of NETA and now BETTA?

Professor Palmer: I do not believe that it is consistent with the whole approach to competition in energy markets and the duty of Ofgem to give a preferred price to any particular technology. If indeed they are asking for that I certainly never said I supported it.

Q194 Mr Weir: If I may summarise your view, you do not believe that nuclear should have a preferred price in future; it should be left to the market and investors to decide, if they want to invest in nuclear, what they will pay for any electricity generated from any source?

Professor Palmer: My view is that if the Government and the country take seriously the need to abate carbon, which is the key climate change issue, we should have a policy that gives a premium in the electricity market to whatever generating sources produce electricity but not carbon. It so happens that nuclear is one of them, but there are many others. All the renewables that we are more familiar with and talk about are the same. It seems to me that the objective should be the cheapest possible electricity with no preference for any particular technology consistent with meeting our carbon abatement targets. That is the end of it. Some may say that that is a subsidy for nuclear. I do not agree. Very obviously, we need to support non-carbon-emitting technologies because of climate change issues, and a consequence of doing that is that nuclear will be one of the beneficiaries, along with a lot of others. That seems to me to be a level playing field in a carbon constrained world with no preference for nuclear.

Q195 Mr Weir: But you mentioned earlier possible changes in the current system as operated by Ofgem. One of the problems, perhaps a particular one for Scotland, is transmission charges on the grid. They seem to work against renewables which clearly are low carbon or carbon neutral. Do you believe that Ofgem would have to change those sorts of regimes in order to create a market for all low carbon electricity generation?

Professor Palmer: If there are perverse costs built into the system which make it unreasonably difficult for renewables in Scotland obviously they need to be addressed. I do not see that as different from what I am saying. I think that all non-carbon-emitting technologies, of which windmills in north-west

Scotland are a part, should be getting more or less equivalent benefit from the fact that they do not put carbon into the climate.

Q196 Mr Binley: Initially I came from the small business sector. Volatility of energy prices impacts heavily on occasions, particularly of late. In that respect there has been some concern about the introduction of the New Electricity Trading Arrangements that you talked about. That introduction contributed to British Energy seeking a government bail out, quite frankly. Has the Government rebuilt trust in that respect with the investment community sufficient to convince it about the viability of future nuclear generation? Are people really going to take a risk on what you describe as pretty much the freest market in the world in this respect?

Professor Palmer: The proposition that I shall keep repeating until you shut me up is that if we create an environment in which the least cost generation can flourish with each of the technologies benefiting or being punished according to how much carbon it puts into the climate then we shall see. My belief is that if we can provide a degree of certainty around the market's premium price for carbon then people will invest in nuclear. You should not underestimate the extent of serious commitment on the part of people to whom you will be talking next to demonstrate that they can build these technologies, absorb the risks and do what they say they can. What they cannot do is know how much they will be paid for their output in a world where carbon premiums are very uncertain. I do not think that trust is a big issue for nuclear generators; the big issue is the future price of nuclear electricity, including whatever premium for carbon they can get.

Q197 Mr Binley: To put a very simplistic question, does one come back to guarantees—a sort of bottom to the marketplace as we used to have, and still have to a certain extent, with agricultural subsidies?

Professor Palmer: The United Kingdom has already moved so far away from that that I think it inconceivable it will want to go back in that direction. If one has a level playing field where one gives all technologies the same opportunity to get the premium because they are not emitting carbon, and it is at a sufficient level, nuclear will put its money where its mouth is; it will invest and take the cost risks of it not being economic. All other non-carbon-emitting technologies will benefit equally. It seems to me that that is very far from a world in which one guarantees prices to anybody. It is a world in which society says, "We are prepared to put a particular value on non-carbon-emitting technologies and make them equally available, whether to nuclear, offshore wind or marine technologies in due course."

Q198 Mr Binley: I am relieved to hear your comments. In an industry which is dominated by a few vertically integrated generation and supply companies, do you think this market structure is best placed to deliver new nuclear build? What would

you say to those who argue that it is undermining consumer choice and, therefore, reducing competition?

Professor Palmer: At the moment we have a more or less vertically integrated generation and supply industry. That is split up more or less between five companies which are the major players in the marketplace. It is a compromise, as it were, between atomistic perfect competition, where everybody is running around trying to do it, which has never succeeded in the energy business because of all the risks that we have talked about, and monopolistic industry where all the costs end up passed on to the consumer, which is what tends to dominate in many parts of the world. As long as the competition authorities have a mandate to keep a close check on these companies and Ofgem and others have no evidence of market abuse it is working relatively well. Whenever one is asked whether something is an ideal market structure one considers the alternative and it seems to me that either of the extremes is not possible or desirable.

Q199 Mr Wright: What changes do you see as necessary to the European Union's Emissions Trading Scheme in order for it to provide low-carbon electricity generation, if any?

Professor Palmer: Let me pose the problem and then tell you what we have with ETS. I guess that the answer will be teased out. What one needs to know if one is investing in any of these generation technologies is what carbon premium is to be paid or what carbon cost one will have to incur if one is a fossil generator. Fossil generation incurs cost under the ETS and has to abate carbon, and non-carbon-emitting technologies benefit because they receive a price premium but do not have any extra costs. That is the way it works. The company that is investing needs to know what that premium will be for its output over the life of its power station. In a conventional or combined cycle gas turbine plant one is talking about probably 15 years, but given nuclear's very long life technology one needs to know for 40 years, or ideally a little longer. What the ETS does for the first time, very commendably, is establish a price in the market for abating carbon. The price that one can get for selling a certificate in the ETS is the amount of money that one is paid for not putting carbon into the atmosphere. However first, that carbon premium is known for only a couple of years because the ETS runs for only that length of time and we have no idea what will happen in the second phase. Secondly, the price is incredibly volatile because one is starting something new. No one quite knows whether the allocation of certificates was right. There is now a good deal of evidence to show that they were not right and that some of the United Kingdom's industries have suffered as a result. It is not possible to form any judgment about how much premium one is likely to get over the life of one's plant, even a combined cycle plant, by looking at the very short-term volatile price in the ETS. One needs to know how to get greater certainty for a longer period about what that price is going to be. It is a price that is fixed entirely by

6 June 2006 Professor Keith Palmer

governments. The carbon premium is there only because countries or their governments acting for them have decided to make it costly to put carbon into the atmosphere. There is here a real problem in that there is no market solution to certainty about the carbon price. This price will be made by you (Parliament) in the United Kingdom and by other governments in the rest of Europe. What one really needs is a mechanism that will circumvent the inconvenient fact that one simply does not have any certainty at all about what the carbon premium will be for even a few years ahead, much less for the life of a plant. How does one deal with it? One approach which is noble but, I fear, unlikely to be successful is to persuade all of our colleagues in Europe collectively to come together and to produce a much better designed and longer term ETS which establishes a forward price for carbon. That is a challenge certainly I would not want to shoulder. If one accepts the notion that one needs to provide a measure of certainty around the future carbon price one needs to look at UK arrangements which will do that for all UK emitters of carbon but which is compatible with a subsequent stage of the ETS. It is by no means an alternative to ETS so much as a degree of assurance that the UK is able to provide certainty for itself which could be shared with the rest of Europe, if and when they ever became persuaded that they wanted to adopt a similar approach.

Q200 Mr Wright: Is it your suggestion that rather than have an EU ETS we should have a UK ETS?

Professor Palmer: I am suggesting that we should have a UK forward price for carbon, which is a slightly strange notion at first blush. If one said to all renewables and non-carbon-emitting technologies that there was a facility to underwrite a minimum carbon price, but if the carbon price in the markets went above it they would have to give something back, it would be a dramatic change in the environment in which one was trying to get all non-carbon-emitting technologies off the ground. This is at least as true for offshore wind as it is for nuclear. This is not to do with supporting nuclear but all non-carbon-emitting technologies.

Q201 Roger Berry: You said earlier that the key intervention in the market was related to the carbon premium. You almost went as far as to suggest that the carbon premium was perhaps the only intervention in the market that really mattered. You clearly indicated that you thought it entirely unfeasible for the governments of the European Union to agree an effective emissions trading scheme. There is no market solution to the provision of an indicator to investors in the UK of the future price of carbon and, therefore, there should be some floor to the carbon premium below which the market should not be allowed to operate, but if the price happens to go higher market forces can rule. Is that a fair description of your view?

Professor Palmer: Almost.

Q202 Roger Berry: I am pleased, but where do I digress from your view?

Professor Palmer: To clarify the last two bits, I do not suggest for a second that we should give up collaboration in Europe to try to get a really good second stage ETS. I just do not think that it is very likely, as the wind is currently blowing, that it will be sufficient to get non-carbon-emitting technologies shifting forward at the pace which this country and its Government say they want to see. What I do say about the UK's position is that it is not a market solution but the reason for it is that the carbon price is a government-made price. It is wrong to think that one should just tell the City to go off and make a forward price in carbon. It cannot do that because the forward price of carbon will be whatever one decides to make it. The tougher one wants to be on emitting carbon the higher the price of carbon abatement. That is the way it works. The reason we need a government initiative is precisely that. It is the Government that has decided on behalf of the country that the UK must put a price on carbon emissions and make people pay for putting that stuff up there and, therefore, allow a benefit to accrue to those who do not emit carbon. It is the Government that will decide all of the parameters which determine what that price will be, so it is impossible for anybody other than the Government to provide a solution. But what I tried to say carefully was that, although devised and implemented by government, it could still be a mechanism that provided a market solution. One does not have to give people a guaranteed price because what one should do is guarantee a minimum price but say that if the price goes above a certain level—because as a society one wants to be more severe on carbon emitting—there is no way that the generators should get that benefit and it should come back to the Government and taxpayer because they took the initial risks to underwrite a minimum price and get these generation technologies off the ground.

Q203 Roger Berry: I entirely understand that and happen to agree with what you say. Would I be right to conclude that your attitude to the debate about whether we should have nuclear build or not is that that question is irrelevant? The point is to set the carbon premium and make clear as a public policy what the penalties are for emitting carbon and what the benefits are for not doing so. Do you say that that is the policy lever and the rest falls out of that and the market should then be allowed to determine whether or not it is renewables, nuclear, gas or whatever? Is it right that the key policy decision is not nuclear or non-nuclear but the carbon premium?

Professor Palmer: That is my position. If one gets it right and puts a technology neutral intervention in place which underwrites the carbon premium the lowest cost and cheapest non-carbon-emitting technology will be brought into the marketplace. That may be nuclear if the witnesses to whom you will be speaking next put their money where their mouth is; it may be lots of offshore wind, but the

6 June 2006 Professor Keith Palmer

great beauty of it is that one is not concerned with picking winners or giving technology preferences. As you rightly said, one is putting the environment in place where people can get on and do their business if they can.

Q204 Roger Berry: Is there not a particular difficulty in relation to nuclear, namely the timescale? As you have said already, the economic life of a nuclear power station is significantly longer than for many other methods of energy generation. You are saying that the Government should say something not just about the carbon premium next year or for 10 years but effectively the next 40 or 50 years. Is that a realistic thing to expect the Government to do and not subsequently to change its mind as things happen?

Professor Palmer: The changing of minds is part of life. Everywhere one goes in the world governments have the right to change their minds and from time to time have been known to do so. I do not think that that is a distinguishing feature of nuclear. However, you make an important point about the long life of nuclear. The design of this mechanism to provide a certain forward price for carbon is very important. The devil is always in the detail. I do not propose that you have a different period that applies to different technologies. If one wants to create this mechanism, one decides to give a, say, 20-year certainty about future carbon prices and then nuclear will have to take its chances. It would have greater risk because it would have a longer payback period, but it would simply have to deal with it.

Q205 Roger Berry: Do you have any view as to whether the Government should lay down such a premium for 10, 20, 30 or 40 years?

Professor Palmer: I always have a view.

Q206 Roger Berry: What is your view?

Professor Palmer: My view is that the longer the profile that one is prepared to provide certainty the quicker and stronger will be the investment response and the less expensive will be the electricity. If one put down a five-year profile one would be wasting everybody's time because it would evoke practically nothing because none of these technologies can pay back in five years. If one did it for 10 years one would evoke a response but nothing like what it would be if it was for 15 or 20 years because that is the full expected life of certain types of technologies and is well within the payback period of most of them. If one can devise a mechanism that does not expose the taxpayer to great risk that extends for 20 years it will be the most dramatic way quickly to bring into existence all the renewables that one keeps talking about but are never built.

Q207 Judy Mallaber: I wonder if you can help me understand more clearly the industry's response. On the one hand, it seems keen to tell us that carbon prices rather than public subsidies is its preferred means of financing new nuclear build and that is about not picking winners and it should be dealt with through the pricing mechanism. On the other

hand, it is asking the Government to commit itself to nuclear and to streamline the planning process specifically to help that. Do you see that as a contradiction in the position of the industry? Can you give me some clarity on where you think it is?

Professor Palmer: I do not believe that it is for me to speak for the industry particularly when you are to meet two great energy companies immediately after me. My perception is that there are mixed views around. The industry is not a great amorphous lump of similar views. Some people will have said one of the things you have suggested; others will say other things. I restrict myself to saying that I do not think one needs to do industry- or technology-specific preferential things to get these investments properly tested and see whether or not they are economic. One needs to create an environment in which the people who keep claiming that they can produce this stuff so cheaply actually have to put their money where their mouth is. As I said to Roger Berry, if one puts in place a carbon premium not only does one achieve that but it is done on a technology-neutral basis. Maybe all the nuclear buffs will go away when they have to put their money where their mouth is.

Q208 Judy Mallaber: Is it reasonable for them to expect government to come out clearly at some stage and say either that it believes nuclear has an important part to play or that it is very sceptical about all the arguments?

Professor Palmer: Yes, I think it is. Whether one is a domestic or foreign investor and one is contemplating huge investments in a strategic industry in any country, one would not expect to proceed with big investments unless it was clear that the direction of travel was broadly supported by government. Particularly given the announcement up to now by the Government that it is to take a decision, I do not think that there can be progress unless it is prepared to say that, subject to all the things I have stressed many times—that it is not preferential, that it is economic and it can hack it and get over the usual hassle of doing business in the United Kingdom—it would welcome the diversity of nuclear. If government said the opposite it would never happen.

Q209 Judy Mallaber: Therefore, government cannot stay neutral and say that the market should decide?

Professor Palmer: I do not think that the Government can stay neutral but it can make clear that it is not saying it is prepared to subsidise this industry. It can say it believes that nuclear has an important place, and if it turns out that the claims about its economics are true and it provides a technology neutral environment it will be competitive with the other non-carbon-emitting technologies. I do not think it can stay neutral in creating the wherewithal to bring carbon-reducing technologies into existence, but it can stay broadly neutral on nuclear to the extent it can be disentangled, and to some extent it can be.

6 June 2006 Professor Keith Palmer

Q210 Judy Mallaber: You keep returning to technology-neutral mechanisms and pricing mechanisms which favour low-carbon technologies, but are there no arguments for mechanisms to encourage other forms of low-carbon technologies, such as renewable microtechnologies? Are there no changes that should be made to the planning process or particular incentives to kick start those other forms of technology that you favour?

Professor Palmer: I do not think it is an “either/or” situation. I am sure you are well aware that at the moment we have huge subsidy support for offshore wind, onshore wind and marine technologies. The operation of the renewable obligation certificate schemes is currently raising the cost of energy from those sources by at least 100% over what it would have cost without the ROC scheme. Yet it is still very difficult to get those projects financed. For me, it is not that we should not be supporting them; we already are supporting them, but we are not doing the critical thing which is to provide a measure of certainty about what sort of carbon premium all of those technologies will receive for a much longer period. To me, it is rather startling that I have been involved in trying to fund renewables for more years than I like to think about. The ROC creates tremendous economic impetus to get these things under way, but it is still extremely difficult because offshore wind turns out to be very expensive.

Q211 Judy Mallaber: What needs to be done? What would be the most practical way to get it going?

Professor Palmer: At the risk of sounding like a cracked record, one needs a technology-neutral carbon premium which applies to all technologies. I know you smile because I have said it 15 times, but one of the big problems with windmill schemes at the moment is that the big premium received under the ROC scheme extends for only a very limited period. Even for offshore wind, these projects have significant capital investments which have much longer lives than the ROC premium is assured. It is extremely difficult to go to the City and say that one wants money to invest in a technology which depends on a huge subsidy that may not be there for much longer.

Q212 Judy Mallaber: What do you say would be the length of time over which you would need that certainty for wind technology, etc—20 years?

Professor Palmer: Yes; it is the same answer as I gave to Roger Berry. That period is not arbitrarily plucked out of the air; it is based on how long one needs to fund these things and that tells one how long the assurance needs to be. The funders get their money back out of future revenue and it is that premium and extra revenue which pay out the lenders. Twenty years is a pretty robust answer.

Q213 Mr Clapham: In terms of the likely impact of nuclear build on CO₂ emissions, what is your response to the Sustainable Development Commission’s view that even if we doubled the nuclear build by 2035 it would be likely to reduce those emissions by only 2–8%?

Professor Palmer: My private response is slightly impolite. My public response is that I just do not understand what it is talking about. The fact of the matter is that if we do nothing and do not build nuclear, given the way we are headed about 20% of the capacity of this country will be gone because the nuclear plants already there will be shut down. They cannot be life-extended very much more; most of them already have been. We will have to build a lot more gas-fired power stations to generate the electricity that our industries and homes need just to replace what will be shut down. I think that we are talking about new nuclear, if we have it, having to run like crazy to have enough capacity on the bars to produce electricity not to increase the amount of gas-fired but simply to replace the retiring nuclear stations. That is the fact; I do not know that it is even contentious. If we say that we do not do that and just have more windmills three matters are true. First, absolutely all the evidence I have seen—I have looked at it very hard—is that offshore wind is at least twice the expected cost of nuclear, even if it is assumed that the true cost of nuclear is being exaggerated and it is really a bit higher than the industry says. Second, one cannot build that much offshore wind in the time; it is simply not possible. Third, if it were possible so much wind power would be highly unreliable and one would be put at a serious security of supply risk because when the wind does not blow there is no generation. I just do not see the point that is being made. The fundamental question is: does one replace existing nuclear with new nuclear? If not, what is to replace it? I promise you that only one thing that will replace it if we do not have new nuclear is a lot more gas-fired power stations.

Q214 Mr Clapham: Do you agree with its assumption, nevertheless, that the impact on CO₂ production is not as dramatic as some people would have us believe?

Professor Palmer: It is not, but that is only because it is not taking account of the fact that there will be a big increase in carbon emissions without new nuclear. One will take all of the existing nuclear plant off the bars and burn carbon-emitting CCGTs. I can play statistical games too.

Mr Weir: You have told us a great deal about the carbon scheme and stressed neutral technology. You are looking purely at carbon which is understandable in view of concerns about climate change, but nuclear has another problem: it creates waste.

Q215 Chairman: That is Judy Mallaber’s question. We are dealing next with waste management. Judy can ask her question on waste and we will then return to it. Let me ask one further question on the issue of carbon. I have heard that the German Government is giving assurances to coal-fired power stations to enable development to take place in Germany, so there is a European government that is already going beyond the ETS. Is that also your understanding?

6 June 2006 Professor Keith Palmer

Professor Palmer: I admit that I am not familiar with that. I cannot comment because I do not know the facts.

Q216 Judy Mallaber: Have you done any work on the other side of the equation, that is, incentives for further energy efficiency and measures to cut demand, which we have not covered at all?

Professor Palmer: That is a very important question. I am certainly not an expert, but in the past I have looked at the cost-effectiveness of energy efficiency savings schemes and expanding efforts to cut back on industrial and residential consumption. It seems to me quite clear that we are not doing nearly enough in that area. I do not believe that it changes the parameters of the debate because we are talking about replacing existing nuclear. Any energy review needs to look at least as hard at demand and new interventions that are paid for by consumers to improve efficiency; in other words, they pay a price if they do not improve efficiency, but I do not think that that will change the overall parameters of the problem.

Q217 Judy Mallaber: Moving on to waste management, the nuclear industry seems to be fairly relaxed about being able to cover decommissioning and waste disposal costs, but do you agree that there is a fair degree of uncertainty about those issues, especially given that we have not yet worked out the long-term solution to the current waste legacy?

Professor Palmer: Again, it is difficult to summarise that in a sentence or two. Decommissioning is not an industrial issue. Many nuclear power stations have been decommissioned and industry is used to reserving in the balance sheet provisions which will be spent in future to deal with that. I do not believe that the cost risk raises particular problems for the industry. Obviously, waste disposal is a different question. Clearly, the nation soon has to come up with a solution. This has nothing to do with new nuclear; it is to do with the fact that we have lots of this stuff lying around and we shall be decommissioning nuclear power stations quite soon. There needs to be a scheme which provides absolute assurance: first, that the waste is locked away where it can never do any harm and, second, that the costs of that are borne by the industry and passed through in whatever way it is able to pass it through to consumers. But in the first instance it should be a cost borne by the industry. There are mechanisms around and are being discussed for a nuclear waste agency to make certain that the costs are borne by the private sector for new nuclear. Certainly, some of those schemes will help to reduce the risk attached to waste management, but I think everybody accepts that the industry should pay for the costs of disposing of waste at the end of the lives of the power stations. The issues are about how one guarantees that if, for example, they go broke the undertakings they have given to fund those future costs are met and how one defines a scheme that properly shares the risks between the people who cause the problem and consumers. I think that all of those are very important questions that can be resolved. Why is the

industry relatively relaxed about all these things? I think the answer is that these costs are a surprisingly small percentage of the total costs that have to be incurred over the life of a power station. On the numbers that I have put together, less than 2% of the total cost incurred over the life of a nuclear power station would represent the amount required to deal with the waste problem at the end of life.

Q218 Judy Mallaber: On what basis have you made those projections? Has government or the relevant agencies done sufficient work to enable us to ensure that those waste disposal costings are accurate?

Professor Palmer: They are not, in my language, bankable numbers, but there is a great deal of information about what the expected costs of the various options are. All of them are uncertain. We have taken a very conservative view; we have more or less doubled, and doubled again, the estimates just to allow for an envelope of uncertainty around it. Because they are deferred so far into the future and these costs are provided for very gradually over the full life of the plant they do not add up to as terrifying a proportion of the cost risk as many of the others costs involved.

Q219 Judy Mallaber: I am unclear about the mechanism to ensure that those costs are borne by the industry. Does government in some sense have to come up with a global figure and is the industry then required to show in its accounts that it has put in the appropriate figure? How does it work?

Professor Palmer: The Government will need to come up with an arrangement that, first, makes clear that the costs will be borne annually by the companies that create the problem to be spent at a future date to deal with that problem. Second, it will need to put in place financial arrangements—bonds or some other assurance—which say that if the company ever goes out of business—or goes back to its home country, if it is not British—we can be assured as a society that those obligations will be complied with. Third, it needs some sort of arrangement which says that if the costs change in future because the sums turn out to be wrong there is scope for future governments to reopen them in ways which will not be too frightening to the financial markets. A whole network of complicated arrangements has to be put in place.

Q220 Mr Weir: I want to ask about the Emissions Trading Scheme. I just wonder whether under your scheme any weight would be given to the environmental impact of various technologies. Nuclear produces waste. Although in a sense it may produce less carbon than other technologies it creates another environmental problem.

Professor Palmer: I think that all of these schemes should properly take account of the environmental costs because the producer should have imposed upon him whatever particular environmental disbenefits he is causing. In the case of nuclear it may be nuclear waste; in the case of windmills it might take the form of amenity concerns, but to the extent that those costs can be borne by the people who

6 June 2006 Professor Keith Palmer

cause the problem, my carbon premium would apply equally so those who incurred greater environmental costs would find their economics less advantageous and they might not proceed.

Q221 Mr Clapham: In answer to a question put by Lindsay Hoyle about security of supply you said you thought that diversity was the answer. Within that context what amount of nuclear energy should be included in the energy economy mix?

Professor Palmer: There is not a single or simple answer to any of these questions, but for me the overwhelming reality is that at the moment the question is whether the existing nuclear is replaced with an equal amount of new nuclear. Obviously, that would not change the portfolio mix of generation; it would simply replace old with new.

Q222 Mr Clapham: Therefore, you would say it should be 20%?

Professor Palmer: That would be the starting position. There is then the question: what is the right share? First, one has to get there. To get to 20% is a

mighty task, but beyond that the right share will depend upon what value one puts on it being non-carbon-emitting. The more one puts a value on that, the more one wants it to displace gas-fired stations. It will depend upon what the cost turns out to be. If by then 20% of the capacity is nuclear and it is getting really cheap because the industry has learned all the tricks of the trade it may be that one wants a bit more than that simply because it is cheaper. In general, I believe that the Government and the country should have a very broad view about the sort of mix that should concern us as a society but within some fairly broad parameters. The actual mix should be left to producers and the markets to figure out. If one has the right carbon premium and effective competition in the electricity marketplace one should then have a portfolio that not only provides security of supply but is the cheapest energy one can get.

Chairman: I think we must leave it there because we have gone well over time. We have found this a very illuminating and interesting session. We are very grateful to you for the thoughtful way in which you have answered our questions.

Witnesses: **Dr Paul Golby**, Chief Executive, E.ON UK, **Mr Colin Scoins**, Director of New Business, E.ON UK, **Mr Vincent de Rivaz**, Chief Executive, EDF Energy and **Mr Denis Linford**, Director of Regulation, EDF Energy, gave evidence.

Q223 Chairman: Gentlemen, welcome. I am sorry that we begin a few minutes late. We need to finish at one o'clock, so I hope that we can put our questions in as brisk a manner as is commensurate with getting detailed answers. I begin as always by welcoming the witnesses to the Committee and asking them to introduce themselves for the record.

Mr de Rivaz: My name is Vincent de Rivaz, chief executive of EDF Energy. I am very pleased and honoured to be invited to talk to the Committee.

Mr Linford: I am Denis Linford, director of regulation, EDF Energy.

Dr Golby: I am Paul Golby, chief executive of E.ON UK, probably better known to most people as Powergen.

Mr Scoins: I am Colin Scoins, director of new business, energy wholesale, E.ON UK.

Q224 Judy Mallaber: In both of your submissions you argue strongly for the role of nuclear in contributing to the Government's climate change objective, but on current evidence if we are to avoid irreparable damage to the environment we have to act to control emissions now. Given that new nuclear build cannot possibly come online until the end of the next decade, can we still make a case for it?

Dr Golby: I would argue that we can. I think that if we are to deal with the issue of security of supply and the environment we need all the tools in the toolkit. We need to deploy all of the technologies. It is quite right that new nuclear will probably not start to make a contribution until the middle part of the decade, perhaps in 2017 or something like that, given an efficient planning decision, but that means we will be deploying other technologies meanwhile. For

example, my company has two gas-fired stations subject to planning and also a demonstration clean coal plant. We will be moving with other technologies of which nuclear is just one, but it will start to make a contribution from the middle of the decade onwards.

Mr de Rivaz: We have to be completely clear about the challenges that we face and their time horizons. Between now and 2016–17 we have to fix the power crunch which will occur at that time if we do not build new capacities in this country. It is obvious that for various reasons this gap will not be filled before 2016 by new build nuclear. The likelihood is that it will be filled mainly by gas. There is a high probability that there will be a dash for gas in the coming years which will create a situation where we are even more reliant than today on imported gas. In that situation we will not contribute, if it continues like that, to reductions in CO₂ emissions. Our second big challenge is to deal with the situation if it worsens beyond 2017. Added to the power crunch is the CO₂ emissions crunch, and that is why it is very important that we now take the decisions to enable the industry to make the investment in nuclear new build given the time horizon when that emissions crunch may happen.

Q225 Judy Mallaber: It has been suggested that new nuclear build may reduce UK emissions by only 4%. We also hear of huge uncertainties about all the figures. At every session we appear to have more rather than less uncertainty. Does that not minimise the reasons for spending all our time talking about

whether or not we should now have new nuclear build? Is that the answer to the problems that we are talking about?

Dr Golby: I do not think that we are spending all of our time talking about nuclear. Certainly, from an industry point of view we are talking about a diversity of technologies. All of these will make a contribution to security of supply and emission reductions. There is no silver bullet and we will need all the technologies—gas, clean coal, renewables, energy efficiency and also nuclear—if we are to solve the problem of both security of supply and carbon emissions. Whether or not the 4% you mention is right I think that it is a contribution, just as some of these other technologies will make a contribution. We need a lot of slices of contribution to achieve our objectives.

Q226 Judy Mallaber: You refer in your evidence to studies by the Energy Saving Trust which suggest that microgeneration could contribute up to 20 to 30% of UK electricity supply. Do you have any ideas what we should be doing to encourage further development of those types of technology and what mechanisms we could use for that?

Dr Golby: I believe that those technologies are coming through and some may need additional help. I co-chair the Energy Research Partnership with Sir David King. We are looking at ways of bringing through some new technologies. But all of our companies are bringing forward some distributed technologies. How far they will get and what proportion of the mix they will make I do not know. They will make a contribution but I am not going to make a guess before the Committee today what that contribution might be. I return to my point that we need the whole range of tools to take forward the UK. There is not a single or “either/or” solution.

Mr de Rivaz: We all advocate a diverse mix of energy and believe that there is a role for renewables, as long as they are realistic, or for clean coal as long as we find a technology that is commercially viable. There is a role for gas as long as we do not over-rely on imported gas with all the geopolitical and price risk associated with that. There is a role for energy efficiency which we need to boost. But the fact is that at the horizon we are talking about existing nuclear power plants, with a capacity of 10,000 megawatts, are being gradually closed. The question is: with what technology will we replace the existing nuclear fleet? If we replace it by coal or gas it is clear that the targets for CO₂ emissions will not be achieved. In my view, it is a contribution to low-carbon and to secure and affordable energy for the long term, along with other elements of the diverse mix. It is very important to understand how a clear statement of energy policy can recognise this role and how, once the politicians have made that clear statement, it will enable the industry to make its choice on how it delivers low-carbon and secure and affordable energy for the long term.

Q227 Judy Mallaber: I shall be asking questions about planning and the development of the regime for potential new nuclear build. At the moment are

there sufficient incentives in the other potential forms of low-carbon technologies for you as companies to wish to invest in them? Are there other areas where you would like to see changes that would encourage you to develop other forms of energy production?

Dr Golby: Broadly, incentives exist. Basically, we want a level playing field but maybe some additional incentive for newer and emerging technologies. While this is not the subject of the Committee’s hearing, I heard this morning that our application for the London Array—a wind farm off the Thames estuary which would supply a quarter of Greater London’s needs—has been rejected by Swale Borough Council, despite the recommendations of its officers. There are a number of non-financial incentives that need to be resolved because they are the issues that stop us moving forward.

Q228 Mr Hoyle: I turn to decommissioning. How much of your plant is due to be decommissioned in the coming year and with what are you currently planning to replace it?

Mr de Rivaz: The nuclear plants in the UK?

Q229 Mr Hoyle: All generating capacity that is being decommissioned?

Dr Golby: My company is currently closing coal plant in the foreseeable future. This is old coal plant which is no longer effective. We do not operate nuclear.

Q230 Mr Hoyle: You do not operate nuclear plants; it is purely coal?

Dr Golby: No. I have a mix of power plants which currently does not include nuclear. Coal would be the plants that we would close initially and we will look to build plants with a range of technologies, including nuclear if the right environment and framework exist. We are looking at the whole spectrum from wind through to gas, clean coal and nuclear.

Mr de Rivaz: I think that all of the industries mirror the power crunch that I described. Something like 30,000 megawatts of capacity will be missing in 10 years or so. That is the consequence of coal-fired plant being closed and nuclear power plants being progressively closed. We have made investments in our coal-fired plant to reduce dramatically their impact on the environment in terms of NO_x emissions and we have invested approximately £240 million to prolong the lifetime of these plants. But the whole industry faces the duty to contribute to filling the capacity gap in this country. The question for us—we are responsible for making investments amounting to billions—is whether we have a clear framework in which we can deliver.

Q231 Mr Hoyle: Nuclear power generation comes from France. Are you decommissioning any plants there?

Mr de Rivaz: I do not want to spend too much time on the French situation.

6 June 2006 E.ON UK and EDF Energy

Q232 Mr Hoyle: You are selling us electricity.

Mr de Rivaz: You are aware that France and EDF are the worldwide leaders in nuclear. In France we have 63,000 megawatts coming from nuclear. To give you a perspective, the average installed capacity per operator in the world is below 10,000 megawatts, so we have more than six times the average. The second one, Japan, is 17,000 megawatts. Many other European companies like E.ON, RWE and British Energy are in the range of 6,000 to 10,000 megawatts. On average we have a track record of 20 years' operation of nuclear and that represents more than 11 centuries of operation in a safe and economical way. We are working to expand the lives of our plants. The first decommissioning of the current generation is not planned to occur before 2017, but the costs of decommissioning and the know-how to deconstruct are well known. It is very important to understand that to deconstruct is more or less the same job in terms of skills as construction and the cost is well known. That cost is part of the price per kilowatt produced in France, which is competitive.

Q233 Mr Hoyle: Obviously, uranium has to be sourced from around the world. EDF's evidence is that this is not an issue or worry for the purposes of new build, yet when we look around we see that there are 85 years' worth of known reserves. If you scratch around the world you may get 270 years' worth of uranium, but some of these countries are rather unstable. The question is whether the uranium will be available as and when one needs it? Is it or is it not an issue?

Mr de Rivaz: First, we have to remind ourselves that in the overall cost of nuclear the fuel element is less than 10%.

Q234 Mr Hoyle: I am not interested in its cost but its availability.

Mr de Rivaz: But that is important because the price risk is linked to the level of reliance on the cost of fuel. The more one is reliant on it the more it affects one's price risk and the overall cost and competitiveness of one's generation. As to the resources available throughout the world we have given the numbers in our submission. It is clear that today compared with oil and gas reserves uranium has a much longer life expectancy with current technologies. If one goes beyond that, there are probably three centuries of availability of these resources which come from countries which, if you allow me to say so, are more friendly than the countries from which we shall import our gas or oil, for example. Australia, Canada and countries like that can be seen geopolitically as probably more friendly than other countries that I shall not name.

Dr Golby: In excess of 50% of the reserves are in OECD countries, so I agree with Mr Rivaz's comment.

Q235 Mr Hoyle: Therefore, what is the life expectancy of uranium supplies from OECD countries—50 years?

Dr Golby: It is somewhat more than that, certainly sufficient uranium to provide beyond the lifetime of any reactors that would be built in the UK as the next generation.

Q236 Mr Hoyle: What is being said is that a fleet of nuclear reactors is being built around the world which increases the demand for uranium. There is a finite amount of uranium available. Does it mean that we would then look at fourth generation fast-breeder reactors to overcome the future lack of uranium?

Mr de Rivaz: In the short term we do not need to rely on the fourth generation of reactors that you mention. If it was available it would extend these periods to thousands of years. It is likely that the fourth generation would be available in the next 20 to 30 years, but in the meantime there is strong evidence that there is no issue regarding fuel availability. The fact that it plays a much lower role in the overall cost is very important in mitigating the price risks associated with availability.

Q237 Mr Hoyle: How much high quality uranium is actually available?

Dr Golby: I would need to come back to the Committee with a precise answer.

Q238 Mr Clapham: To revert to what was said earlier about the environment necessary to encourage investment in new nuclear build, you referred to gas in the energy economy mix. Given that we are likely to see more gas on-stream from Norway in the next 18 months and that 40% of our electricity generation is from gas, is it your view that the Government should consider capping the amount of gas in the energy economy at 40%, or do you believe that the market should reign?

Dr Golby: I do not believe that the Government should intervene in that way. In the short term we need to build more gas because that is the only short-term technology which will be available to us over the next few years. We need to build gas in the short term. I believe that the market will make the right decisions here. If we have a level playing field and a regime and framework that value carbon we have a range of technologies to deploy. I do not think that we need the Government to determine the energy mix in that way.

Q239 Miss Kirkbride: You mentioned a short while ago that you were having problems in getting planning permission for the Thames estuary project. Do you think that it will be easier to get planning permission for nuclear reactors than for wind farms, especially on land?

Dr Golby: The first point I make is that planning is an issue. As we see increasingly, energy is quite a strategic issue in the UK as our own natural gas resources reduce. Planning is an issue which hopefully the energy review will address. Moving on to the specifics of planning and licensing for nuclear, what my company wants is a clear statement from the Government acknowledging the contribution that nuclear can make. Then I see planning in three

areas: first, an environmental assessment by the Government which looks at nuclear generically. Therefore, do we want nuclear? As a nation, what are the issues generically? That might lead to some early views on potential sites. Second, we need to look at the licensing of a number of potential international reactor designs so we have some options to choose from. There are various designs available and deployed internationally. Thirdly, I think that we move to the site-specific issues with which local inquiries have to deal. I would not like to see a repeat, for example, of the Sizewell B inquiry where all of the issues are open at local level rather than being dealt with strategically at national level and decisions affecting the local community are taken subsequently.

Mr de Rivaz: I totally concur with that point. I simply add that we should not cut corners about the issues that public opinion wishes to address. Public acceptance is a condition precedent for all potential investors to make their decisions. What we propose with this streamlined process is not to weaken the debate or cut corners but the opposite; it is to reinforce public confidence and acceptance at the end of the process. A process which is flawed, not robust or predictable and will end in an unknown number of years is not one that is capable of creating public confidence. I think that the interests of investors and the industry in a robust process match the expectations of public opinion in having a clear understanding of the decisions that are taken at the global level, nationally or, as Dr Golby has just said, at a local level where the population is directly impacted. This clarification and predictability is well understood as a condition precedent for investors to make their choices.

Q240 Miss Kirkbride: Taking on board what you have just said, that, nevertheless, there must be some streamlining of the process to make it viable, is it acceptable to have pre-licensing of sites and certain acceptable designs given that the kind of reactor to go on any pre-licensed site may depend on whether it is located inland or in a coastal area? Can you really have off-the-shelf designs and put them together in any way you see fit, or should greater attention be paid to what matches?

Mr de Rivaz: A lot of attention has to be paid to how the technology matches with the sites. Obviously, that is part of the whole process. It is not a matter of taking a reactor off the shelf and building it anywhere. What we are saying is that national safety authorities in any country which are serious about new nuclear build will have the opportunity to build on the experiences acquired by other countries. We are advocating, for instance, that the European nuclear safety requirements which have been built up in European countries can be used by the UK safety authorities to make their own safety assessment and applicable principles. There are a number of technological developments which fit the bill, if I may say so, and it is wise to use them rather than reinvent the wheel and create a brand new technology just for us in the UK. It will mean a loss of time and money and in reality it will not

contribute to safety because the requirements of other countries can be useful. As to the site issue, there are two elements. How does the technology fit the site? Beyond those aspects there are other elements: connection to the grid and the consequences for the river or seashore according to the site. That has to be assessed locally. I think that clarification would be very helpful in creating public confidence and acceptance that we all look for.

Q241 Miss Kirkbride: What about the capacity and resources of the NII? Are you happy that it is doing its work as quickly as it should? Does it have the necessary skills? Is there a skill shortage? How do you see its role as affecting your ability to deliver on these matters?

Dr Golby: Historically, it has had some difficulty in obtaining qualified and experienced people to do this work, and certainly there will need to be increased resources particularly if it is to look at a number of potential designs. It will need to think about greater use of contractors and use of information that is available from other licensing authorities. At the beginning the UK was leading the way but a number of other countries have now built nuclear reactors and there is a lot of safety and design information available. It will need to make use of a lot of work that others have done, in exactly the same way that the CAA makes use of information from other national aviation authorities, the US and French equivalents. They cooperate with one another and share information on aircraft design, for example.

Q242 Miss Kirkbride: Do you think that skill shortages will create a problem for your industry in both the regulatory process and construction?

Dr Golby: There is a skill shortage generally in this area. We are faced with a massive programme of investment in electricity infrastructure in this country; it will probably be of the order of £50 billion over the next decade. We will certainly face a skill shortage. We need to improve the number and quality of graduates and craftspeople who come through our education system, but these are also international skills. One of the benefits of both our companies as international groups is that we have some of these skills elsewhere around the world that we can use to deploy in the United Kingdom.

Mr de Rivaz: It is also a matter of attracting the talents. If young engineers who have to opt for one career are told there is no future in nuclear they will not be minded to study in that field. If nuclear is back on the agenda as a key element in future energy policy in our countries, in particular this country, I have no doubt that we shall be able to attract, train and retain the talents and skills we need. But it is absolutely clear that nuclear is an industry where the human factor is very important. We cannot make any compromise about the ability of people to design, build, operate and maintain nuclear power plants with the highest safety standards. It is clearly a challenge for all of us, but on that point and the others all of us expect that ongoing debate will lead

6 June 2006 E.ON UK and EDF Energy

to a clear policy that will engage the industry, citizens and the talents of young people so that they join the nuclear future.

Q243 Mr Weir: Obviously, assuming you were planning new build nuclear stations the chances are that if they were constructed on existing sites they would be less likely to meet public opposition than if they were located in other areas. Given that many of the present nuclear stations are built on the coast and there are problems with rising sea levels and the threat of coastal erosion, how much of a problem does that present with new build on existing sites, and will they be available for potential new build?

Dr Golby: Clearly, very detailed study of the existing sites would have to be undertaken, but I do not believe that to be an insurmountable problem. I think that civil engineering solutions can be deployed. It just so happens that both our companies participated with the Met Office yesterday in the launch of a new climate change programme. Part of the output of that suggests that sea levels around the United Kingdom might change in the range of 200 to 800 millimetres. To deal with that particular problem is well within the range of civil engineering capability, but clearly it is a serious problem and would need a lot of detailed work to make sure we got it right.

Mr de Rivaz: I agree with that. One of the key elements of the policy statement that we expect from the Government in the coming weeks is site availability. There are clear benefits in delivering this agenda in using existing sites for various obvious reasons. They are designed for nuclear power plants; there is already a form of local public acceptance; there are connections to the grid, etc, etc. It is very important that in moving forward there is a level playing field in the process which gives to the investors minded to invest in new build nuclear the availability of existing sites without which they would not be able to deliver.

Q244 Mr Weir: Do you think that if the existing sites are not available it will slow up any new nuclear build or stand in the way of it? How will it affect the planning process? Will it be much longer if you go for a completely new site?

Mr de Rivaz: I am very optimistic. If the policy which is to be decided includes nuclear new build the Government, the authorities and all the relevant parties will want to talk and make site availability part of the solution and not part of the problem.

Q245 Mr Weir: I do not quite follow that. You agreed earlier that there had to be public acceptance which would necessitate a planning process, presumably in most cases a public inquiry, before there is a site. But you seem to suggest that in some way the Government should make the site available. Surely, it does not have the power to do that without going through the process?

Mr de Rivaz: It is linked to the legal status of those sites and it is part of the matter that has to be investigated in detail so that new players and investors can have access to existing sites.

Dr Golby: I do not think anybody is suggesting that there should be an overruling of local planning issues. I believe that the existing sites are advantageous because they carry the existing infrastructure. In a lot of cases the local community not only accepts the nuclear sites but in my experience welcomes them. That makes the process simpler and perhaps faster. If those sites are not available alternative sites can be looked at; it is not an "either/or" but one is perhaps a simpler way forward. We fully take on board public opinion.

Q246 Mr Weir: I take it from what both of you say that, obviously, the existing sites are run mostly by BNFL or British Energy, but if you were looking to build a new nuclear station you would seek access, if I understood Mr de Rivaz correctly, to one of these sites. You would want to takeover, if not an existing station, an existing site. Is that your preferred way to proceed?

Dr Golby: I think that on the information we have available that would be preferable, so we would look to gain access to those sites at a commercial market rate. We are not asking anybody to give us sites or anything like that. Equally, we do not want to be held to ransom for those sites which is the other side of the coin.

Q247 Mr Wright: We have moved on significantly from the first generation of nuclear power stations and we have to give serious consideration to decommissioning before we even start the planning process. What is your preferred approach to the decommissioning of nuclear build? Should the industry pay a separate body to carry this out, such as the UK Nuclear Decommissioning Authority, or should we follow, for example, the preferred model of another country, for example France?

Dr Golby: My company would expect to fund and carry out the decommissioning of any nuclear plants in our ownership, as we have already done in Germany and are currently doing in Sweden. The existence of the Nuclear Decommissioning Authority and the competitive process that it is now engendering means that there would be a far more competitive and robust market to carry out that work in due course. I think that decommissioning from that point of view is relatively straightforward. Of course, new nuclear power plants are designed far more with decommissioning in mind than the early versions that we have in the UK. I do not know whether you want me to extend my answer to waste management.

Q248 Mr Wright: You mentioned the Swedish model and what you are doing there. Perhaps you would answer the question in terms of decommissioning and say how the Swedish model works in terms of waste disposal.

Dr Golby: Obviously, long-term waste management is a different issue. As an operator we would expect to pay for that, but because it is such a long-term issue we think that it needs to be dealt with in a separate way. We need a very clear framework to be agreed with the Government to do that. As a

6 June 2006 E.ON UK and EDF Energy

company we support the deep disposal route that was identified as the preferred option in the interim report of CoRWM. That means burying the waste deep underground in granite (or other suitable geological) formations. My company is involved in the design and operation of the Swedish facility. I extend an invitation to the Committee. If it would like to visit that facility in Sweden we are more than happy to arrange it. The way it is dealt with there is that effectively all the nuclear operators contribute to a waste fund that is ring-fenced and invested in long-term government securities to provide a growing fund for management of the waste long term. That fund is then drawn down to manage the long-term storage of waste. That is one way in which it can be done and I am sure that there are others as well.

Mr de Rivaz: To dwell on that, recently EDF in France announced its decision to invest in a new reactor. The decision has been taken on the basis of the economics of it. The cost will be €46 per megawatt hour compared with a market price of about €50 per megawatt hour. This cost includes, obviously, the construction, operation, maintenance, decommissioning and waste disposal. We know that the cost of decommissioning is of the order of 15% of the cost of construction. We also know the cost of waste disposal because we know of the technical solutions that are available at the moment and are safe. The question of waste disposal is no longer a technical issue; it is a political issue because, rightly so, public opinion is asking government to be accountable and responsible for the choice to be made which is concerned with the very long term. For potential investors in new build in the UK the resolution of the long-term waste management issue is important. For this aspect as for others it is important that the framework is clear. Perhaps I may make a suggestion about this debate which is obviously very important. I fully understand the concerns expressed by many because it is a very long-term issue. Politicians are in my view accountable and responsible to make a choice between two types of risk. One is the risk of not knowing for sure what will happen in 400 years, which is the horizon when we know that the available technologies for all that period will be absolutely safe. I think the risk that in 400 years the behaviour of mankind will not allow decision-makers at that time to make the right choice is very low. This risk is remote and its likelihood is very slim. That has to be compared with another risk which is climate change. We know for sure that in 40 years we may have reached a point when the impact of climate change on our populations and economies will be such that the damage will be huge, so there is a real political choice between the certainty of that risk if we do not address the carbon emission challenges and a very much more remote risk which in my view would be under control at that horizon. The decision, therefore, is not a technical one but a political one. Because of the public concern about this problem it is very

important for investors that the Government has accountability and the responsibility to make the decision.

Q249 Mr Clapham: I want to come back to the major issue of nuclear waste. We have been searching for a long-term solution for a number of years. Is it important to you that government makes a decision on this matter in order to ensure that you will be able to make your investments?

Mr de Rivaz: Yes.

Dr Golby: Yes.

Q250 Mr Clapham: Therefore, we need a government decision on long-term waste management before you make your decision to invest in new nuclear stations?

Mr de Rivaz: Yes.

Dr Golby: Yes, indeed.

Q251 Mr Clapham: As to the location of the repository, Dr Golby referred to what is happening in Sweden. Do we need to identify where the repository is to be?

Dr Golby: No. We need to understand the process and the regulatory arrangements. The plants that we might build would not be decommissioned until about 2080 and there is quite a lot of time to decide the precise location, but we need a very clear view on the policy and framework.

Q252 Mr Clapham: Given you are aware that the Committee on Radioactive Waste Management has suggested that it could take decades to identify regionally the location of the repository, are you quite prepared to wait that long before you make your investment?

Dr Golby: No. I said that to make the investment we would need a very clear policy. I would not need to know precisely where the repository is sited in order to make that investment. That could take a couple of decades, but it would be more than that length of time before the plants would be decommissioned.

Q253 Mr Clapham: That is true, but at the same time because of the technology of the new plants we shall be producing more high-level waste and there will be a need to deal with and manage it properly?

Dr Golby: No. We shall be producing less high-level waste. If we replaced the entire UK fleet we would be adding to the current nuclear waste stockpile by only about 10%. The new reactors are far more efficient.

Q254 Mr Clapham: Although there may be less waste overall, is it not correct that there will be more waste of a highly radioactive nature?

6 June 2006 E.ON UK and EDF Energy

Dr Golby: That is not correct. I think that in the old fleet we have a lot more low radioactive waste, but the spent fuel is essentially the same.²

Mr Clapham: We have had some evidence that contrasts with that.

Q255 Roger Berry: I want to look at long-term incentives for investment. In paragraph 1.37 of EDF's memorandum we are told that in the event that there is no internationally agreed framework on emissions reductions there may be a need for "contractual carbon price hedging mechanisms". Briefly, can you clarify precisely what you mean by that?

Mr de Rivaz: Thank you for the question. I recognise that we have so far been the only one among our peers in the industry to propose these contractual carbon price hedging mechanisms. One has to recognise that the Emissions Trading Scheme is still an emerging market that does not at the moment fit the bill. It has been designed to reduce carbon emissions but so far it has not contributed to the reduction. It has contributed to increased prices of electricity. How does one find a mechanism that gives predictability in the long term and visibility of market price for carbon which will incentivise investors to reduce carbon emissions? Our proposal is a contract or a kind of win-win commitment between investors to invest in technologies—not only nuclear but any technology which effectively reduces carbon—to commit to a certain reduction and to receive a kind of guarantee by market mechanism that the value for the money it puts into the investment will not be undermined by the volatility and unpredictability of carbon prices. You are aware that perhaps three weeks ago suddenly the carbon price—nobody knew what was happening—plummeted from €20 per tonne to a figure below €8 per tonne. It is now back to more or less what it was before. This kind of volatility is dangerous. The ETS scheme does not exist beyond 2012, which is very soon. The investment that we have to make is for decades ahead and the cycle of the ETS today does not match the cycles of our investments. I believe that the UK Government is to be praised for its leadership in the battle about carbon emissions to get all the 25 countries in Europe to agree on phase 3, which will be much longer than five years. Be aware that phase 2 is not yet agreed. In the meantime we have to make our choices. I do not suggest that in the coming weeks we are about to create a new

mechanism which will substitute the ETS, but that there is a clear commitment from the Government that in the case of ETS phase 3 not being available there is plan B and governments and industry will work together in the coming months to have something ready to complement, substitute or reinforce the Emissions Trading Scheme for the long term. In a nutshell that is the proposal that we make, and it is a very serious issue. We have to move from the short-term to the long-term world, or from a world of volatility to a world of sustainability. The billions that we need to invest will not be there without this kind of framework.

Q256 Roger Berry: Are you not very nervous about the long term? Clearly, the ETS has had its difficulties and, as you suggest, the Chancellor's nationally agreed framework looks pretty doubtful for the long term that you contemplate. In no way has long-term carbon pricing yet been implemented. What we are talking about here is the need for long-term incentives and the nature of them, about which some of us would probably agree, but there is no precedent; no one has done it. You are talking about whether in the next few months you can get something together. Does it not make you nervous?

Mr de Rivaz: I am not nervous; I am trying to contribute to an important question, and I think it is a proposal that is worth discussing. I do not suggest that in a couple of months we will have made our proposals and everybody will agree with them. I am just raising a key issue which we have to look at as a real one. I believe that the UK is in a unique position, as often, to take the leadership in this field. We in the UK have been at the forefront of the battle over the climate change agenda and we should be satisfied to see so many people coming with us on this agenda. But it is not enough to have agreement on the problem; we also have to have agreement on the solution. The solution today, the Emissions Trading Scheme, is not yet working well and there is a risk that we do not find the solution through that mechanism in due time. Let us be prepared to have something which helps create a level playing field. It is not a proposal for nuclear but for low carbon technology.

Dr Golby: I disagree somewhat on the point. To get a trading scheme working like this is unprecedented; climate change and the threat that it poses is unprecedented. I would much rather focus upon and be optimistic about the European trading scheme working. It has had teething difficulties. Some would say that it is an absolute miracle that it is working as well as it is at the moment. I think that our effort ought to be directed towards getting phase 2 sorted out and then to design phase 3 which will take us beyond 2012. This is an international problem and unless we can extend the scheme not just throughout the EU but other countries frankly we will lose the battle. We have to get India, China and other countries to participate in this kind of thing. I would much rather the Government put effort into doing that than trying to design a plan B at this stage.

² *Note by witness:* Understanding and summarising radioactive waste data is complex. The amount of radioactivity created for each unit of electricity generated by a new programme of nuclear power plants will be less than we have seen in the past. However, the radioactivity appearing in each category of waste (high, intermediate and low) and their respective volumes, can be expected to differ between legacy and newly arising waste, in the same way that there are large variations within the legacy waste. This is because of the different options deployed for the management of the waste. For example, much reprocessing of legacy irradiated fuel has reduced its volume to vitrified high-level waste, but in doing so has created large quantities of intermediate-level waste.

Q257 Roger Berry: Surely, a scheme that runs to 2012 is simply not good enough. It will not give the right incentives for potential investors to know what to do?

Dr Golby: Of course it is not good enough and that is why the Government must intensify its efforts with its European counterparts to design a scheme beyond 2012. I know that a lot of effort and discussion is going on to do that.

Q258 Roger Berry: The cynic would say that one does not expect this to happen in the necessary timeframe but one expects a government bail-out if things go wrong?

Dr Golby: I certainly do not look for any government bail-out here and that is why I am optimistic. I believe that the European emissions trading system is the way forward.

Q259 Chairman: Are you saying, therefore, that you will not make investment in nuclear unless you know about the price of carbon?

Dr Golby: I will not make investments in nuclear unless I can see a carbon framework that gives me confidence there will be a price for carbon going forward, but I am not looking for guarantees.

Q260 Chairman: In your evidence you also suggest that one of the issues that needs to be addressed is public confidence. Not only does the framework need to be right at the governmental, legal and regulatory level but you also need public confidence. Do you believe that the way the Government is handling the energy review is sufficient to satisfy the public that the nuclear option is the right way forward, or do we need a White Paper and further public discussion before final decisions are taken?

Dr Golby: That is probably more in your court as politicians than mine.

Q261 Chairman: I want to know what reassurance you need as investors to make the investment?

Dr Golby: The reassurance I need is that there is a broad level of cross-party support for this because we are investing over several government cycles, not just one, and there is increasing public support. In the 2003 White Paper the Government said that it would need to publish a further White Paper in this area and that could well be the process for doing this.

Mr de Rivaz: Perhaps I may add to that. Although I have been in this industry in the UK for no more than five years I have been impressed by the process that is going on at the moment. The energy review has been, is and will be to the end a robust, transparent and sensible process to examine the problems that face us and what the solutions to those problems are, so we and many others have been engaged with government and officials to participate in this debate. I feel that this debate will have been extremely helpful to get cross-party support for a policy which is not for one or two Parliaments but for two or more generations, and, beyond the parties, the support of public opinion. It is one of the key elements for us as potential investors to make our decisions. There is no alternative but to have public acceptance. For us with our huge experience in nuclear we have always thought that public acceptance is essential. We have been working for decades to get public acceptance where it is and we are willing to be helpful in this country to create the conditions for public acceptance. If we are welcomed by customers and politicians in this country and by our shareholders we will make the choice to invest in new build in this country.

Chairman: Gentlemen, thank you for your contribution to the debate today. I shall be writing to EDF about one issue which I had hoped to raise: third-party liability insurance. I am very grateful to you for your time and trouble. I am sorry that it has been a bit more rushed than we would have liked but you have made your case very clearly.

Tuesday 13 June 2006

Members present:

Peter Luff, in the Chair

Roger Berry	Judy Mallaber
Mr Peter Bone	Anne Moffat
Mrs Claire Curtis-Thomas	Mr Mike Weir
Mark Hunter	Mr Anthony Wright
Miss Julie Kirkbride	

Witness: **Dr Dieter Helm**, gave evidence.

Q262 Chairman: Dr Helm, welcome to this evidence session in which we are gathering evidence particularly on the nuclear new build question but, of course, it is important to emphasise the evidence you have given us would relate to any part of the energy review and not just the nuclear question. Before we begin questioning, can I ask you to introduce yourself for the record, as I always do?

Dr Helm: My name is Dieter Helm and I am a Fellow of New College Oxford.

Q263 Chairman: A very, very brief introduction, thank you. What you have written about the Government's energy policy has consistently highlighted the fact that the electricity market is not meeting the challenges of climate change and security of supply. Do you think the Government chose the right time to conduct an energy review then, three years after the last one?

Dr Helm: The answer to that question depends on what you think about the 2003 White Paper and whether you think it is an enduring basis on which to construct energy policy. My own view is that it does not provide such a base. It does not provide such a base even to address the short-term problems which were witnessed last winter and arise especially with respect to the gas market. More generally, it has not provided incentives to ensure sufficient investment in the energy sector to meet the security of supply objective. On climate change, I think it is already patently obvious that the strategy that is set out in the 2003 White Paper, while making a contribution to dealing with emissions, is a long way adrift from either the domestic targets of 2010 or, more seriously, the longer-term targets.

Chairman: Thank you very much indeed. We are now going to pick up the points that you made in your written submission to us.

Q264 Mrs Curtis-Thomas: Last week we took evidence from two major generators—E.ON and EDF—likely to be involved in any potential nuclear build. Do you think that, with six main energy firms in the UK, we have market players capable of the competitive delivery of new nuclear build?

Dr Helm: It depends on the structure of a nuclear project. You can imagine consortia being put together which might comprise any of the players in the UK market. In terms of companies with large balance sheets and the capacity to run a nuclear

programme and to carry through most of the main components of a nuclear project then I think we are quite limited to the big three European players.

Q265 Mrs Curtis-Thomas: Just to summarise what you have said: we have got six major players but they would only take a small role in the consortia. What role do you think they might take and is it a significant role with the rest of it being parcelled out to our European colleagues on the Continent?

Dr Helm: If you think about how a nuclear project is put together, first of all there are the sites, and British Energy and the remnants of BNFL own all of those, so that is part and parcel. There is the question of off-take contracts and if anyone commits to a fixed price contract to buy the power effectively they are taking some of the risk of the project and any of the players might want to take some of their capacity in that form. Then there is the issue of the bidding and construction costs of the plant and it is none of the UK players as currently constructed, it is the French nuclear reactor developers and the Americans. I think the idea of seeing this as a company building a nuclear power station is to misconstrue the way in which the risks of these pan out and the way in which consortia may well be formed.

Q266 Mrs Curtis-Thomas: The construction and build is not ours, that is for others, but service and contract provision is ours.

Dr Helm: In the end somebody has to buy the power and it might be that large suppliers take a chunk of that, but it might also be that financial institutions do. For example, in the Finnish case it is a nuclear power project and large industrial customers. A financial intermediary might buy the contract, break it up into all sorts of small bits and you might personally like to take a little bit of your power on a guaranteed price, but not all of it. I think we need to move forward into a world in which contracting is a much more diffuse and potentially diverse type of activity than simply some lump sum big contracts, but there might be such contracts.

Q267 Mark Hunter: Dr Helm, can I ask you how important you think is the need for political consensus on any final decision on nuclear. Do you think the Government is going about achieving this in the right way?

Dr Helm: I think it is very important to have political consensus about the climate change targets, the climate change instruments, the structure of the electricity market and particularly the security of supply incentives. I think that requires an overarching framework which has to look beyond the natural life of one party's period in government. We need to get political consensus around that. So far, although it seems to me most political parties take the issue pretty seriously, as yet there is not much evidence that people are going to sit down and hammer out an all-party enduring agreement. By the way, that is one of the reasons why I think some institutions are needed behind this to provide that. A separate question is whether there needs to be political consensus on nuclear power. The strong difference between the really very, very poor record of nuclear development in the UK and the much more successful development in France is clearly political commitment in France across the spectrum and not in the UK. If you are going to engage in a large lumpy capital project, or series of capital projects, the chances that a government might subsequently change the rules increases the risk of that project, raises the cost of capital, and in a large capital-intensive industry it is the cost of capital that really matters. The answer is if there is not cross-party support for a nuclear programme, or at least the framework within which one might be constructed, then it is going to be very expensive.

Q268 Mark Hunter: The second part of the question was do you think the Government is currently going about achieving this in the right way?

Dr Helm: No. I have argued all along that these long-term energy questions should be taken, to an extent, outside the party process. That does not mean in the end it should not be political, it has to be political in a democracy, and when one is talking about industry with long-term waste the politics of handling that is paramount. We need to find a framework within which the parties can sign up to such a framework without it being the initiative of one or the other. In the past there were mechanisms for doing these things, things like Royal Commissions and things of that ilk, but I am not sure that is appropriate in this context. I urged at the beginning of this current energy review that it should be cross-party and it is not, it is a governmental review, and I think that is a mistake.

Q269 Mr Bone: From your comments, and there clearly is not cross-party consensus on this, and you quite rightly have said the Government has not encouraged any cross-party discussion by doing it as a single issue for themselves, can I conclude that because it is going to be very expensive you would be against a nuclear option?

Dr Helm: I am neither for nor against. It is utterly critical to my arguments about energy policy that I am in favour of setting a level playing field in which carbon and security of supply are properly placed in the market. In that context I hear from the nuclear industry that they think they are the cheapest way of achieving low cost emissions and security of supply.

If that is true then if the playing field is level there will be nuclear build, but I do not know. I am highly sceptical, having studied energy policy for 20 years plus and watched the numbers the Government produced about the costs of different technology, about any point estimates of the costs of different technologies. I think the market will out who is bluffing, who is not, and what those prices are. Additionally, the nuclear side—this is where you fray the edges of the playing field—has some issues which require solutions which go across political parties. One of the reasons I propose carbon contracts is that a carbon contract is a contract which will have to be honoured, so it is important to recognise that the carbon approach is a cross-party commitment because somebody has underwritten a contract. It is not enough to simply say, "We are going to have a carbon price in the future" or there will be some sort of floor that we will deal with, that is open to political movement. What is not open to political movement is offering a contract, signing a contract and then delivering on that component. Commitment is part and parcel of the way I have thought about designing a carbon framework. I am sorry if that is a little convoluted.

Chairman: We will come back to the carbon framework later, I know it is one of your principal points.

Q270 Mr Weir: I was interested in what you were saying about markets deciding. Given that evidence we have had, not only from nuclear but from some energy providers, is they are looking for long-term guarantees, and perhaps some guarantee on long-term pricing, is it truly the market deciding on that basis or are we looking at a skewed market to deliver energy for the future?

Dr Helm: I think you have to be very careful of the word "guarantee". In a market you can get contracts. Contracts establish a fixed price for certain activities and those contracts are enforceable. A guaranteed price by government is quite a different thing. For example, mechanisms like the Renewables Obligation or—I am not in favour of this—a nuclear obligation effectively guarantees that costs will be passed through in one form or another. That is not a very good incentive mechanism and can produce all sorts of outcomes.

Q271 Mr Weir: Is it your feeling that government should not be involved in effectively setting a base price for any form of energy?

Dr Helm: Absolutely. Why should it, and how would it know? If you had a benign planner who had perfect information about everything and could perceive the future, was immune to lobby groups and interest groups, fine. I think what government should do is sort out what its objectives are here. It is for government to sort out what carbon policy it wants, ie what targets, and it is for government to sort out what level of security of supply it wants and is prepared to take a risk on. Given that framework, what we want to find is the cheapest way of achieving that outcome. If it is a sharp and sustained reduction in CO₂ emissions then the question is how we can do

13 June 2006 Dr Dieter Helm

that as cheaply as possible. For the government to go in and say, "We know that the answer to that is wind" or "We know the answer to that is a nuclear power station" assumes a level of information and understanding and an immunity to lobbying which has never been witnessed before in an energy policy. The history of energy policy and governments picking technologies has been at times quite close to disastrous, particularly in the nuclear sector.

Chairman: I think we are getting into the danger of stealing some of the territory Mark Hunter wants to ask about.

Q272 Mark Hunter: Before I come on to my next question can I take you back to your answer to my previous question. If I heard you correctly I think you were implying that it would help, if that is the right term, if this decision about nuclear were taken outside the party political process. Could you extrapolate briefly on that given the fact you are talking to an audience of people very much involved inside the party political process. I am intrigued to know what your ideas might be in that area.

Dr Helm: The political process is involved in setting the carbon targets and the security of supply requirements, fuel poverty and other objectives. (On the objectives setting on the carbon side, I propose that there is an auction of long-term contracts.) Somebody has to run those auctions and I propose that there is an energy agency which has the job of delivering the objectives which Government has set. The auctions are one form of that. Similarly, on the security of supply, the capacity market has to function in a context in which a view has been taken about that security of supply and, again, in my world that would be delegated to an agency. I strongly distinguish between the setting of objectives as a political activity and the delivery of those objectives which I delegate to an agency in my proposed framework.

Q273 Chairman: The challenge to the political process is for us to agree a consensus on supply and carbon emissions, is that right?

Dr Helm: It is. It has proved very difficult. This is not about aspirations. We can aspire to reduce CO₂ emissions by 20% by 2010 but, to be blunt, it never was going to happen and it has no credibility. On the other hand, you can auction contracts for carbon and they have credibility by definition because they are contracts. You can tie yourself to an EU emissions trading national allocation plan and that is it. So far the politics has not gone so far as to even have agreement about what those carbon targets are before we get into all the detail about how they might be delivered.

Q274 Mark Hunter: On the last scenario you advocate I am sure you would accept there are some fairly basic issues about accountability that would need to be overcome, but that is perhaps best left for another day. I am keen to make progress, if I might move on to my next question. You have also suggested the possibility of a single agency for the implementation of energy policy which would

encompass the work of Ofgem, the Carbon Trust, the Energy Saving Trust and parts of the DTI. Could you elaborate on how you might see this working and how feasible you think that would be? Perhaps, how would it differ from a Department of Energy?

Dr Helm: In my framework the government sets its targets on climate change on security of supply. It delegates those targets to an agency to deliver and that agency reports publicly on progress with respect to those targets and publicly alerts ministers to any substantive problems that arise. It is somewhat modelled on the Monetary Policy Committee of the Bank of England. It has both security of supply and climate change together because trying to solve them separately creates enormous inefficiency and, indeed, that is reflected at both the government level and the structure we have at the moment between Defra and DTI and between the energy regulator and environmental interests. It is less bureaucratic than we have at the moment. We have spawned a very large number of organisations across the energy sector solving problems on a piecemeal *ad hoc* basis. I would bring together the expertise of the Carbon Trust, the Energy Saving Trust and Ofgem in particular within that body, it would have a core modelling skill and we would have people with substantive expertise in that body who would be there full-time and we would build up a level of knowledge which we clearly do not have in Government at the moment to address these issues. It is a delivery body with two objectives, publicly accountable and it is a reduction in bureaucracy from what we have at the moment.

Q275 Mark Hunter: I am interested in the accountability factor, as I mentioned before. You just said it would be publicly accountable.

Dr Helm: Absolutely.

Q276 Mark Hunter: If it is responsible for delivery how is it going to be publicly accountable if we do not have the situation of the minister being able to account for progress, or lack of, in front of Parliament?

Dr Helm: We have that problem across all aspects of delivery of government policy, so there is nothing new, whether it be in the health service, education or elsewhere. In my view, the agency status would not be the same as the Ofgem status. We have thought through, perhaps well or badly, the relationship between Defra and the Environment Agency and the Environment Agency's accountability in that framework. I envisage the normal mechanism for doing that might include guidance, it will include select committees, it will include the normal ministerial relationships with agencies, but there is one separation in that ministers cannot say, "This is our carbon target but, by the way, it looks like it is much more expensive than we thought it was. We charged you with delivering it but now we do not like how you are delivering it, could you change it a bit without undermining the targets?" The crucial thing here is how ministers make it credible that they are going to stick to their targets and take the consequences for prices that follow from those

13 June 2006 Dr Dieter Helm

targets. It is better to be honest and say, "We are not going to have these targets" if you cannot do that, but if you are going to do it I do not think we want to continue, if we take climate change very seriously, with the current world where nobody really knows what the 20% 2010 target means. That is the difficulty. If you want credibility it is expensive, that is what it is like in monetary policy. We have learned there is a massive pay-off in monetary policy from having clarity, of the inflation objective being the Chancellor's and the delivery of that objective being the Bank of England's.

Q277 Mark Hunter: That is interesting, thank you. You have talked this morning about the importance of establishing a level playing field, as you put it, on which all technologies can compete. To what extent do you think the current market provides such a level playing field?

Dr Helm: It is certainly not a level playing field. We have a whole host of different kinds of interventions and they are for different time horizons and they treat different technologies differently. I am in favour of a technology-neutral policy. For example, the Renewables Obligation is largely a wind obligation, it excludes nuclear power, although nuclear power is apparently low carbon. The Climate Change Levy is not a proper carbon tax. There are a host of other interventions in support of particular options within the marketplace. No, it is not, but more fundamentally it misses out long-term signals for the two things that you want this level playing field to take into account. There are no serious incentives in the market to provide excess capacity, which is what you need for security of supply. No rational capitalists worth their salt would deliberately engineer excess supply unless they were paid to do it, and clearly they are not paid to do it. On the carbon side, we have no idea what the carbon regime is beyond 2012 and we do not yet know what the Emissions Trading Scheme looks like from 2008–12. I cannot think of any serious technology on the carbon front which is interested very much in what happens before 2012 other than very established technologies. The two key elements to energy policy are outside the market and, therefore, not part of that level playing field. This market, whatever it does do, cannot possibly provide a secure, climate change friendly energy outcome.

Chairman: Let us move on to the specifics of the carbon contract now.

Q278 Roger Berry: Dr Helm, you make a powerful case for using market-based mechanisms for dealing with CO₂ emissions, the two obvious mechanisms being carbon contracts and a long-term carbon tax. Could you comment on the relative advantages of the two mechanisms?

Dr Helm: In theory, and forgive me I am an academic—

Q279 Roger Berry: I understand, I used to be one.

Dr Helm: My condolences! In theory there is much to recommend a straight carbon tax over permits, however international agreements are much easier struck in quantities rather than prices, ie permit trading rather than taxes, and Kyoto in itself is fixed in quantities. There are reasons for thinking that if you want to approach this problem internationally you have got to go down the permits route. Then there is the industrial lobby which would much prefer permits than taxes because taxes provide revenue for Treasury, permits tend to get grandfathered and not have the income effect on industry. We have the European Emissions Trading Scheme, it is probably the only main game in town, and the scheme that I propose with regard to carbon contracts is designed exclusively with a view to reinforcing that regime and providing a bridge to the longer term for that regime and also fitting in with a framework for thinking about more international agreement about carbon. The carbon contract proposal I have is essentially an elongation of the Emissions Trading Scheme and has the nice feature that if it comes into form it gives politicians an extraordinarily strong interest in making sure the European Emissions Trading Scheme goes forward because they need that to offload the contracts on subsequently.

Q280 Roger Berry: Given the difficulties with the EU Emissions Trading Scheme, given that to some extent this would be a leap in the dark, and given that it would cost the Treasury money rather than raising it, does not a carbon tax in those respects appear to be somewhat more attractive? What are the costs that you estimate the Treasury would have to pick up if it pursued a carbon contract arrangement?

Dr Helm: It is not necessarily that the Treasury would have to pick up any costs. Someone would, but not necessarily the Treasury. If you do not like the idea of the Treasury being the intermediary in this framework between potentially an EU ETS in the future to offload the contracts and the investors who are building low carbon plant, you simply assign the costs to the system user charge of the electricity transmission system. In the end we are all going to pay in one way or another for having low carbon technology, there is no escape for the British economy from that, the question is who? Do you want taxpayers or customers to underwrite the risk? It is only underwriting the risk, we will pay for the energy as customers. I am indifferent. It is slightly cheaper for the government to underwrite the risk than perhaps customers but you can tie it to the system user charge. There is no necessity for any cost to the Treasury if they are so minded to avoid having such a cost. That is a different question from the question about nevertheless does the carbon tax have some advantages. It is true that the carbon tax would make lots of money for the Treasury but that is also its potential disadvantage because what you are interested in here if you are an investor is knowing what the future carbon tax is going to be. If governments find that it is a major source of revenue, the incentive to use it as an instrument of

13 June 2006 Dr Dieter Helm

fiscal policy as opposed to a clean, clear energy policy instrument would be very large indeed and it would be Treasury determined, not by an agency, not by DTI, and in consequence we would end up playing a game of predicting where politicians are going on that rather than the market. It might turn out okay in the sense of you might think the government is going to be so strapped for cash that they are going to have to ratchet up the carbon tax a lot through time and that might provide an incentive but it is political and regulatory risk which you are transferring to the private sector then and, broadly, that is not a good idea.

Q281 Roger Berry: In terms of saying a long-term carbon tax, you say what government should do is set the target and then debate about the instruments, and I understand that, but the problem with a target in terms of reduction of carbon emissions by, say, 2050 is that is premised on some assumption about what carbon emissions would be without the policy, so you make a big guess about what the situation is going to be in 45 years' time or whatever, and of course that could be wrong.

Dr Helm: The point here is in the carbon contract proposal I am not saying that you look at the target you have got and take the whole lot out as contracts. I am saying whatever you do over the next 20 or 30 years you have got a carbon problem. You have got 20% of nuclear power dropping off the system, you have already got emissions rising, and they have been rising since 1997. The only reason we have overall lower emissions is because the coal industry contracted and that had nothing to do with the climate change policy at all. The underlying story is not a good one. What I am saying is some of the carbon reductions that you may have to make we can make through carbon contracts. For example, you could take the 20% that comes out from the closure of the nuclear stations. You do not have to auction a lot of contracts, you could decide how risk-averse you want to be. That does not require forecasting forward that you are going to have to reduce by 60% by 2050. It merely says even if you want to hold your own, even if you just want to keep emissions constant, you have got to find a major source of large scale carbon reductions in the next 20 or 30 years. The way to do that is to take that amount, auction it and that should provide, I hope, a most efficient outcome and certainly will reveal the difference between people saying that things are cheap and low cost and the reality of what they put on the table when it comes to their money that is being invested.

Q282 Roger Berry: In relation to other areas where inaction leads to greater carbon emissions, and I am thinking of energy inefficient homes, the transport sector and so on, do you see a role for carbon contracts in relation to dealing with those sources of the problem?

Dr Helm: There could be, but this is a flexible arrangement. We have the EU ETS, which is a narrow-based emissions trading scheme, and aviation is likely to be brought into it. Can we

expand an emissions trading scheme to bring in other sectors? Yes. Should we do it in one big go? No, we should do it in an evolutionary way because the difficulties of designing these schemes are really quite complex. I had in mind quite large scale and relatively simple contracts but if you want to make it more complicated and add in other sectors earlier on, fine. In all of these areas you have to define a baseline and the baseline is not without controversy: what would have happened in the absence of this? What is a genuine saving? In any event, all of those questions arise under the EU ETS now so there is nothing new in those problems, but baseline energy efficiency, for example, is quite difficult.

Q283 Roger Berry: From the Government's point of view, if it were to pursue a carbon contract arrangement, it obviously wants to get the best deal possible and needs to encourage people to stick in low bids. You have rightly said that in practice you would have to sequence this anyway, whether it is every couple of years or five years or whatever, or even more frequently. What advice would you give in terms of how the carbon contract policy should be pursued in terms of trying to maximise the chance any government gets the best deal out of the system because in the past we can think of bidding systems where the government has done remarkably well, surprisingly so, and other areas where they have not?

Dr Helm: In the proposal for carbon contracts which I and my colleague, Cameron Hepburn, have put forward we deliberately have a two-stage auction. The reason we do that is in the first stage people bid the kind of contract they would like to bid. This is quite common in construction and other areas. So you first of all reveal a lot of information about how people would like contracts designed before you go to the stage of having the formal auction itself. That is because government does not know very much about how to design these things. That is what we learned through the EU ETS, it takes time to evolve these things. Ask people first of all what kind of design of contract they would like, then stand back and look at it and decide the auction itself. The lesson from the 3G licences is these design questions are complicated but they do have solutions and the solutions depend on the context in which the contract is set. I do not see that as an insuperable barrier. It is important. It could be got badly wrong, but it is not impossible. Err on the side of simplicity too. You mentioned bringing in energy efficiency and lots of other things. The more things you want to bring into the frame in one go before you have had any experience of doing it, the more likely you are to make mistakes. My judgment is start simple and then add more things rather than start complicated. Again, maybe do not auction too many contracts to start with.

Q284 Roger Berry: As I understand it, and correct me if I get it wrong, the bidding process involves government, or a government department or whoever, saying "Right, put in bids for reducing CO₂ emissions by X" and you clearly take the lowest bid, but for companies making those bids

13 June 2006 Dr Dieter Helm

presumably they have to demonstrate that they are meeting that particular target. How do you see that happening in practice when it is not just the immediate impact on carbon emissions that a particular energy source might create but obviously there are the energy implications of inputs? We have all heard “is nuclear really carbon free?”—it clearly is not carbon free but it is low in terms of carbon emissions. How do we ensure in these contracts that the energy implications of the source of supply are taken into account?

Dr Helm: There are two points here. The first point is these are payments for carbon reductions delivered, and if you do not deliver you do not get paid. That is crucial when we come to nuclear technology because what I am trying to avoid in almost any circumstance is the government underwriting the construction and performance risk of a nuclear project. That is what we used to do in the past and that was what went very badly wrong. It has to be delivered. The question is, have we taken in the full effects? The answer to that question is it depends whether you have got a carbon price through the full chain and depends what you have included within it. At the moment the answer is of course we have not got it fully included for any of the fuels. Does it help if you make an incremental step in the direction I have described? Yes. Should it go further down the supply chain? Yes. For example, there is carbon used in producing wind turbine, that is not included in the Renewables Obligation, and there is carbon produced in all kinds of mining operations associated with other technologies. The further you can broaden out the economic instrument the greater the grip over those things, but it is incomplete and it is incomplete for all the current technologies.

Q285 Roger Berry: This is my final question because I realise that time is passing. If carbon contracts operate throughout the chain and all the major countries are engaged in this I can see the effectiveness of the system but realistically, of course, that is not going to happen. Nor, indeed, is there evidence, to the best of my knowledge, of carbon contracts as of today working effectively. There is the European Emissions Trading Scheme but that is about it and it has encountered lots of problems. Theoretically I understand what you are saying but in practice do you believe such a system could be got up and running quickly enough for it to have effects reasonably promptly? Is it a runner in practice?

Dr Helm: Its very practicality is what makes it very do-able. If governments and politicians do not want to have a credible carbon target then none of this is necessary. If you want to reduce CO₂ emissions then you have to decide the level at which you want to do that. If you want to do it at the EU level, then emissions trading has to be defined at the European level. If you want to have a domestic target then you do it domestically. Internationally, if you want to have any arrangement that brings the Chinese, the Indians and the developing countries into a post-Kyoto world you will have to contract for carbon,

you will have to use the clean development mechanism. These are all carbon contracts. The Emissions Trading Scheme itself is a carbon contract. What is proposed here is a remarkably simple bridge between the problems up to 2012 and the time horizon of the kinds of investment we need to make. Supposing you do not do it, supposing there are no carbon contracts, what is the consequence? You endanger your target. You may not mind that but if you really credibly want to achieve it, it is the simplest, cheapest way of doing it. If you are going to go forward and say, “We are going to have a nuclear programme”, if you want to create a playing field in which nuclear is properly rewarded for its carbon characteristics but the government does not go around underpinning its other features, then the carbon contract is the simplest way of focusing down on that bit of the level playing field which you might want to take into account. I think it is eminently practical. It is not perfect from a theoretical point of view but practically it works.

Q286 Chairman: Just a point of pedantry from me. The UK Government can go ahead and produce this system but it has an incentive to ensure the EU ETS actually endures and succeeds as well.

Dr Helm: If it does go down this route it has a fantastically powerful incentive to do everything it can to make sure the EU ETS succeeds because that is its route for handing on the contracts subsequently, but it might decide for other reasons it wants to go down a particular route, like nuclear power, and if it is so minded to do that then this is the way of handling one particular component of it. If you do build a nuclear power station, someone has got to pay the cost. You do not escape that because you do not have a carbon contract arrangement.

Chairman: Let us do the other half of your proposal now.

Q287 Mr Wright: In terms of the capacity market your memorandum has outlined the need for a capacity market to create security of supply. Could you explain the proposal to us and, also, why is it needed in addition to carbon contracts?

Dr Helm: The carbon contract deals with the carbon problem. That is your objective, that is your instrument. You must have at least as many instruments as targets. Carbon is on that side. The other problem, which I think was seriously ducked in the 2003 White Paper, is security of supply. There is no point in any intervention unless there is a problem, and the problem here is the following: in security of supply what we require is excess supply. We require a margin of plant which on average probably will not be used and we need a margin of gas storage that on average probably will not be used. No rational capitalist will invest to create excess supply: it reduces the value of all their existing assets because it drives down the price. Therefore, almost all electricity markets in particular over the 20th century had an energy price and a capacity price and a separate market in capacity to pay investors to provide that margin. We have not got

13 June 2006 Dr Dieter Helm

that in NETA, which followed on from the abolition of the capacity market which arose under the Pool. The capacity market under the Pool was a very ill-designed capacity market but it does not follow that because the Pool had a badly designed capacity market, that all capacity markets are bad. Under NETA, we have a single uniform market. Because we had a large scale excess supply of gas, of power stations, we were awash with the stuff and we had a system in which we had a low fossil fuel price as well, there was no security of supply problem, and therefore there was no need for a capacity market to address it. Now we have it with a vengeance, and that is why I advocate the strategic storage of gas as a requirement on the system and that people get paid for that, and in electricity I recommend we have a separate capacity market which is added on to the existing arrangements to address precisely that question of making sure investors get paid and then ensure we have adequate supply going forward.

Q288 Mr Wright: Would you see that the capacity market would reward particular types of generation more than others?

Dr Helm: No. The capacity question is like the carbon question: we can either fix the price or the quantity. If you have a fixed quantity target for carbon then you are fixing the quantity and you want to find an instrument that backs that up. In energy, security of supply at the margin is about quantity, not price. You fix the quantity and then you auction it. Anyone can bid, but you have to deliver and there are big penalty payments if you do not. Similarly in the gas storage market or, indeed, the oil strategic storage market, firms can bid to provide that service. Let all the technologies compete. I do not know whether a wind farm would be better for this or a peaking gas plant or an existing coal station with particular characteristics, or something else. Certainly the Government does not know the answer to that question, so you use the market to bring forward a solution. The objective is clear, politics sets the security of supply objective, and the delivery is by auctioning and making people reveal not what they would like you to believe but what they are prepared to put their money to and do the investment with.

Q289 Chairman: How would microgeneration fit into that structure?

Dr Helm: Microgeneration as a term covers all sorts of different things. If at its bare minimum it is a small-scale generation option, it is perfectly possible that it offers essentially a peak service, that it manages the margin, and you could think about that backed up with consumer tariffs which allow consumers to behave like industrial customers do and turn the power off when it becomes expensive. I suspect customers do not want to do that, but in principle the backing up of a capacity market feeds all the way through to people being able to auction in demand-side effects, which is the offer to reduce demand at peak points rather than the offer to

produce new supply. It could be completely symmetrical between the demand/supply side and the market. Microgen could fit into that frame.

Q290 Chairman: I am sorry, I am sure everyone else in this room understands everything about this and I am being the dense one, so just help me a little bit, please. What this means is the Government will make a prediction for how much generation capacity we need.

Dr Helm: They will have a capacity margin requirement, say 20%.

Q291 Chairman: Going forward how many years?

Dr Helm: At the moment, and this is to illustrate this is not a new blue sky thought, the National Grid Seven Year Statement goes forward for a period of about seven years. You would probably have a seven year horizon but an indicative framework beyond that. It depends on the time horizon for investment to meet the requirements. When you identify shortfall, what is the time horizon that takes you to get some kit that can meet that shortfall? Seven is the time period used for the National Grid Statement.

Q292 Chairman: Do you think someone would invest in a new nuclear power station in a seven year time horizon on the security of supply contract?

Dr Helm: No. The question then becomes: do you set up a regime which tells you through time that capacity margin will be maintained. It is not the time horizon that binds upon it, it is whether you believe it is credibly going to be the case that government is going to commit to a framework which produces that level of security of supply. If someone comes along and offers a long-term basis for that there might be people who want to arbitrage, take the position long on the bet that other producers will not be on the system. There might be a need for a long-term framework. The energy agency would have to sort that out. I am against blueprints which emphatically define the future in some kind of cast iron way 20 or 30 years ahead and then just turn it on to automatic pilot because of course conditions will change, and we do not know what demand will be like in that period.

Q293 Chairman: The Government has to say “we reckon we need 110% of what we think might be used”?

Dr Helm: A 20% margin has been perfectly normal.

Q294 Chairman: 120%, a 20% margin and you know the Government is thinking about the long-term so how long the actual contracts last for is less important than the structure's endurance.

Dr Helm: It is only making a reality of what is already there. We have always had a guideline margin. The problem is over the last few winters we have been in danger of being significantly below that and in part that is because nobody has been particularly concerned about that because we have lived in a world of excess supply where we have comfortably exceeded these things for 20 years.

Q295 Chairman: How quickly can you introduce this?

Dr Helm: It is part and parcel of the energy agency. If governments were minded to go down this route then it seems to me you would do it in a stepwise fashion. You would set up the agency. The carbon contract is a matter of some urgency. Grafting on a capacity market takes a bit of time, but it is not rocket science. There are loads of capacity markets around the world and many jurisdictions in the US either have capacity markets or are quite desperately searching for ways to introduce them because this problem is not a British-only problem. It will take some time to put those bits in place. We need pretty close to semi-emergency measures to worry about next winter, and nothing I propose is going to solve those problems. Thinking out over the next three, four or five years most of this can be put in place.

Q296 Mr Wright: Can I just come back on that particular point. The same thing was said last winter but never applied. Obviously the gas supply from the Langedale field in two years' time will probably resolve the problem with gas.

Dr Helm: With respect, I think that is almost wholly wrong. People think insecurity of supply means will the lights go off or not—but that is not the issue. It is what happens just before the lights go off. It is the volatility and sharp prices. Everybody in this country had a security of supply crisis last winter and they paid for those spikes. That is what you want the margin for. It is not just physical quantity security, it is the stability of price that provides that buffer. That is why you want strategic gas supply. I think, and I feel very strongly about this, it is not only wrong but very misleading for ministers to say, "People said there was going to be a problem last winter and there was not". They have redefined the problem as meaning the lights going out but the competitiveness of economy, the bills to households, volatility of pricing, these are consequences of running the system in a way which is tighter than is optimal for our economy and our society. Will we have those problems again next winter? Yes. Will the lights go out next winter? Probably not.

Q297 Chairman: Do you need security of gas supply contracts too, like electricity generation?

Dr Helm: The gas supply side is complicated by a number of features. First of all, long-term take or pay contracts are quite normal in the gas supply side and that is part of the row between Europe and the large players in the European Union and between Europe and Russia. Secondly, in gas the immediate requirement is to focus on storage, which I think the Secretary of State has indicated he is focused upon. I think, and I advocated in the Hampton Court paper for the EU summit, that we should move towards strategic gas reserves like in the oil market, and that is in the European Green Paper too. Naturally there is resistance to that from the oil and gas companies but you have to ask whose interests are best served by a world in which prices are volatile and high.

Chairman: There is some insistence from the European Community that gas should be stored as well, it seems.

Q298 Mr Weir: You have made it pretty clear that you see the way forward as the government basically setting objectives and leaving a lot of it to the market. Given that we are not in that situation, and not likely to be in the foreseeable future, and the energy review is due to report fairly shortly, if the Government decides to give nuclear the green light is it credible to suggest that it should also give some indication to the industry as to how many reactors it expects to be built?

Dr Helm: I, like you, I am sure, read the press and what is being suggested is there will be no financial assistance for any new nuclear projects. If that is true, and if the three things Government does is address planning, licensing and waste, in that context how can the Government indicate how many power stations it wants to build? If it is the private sector building these things and it is private sector money and there is no financial support for them, the answer will turn out to be whatever the private sector is willing to do. That is a market solution. All I have suggested in that framework of the market should be a level playing field. Some people in the nuclear industry argue that in such a level playing field they could build lots of nuclear power stations and I am agnostically sceptical. Okay, let us create the framework, let us see if they want to do them, but in the end these are billion pound investments and people are not going to make those investments unless they are convinced that these are attractive investments to make, and in that context it is crucial that they carry the construction and the performance risks that go with those. I am not sure what it means to say 10 nuclear power stations, or five or 15, in a context where you have already said it is the market that is going to decide.

Q299 Mr Weir: In the evidence we have had it seems to be the case, perhaps a bit like yourself, they are looking for forward carbon pricing and some idea of the cost some years in the future. I know you have been advising both Defra and DTI on sustainability issues, do you believe these departments are joined-up enough to deliver forward pricing of carbon?

Dr Helm: It is partly for the reason that historically Defra, or whoever has had the environment department, and the DTI have had, let us say, significant elements of tension between them. Energy efficiency is an area *par excellence* but we had it with the EU ETS last time around. I wanted to take it away from that framework and sort out target setting and delivery. Right now I am not convinced that the Government is capable yet of even addressing the question of credible targets, let alone the bit that follows from it, which is the carbon contract. The idea that energy policy should be run between government departments, between Defra, DTI and Treasury, is not a recipe for creating clarity for the market out there to try and predict what the incentive structure is going to look like. It is partly dissatisfaction with the structure of government at the moment which leads to the suggestion that an agency might be appropriate.

Q300 Mr Weir: Do you see this agency as being completely outwith government and setting targets that are binding on government, if you like? Do you see the government having any input into these targets at all?

13 June 2006 Dr Dieter Helm

Dr Helm: The government sets the targets. It is the government's job to decide what its policy is, that is the political decision. The only thing the agency does is deliver. It says, "If that is what you want to achieve, we will try to harness the market to deliver those at the lower cost to the economy and to society and for customers", that is what it does. You cannot jump to the delivery issue, "Shall we build 10 nuclear power stations" before you have sorted out what the question is that they are supposed to be an answer to. The question they are supposed to be an answer to is: what is your climate change objective; and what is your security of supply objective. That is what I think we should focus on. That is the area where it is more likely there is a possibility of getting a political consensus than a political consensus about picking a particular technology.

Q301 Mr Weir: Given the experience with the EU scheme, do you see any government being able to set a long-term carbon target and sticking to it?

Dr Helm: You say given the experience with the EU system. First of all, we had a three year trial period, it was set up as such. This is the most ambitious emissions trading system in the world, nobody has done anything on this scale. It is true that there have been some serious teething problems with this regime, higher prices than anticipated and then the collapse of prices, but what do you learn from that? Do you learn that because it has not worked exactly as we planned it to work in the first three years, we should abandon it, or do you learn from that that we can make the system work a lot better than it currently does and build consensus around it to build a framework not just for Europeans to find the most efficient solutions to reducing carbon but find a basis for

constructing a post-Kyoto world? Think about it the other way round: supposing you just abandon it, give it up, have no Emissions Trading Scheme at all in Europe, and presumably in the UK too, what happens then? Any semblance of an attempt to achieve the Kyoto targets from a European point of view would probably go out of the window. Is that a bad thing? It depends upon your view about the seriousness of climate change and the contribution that Europe has to make to engineering some form of international treaty. Trading in quantities is usually the way in which that is achieved.

Q302 Chairman: Your ideas are both simple and radical at the same time. In the very short time until this energy review do you think their radical nature will commend themselves to Government and be likely to be adopted?

Dr Helm: Who knows what the Government will do? That is for elected politicians, not an academic. The attraction of my suggestions is they are very focused, very simple and they address the cost issue and the competitiveness issue. If the Government goes forward by trying to intervene in lots of detailed ways there will be unintended consequences and it will turn out to be vastly more demanding and complicated than they think it is at the moment. In the end the results will be that the cost will out, someone has to pay those burdens. I remain optimistic that capacity markets will be seen in the UK. It depends how many tight winters it takes to get there but they will be seen, and some form of carbon contracting is plausible, practicable, do-able and in the spirit of the EU ETS. Whether it will be done or not is a matter for Government and not for me.

Chairman: Dr Helm, we are most grateful to you for a very interesting hour, thank you very much indeed for your time and trouble.

Witnesses: **Mr Clive Bates**, Head of Policy, and **Mr Joe McHugh**, Head of Radioactive Substances Regulation, Environment Agency, and **Dr Mike Weightman**, HM Chief Inspector, Nuclear Installations Inspectorate, and **Mr Les Philpott**, Head of Specific Interventions, HSE Policy, Health and Safety Executive Nuclear Installations Inspectorate, gave evidence.

Q303 Chairman: Gentlemen, thank you very much indeed for coming to give evidence to this Committee on the issues relating to nuclear new build. As I always do, can I ask you to begin by introducing yourselves for the record?

Mr Bates: I am Clive Bates. I am Head of Environmental Policy at the Environment Agency and I look after wider aspects of energy policy.

Mr McHugh: I am Joe McHugh. I am the lead for nuclear regulation at the Environment Agency.

Dr Weightman: Mike Weightman. I am Her Majesty's Chief Inspector of Nuclear Installations and Director of the Nuclear Safety Directorate in HSE.

Mr Philpott: I am Les Philpott. I am a Director in HSE's Policy Group responsible for managing hazards regulation. I am also the Project Director in HSE for our contribution to the Government's Energy Review.

Q304 Chairman: I must say I do find all the various bodies involved in this extremely confusing. Can you define for us the difference in your two sets of responsibilities?

Dr Weightman: We do work in partnership. We are in charge of securing nuclear safety on nuclear licensed sites, securing proper attention to radiation protection, securing proper attention to radioactive waste handling on those sites. We are also responsible for industrial safety on those sites as part of the wider remit of the Health and Safety Executive. Basically we are about protecting workers and people from activities on those sites.

Mr McHugh: The Environment Agency is the environmental regulator for those sites. We regulate the radioactive waste disposals and radioactive discharges on those sites and we have wider responsibilities for licensing cooling water abstractions and discharges. In some particular plants we license the auxiliary boilers and in relation to construction of new nuclear plant, any construction waste, so a range of environmental permits, although perhaps the most controversial is the permit for radioactive waste disposals and discharges.

Q305 Chairman: So broadly speaking the Inspectorate does the people on the site and the Environment Agency does the broader implications of the site?

Dr Weightman: Not quite. We also look at the impact of the activities on the site on the public, either from radiation emanating from the site rather than the discharge from the site, but also in terms of accidents. Clearly, we are interested in securing high standards of safety with regard to accidents on the site.

Q306 Chairman: So there is quite a lot of overlap?

Dr Weightman: Would it help the Committee if we also explained that there are other regulators on the patch?

Q307 Chairman: Just run us through the list quickly. We have been briefed on this.

Dr Weightman: Yes, and I know next week you are seeing Roger Brunt from the Office for Civil Nuclear Security. Clearly they have a *locus* on these sites as well to secure proper attention to security, and we do liaise with them as well around that. There is a regulator on the transport of nuclear materials as well, which is part of the Department for Transport.

Q308 Chairman: Do security and safety issues ever clash or do they normally coincide?

Dr Weightman: I would say generally they are very much aligned and we work closely together around that. There may be the odd occasion where, for instance, an escape door which for safety reasons you want to be able to open pretty readily to escape, for security reasons you may want to secure, and we have discussions to decide how that might be resolved.

Mr McHugh: We are an England and Wales regulatory agency. HSE covers GB. We have a Scottish counterpart for environmental regulation.

Q309 Chairman: It is certainly helpful for Mr Weir to know that. I am sure he already did. Could you explain what your contribution has been to the Energy Review process so far of your two bodies?

Mr Philpott: We have not produced anything yet. We have a request from Malcolm Wicks in a letter to our Chief Executive dated 10 January to provide an expert report covering a number of matters on safety issues, and I will just go through them for you. We are to provide an expert report on our approach to ensure that risks arising from a number of health and safety issues are sensibly managed by industry, including in the areas of an increasing need for gas storage in the UK, new demonstration projects for carbon capture and storage and its potential use in the UK, an increasing penetration of renewables and the whole issue of new nuclear build. What we have done so far is produce our thinking. We have a draft report that we have discussed with some of our stakeholders and we are on target to deliver our expert report to the Energy Minister by 30 June.

Q310 Chairman: So they have had two or three weeks to look at it before they reach their conclusions. Those are quite tight timescales. Mr Bates?

Mr Bates: We have participated in a joint activity where we have assisted the Health and Safety Executive in drawing our side of the regulatory and pre-licensing issues into their work, but we have also produced a publicly available submission to the Energy Review dealing with many of the issues you were discussing in the last session and that is in our role as environmental adviser to the Government.

Q311 Mr Bone: If I were to build myself a nuclear power station, in France I would have approval before the end of this year. In this country it might be 2013 before I got approval. Why?

Dr Weightman: I do not think it would be necessarily 2013. The French, in relation to the EPR design, have been working on that for some years. That has evolved over time and their regulator has been involved in that period. At the moment they are very much at the last stage of their approach to regulating any new build in France, and they have been involved in looking at the design for some years. I would not think that it would take us until 2013 to look at a new design and, if it is adequate, to license it for the UK.

Q312 Mr Bone: We have heard differing reports on whether you should take the design of the reactor and the site as two different entities, so you almost get the design approved or you are only looking at the site. Do you think that is a feasible way of going ahead?

Dr Weightman: I think it is going along the lines of the way we have been thinking. We are engaged with a whole variety of different types of stakeholders trying to look at the modern arrangements and the way in which society has changed over the years. When we come to license a reactor to go on to the site and grant a site licence there are three things we look at: one of which is the design, to see that that is adequate; one of which is the siting; and thirdly is the organisation of the licensee to see that they are fit to hold a nuclear site licence. In essence we can look at the design before we look at the other two and if we did that we could look at it on a generic basis if the applicant put forward, say, a generic site envelope that covered all the likely sites in the UK. Then we could look at the design and their safety case, see how it compared with our safety assessment principles against the background of the generic site envelope that covered all the likely sites in the UK. Once you had completed that stage you could then go into a specific site and a specific licensee and look at those issues separately. That is completely feasible in our mind.

Q313 Mr Bone: One of the problems that might come up with that, given the number of companies interested in it, is that you might get a whole lot of requests for pre-licensing. How would you prioritise that?

Dr Weightman: In essence it would be for others to prioritise it. We are there to safeguard nuclear safety on behalf of the public and we will address what is put before us in that sense.

13 June 2006 Environment Agency and Health and Safety Executive

Q314 Mr Bone: If we are going to go down the route of pre-licensing, how is that going to be funded? Who is going to pay for it?

Dr Weightman: The present arrangements are that nearly all of our costs are borne by the industry, by those who are controlling the hazards. Those monies go to the Treasury and come back down to DWP through HSE routes to fund our activities. Clearly we would want funding for any activities in relation to pre-licensing and it could possibly be the applicant who would fund those activities.

Q315 Mr Bone: Could you in your answer give me an idea of what the level of those costs might be, Mr McHugh?

Mr McHugh: We would need to provide you with a written note on that. The situation is slightly different in the Environment Agency because under the Environment Act we can recover our regulatory costs and we would seek to make an agreement with either the developer or the vendor or the utility which is making the pre-licensing submission. There are some legal powers that we can use to recover our costs. It would not follow the Treasury route. We would directly recover our costs.

Q316 Mr Bone: In conclusion, to speed things up, if we were going to a new nuclear build you would have designs A, B and C, say, which you would approve, and then the decision would be, "Can you put that in the middle of Wellingborough?", which would be the significant period of determination?

Dr Weightman: The first period of examination would be the most significant timing for us. Clearly, the question about whether it could be in the middle of Wellingborough is not for me to decide; it is somebody else's decision. The longer part of time would be around the pre-licensing and then we could look at the site specific issues on a shorter period of time, making sure that the organisation that was going to run the facilities and be in charge of construction was a suitable organisation to hold a nuclear site licence. We can possibly also overlap some of those activities and that depends on resourcing.

Q317 Mr Wright: On the question of design and planning, to try to speed the process up in terms of reactor design, if there is a design that has been licensed by another country, say, France or the United States, for instance, would that be good enough for the UK regulators without you having to approve the whole process again, do you think?

Dr Weightman: My simple answer would be no. I have a duty to the UK public to secure nuclear safety on their behalf. My focus is not on speeding things up, but clearly I will do things as efficiently and effectively as I can. That does not mean to say we would not take account of what has happened in other countries. If I take a very simple example, we would not just tick a box for a Russian reactor design. We would look very intently at how they regulated that design and what the basis of that regulation was and how we would take that into account. It depends on the confidence we have in

that other regulator and the way in which they approach things, and the design itself, how much we say, "Right, okay, we can look at that". We can take on board the fact that they have looked at the detail, the technical code, and perhaps not go down that route ourselves, making best use of our resources to address our issues. We would back this up because we have good bilateral relationships with a whole variety of other national regulators.

Q318 Mr Wright: In France, obviously, with the number of reactors that are going forward it would be even more so. Would you say that your relationship with them is better than with most places and would you have confidence in their designs, for instance, and in their regulators to bring that forward here?

Dr Weightman: We would look at each individual case to make sure it was compliant with UK approaches to nuclear safety, which includes the use of 'as low as reasonably practicable' to secure the most optimum design we can. That does not always apply in other countries but yes, we have very good relationships with the French, we have very good relationships with the Americans, the Canadians and others, and so we can make use of those relationships in getting access to their cases, their regulatory opinions on things, their files and perhaps indeed some of their resources as well.

Q319 Mr Wright: So, in a word, the general public in the UK can take comfort from the fact that you are not just going to take the blueprint from another country; you are going to have a look at it from scratch?

Dr Weightman: I would not be fulfilling my duty if I did not act on behalf of the UK public and the workers on the sites to ensure that it is adequate for the UK situation.

Mr Bates: The Environment Agency is exactly the same. We cannot and do not want to outsource our regulatory responsibilities to any other country's regulators. There is not a single European licensing regime for these plant.

Dr Weightman: Clearly there is a question about international nuclear safety standards. I do not know how much the Committee is aware of the work that is done under the International Atomic Energy Agency which is based in Vienna and which promotes international nuclear safety standards as a way of trying to capture good practice and in some cases best practice across the world. Over the last two years we have reviewed our standards and principles in the UK against the IAEA standards as a means of saying are we up there with the best we can get to for the UK public.

Q320 Mrs Curtis-Thomas: Before I ask the question I was intending to ask, I just want you to re-assert that what you would be doing is not necessarily starting from scratch but looking at standards, comparing and contrasting standards and being satisfied that the standards that are being offered are

commensurate with our own understanding and our own requirements. That is not quite starting from scratch, is it?

Dr Weightman: No, but we would hope that the applicant in their safety case to us would reflect international nuclear safety standards, the IAEA safety standards, because that then gives us a firm starting point.

Q321 Mrs Curtis-Thomas: But would you also say that the authorities that are currently in a position to proffer a design are competent authorities and you can take some reassurance from that fact when you consider those proposals?

Dr Weightman: Clearly we take account of the competences of those who are putting forward designs when we look at them because we do not look at each and every aspect of a design. We have to take a sampling approach across some of it, we have to take account of what we term suitably qualified and experienced people who have developed that design. We look not only at the outcome of their design process but also at how it has come forward and clearly, when it has been subjected to some independent peer review by another regulator, we can take greater comfort from that.

Q322 Chairman: We are not talking huge numbers of competing designs and practice. There are quite limited numbers of designs, are there not?

Dr Weightman: That is right.

Q323 Chairman: And they are coming from quite reputable sources.

Dr Weightman: Yes.

Q324 Chairman: So you will not go back and reinvent the whole wheel when those very well established and known companies produce their designs for licensing?

Dr Weightman: No. It is not intended that we start from scratch but we have to do our duty on behalf of the UK public and I am going to make sure that we do if we are asked to do it.

Q325 Chairman: The question of prioritising pre-licensing requests is not that serious an issue for you because there are unlikely to be many pre-licensing requests before you?

Dr Weightman: We perhaps look to others to decide which, if any, new designs this country is going to look at.

Q326 Chairman: Could you run two or three at the same time, I mean, literally two or three?

Dr Weightman: It is a question of resources.

Q327 Mrs Curtis-Thomas: Could you clarify "look to others"? Who are the others you are going to look to?

Dr Weightman: It might be Government or it might be the market itself that decides whether they can run with all the possible designs that are coming

forward. If you look internationally there is not a large number of designs which are at that stage of readiness at this point in time.

Q328 Chairman: You said that when dealing with two simultaneous applications it would be a question of resources.

Dr Weightman: That is right.

Q329 Chairman: That is obviously financial but also it is the skills base.

Dr Weightman: Yes.

Q330 Mrs Curtis-Thomas: With regard to the skills base, you have been quoted in the press as saying that you are finding it difficult to recruit. How much would you need to increase your resources and staff to meet the workload presented by new nuclear build?

Dr Weightman: It is true we are finding it difficult to recruit. Perhaps I can explain some of the background. HSE had a pay dispute running for a few years. That was resolved in January, but as part of that there was an agreement to look at a pay and rewards package for nuclear inspectors and that is what is happening now. Our previous contributor to your Committee would have said that the market plays a hand in some of this and we have to make sure we are up there and get the right people because our regime is based on having highly competent and experienced people to address the issues that are in front of us.

Q331 Mrs Curtis-Thomas: Do you employ contractors?

Dr Weightman: Yes, we do.

Q332 Mrs Curtis-Thomas: So you do not necessarily have to have it on board; you can just buy it in when you need it?

Dr Weightman: We make sure that we take the regulatory decisions.

Q333 Mrs Curtis-Thomas: But you can still buy in technical advice?

Dr Weightman: We have contractors where we need to support our resources but internally we also have highly technically qualified resources.

Q334 Mrs Curtis-Thomas: Is there a lack of capacity in the market irrespective of whether you employ directly? Can you get what you need indirectly?

Dr Weightman: I do not believe there is a lack of capacity in the market. The numbers we would need are pretty low compared to what is still out there in the market. We have to recognise that it is an international market now as well.

Mr McHugh: Can I come in on this? We would need a fraction of what HSE requires but we are recruiting from the same pool. Having said that, people like to come to work for the Environment Agency. We have recently had some success in recruiting particular types of skills in the Agency but there are still some needs we have and we are trying to develop those skills through, for example, foundation degrees that

13 June 2006 Environment Agency and Health and Safety Executive

we are sponsoring. In general, however, we are recruiting from the same nuclear specialists pool as HSE.

Q335 Mrs Curtis-Thomas: Are you happy with the HE provision then with regard to the nuclear industry?

Mr McHugh: The higher education provision?

Q336 Mrs Curtis-Thomas: Yes.

Mr McHugh: There are very few undergraduate courses in nuclear engineering. There are some postgraduate courses which are up and running and the NDA has a big role in developing nuclear skills through universities and there are some initiatives to develop the nuclear skills base for decommissioning. I do not think it has recently been addressed in relation to new build skills.

Dr Weightman: The simple answer is no, I am not happy with the skills base and the higher education base to support the nuclear industry in the future. That is something the Government is starting to address that and we would encourage them to address it with more vigour.

Q337 Mrs Curtis-Thomas: Nevertheless, you did say that there is not a shortage of capacity in the marketplace and you could go internationally to get it if you wanted it.

Dr Weightman: For our needs.

Q338 Mrs Curtis-Thomas: For your needs?

Dr Weightman: Yes.

Q339 Judy Mallaber: Does the division of nuclear regulation across different bodies slow down the regulatory process after this split into different functions?

Dr Weightman: Not if we talk to each other properly and act in partnership, which we endeavour to do.

Q340 Judy Mallaber: You “endeavour to” does not mean you achieve it.

Dr Weightman: I think it is for others to judge but I believe we do. We have worked on it over the years and it is a lot better than it was in the past.

Mr McHugh: I agree with that. It is not unique. In other high hazard industries the HSE and the Environment Agency share responsibilities for the COMAH regime covering major accident hazards.

Q341 Chairman: I am sorry; I did not hear that.

Mr McHugh: The HSE and the Environment Agency collaborate and work closely together as joint competent authorities for regulating other high hazard industries under what is called COMAH, the Control of Major Accident Hazards. As Mike has indicated, the key to it is working together closely and we have been working very hard on that in recent years. We are publishing joint guidance, for example, for the industry, doing team inspections, working as closely together as possible, sharing business plans, et cetera.

Q342 Judy Mallaber: Would it be better to have one regulator, a super-regulator, rather than split those responsibilities?

Dr Weightman: There are pros and cons, I think. As a nuclear regulator we gain something by being part of HSE. There would be opportunities gained from being part of another body as well but it is a balance.

Mr McHugh: The standards we apply to the nuclear industry for environmental performance are no different from those which would apply to other industries in terms of the environment. We report, for example, on other industries’ environmental performance. If you have put it into a nuclear specific regulator you would lose some of that.

Mr Philpott: I was just going to make a slightly wider point to say that we are cooperating with each other in investigating the Buncefield incident where HSE and the Environment Agency are joint investigators. We have produced together three reports now which set out some issues around what caused the incident and that is a demonstration of how we can cooperate together effectively.

Q343 Judy Mallaber: Is there any danger that things can slip between you in an area like this which is so important we get right? Are there potential dangers about having that split?

Mr McHugh: My experience is that the industry complains the other way round, of us duplicating rather than something falling between the cracks, and we do our best to make sure that there is no duplication but that nothing is overlooked.

Dr Weightman: I would say yes, the complaint really is about overlapping rather than things getting through the cracks but we are not complacent about it. That is why we have very close liaison between our people, not only at policy level, at senior level, but also at site level, so there are very close connections there. They will talk to each other about aspects relating to the site to cover the point you are making.

Q344 Judy Mallaber: Do people in the industry argue that you should come together rather than be separate bodies or is it not something that comes up?

Mr McHugh: It was an issue several years ago and, as part of one of the Environment Agency’s reviews by our sponsoring Department, Defra, it looked at that issue, whether there should be a single nuclear regulator, and came down with the decision that there should not be but that HSE and the Environment Agency should be working closely together, which is what we have been doing over the past few years.

Q345 Judy Mallaber: What are the weaknesses in doing that? When does it not work? You said you endeavour to do that. Do you fail to do it sometimes and, if so, in what kinds of circumstances?

Dr Weightman: At a local level there might be one or two issues that come to light with not quite understanding what the other’s position is, but we have mechanisms through what is called a memorandum of understanding by which those can be escalated up through the line management chain

to resolve the issue. I must admit that over the last few years I cannot recall any that escalated up that chain.

Mr McHugh: Nor can I.

Q346 Mr Bone: Would you know whether France has one regulator or a series of regulators?

Dr Weightman: It is just changing its regulatory system at the moment to put it on a more formal legal basis with a separate nuclear regulator. Their security regulator is separate and they do not have as close a liaison with the nuclear safety regulator as we do in the UK.

Mr McHugh: It is slightly more complicated on the environment side. I understand there is a different regulator for radioactive protection generally in France.

Dr Weightman: That radioactive protection has just been brought together with the nuclear regulator but in our case it is already there because it is part and parcel of our regulation sites anyway.

Q347 Roger Berry: If I may turn to the issue of the availability of sites for nuclear new build, to what extent will the ability to use existing nuclear sites speed up the regulatory process?

Dr Weightman: Clearly we understand the sites and the aspects of the sites more than any new site; therefore we would have a better start than if we had to start with a different site. It would be easier for us with an existing site.

Mr McHugh: I agree with that point, that existing sites are well characterised in terms of geography, demographics, situation, et cetera. We would not seek to be any less rigorous if there were an existing site compared to a new site. We would apply the same standards.

Q348 Roger Berry: To what extent is the timetable for decommissioning of existing power stations critical in terms of the site periods for any possible new build, or can you as of today identify sites that would be available very quickly?

Dr Weightman: I think you could identify sites that would be available fairly quickly because some of the land owned by the licensees is fairly extensive around the footprint of the existing facilities on that site.

Q349 Roger Berry: The Sustainable Development Commission, the independent advisory body to the Government on environment issues, cast doubts when they gave evidence on the availability of existing sites because of issues like coastal erosion and rising water levels. Have you made any assessment of the availability of existing sites as yet or are you waiting for the private sector to decide whether or not to build?

Dr Weightman: The simple answer is no, we have not made any assessment of existing sites yet because we have not been asked by Government or anybody to look at a specific site for a specific new reactor. It would be part of their case that we would require them to present to us to demonstrate that, given all those factors and taking them into account, that site

was suitable for that particular facility with the particular defence arrangements in place against that external hazard.

Q350 Roger Berry: Mr Philpott earlier referred to a request from the Minister, Malcolm Wicks, for information by 30 June, I think it was. Did that include any requests about an assessment of the availability of existing sites?

Mr Philpott: No, it did not, specifically.

Mr McHugh: There will be environmental issues at some of those sites, for example, as you mentioned, coastal erosion, flood risks and even water abstraction in relation to existing nuclear sites being in relatively shallow areas, and one thinks about Morecambe Bay, for example. There will be a wide range of issues which are relevant to where any nuclear power stations are sited.

Q351 Roger Berry: Can I come back to Mr Philpott's answer? I am reluctant, obviously, to ask you to comment on the wisdom of the Minister excluding that question from what appears to be quite a long list of questions about the nuclear sector, but can you give us some indication of the range of questions you are being asked to provide answers to by the end of the month?

Mr Philpott: I read them out previously.

Q352 Roger Berry: Could you remind me how extensive the list was?

Dr Weightman: Would it help if we passed a copy of the letter to the Clerk?

Roger Berry: It would; that is the most efficient way. Chairman, I would be happy with that.

Q353 Chairman: Can I just question the Environment Agency a bit more on this because the flood risk and coastal erosion issues are very much mainstream Environment Agency issues? Will there be existing sites that can be used, in your judgment?

Mr McHugh: If I can approach it in a different way, for flood risk and flood defences at nuclear sites the responsibility is with the operator as a condition of the HSE licence to maintain those defences to a high standard. If there were to be new build on those existing sites it would be for the operator to defend those sites to the appropriate standards and to bear those costs. It is a matter not of saying, "You cannot use these sites", but rather, "If you choose this site you will need to defend the site to this standard and bear the costs". The HSE reviews the safety of nuclear sites every 10 years and that includes the flood risks, so over the period that we are talking about for the changes in coastal erosion there will be periodic reviews of the risks and whether defences need to be maintained and strengthened.

Q354 Chairman: But there is no insuperable obstacle that you are aware of? There may be some commercial issues for the company but there are no regulatory obstacles?

13 June 2006 Environment Agency and Health and Safety Executive

Mr Bates: Many of the sites have to be defended during the decommissioning process of the existing stock of reactors anyway, so there is already a flood risk/coastal inundation challenge to be faced there.

Q355 Mr Weir: I am interested in the issue of waste management and I appreciate you are England and Wales only, but there are similar problems on both sides of the border regarding waste management, and on many of the existing stations which might be places where new stations might be built there is already waste storage. Some of these sites have had problems with that waste storage and seepage into the surrounding seas, for example. What would you be looking for by way of environmental considerations for such sites dealing with existing waste before allowing any new build on such sites? Would they have to be cleared of existing waste, for example?

Mr McHugh: I think we were talking in the discussion we had earlier about building on land which was relatively uncontaminated which was owned by British Energy. In terms of developing existing sites where there is existing contamination, there would need to be a risk assessment of the long term health, safety and environmental risks of building on those sites. The Government generally is encouraging build on brownfield sites rather than greenfield sites.

Q356 Mr Weir: But, given that some of these sites already have problems with waste storage and presuming any new reactor is going to create more waste, and there may be arguments there about how much they will create, what sort of weight would you give to the safety record of seepage from existing sites in considering new build adjacent to those sites, if you like?

Mr McHugh: We are probably talking about different types of operators that would be running a new site compared to an existing site. The existing sites, certainly civil nuclear sites, are under the control of the Nuclear Decommissioning Authority and their contractors and they are not involved in new build.

Q357 Mr Weir: But presumably if they control the sites they are going to have to come to some sort of deal, if you like, with the new generator to allow building on that site?

Dr Weightman: Can I assist the Committee there? NDA own sites as well. There are some operating reactors on the sites they own, Magnox reactors, and on some of these sites they do have waste stores. I think the site you may possibly be thinking about is Dounreay, with the problems with the shaft and particles on the beach there—

Q358 Mr Weir: It is not the only one.

Dr Weightman:—and I think that is a specific issue there concerned with past practices. In terms of wastes on existing sites we have been pushing hard for some years now to make sure it is pacified and put into modern standard stores and that is an ongoing process where the Nuclear

Decommissioning Authority is assisting to encourage some of that. Any new waste arising would have to be in stores to modern standards which have a very high degree of containment standards around them.

Q359 Mr Weir: The Government has set up CoRWM to look at long term disposal of waste and the interim report suggests deep burial as the way forward and presumably that would mean removing the waste from the existing sites to a deep burial storage site, wherever that may be. How much progress do you think the Government needs to make on identifying a site for disposal of that waste before proceeding with new build, given it is going to create new waste once new generators are up and running?

Dr Weightman: I think that is more of a policy decision rather than for me as a simple engineer to answer. I would tend to make sure that any waste generated was safely stored for the foreseeable future until such a long term waste disposal management facility was in place. We already are pushing to have waste stores and we need to make sure that they are adequately safe for decades to come because we have not got sites yet for the out-turn of the CoRWM work. That is a continuing process and something that we would adhere to in any generation of new waste.

Q360 Mr Weir: But equally, when we had the Nuclear Decommissioning Agency here, it seemed clear to me that no-one was exactly certain what waste there was on some of the existing sites and I am concerned that there is a potential problem with these sites. There is no deep storage site that has yet been identified. Is it not the case that that needs to be done before we create more waste?

Dr Weightman: As I say, I think that is outside my area of competence. My role is to ensure that waste is stored safely.

Mr McHugh: I think this probably is one of the key issues for the question of justification for nuclear reactors, what would happen to the spent fuel and the radioactive waste which would be created. We have not talked about the justification yet, but that would be a decision for the Secretary of State for Trade and Industry to take. That is a very important question which needs to be addressed as part of the justification, what will happen to the spent fuel.

Q361 Mr Weir: Do you think fuel reprocessing should play any part in the future nuclear programme?

Dr Weightman: Again, that is a policy decision. What I am about is making sure we secure safety on behalf of the public.

Q362 Mr Weir: It is not entirely a policy decision. One of the types of reactors that has been mentioned, especially in the area of pre-licensing reactors, is the fast breeder reactor that destroys much of the fuel as it goes through. If we are creating nuclear waste, is something like a fast breeder

reactor a runner, if you like, for a new nuclear programme to ensure there is less waste produced in the future?

Dr Weightman: Not in the foreseeable future. There are two aspects to the fast breeder reactor. It can generate new fuel; that is the breeding bit, but also you can use some of the neutrons to transmute some of the nuclides around that, but that technology will not be anywhere near developed in the foreseeable future.

Mr Bates: It is worth saying as well that the generators appear to be moving away from wanting reprocessing, perhaps because of its costs and the question of value of the output of reprocessing. It is not like there is a big market demand and they are having to assess, looking forward, that is, to new nuclear, whether there will be a big reprocessing component to that. It does not appear to be that that is the way they want to go.

Q363 Mr Weir: Given that reprocessing could mean, as I understand it, less waste, does the Environment Agency not have any view on whether that is preferable to creating more waste?

Mr McHugh: In terms of volume it creates more waste; low level waste and intermediate level waste from the spent fuel.

Q364 Mr Weir: Is it less radioactive than the waste that would be created by the other reactors?

Mr McHugh: You create different types of high level waste. You create high level waste in the form of what are called fission products and you separate out the plutonium created in the reactor and the uranium and plutonium that you may or may not be able to recycle in fast breeder reactors.

Mr Bates: Reprocessing stands or falls on whether the value of the recovered products, the recovered uranium and plutonium, outweigh, both environmentally and economically, the costs of the process which involves an expansion of the volume of waste—more discharges, more complexity, more risk.

Q365 Judy Mallaber: Can we move on to the question of public confidence? I am very conscious of this because we had a very difficult couple of years in my constituency, about which you will know, regarding the disposal of low level nuclear waste arising from a Rolls-Royce marine operation in Derby. At one point myself and my then MEP, Philip Whitehead, were mediating between the Environment Agency, who were actually the good guys, and the local campaign groups to get people in the same room, the level of tension over even an issue like that was that high. I am interested in how you see your roles evolving in ensuring public confidence if there is a decision to go ahead with new nuclear build and public confidence in the regulatory process. Maybe you could speak on that as I know you have considerable experience in dealing with problems at a local level.

Mr McHugh: The subject we are debating is highly controversial and highly contentious, as you found in your constituency. We publish a lot of

information for members of the public when we are going through changes in our regulatory permits, in our authorisations, and we are just doing that with some of the British Energy sites. We try a range of different methods to engage with people at the local level particularly through, for example, drop-in sessions, surgeries, as well as consultations and traditional means such as paper and things going out on the website. We find generally that we are regarded as being a firm but fair regulator in sessions that are open to free discussion. A lot of people do not know a lot about the subject and a lot of our job is trying to communicate the risks of the radioactive waste disposals which would arise. I am sure that is the case for HSE as well in relation to nuclear safety risks. It is a very technical subject to get the message across in a simple form. We try lots of different methods to communicate and to engage with people to ensure that they have a better understanding of the way in which we regulate and which risks are controlled. Is that what you were trying to get to?

Q366 Judy Mallaber: I just wondered if you had any plans in place now, given how difficult it has been even in what should have been an easy situation in my constituency.

Dr Weightman: Perhaps I can add something there. It is a very complex question and for me it is clear that I have the responsibility to ensure that the public trust the nuclear regulatory system. That is not the same as saying that I have not got a role to promote nuclear energy or the use of nuclear energy. It is for me to focus on the nuclear regulatory system. For me it is not something that is a given because I am a technical expert (if I was) or our body is a technical expert. We have to earn that trust and I think society has changed and you can see this right through society, the way in which experts are viewed in court cases and elsewhere. You very much have to earn that trust, and with that trust comes confidence. For me it is about being open, it is about being transparent in what we are doing and listening to people, what their fears are, and trying to explain what we are doing in relation to securing high levels of nuclear safety on nuclear-licensed sites. For me it is not something where I can say, "I am an expert; therefore trust me". I have to earn that trust. We have to earn that trust as a body and we do that by being open and transparent about how we go about our business. For example, for many years we have supported local liaison committees around nuclear licensed sites with our local site inspector who looks after the site (but who is not locally based). He will put forward a report and be there to answer questions for anybody who wants to ask questions around that. Similarly, when we go onto sites we talk to workers and workers' representatives to make sure we understand and listen to what their fears and concerns are on the sites.

Mr McHugh: Can I come back about the process that we might follow in relation to pre-licensing? One process which might be appropriate would be for the applicant in effect to place as much information as possible in the public domain and seek comments on it which would be fed back to the

13 June 2006 Environment Agency and Health and Safety Executive

regulatory bodies so that there could be as much transparency about the process as possible in relation to the pre-licensing decisions that we would be making. We want it to be as open and transparent as possible in the pre-licensing process. It would not be something we would do in private. We want to engage with people as much as possible about what is planned for pre-licensing arrangements.

Q367 Chairman: The border has featured briefly in our discussions. Obviously, waste management is a devolved matter. Are there any problems or issues that we should be aware of about the implications of the regulatory process because of the devolved nature of some of the issues, or is it in practice not an issue?

Mr McHugh: Again, we work closely with our counterparts in Scotland, with SEPA. The Scottish Executive have fully devolved powers in this area in terms of environment. They have intervened in relation to a low level waste decision in relation to Dounreay, for example, so the Scottish Executive can make decisions. I do not get the impression that it is not coordinated but the devolved administrations have separate powers and can choose to find solutions which are right for Scotland.

Dr Weightman: For ourselves health and safety is not a delegated power and we have close liaisons with SEPA, the Scottish Environment Protection Agency.

Q368 Chairman: So there are similar arrangements?

Dr Weightman: Yes.

Q369 Chairman: The pre-licensing process—you have got the powers necessary to do that. You do not need new legislative powers to do that?

Dr Weightman: That is right.

Q370 Chairman: There is no change there. So when you produce your conclusions for your consultation you can go ahead and do whatever you need to do if the Government tells you to do it?

Dr Weightman: Yes, if we get requested to do it, and the vendors or whoever comes forward with a safety case to assess.

Q371 Chairman: Let me end by asking you an overall question about your approach to this review. We are told that this is fundamentally a nuclear review; that is what somebody has said anyhow. I presume that pleases you in the Nuclear Inspectorate because you are going to have a lot more shiny new reactors to inspect, are you not?

Dr Weightman: Both professionally and personally I am neutral on it. It does not matter to me. I have enough business in front of me with the acceleration of decommissioning to address. There is increased activity at the Atomic Weapons Establishment with the £1.05 billion investment over the next three years which we also regulate. There is a lot happening out there. Whether there is a shiny new reactor or not I am completely neutral about.

Q372 Chairman: But with regard to these four issues the Government is asking you to respond to them on—gas storage; demonstration of carbon capture and storage; renewable issues; and nuclear—is there not a relative workload waiting in those? Are any of them going to be more important and is there more pressure from the Government on some of them? Are some of them taking more of your time to deliver answers to because they are more complex? I imagine the nuclear one is a very complex one to answer.

Dr Weightman: The simple answer is yes, it obviously has taken more time because they have also asked questions around pre-licensing and we have looked at what the issues might be around that, and we have engaged with stakeholders to get their views as well, and that obviously takes time and resources to do.

Mr Philpott: On the other issues, we have done a similar exercise and we have looked at the health and safety implications of greater use of gas storage and so on, but it is not for us to decide whether there is greater reliance on that or not. We have identified what the issues are and we will report to Government by 30 June.

Q373 Chairman: But the Environment Agency is not quite so neutral because, as I read your evidence to this Committee, and we are talking about looking at three issues, saying, you are pretty dubious about nuclear, you will reluctantly accept gas and get really excited about microgeneration, so presumably you will be pretty upset if there is nuclear new build.

Mr Bates: That is not the intention. Right at the very beginning of that document the words “technology neutral” should jump out. We favour many of the mechanisms and ideas that were put to you by Dieter Helm in the last session, or at least the principle by which he is working, which is that Government should establish an objective and then set up a market that rewards or penalises and then brings forward according to how good particular technologies are at achieving those objectives, so some kind of long term value placed on carbon, something that reflects energy security objectives along the lines of his capacity market or something similar. That is the way we think it should go. In the case of renewables there is perhaps additional justification for some of the technologies associated with innovation policy in which we are dealing with technologies that are not yet mature. In that case you need something quite technology specific to drag them towards market but I think you will see in our work some scepticism about whether that justification has been overplayed in the case of some renewables that are in effect mature technologies and are over-rewarded in the current Renewables Obligation. On energy efficiency, we would like to see it played on a level playing field with supply side measures because it is fantastically cost effective but there are all kinds of quite specific barriers in the way of that happening and therefore we need quite a specific approach to removing those barriers so that we have a proper level playing field that can expose the true economics of demand side measures.

13 June 2006 Environment Agency and Health and Safety Executive

Q374 Chairman: The specific concern about nuclear was that if the Government subs nuclear it could in effect crowd out the other low carbon technologies. We have heard from the industry that they do not want subsidies; they prefer solutions such as Dieter Helms'. There do not need to be subsidies. Do you think there will not be?

Mr Bates: That is not for us to say. We have put forward our advice. We are supposed to give advice to the Government. Our advice is to set the objectives and reward the technologies that help to meet those objectives without being specific about what the technologies are. If they do that and it all works well then the right technologies will be those that come forward to meet the objectives that we have.

Q375 Chairman: Do you feel the Energy Review has been conducted in a neutral way and you are happy about the way in which your evidence has been listened to by Government?

Mr Bates: The advice that we put forward is very much aimed at creating a technology-neutral framework for energy policy. There is a lot of agreement around that. I know Ofgem, the regulator, put forward similar views. Quite how the Energy Review team itself is working through the practicalities of dealing with that and delivering to what is a very aggressive timetable by anybody's judgment is another matter, but what we are hoping is that they will use fairly sound environmentally economic practices when they shape the market that will deliver on these very important objectives.

Q376 Chairman: And was the Prime Minister technology neutral at the CBI dinner?

Mr Bates: No. He was not technology neutral and he may not be listening to our advice.

Chairman: On that note, unless my colleagues have anything else to ask you we will declare the session closed and express our gratitude to you for your time and trouble. Thank you very much.

Monday 19 June 2006

Members present:

Peter Luff, in the Chair

Roger Berry
Mr Michael Clapham
Mr Lindsay Hoyle

Mr Mike Weir
Mr Anthony Wright

Witnesses: **Mr Roger Brunt**, Director of Civil Nuclear Security and **Mr Bryan Reeves**, Principal Inspector, Transport, Office for Civil Nuclear Security, gave evidence.

Q377 Chairman: Gentlemen, welcome to this session of our inquiry into issues around nuclear new build. It may be almost the final one but I think it is the first time the Office for Civil Nuclear Security has given evidence in front of a Select Committee, so we are very grateful for that. We do understand that there may be issues you would not want explored in too much detail in public, but we hope the issues of principle will not pose any problems for you. Can I begin by asking you to introduce yourselves?

Mr Brunt: Thank you, Chairman, it is a great privilege to be here. My name is Roger Brunt, I am the Director of the Office for Civil Nuclear Security, I took up the post some two years ago in September 2004 after a career in the Army. That is my background. My colleague is Mr Bryan Reeves.

Mr Reeves: Chairman, my name is Bryan Reeves, I am the principal inspector for Transport Security at the Office for Civil Nuclear Security and I have been with the organisation now for 10 years.

Q378 Chairman: Thank you very much. As this is the first time your organisation has given evidence, can I begin with the slowest imaginable ball and ask you to begin by outlining the areas of responsibility of your Office?

Mr Brunt: We are the Government's security regulator for the civil nuclear industry and as such we are responsible for ensuring the standards which have been laid down in a very recent piece of regulatory code, the Nuclear Industry Security Regulations 2003, are complied with across the 47 nuclear sites in this country. Without being too hyperbolic, it is going from Dounreay to Dungeness, from Sellafield to Sizewell. Our activities embrace four main areas: the actual physical security of the sites themselves; information security, so if you are keeping information with sensitive nuclear matters on it you need to make sure that information in whatever media is kept secure; there is then transport security, which makes sure as nuclear material moves between sites it is looked after adequately; and finally personnel security, that everybody who works in the industry, whether as permanent employees or as contractors to the industry, needs to be security-cleared, vetted to a level appropriate to their access to nuclear material. We have some 42 members of staff committed to those activities, the majority are based at our main offices at Harwell near Oxford, on the current United Kingdom Atomic Energy Authority site, and

clearly with the geographical responsibilities I alluded to earlier we travel the country and are constantly on the road.

Q379 Chairman: That leads me on to my next, slightly less slow, ball: 42 staff I think you said.

Mr Brunt: Correct.

Q380 Chairman: It does not sound an enormous amount given an issue of this sensitivity and that range of sites.

Mr Brunt: I think, Chairman, we could always ask for more, but the way we currently organise our business I am satisfied at the moment we are currently well organised to do what we are required to do. If I may, I will just go slightly into the regulatory background because I think it will help you understand where we are coming from. Since 2001, with the Anti-Terrorism, Crime and Security Act, which gave rise to the Nuclear Industry Security Regulations 2003, we have really been able to change the way we do business. Prior to that there was always an element of OCNS inspectors turning up at a site with a clipboard and then making outrageous demands on the site owners in order to make sure security standards were complied with, but with the new regulation which came in, it gave us an opportunity to re-calibrate all that we did. So with effect from December 2004 every single site, all those 47 sites, had a new site security plan adopted where we knew exactly where we were and what needed to be done to keep things at the level where they were at, and each one had a schedule of improvements attached to it. So we were able to start from a business where we had great confidence in the structures which were in place, we knew what was required to keep them up to the standard we wished, and very importantly we were dealing with a compliant industry. There is a sense of corporate responsibility, not just at board level but right down to workers at the coal face—if that is not mixing my metaphors—and they have a very strong commitment to security. I know that from my visits to sites and from the times I have addressed trade union meetings, everybody shares that, so it is not as though we are trying to impose something which they are rejecting. So, yes, the numbers are tight, we could always do with more, I would be like a boy in a sweetshop if I did not say that, but I feel given the current state of the industry and the commitments we have I am satisfied we can deliver the job as it should be done.

Q381 Chairman: Thank you, that is helpful. Reading your memorandum I did not quite understand your relationship with the Civil Nuclear Constabulary. Perhaps you could explain that and perhaps give us an indication of the size of the Civil Nuclear Constabulary as well.

Mr Brunt: The Civil Nuclear Constabulary is about 700 strong all up. They provide an armed guarding service on those sites where we need to have an armed guard on the category of nuclear material at those sites. Again if I may can I delve slightly into the past so you understand the background to it: prior to October 2000 when OCNS was formally established and became part of the DTI as an independent regulator, there was really no mechanism whereby sites and the chief constable of the United Kingdom Atomic Energy Authority Constabulary, as the CNC was at the time, could arbitrate between the levels that a company was prepared to pay and what the chief constable was saying was necessary from an operational point of view. So as the OCNS was formed one of its most important jobs—and I believe my predecessor set this up—was to establish something called the Standing Committee on Police Establishments, or SCOPE, where as the chairman I have the ability to arbitrate between what is necessary on the ground from the chief constable's point of view and what I believe is necessary, and also to make sure that the companies are prepared to pay for the posts which are in place. That is one very important part of the mechanism, it is making sure that we have an arbitration service so we can put in place what is needed to secure this nuclear material. The other side of it is that I, as the regulator, can lay down the standards which I expect the chief constable's officers to achieve. I do not have the presumption to tell him how to achieve it but I tell him what I want to have in place and I think that gives a very useful yardstick for us all to work against. As an observer on the Civil Nuclear Police Authority I am able to ensure my views are heard at the authority. I agree it is a very strange relationship, particularly with people who have been used to Home Office forces with just a police authority and the chief constable, and this third area really just reflects the fact that this nuclear material is of such potential significance that we need to make sure no risks are taken with regard to looking after it.

Q382 Chairman: Is the constabulary effectively always paid for by the industry?

Mr Brunt: That is absolutely correct, yes.

Q383 Chairman: So it is rather like the arrangement between a football club and a chief constable who will arbitrate and say, "You need this many police to deal with any situation"?

Mr Brunt: You are right, Chairman, and you are right too that the entire police force is funded by the industry, so if you have a policeman on site then you will pay for him. I believe in Canada there has been an arrangement whereby a local force has been contracted to provide an armed guarding service at comparable nuclear sites in that area and I think

when that started they had an arrangement which ran for three years where the levels of numbers of police were agreed at the beginning of that three year period. At the end of the three year period there was an exponential increase in the numbers as a result of recommendations by the chief constable and there is a sense of frustration now between the two parties that there is no way of adjudicating in those circumstances. One of the advantages with OCNS and my role in particular as chairman of SCOPE allows us to make sure things are kept in proportion.

Q384 Chairman: Can I clarify one thing. We will be asking some questions later about some of the detailed security issues and I expect Mr Reeves will want to come in on those, but I want to understand the scope of your responsibilities. We have heard evidence so far on this Committee that the general public are worried about the big incidents—the classic illustration of that is the aircraft flying into a nuclear installation—but actually they should not be worried about that, the risk is small and the containment is very good, and it is the smaller risks down the chain they should be more concerned about. Would you give advice on the issues relating to a plane flying into a nuclear installation or a bomb going off at a nuclear installation? You start at every single level?

Mr Brunt: Absolutely, yes. The site security plan, which I mentioned in my opening remarks, which each site has, has to lay down the provisions for every reasonable contingency which can be foreseen. You are quite right that the nuclear installations do represent a tempting target, in the same way that this building and next door do as well, and because of that we would get involved very much in the studies we would take and the measures and procedures which should be taken to mitigate the effects of any of those scenarios you postulated just now. We must be realists about this, we are risk-managing in OCNS, we can only make sure that we take every reasonable precaution, but there will always be a chance, in the same way that there will always be a chance of an attack on the London transport system; we try to police out everything we possibly can and take every reasonable precaution to do so as far as the major incidents are concerned. As far as the lesser incidents are concerned, it is very much the case that the requirement is for us to keep going round with the messages that it is complacency, human error, we must guard against all the time. I believe the system we have, whereby OCNS inspectors at the working level visit the sites regularly in order to make sure the site security plan is being complied with, is a big advantage. In my time I have taken to discussing these matters at board level with the various nuclear operators in the country and also by engagement with groups such as trade unions. We have spread the message as far as we possibly can. In my annual report each year I try to make sure that people are hoisting on board this message about complacency, it is the enemy we must fight against all the time. It is a long time since 9/11,

19 June 2006 Office for Civil Nuclear Security

those messages are blurring, and similarly with the 7 July attacks last year, those messages are blurring as well.

Q385 Mr Hoyle: Just to follow on from that, have you responsibility for material being moved by road and rail between sites?

Mr Brunt: Yes, I do.

Q386 Mr Hoyle: So it is responsibility wherever it be? The material is your responsibility?

Mr Brunt: Road and rail.

Q387 Mr Hoyle: In the air if need be?

Mr Brunt: If need be.¹ In ships, if they are British-flagged ships, we have responsibility for them as well.

Mr Reeves: The nuclear industry's security regulations, aside from setting requirements for security on a nuclear licensed site, also cover the transport of nuclear material. I must make that clear: nuclear material, not radioactive material. All civil nuclear material by road, rail and sea within the UK and anywhere in the world on a UK-flagged vessel.

Q388 Mr Hoyle: Just to put our minds at rest, what are the chances or risk of a dirty bomb taking place? None?

Mr Reeves: A dirty bomb constructed from—?

Q389 Mr Hoyle: Blowing up one of your installations or your material.

Mr Brunt: I think there is always a chance it could happen and it would be wrong of me to suggest otherwise. I think the measures we have in place reduce that risk to the absolute minimum.

Q390 Mr Hoyle: The OCNS has changed in recent years since the Anti-Terrorism, Crime and Security Act 2001 and obviously the Energy Act 2004. Do you think these changes were necessary and, if so, did they go far enough?

Mr Brunt: I am absolutely convinced that the changes were necessary. If I may, I will just tell you why I think that. The Office of Civil Nuclear Security had its origins in the United Kingdom Atomic Energy Authority security branch and, as such, we were part of a company which was operating just one of the sites. We need not go back into all the history but at the end of the 1990s there was an issue concerning police numbers at Dounreay and the chief constable at the time chose to resign because he made a recommendation as in effect a UKAEA employee to the UKAEA board to increase police numbers and the board turned down his recommendations, so he felt his position was untenable. It was as a result of that that an inquiry was held and it was decided to move the OCNS into the Department of Trade and Industry in October 2000, which occurred and they set us up with an independent adjudicator to fulfil the function I have described earlier.

Q391 Mr Hoyle: We went to look at Dounreay and there was total disarray, there were not even armed guards there at one stage. We hope that will never ever be repeated and we will never forget what we looked at when we got there. One of the changes was to ensure that if anybody enters a nuclear site you can charge them, whereas previously people used to trespass but you did not have the powers. Now you have the powers. Could you tell me a little more about that?

Mr Brunt: You will recall that there were two major incursions into Sizewell a few years ago, before and after Christmas, and as a result of that one of the criticisms which was levelled against us was that there was no power on the statute book to make unauthorised access to a nuclear site a criminal offence. I raised that point in my annual report last year and I am delighted to say the Government responded and in clause 12 of the Terrorism Act this year that offence was put on to the statute book and I am grateful very much that is now in place.

Q392 Mr Hoyle: Obviously there are ways in which you would wish to see your work or powers change further, are there any particular ways now that you are looking for more support from the Government?

Mr Brunt: I think we are currently well structured to look after an industry which is basically in decline and is decommissioning. From that point of view, I am satisfied with broadly the parameters we have got. I would always take more, because that is in the nature of an individual, to ask for more, and if we took more we could do more of the same and give a greater degree of warm feeling that what we are doing is correct and delivering. I do think, and I suspect this is probably where your question is coming from, if there are changes in the industry to come then I would fully expect us as an organisation to have our role and our structure and our affiliations, as it were, reviewed to see whether we are doing it the right way in the circumstances which were then postulated.

Q393 Mr Hoyle: There are other parts of the nuclear industry, how are you linked to the Nuclear Installations Inspectorate? Do you meet on a regular basis, do you share ideas?

Mr Brunt: We do, yes. We personally get on very well at every level. I am not just saying that, it would be easy to come in here and say that everything is fine and dandy. Clearly we understand that many of the items which are important to the NII are of equal importance to us, and it would be absolutely daft if we did not have an effective working relationship at every level. There have been times when we have had to liaise, de-conflict, make sure we are doing the right thing, but it has been my experience in the just under two years I have been doing this job that there has always been a very sensible and pragmatic approach, and where there have been areas where we have had to agree a slight difference in interpretation we have done so without undermining the requirements either of the safety side or the security side. I would reassure you that the NII and OCNS

¹ *Note by witness:* This is incorrect. Our regulations exclude air transport.

work extremely closely together and I am very satisfied with the rapport and the service I get from them.

Q394 Mr Hoyle: You did mention that you have a force of 700-strong.

Mr Brunt: Yes.

Q395 Mr Hoyle: Do you share with local constabularies where you have installations so there is a back up and a sharing of knowledge?

Mr Brunt: Yes. We have a programme of exercises which takes place at every nuclear site. Not all our sites have CNC officers at them but everywhere there is one, those exercises will involve the local force. It is probably worth making the point that the Civil Nuclear Constabulary have been employed there because they can provide an armed guarding response to the security of the site, they are not there for a public order role. So if there is an incursion which develops into a public order problem, I would expect support from the local forces to respond and provide assistance. In order to achieve that, it makes absolute sense we practice the various levels of command, and that is gone through meticulously, if I may say, at each of the exercises that we do. There are also local memoranda of understanding between the chief constable of the CNC and the chief constable of the local force involved, so that they all understand where they are coming from. Indeed, over the past six months we have been putting a particular emphasis on this because I think it is an area where we can never do enough in order to make sure that people know each other on a personal basis, and that there are contingency plans to bring individual or bodies of officers from a local force to a site in order to react to a public order problem. You cannot practice that enough in my view, particularly as some of these sites are quite remote and it would be quite a logistical exercise to get people there in time to make a difference.

Q396 Roger Berry: Good afternoon. If there were to be new nuclear build in the UK, what would the role of OCNS be in the regulatory framework? Where would you fit into the jigsaw?

Mr Brunt: I take it the question really is looking at what would we do in the licensing process and then what would we do once the sites were established.

Q397 Roger Berry: Yes, there would be issues about location of site, types of technology, and so forth, and to what extent would your views on security matters impact on those decisions?

Mr Brunt: If I was being really straightforward and just putting the blinkers on and giving a straightforward approach, I would say as the security regulator nobody is going to make any potentially new nuclear site live with nuclear material until I have approved the site security plan. We would then conduct pre-commissioning inspections to satisfy ourselves that our requirements had been met. That is the blinkered answer. In actually going about the design of the site, clearly we would have a very clear wish to make sure

that the lessons which had been learned over the various generations of nuclear power station construction were then reflected in whatever site was being built. If you look at the three generations of power stations we have in this country—Magnox through to the advanced gas cooler reactor to the pressurised water reactor—each one is a step change in terms of increasing its natural security and its ability to withstand current threats. So we would not expect any lessening of the standards we are at now. When a potential contractor gets to the point where he is submitting to the Nuclear Installations Inspectorate a design for a new nuclear build, we would expect to get involved, firstly, by saying straightaway under Regulation 22 of our Nuclear Industry Security Regulations we want to make sure the information he is supplying, which is sensitive nuclear information, is being guarded properly. We would not want him splashing it across everywhere so the design is available as a blue-print for someone to plan an attack in the future. That is the first step. Then as the planning and the licensing process continued, we would want to make sure that in effect a security statement of requirement was included right from the word go in the planning and design of the site. There are lessons we have learned, and an obvious one is if we could avoid having cars parked on every nuclear site, that is a state of Nirvana for us which we would want to achieve very early on. So we would insist no cars parked on site right from the word go. It is those sort of practical lessons we want to see reflected in the design process right from the word go. As far as the design itself is concerned, we are not the only ones who would have a view on this, it is very much an NII bailiwick and the Environment Agency or SEPA who would have that; we would just be checking on the security of the site. Clearly if someone is going to come along with an idea of putting up a Chernobyl-type reactor, it would be a big no no. It is a ridiculous example but that is the sort of thing we would want to stop and just make sure that anything which was adopted reflected best practice.

Q398 Roger Berry: In relation to choice of location, is the process there that the company comes along, says, “We would like to have a facility on this site” and then you do the security assessment of the appropriateness of the site, or do you offer advice to the industry, to Government, about general considerations in their security which might suggest there are certain sites which you feel are more appropriate than others? To what extent are you at this stage identifying sites which from a security point of view would just not be sensible? Are you reactive or proactive, is what I am trying to say.

Mr Brunt: I am reactive, but I hasten to add I am not giving anybody any advice at the moment because I do not know whether the decision has been made to build any. There are things which I would want to see as a security regulator—I would not want to see them in the flight path of Heathrow, for example—which would need to be incorporated in the design, but equally I could not then say, “Actually the best place to put this would be outside, I do not know,

19 June 2006 Office for Civil Nuclear Security

Cambridge” when there is no source of water there or no access to the national grid. So this is not something I would expect to have a view on all by myself, I would expect to be involved very much in the process with the NII ensuring that their needs conform to my needs and vice versa. There are certain things you would expect to have—the water supply, the access, the link into the grid—there are things there which are important to us. Once the site is there, once it is built, it is something which you cannot camouflage, it is going to be there and people are going to know it is going to be there.

Q399 Roger Berry: If the existing nuclear capacity were to be replaced, let alone increased, that would presumably impose a substantial demand on your staff?

Mr Brunt: Yes, it would.

Q400 Roger Berry: Would you have staff to do it? Are the skills out there?

Mr Brunt: The skills are there but I personally do not have the staff to do it. In the time frame we are looking at, if a nuclear new build is decided, then I am confident there is time to recruit those staff to deliver what is required. I have enough at the moment to do the basic number-crunching, the basic thinking through, but in terms of the actual work on the ground, yes, I probably would need more people to achieve that. But I am confident there is time to recruit them in the period available.

Q401 Roger Berry: So the kind of concerns that other witnesses have expressed in relation to people not going into nuclear for a career because there has not been new build for so long, and therefore they have expressed concerns about the lack of appropriate skilled workers, in terms of your activities as an inspectorate, you do not see that as being a significant problem?

Mr Brunt: Not for me. I think it is probably worth dwelling on that. I am not a nuclear physicist, I have a history degree; but I have spent 31 years in the Army where I spent 13 years on active service in Northern Ireland and the Balkans, and in staff jobs over here I was responsible for coordinating the response to the foot and mouth disease outbreak and also the firemen’s dispute a few years ago, so I am bringing skills which are important to this debate in terms of the security of a location. I do not need to be a nuclear physicist to do that but I am humble enough to go on nuclear courses where they are giving a basic grounding of the knowledge so I understand what they are talking about, and there are plenty of people I can go to for advice and I do that. I have attended courses which have been laid on by British Nuclear Fuels, by fuel reprocessing experts, so I have an awareness of what is required. To answer your question, yes, as long as I have people, like my colleague, Bryan Reeves, who spent a similar career in the armed forces and also in the police, and as long as we can get those security experts who have garnered their experiences in government service over an earlier career, then I am confident we can turn those skills to the sort of

activities which are probably going to be needed should the decision to build new power stations be taken.

Q402 Roger Berry: Some of our witnesses have not been concerned about security issues for nuclear new build, others have been critical of security issues in relation to what we have now. How critical do you think the security issue is in relation to a decision whether or not we should have nuclear new build?

Mr Brunt: I personally think it is paramount. You may say, “You would say that, wouldn’t you”, but I do mean it. It is so important that people have confidence in the industry, if we decide to go down the new build path; we must make sure that people have confidence in this. I think if I was presiding over an organisation which was really just paying lip service to the need for security, if I felt the people I deal with on a day-to-day basis were just treating security in a light-hearted manner, I would be extremely concerned by it and it is something which I would be taking to the barricades over. We must make sure that people are confident in this industry and that people’s commitment to security is more than just lip service. I have to say at board level, at working level, at the level of security professionals that my people deal with on a day-to-day basis, I have seen no evidence that people are taking security and their responsibilities lightly.

Q403 Chairman: Your organisation is full of security experts who apply their knowledge to the nuclear industry rather than the other way round; rather than nuclear experts who learn security?

Mr Brunt: Absolutely, yes.

Q404 Chairman: For the constabulary that is essentially a pretty conventional policing role in an unusual situation?

Mr Brunt: It is conventional in that they are authorised firearms officers. The reason why we have a police force guarding our nuclear sites is because in this country we only allow the armed forces and the police to carry weapons. We could not go to Group 4 and ask them to provide an armed guarding service at Dounreay, for example.

Q405 Chairman: But they do not need to have any knowledge of the nuclear industry at all to police the facility?

Mr Brunt: Absolutely.

Q406 Mr Weir: When you answered one of Roger’s earlier questions about new nuclear sites, you said you would not want to see one under the flight path of Heathrow, but the evidence we have from the generators themselves seems to suggest any new nuclear stations are more likely to be on existing sites than completely new sites. Would you feel confident that existing sites would be able to take new nuclear generation? Would you expect to be involved at an early stage to advise on security for any nuclear new build on an existing site?

Mr Brunt: Yes. I certainly think that the majority of the existing sites would be capable of having, in most cases, a third nuclear power station built on them, I have no difficulty with that at all. The reason why I hesitate slightly is that there are some where you just want to make sure that the geology, and people's perception of it, has not changed over the years. I do not want to mention specific sites because I think somebody is bound to come back and give me a hard time about it later, but we need to make sure that those which are very close to beach sites, for example, are not in a position where coastal erosion is going to take them away. I hasten to say there is no danger of that at the moment but we need to take a long-term view of it. Yes, I think the existing sites are the way forward and certainly I would have no difficulty with them from that point of view in terms of making sure that they conform to the security requirements we have there at the moment.

Q407 Mr Clapham: Mr Brunt, could I first of all ask a question about the safety regulation of the industry as it relates to new build. For the first time I think it is fair to say nowhere else in the world have private companies, quite separate from either regional or central government, gone into a civil engineering project of the size of building new nuclear power stations as will be the case here in the UK. Do you feel that may have an impact on the way in fact your organisation works or do you feel that there is sufficient regulation to ensure that private companies will have to work collaboratively with yourselves?

Mr Brunt: I am confident that the regulations that we have got give us the powers in order to do what is required. If I was to say I was worried about anything, it is the fact that at the moment we do a security vetting service of everybody who works in the industry. Last year we issued some 17,976 clearances. It is a challenge doing that with people who live in this country. If we then have to start vetting people from overseas as well as part of the scenario you have just postulated I think that would be a challenge for us and it is something we would need to be very careful about making sure we do it properly. It would make no sense to allow people to be constructing a site who might subsequently then pass that knowledge on to a third party with a malicious intent. From that point of view, yes, there is a concern there and we need to bottom that out. In terms of the actual mechanics of the regulation, again it is back to what I said in an earlier answer: the site security plan has got to be approved, the pre-commissioning inspections have to occur. If someone comes from overseas with a plan to build a power station I am going to slap on some restrictions to make sure those plans do not go into the public domain and he will have to understand that in the interests of security he is going to have to work within those parameters. There may be a bit of blood on the carpet but we are going to make sure this is done properly in a way that we can have confidence in.

Q408 Mr Clapham: Looking at the regulation of the civil nuclear industry, there is some indication that regulation responded quite swiftly to the post 9/11 situation.

Mr Brunt: Yes.

Q409 Mr Clapham: Given your role, do you feel that regulation is sufficiently manoeuvrable to respond generally to changes in the industry?

Mr Brunt: I do because we have been doing a lot of work recently with the NDA, particularly as they start their competition, for example for the low level waste repository at Drigg which will be the first candidate for being put out to competition. We got very much involved in that process. I am confident that our engagement in that has shown that we can come with a package to potential buyers. I took part in an industry day seminar where some 100 companies were represented and we were able to explain what we did as regulators on the security side and it provoked a lot of questions. It was a great debate but I was confident that they were saying, "Okay, fine, these are the rules of the game". As long as they know what they have got to do I think there is a degree of confidence beginning to build in that. I believe that will happen again should we go down the path of new build and again it is a case, particularly if we get foreign companies coming in, of just making sure they understand the ground rules here in the United Kingdom. I should add too, we do meet with our European counterparts on a reasonably regular basis at the European Nuclear Security Regulators Association. The last time that we got together we went to Finland to see the new power station that was under construction there which in some ways will give lessons to us over how it is being done. It is a turnkey facility, so they will turn up "Here you are" and you go and start operating it. I think the Finns have learnt a lot of lessons from how to regulate that and we are benefiting from learning from their experience and trying to incorporate anything we might have to do in the future on the basis of those lessons, someone has already done it and recently.

Q410 Mr Clapham: Can I just explore that a little more. Is there a kind of council then of people like yourselves who have a responsibility to various countries in Europe on which you come together to exchange experiences?

Mr Brunt: Yes, we do. We try to meet about every six months and if people are unkind they say it is like a nuclear Cook's tour of Europe, and there is an element of that. Frankly they are very valuable lessons. Okay, we have been to Madrid and Finland and Brussels but we have had the opportunity to exchange a lot of useful work. I have to say that our regulatory set-up, the fact we have had the Anti-Terrorism Crime and Security Act, the Energy Act, the Civil Nuclear Constabulary, it has generated more interest from others in the way we do things which is an indication that perhaps we have got some of the answers right. I find it a forum that I get an enormous amount from and I have learnt a lot from it.

19 June 2006 Office for Civil Nuclear Security

Q411 Mr Clapham: Thinking about your exchanges with experts from other countries, are there any areas that you see in the UK which are inefficient which you think could be made better?

Mr Brunt: There are several models about how to regulate and I think the area that perhaps you are alluding to is the business of should we separate safety from security. There are many people who do not do that and I think there are synergies there that might be worth exploring in our case as well. At the moment we have a system that, as I said earlier, works for us. I would be arrogant if I said to you that we can never learn to do things better, we are always seeking to learn to do things better. Part of the process of seeing how others do it gives us the opportunity to explore things. For us, as things are at the moment, the industry is in decline, it is decommissioning, we have a system which currently works, it might not if things change direction in the future and we might need to think again and I would welcome that debate, frankly.

Q412 Mr Clapham: Finally, in terms of the interchange that you have with colleagues in Europe, is there a great deal of difference in the way in which Europeans regulate their civil nuclear industry from the way in which we regulate ours?

Mr Brunt: The basic principles are broadly the same. We are all very much aware of the guidelines issued by the IAEA and we clearly seek to comply with them. Clearly there are areas there where we have no choice, I cannot go away and think up my own idea of how to define what is a category one quantity of nuclear material. Those standards are laid down for us by the international community and I welcome that. Having said that, when we see people on the Continent it does give us the chance to see the way they do business. There are some countries, and I think it is probably invidious to name them now, where I simply would not use their model and we spend a lot of time trying to persuade them to do things in a slightly different way. There are others, and perhaps I should mention this, like the French, where our two methods are very similar and it is very reassuring that we have this forum where we can get together and discuss the issues, and where there are differences because of the way a country might do things we can understand why they do that rather than because it is a basic philosophical diversion which points up a failing on our part; it does not generally do that, we understand why they have to do it.

Q413 Mr Clapham: Finally, finally, Chairman, there are obviously issues where there may be a difference of opinion between yourselves and the Nuclear Installation Inspectorate regarding, as you said, the safety issues. If that occurred is there a mechanism by which you can come together to resolve the problem?

Mr Brunt: I think Mike Weightman and I, who is the head of the NII, would find a pub and we would have a couple of beers and we would sort it out between us. It is a flippant remark but we do not have problems. We have had a number of issues over the

time that I have been DCNS where we have had to talk together and we have come up with solutions that have worked. It might be something as straightforward as a fire door which they want to keep open but we want to keep secure, there are ways of achieving that. That is an example that I would put to you but then there are other areas too where in the process of clearing up some of these legacy stores that we found a crate which has got, from the tests, an indication of a greater quantity of nuclear material in there than we thought was the case. We have then insisted that the appropriate measures to guard it have been put in place, and then rather than leaving it at a place where clearly it has not been constructed to keep it there we want to move it to a location where it can be done, so we then pull together the safety experts who tell us whether we can move it without damaging people on the way, we make sure the place you are taking it to can take it in terms of its protection both from physical and guarding and then we make sure that on the transport side there is nothing to stop us bringing it over. This is not something we want to take a stand on and say "It is your problem, mate, sort it". We have got to get together and work out how to fix it. Each of us has been set up to look after a specific area of critical importance to us all as citizens of this country and we believe passionately in making sure that this nuclear material is kept in a way that it should be kept, appropriate to the threat it poses as an element.

Q414 Chairman: There has been no occasion on which you have come across an irreconcilable conflict between the safety of the nuclear personnel and the security of the site?

Mr Brunt: Chairman, in the time I have been DCNS there has not been any occasion and I am not aware of any in the past.

Q415 Mr Weir: Right at the beginning you said that you stretch from Dounreay to Dungeness, Sellafield to Sizewell which is a wide spread of nuclear installations within the UK but obviously because of that there are transport of materials between these sites on some occasions. Now many environmental groups, such as Greenpeace, have expressed concern about transportation of fuel waste and other radioactive materials and they have argued the arrangements for transportation leave these materials vulnerable to terrorist attack, theft, accidents. They have questioned the cooperation between yourselves and other agencies like the HSE and local forces. What is your response to these worries?

Mr Brunt: I am aware of the submission they have put in recently. I know it is very much at the moment a matter for inter-departmental consultation between the DTI and also the DfT. I am quite clear that we are applying regulations which have been agreed to international standards. We are making provision for the secure transport of those materials so they are secure from theft and from sabotage and I am satisfied the measures we have in place achieves it. I would be the first if those standards change to

ensure that all those movements were done in a way that complied with the current regulations. I do not want to sound as though I am being complacent, I am not, I think it is inherently too dangerous a commodity to be flippant over, we are not. I am quite clear that the measures that we have in place fulfil the remit that has been placed on me as the regulator to guard against theft and sabotage.

Q416 Mr Weir: What about road accidents involving nuclear transport?

Mr Brunt: Can I ask Mr Reeves to answer that who has a great knowledge of all the various containers that are used. This is not a hospital pass but I think he can probably answer convincingly on the class themselves.

Mr Reeves: Of course, the measures that we have in place as laid down in the nuclear industry's security regulations provide that nobody may transport any nuclear material without being firstly approved by our office, and to do so they must transport it in accordance with previously agreed security standards. As far as accidents are concerned, one can never legislate for accidents. However, the packages that nuclear material is transported in are designed to internationally laid down safety standards which provide for protection in the most severe of accident scenarios. From those standards we security professionals can also derive a certain degree of comfort in that if the packages are designed to withstand the most severe of accidents then it can follow also that they will offer some protection in the event of a malevolent act, which of course is the aim of security. Safety is there to prevent accidents, security guards against a malevolent act. To pick up on the latter part of your question, we are in regular contact with other security agencies: the British Transport Police, the Civil Nuclear Constabulary, clearly, Home Office forces, where appropriate, TRANSEC being responsible for the transport of other dangerous goods by road and rail in the UK. Whilst it is very easy for any reporter or the media, for example, to make comment about perceived inadequate security standards, that also ignores the need for confidentiality of the security measures that are in place and the contingency plans that are already in place. Clearly we cannot publish those.

Q417 Mr Weir: In answer to an earlier question you said that you had regular training with local forces around nuclear installations but transport of waste and materials is another problem in that it will go through areas perhaps where there is no experience of dealing with nuclear installations. I wonder if you have contact with other police forces that perhaps do not have nuclear installations on their patch, so to speak, to give them specific training and advice in the event that there is an accident, sabotage or whatever of one of these nuclear convoys passing through their areas?

Mr Reeves: The types of nuclear material we are talking about here, without wishing to get into too much fine detail, the very highest category of material, categories one and two, moves on a very,

very infrequent basis and would not be permitted to move by my office without the most thorough coordination, a whole series of meetings with all bodies concerned. The lower category material, typically spent nuclear fuel, fresh fuel, certain other types of material, is moved on a regular commercial basis throughout the UK. That sort of material is class seven dangerous goods as defined by the United Nations' Orange Book. It presents no more of a hazard than, indeed, many other classes of dangerous goods. Where necessary and, where appropriate, prior liaison is already undertaken with any other emergency services and the emergency services are geared to deal with it as, indeed, they are geared to deal with any dangerous goods in transit.

Q418 Mr Weir: Picking up again on one of Michael Clapham's earlier questions, presumably if the Government goes down the route of a national repository for nuclear waste, and it is still quite a long way away, there would be considerable movement of waste around the country. Would you have to look anew at your procedures to deal with that situation and have increased liaison with other forces, increased numbers to deal with that perhaps substantial movement of waste?

Mr Brunt: I would certainly welcome any further increase in liaison with local forces. Indeed, we have recently started an initiative which has been sponsored by the British Transport Police whereby they are getting in local forces who are particularly affected by current movements to ensure that our procedures are as good as they can be. As far as a national repository is concerned, I would not shut my mind to anything that I would consider to be a measure that would improve security. I would welcome a greater involvement, a greater profile amongst security professionals in the police force of this country in order to make sure those materials are given every consideration from a security point of view. I have no difficulty with that at all and I would encourage it.

Q419 Mr Weir: Moving on to the current storage. Obviously facilities for storage around the country vary, facilities for storage of waste have lower safety and security standards than nuclear reactors, and some have been described as little more than sheds. Given that CoRWM's interim report has suggested that it would take decades before existing intermediate and high level waste is placed in long-term geological storage, do you envisage making any changes to the current regime of storage for intermediate waste?

Mr Brunt: From a security point of view I do not because the standards that we have got at the moment are such that they reflect the regulation. If we have category one levels of nuclear waste at a particular site then they are looked after to the point of category one security. I would reassure the Committee, if I may, that just because we are not in a permanent repository nuclear waste is not simply being disregarded and left lying around, it is being looked after as well as we possibly can do in the circumstances.

19 June 2006 Office for Civil Nuclear Security

Q420 Mr Weir: I do not think anybody is suggesting that but much of the existing storage was considered to be temporary pending the decision on storage, which has dragged on now for decades and, according to CoRWM, it may be some decades before it is ever produced. Are you satisfied that existing systems are sufficient to store that waste for the decades ahead before there is, if there ever is, a national repository?

Mr Brunt: Given that we do not have a national repository, yes, I am satisfied it is stored to the standard we would expect it to be, but it is a temporary solution and it will not be as good as a permanent solution which is represented by the repository that CoRWM has reported on. That is what I would wish to see. If we could achieve that sooner then I would welcome that because from a security point of view it would mean that less resources are being diverted to look after the material than would be the case if it was all in one place in a properly constructed and secure repository.

Q421 Mr Weir: How temporary is temporary?

Mr Brunt: I do not wish to sound facetious but temporary is the time it takes to get the repository built and the materials moved to it. I am a security man, not a constructor.

Q422 Mr Weir: Would there have to be considerably stricter security standards for storage if uranium, depleted uranium and plutonium are classified as waste? If so, have you made any estimate of the extra expenditure?

Mr Brunt: I have not made any estimate of extra expenditure but I can say that these are category one materials and they will be looked after in accordance with category one standards. The additional expense will lie in the armed guarding that will be required from the Civil Nuclear Constabulary, and that is a significant cost over an LCBL² for a company storing such material. In terms of changing our approach, it is quite clear we have standards for that type of material at locations and they will be applied rigorously.

Q423 Chairman: We do not want you to comment on the merits of new nuclear build or no nuclear build, but a recurring theme of the evidence we have had over the last few sessions is if there is to be new nuclear build—if there is—public confidence in the need for and in the integrity of that process must be maintained. Clearly, to my mind security issues are one of the central issues there. What role do you think OCNS would have in maintaining public confidence in any new nuclear build?

Mr Brunt: You pointed out in your opening remarks that this is the first time we have appeared in front of a Select Committee and, frankly, I welcome this opportunity to raise our profile. I think it is incumbent on me to give the public an assurance by my actions, if not by what I say, that they have got a responsible, proportionate and effective regulator here who is looking after the security of this material. I do have to recognise the reality of my situation. I am a civil servant, I am part of the Department of Trade and Industry, and ministers will wish to take the lead on many of the issues that I get involved in. In the meantime, I must back that up with being seen to be effective as a regulator and every opportunity I have like this in order to reassure the public through your good offices, I welcome it and that is what I intend to do throughout the period of my contract as DCNS.

Q424 Chairman: At the risk of ending with an equally easy ball as the one I started with, we have also heard evidence that people tend to focus more on the very, very small probabilities of very, very large events and that excites people more, newspapers can write stories about that much more excitedly, whereas so often in any system it is the much higher probability of a much less exciting event that ought to be concerning them. You will be able to tell me, I am sure, that they all have an equal priority in your thinking.

Mr Brunt: They certainly do when the phone goes at two o'clock in the morning. The critical thing is that we cannot afford to take chances. I think such an important part of my job is to ensure that complacency does not set in, whether it is an individual looking after his laptop with classified material on it when he goes on a train or whether it is making sure that a vehicle is properly searched when it makes a delivery to a site, all these things are important. Day after day when there has been no incident, I know human nature, people get bored, they get complacent, they cut corners, and that is what we have got to stop. It is very much a key role for the OCNS inspectors and myself to make sure that complacency does not set in.

Q425 Chairman: Unless my colleagues have any further questions, gentlemen, we are very grateful to you for breaking your duck—another cricketing metaphor—and thank you very much for the evidence you have given us, we are grateful.

Mr Brunt: Chairman, gentlemen, thank you very much indeed, we are grateful for the opportunity.

Chairman: Thank you.

² Life cycle baseline (lifetime costs).

Witness: **Professor Gordon MacKerron**, Chairman, Committee on Radioactive Waste Management, gave evidence.

Q426 Chairman: Professor MacKerron, welcome to this evidence session on the issues to be considered when discussing nuclear new build. I wonder if I can begin, as we always do, by asking you to introduce yourself to the Committee for the record, and perhaps couple that up with a question that flows naturally from that, if you could explain your involvement in the Energy Review process, in your capacity as Chair at CoRWM and any other way that also appears relevant.

Professor MacKerron: Thank you very much. Thank you for giving me the opportunity of giving evidence today. Yes, I am Gordon MacKerron. I am here today principally in my role as the Chair of the independent Committee on Radioactive Waste Management, which is advising Government on long-term options to manage radioactive waste, for which there is no current management route. As it happens, I spend some of my time directing an energy research group, which gave evidence to the Energy Review some time earlier. My preference, where possible, will be to wear the hat of the Chair of the Committee on Radioactive Waste Management, because that is my principal task and on which I believe you are most interested to hear. If people wish to ask me other questions, of course I will not refuse to answer them but I will be wearing the hat of the Chair of the Committee unless I take it off and tell you I have put another one on.

Q427 Chairman: You will tell us when you are changing hats because it is not very visible from where I am sitting at present.

Professor MacKerron: Indeed!

Q428 Chairman: Thank you. What is this Energy Review? The press keep on telling us that it has already made its mind up, it is pressing ahead with a nuclear programme and it is trying to legitimise that with the Energy Review process. I have to say I am a bit inclined to that view when I consider that your recommendations are only in draft—they have been published, which is welcome—but the Government intends to make a definitive statement within about four weeks and you have not produced your final recommendations yet. It does not seem to me that your issues are being taken full account of in the review process.

Professor MacKerron: Perhaps I can give a small bit of background. We were set up as a committee in November 2003 and although within our terms of reference it did say we should look at all possible future states of the world, including potential new nuclear build, that was not really even on the political horizon at that time. The Energy Review, as you know, is a much more recent event. When we agreed our timetable with the then Secretary of State for Environment, Food and Rural Affairs we agreed to report by 31 July, having initially asked to report as late as November which would have given us the three years that Defra and the devolved administrations initially thought it would take for our work to be complete. We have been working extremely fast. We will just about make 31 July. We

have been keen to distinguish ourselves as a separate issue from the Energy Review because by definition, since no decision has been made yet to create any new wastes, the main focus of our work inevitably has to be on the management of the very large legacy of waste which will exist irrespective of any decision for or against nuclear new build. We are keen to remain separate from that process and we have already made in public, on more than one occasion, the statement that our recommendations should not be taken as either a red or a green light for new build because although there are some issues that are relevant, we do not see our report as being directly relevant to the question of new build within the review.

Q429 Chairman: Just to be clear, you are still intending to report on 31 July.

Professor MacKerron: We are.

Q430 Chairman: Probably some 10 days after the Government announces its conclusions to the Energy Review.

Professor MacKerron: That may well be true. All I would say is—

Q431 Chairman: I am not criticising you for that. There is no criticism intended.

Professor MacKerron: At some point in 2004 we agreed a date. We have been asked whether or not it is possible for us to issue a final report ahead of 31 July and we have looked very hard at whether or not that is possible but the logistics simply do not work. When on 27 April we published our draft recommendations, we also made it very clear that we did not expect materially to alter those recommendations when it comes to our final report. It is worth saying that since that time we have gone out to a very brief period of further public and stakeholder consultation and we have had generally a favourable response to those draft recommendations. There are very few people who have suggested to us that our draft recommendations should be materially altered. Although it is the case that we will not, as it were, finally pronounce until the end of July you can probably take our draft recommendations as a very clear indication of where we are going to end up. The detail may change, but the direction and the substance is extremely unlikely to change.

Q432 Chairman: Before I hand over to my colleague, Mike Weir, can I just clarify one thing in your draft recommendations, I think it is recommendation seven, about community involvement in new proposals for the siting of long-term radioactive waste facilities. You say that participation should be based on the expectation that the wellbeing of the community will be enhanced. How will the wellbeing of the community be enhanced by it being chosen as a repository for nuclear waste?

Professor MacKerron: We presume that the act of choosing, which in our view will be partly made by the community itself, would, if unaccompanied by

19 June 2006 Professor Gordon MacKerron

anything else, be a detriment as perceived by that community and others. An important part of our recommendations, which we do want to be seen as a package, is that the community would negotiate, not without constraint, some package of measures which would more than compensate for the perceived detriment of the sacrifice of being the host for that repository. What the details of that compensation would be would be very much up to the community and the relevant authorities, including national government, to negotiate. It might include monetary elements, it might include infrastructure, training and others, but we are not really in the prescriptive business of saying what such a package might involve, only that we know it would be necessary and that a basic principle is that the community involved would have to play a large part in that process and not have it, as it were, imposed upon them from the outside.

Q433 Chairman: Rather like the planning gain that planners look for in the planning process.

Professor MacKerron: That is certainly one way of looking at it.

Q434 Mr Weir: Your interim report suggested geological disposal for long-term storage of nuclear waste, but if I understood correctly from your opening statement you said that you started looking at this on the basis of disposing of historical waste rather than new build. Do you think the creation of new waste under new build would in any way alter your view on the best way to dispose of waste?

Professor MacKerron: There are two parts to that question. The first part, which is the technical one, which we looked at some time before the Energy Review was announced, was whether or not there would be any serious technical obstacle to housing the waste from a new build programme in the kinds of facilities which we are recommending, which as you rightly say is now in the long-term by geological disposal. The answer very simply is for the kinds of reactors that are probably going to be proposed, and if they are built, then the kinds of waste they would produce—spent fuel and possibly the products of spent fuel—would be similar to those that already exist and would not pose a significant technical problem in principle. What we are saying, and we think it is extremely important to say this quite loudly as well, is that the politics and the ethics of a deliberate decision to create new waste are different from the inevitable need to manage existing legacy wastes which are the result of past activity over which we now have no further control. We are very keen to say that although you would not want to reinvent our committee and start from the blank sheet of paper that we were asked to start from, you would have to ask for any future assessment process for new build to include a proper assessment of the specifics of any proposal for waste management for that new build.

Q435 Mr Weir: Would you see that assessment process taking place prior to a decision to go ahead with new build?

Professor MacKerron: I think inevitably it would have to take place in relation to any specific proposal. We are not in the business of trying to advise Government on how it might put forward any proposals it might have on new build. We would expect Government, as it has in the past, when it came to the detailed assessment of any specific proposal, to include waste within the assessment process and not take it as something that had in some sense been nodded through because CoRWM had made its own report by the end of next month.

Q436 Mr Weir: Can you tell us what other options you considered for disposal of waste apart from geological disposal?

Professor MacKerron: Certainly. We considered initially up to 15 potential options, some of which seemed quite bizarre—disposal in space—but we did so only because serious scientific communities at some point historically have done so. As quickly as we could we reduced those 15 initial options to what we regarded as four but they are essentially variants of two different things. One is, as we have recommended, deep geological disposal—we prefer the word “geological” because “deep” is a slightly ambiguous term—or some form of what we called interim storage, in other words a robust continuation of present policy. We were very persuaded that because the timescales in this business are long and you cannot guarantee institutional control into the indefinite future that reliance upon storage on an ongoing basis risks a loss of institutional control in a way that geological disposal does not. Given that we have sufficient confidence in the long-term safety of geological disposal, that was the primary reason why we recommended that ahead of storage. In our view, there were no other major technological options that could be taken seriously in the near future. There are many other possibilities but none of them is anywhere near the possibility of constructing them within the next couple of decades.

Q437 Mr Weir: You also said in your report, if I recall correctly, that it could be some time before a long-term site is available and obviously there is the need for interim storage in the meantime. Could you tell us what factors might delay the determination of a final site for storage?

Professor MacKerron: There are two parts to that again. One is the inevitable minimum period that it would take to go through proper due process, both in political terms and in safety terms and community consent. The other is the risk of delay. If you take, for example, the views of Nirex, who previously had, and to some extent currently still have, responsibilities in this area, they said not that recently they thought a repository might be ready to take waste by about the year 2040, or as it is now 34 years from now. Because we are suggesting, in addition to the process that Nirex suggested, one in which communities have to be willing to participate and negotiate some agreement to participate, that is likely to lengthen that timescale rather than to diminish it. Although we have not finally committed

19 June 2006 Professor Gordon MacKerron

ourselves to what we think timescales might be, we think that a reasonable minimum time is of the order of 35 to 40 years, and that is if everything goes well. I can give you some international analogies to show that is not very out of line with other people's experience. The second part, briefly, is there could be delays. We have had 30 years' worth of delay and have not got anywhere very much. It would be foolish to discount the possibility of further delays, either because of local opposition or because, for example, once a site is investigated it is discovered that it is not actually suitable. The earth sciences community is very definite that it may take them up to 10 years to investigate any specific site and while it might be generically suitable it is always possible that there might be local factors that would cause you on safety grounds to have to abandon a site and start again. That is the kind of technical factor that could lead to delay. We feel it is important that the interim storage arrangements are robust to both the inevitable minimum time and the possibilities of delay or even, in the last resort, failure, although we do not emphasise that particularly.

Q438 Mr Weir: I take a point the Chairman made earlier about the volunteerism aspect of local communities. Nirex's experience has been quite the reverse, whenever they suggested a site there was massive local opposition to it. Do you see that changing in the foreseeable future? In your scheme of volunteerism do you envisage adopting what I believe is the model in Finland where the local community can in effect have a veto and say they do not want it in a particular place?

Professor MacKerron: I think it is the essence of an approach that asks for community willingness to participate that up to a certain moment in the process the community has to have a right to withdraw. Beyond that moment, of course, it does not, especially after serious expenditure is incurred. If I can give you an anecdote which I think has very great weight. When we visited Sweden as a committee and we spoke to the mayor of one of the communities that was involved in a competition to be the host site for the Swedish repository, the mayor said to us, "The only way in which we could ever have said yes to this proposal was that until a certain moment we were given an absolute right to say no". In other words, he was saying had there been some sense of imposition on them they would have fought it almost irrespective of the technical merits of the proposal. Although people think that asking communities to volunteer is like turkeys voting for Christmas we do not think that an imposed solution will work and we do have experience from both Finland and Sweden where communities have volunteered and even competed. Although we cannot transpose that experience directly we think that offers a much more promising and realistic way forward than the previous attempt that Nirex were involved in to impose a site and a solution on a community without its involvement or consent.

Q439 Mr Weir: Given your answer to the previous question, do I take it that we would have to

investigate several sites at once because of the dangers of one or other site being geologically inappropriate after some considerable investigation and possible expenditure on it? At what stage, if you like, does the competition come in? You will have to look at several sites—and there will be expenditure—and decide on a potential site, but do you envisage several sites having a competition between communities for whichever site will be chosen?

Professor MacKerron: It is very hard to say how it will work out in practice. If it were the case, for example, that there were two communities, however defined (and that is an important issue in itself) willing to participate and be involved in the process then it may well be a very good thing to investigate more than one site, apart from anything else to make sure that there was a better chance that one would definitely prove suitable. It would be idle to pretend that the politics of England and Wales on the one hand, and Scotland on the other, might not come into this. We are not going to make any siting recommendations. What we will almost certainly say is we want the minimum number of sites necessary to achieve the objective. I do not think we are in the business of prescribing issues of how many sites might be investigated, it will depend upon how many communities volunteer and the resource commitment that will be involved in investigating several sites. Detailed decisions of that kind are very much for Government, or oversight bodies that might succeed us, to take if and when our recommendations are accepted.

Q440 Mr Weir: One final question on this. You also say in your report that there should be the minimum transportation of waste. Do you envisage one national repository to take all waste or do you envisage more than one to avoid large-scale transportation?

Professor MacKerron: Clearly minimising transport where possible is an objective. We are not going to prescribe that there will be only one site, we are going to say simply that one should minimise the number of sites and, as you rightly say, avoiding unnecessary transport is one of the issues in that respect. There are certainly arguments in relation to security that suggest minimising sites may be a good thing to do as well. We are not going to pronounce on the exact number of sites, we are just going to say we minimise the number. The presumption is the fewer the better.

Q441 Chairman: You referred just then to "oversight bodies that might succeed us", I think that was your phrase. Your final recommendations are in July, presumably there is then a process of discussion with the Government about those recommendations, but what happens to CoRWM then after they have either accepted or rejected your recommendations?

Professor MacKerron: It would be very nice to know. We have got an assurance from Government and the devolved administrations that we will be kept in existence at least until November, and possibly December, to answer questions on our

19 June 2006 Professor Gordon MacKerron

recommendations, to make sure that our audit trail is as firm as it can be and possibly to initiate some further discussions. I think it is going to be important for Government to make a decision whether or not it wishes to pursue our package of recommendations. There has been an inter-departmental group meeting now for the best part of a year to think about how the baton can be handed on, to use an athletic rather than cricketing analogy, from ourselves to the process that follows. I imagine they will be anxious to try and make sure there is not discontinuity. We are certainly very keen that momentum is maintained. We are also very keen to say to Government that some kind of oversight body with some independent membership, although of course accountable to Government, should be set up to help maintain the higher degree of public trust that I think through CoRWM we have won. We have reasonably well succeeded in establishing some level of public confidence and stakeholder confidence greater than when we started and we think it is important that that be maintained in some way, but Government will clearly have to make its own decision.

Q442 Chairman: Your draft recommendations have been in the public domain for some two months now. You must have a reasonable gut feeling whether the Government actually likes them or not.
Professor MacKerron: Indications are that Government is reasonably happy with them, yes. I think we would have heard by now because we talk regularly to our sponsors. We are independent, but we are accountable, they are people whom we have to please in the last resort. We have had discussions and nothing in those discussions suggests that Government is deeply unhappy but, of course, our discussions are principally at the level of the Civil Service and we know there are big political decisions ahead, so it would be wrong of me to anticipate what Government might actually decide, but indications are reasonably good, yes.

Q443 Chairman: This time the recommendations might actually be acted upon.
Professor MacKerron: We very much hope so.

Q444 Chairman: This time round. One last question from me before I bring in Mick Clapham. Do you have any idea at all of what the sort of order of magnitude of cost this long-term storage is going to be? The NDA is going all over the place with decommissioning costs at present which seem to be going up quite sharply. After all, if the industry is to make private sector investment in new nuclear build it must be charged with the costs of waste disposal, so they must be able to give them some kind of indication of the kind of levy that is going to be imposed upon them to pay for the costs of that long-term disposal.

Professor MacKerron: The mechanism that might be used is one that clearly we have not been charged with looking at and we are not making any clear recommendations on. In terms of the total cost, we know that Nirex costed reasonably carefully on an

engineering basis and from the bottom up what the kind of repository it was trying to build near Sellafield would cost in about 1997, and the answer was of the order of—let us give it a round number—£10 billion for the entire repository, including the development work and its other operating costs before it closes. If a repository was built that was designed to accept all categories of waste that cost would rise, we have been advised, by of the order of maybe two or three billion, but within a very wide uncertainty range, and the uncertainties are very much more weighted towards the upper end, increases in cost, than towards the lower end. Until any particular design and site has full regulatory approval it will be difficult to know whether that is realistic. As I say, we have not looked at the funding regime. If it were the case that Government did decide on new build, and if it decided that the waste from that new build would be housed in such a repository, then clearly some formula would have to be found. In volume terms it would not add a very great deal, at least until you have got a very large number of reactors, to the material already being housed. We have not been into that issue in any detail. No doubt the Treasury and others will be doing the arithmetic and the companies involved might be doing the arithmetic, but we have not done any detailed work on that.

Q445 Mr Clapham: Given that your committee has made it clear that it does not want to be seen to be taking a view on new nuclear build, but in relation to what you said about your indication on your recommendations, do you feel the Government could take the recommendations as an indication that you are giving the go-ahead for nuclear build because we can manage the storing of waste?

Professor MacKerron: It is very difficult for us to speculate on what Government will do with our recommendations. I know that when the DTI published its consultation document for the Energy Review it quoted us as having already said that there would be no major technical obstacle to accommodating new build waste in the kind of facilities we are looking at. At that time we had already said that we thought the politics and ethics were different. As it happens, the DTI chose not to publish that part of our recommendations at that time. Clearly people will select from our recommendations according to taste. There is nothing we can do to prevent that, but we are very keen to say that we have no remit in terms of the new build debate, no view, but, even more important, we do not see our recommendations as either a red or a green light for new build and we do think that the waste issue that would emerge from new build would need to have its own assessment process because, as we say, politics and ethics are different when you decide to create new waste from the inevitable need to manage legacies.

Q446 Mr Clapham: On that new waste and new build, the new build is likely to be private. I do not think there is another country anywhere in the world that has embarked on private nuclear build, it is

generally there is either input from central government or regional government. Are there any implications for waste management from privatised ownership of the new nuclear build?

Professor MacKerron: This is not an area which either in my capacity as a researcher or as Chair of CoRWM I have ever investigated in any great detail, so it is not an area on which I have any expertise. I cannot offer any help on that.

Q447 Mr Clapham: Given that the new nuclear stations are going to be rather different from the older ones—we have a mixture of Magnox, advanced gas-cooled reactors and then, of course, the pressurised water reactor at Sizewell—is there likely to be a difference in the type of waste? For example, some people are saying there will not be as much low level and intermediate waste but there is likely to be more high level waste. Will there be more high level waste and is that likely to have implications for storage?

Professor MacKerron: We have looked at that on the committee. We have made the initial assumption that the spent fuel from any new nuclear reactor programme would not be subject to reprocessing, to separating out the plutonium, the uranium and various other fission products. If that were the case then the waste from a new build programme, let us say notionally of 10 large reactors, would increase the total volume of spent fuel to be managed by of the order of five times, but it would only increase the volume of waste across the board by about 10%. The reason for that disparity is that historically we have nearly always reprocessed spent fuel so that the spent fuel turns up in the form of plutonium, uranium and intermediate level and other wastes. If it were not so reprocessed in the future it would be concentrated as spent fuel, but there would be only marginal additions to the other categories. Of course, we do not know whether or not the spent fuel would be reprocessed, we made that initial assumption and nobody quarrelled with it. Just to go back to the overall question about volumes: while the total volume might increase by only of the order of 10% if there were a programme of 10 reactors, the total amount of radioactivity to be managed would go up by a factor of about three. Both those figures are misleading. It does not mean that because the radioactivity goes up by a factor of three that the problem is three times more difficult; nor does it mean because the volume only goes up by 10% it is only 10% more difficult, there is something in-between those two numbers. The interesting thing is what is the footprint of that waste relative to existing waste, and the answer is it is somewhere between those two rather extreme figures. I think both need to be borne in mind in thinking about the scale of the issue that would be raised.

Q448 Mr Clapham: Obviously when Government is thinking in terms of making the decision, how far do you think we must be down the line towards actually making a decision on the solution of geological storage before the order is given to go ahead with the new build?

Professor MacKerron: It is very hard for us to say. That is the kind of political question that is somewhat beyond our remit. The only thing I would say is, as I said to the Chairman earlier, although we have had reasonably favourable indications from Government that they quite like our recommendations, you have to bear in mind that we are an advisory committee and our constitution does not allow, I am glad to say, advisory committees to make policy. Clearly Government will have to endorse the policy if it chooses to do so, and it will then, no doubt, choose to move some way down that path in order to implement it. When the problem is in some sense managed is very much a political decision. Clearly our recommendations do not solve the problem, our recommendations are the first step in what we think will be quite a long process, and we hope very much it will be successful but it will still be a long process, of managing the waste into the future.

Q449 Mr Clapham: And an extremely costly one. We are talking in terms of £90 billion at the present time for decommissioning. There has been a figure of £20 billion suggested, and it may well be in excess of that, for the storage. Can we afford it?

Professor MacKerron: There is a question of what we can afford to do if we do not. If we take the current state of radioactive waste and think about its safe and secure management into the future there is a certain irreducible need. If we were to decide nationally not to go for disposal but to continue to store, there would still be very large costs and, of course, they would then be costs that would impose themselves on future generations to a larger extent because if you continue to store and refurbish or rebuild stores there are significant costs there and they would then be ongoing for many decades, and possibly even centuries. One of the advantages of a geological disposal option is although it will still take time, it means that the generations closest to those who have benefited from the original activity will still be bearing most of the cost, both in terms of financial and radiological impact, and further future generations will be exempted from those costs, and under the 'polluter pays' principle we think that is a rather good idea, but we still recognise it is a lengthy and, as you rightly say, costly process.

Q450 Chairman: Can I clarify a couple of things before I bring in Tony Wright. At the risk of being pedantic, what you are saying is the high level waste increases which would be associated with a programme of new build are largely the product of ending reprocessing rather than the build itself.

Professor MacKerron: What will happen, we think, is if there is new build, as with any existing reactor, you get spent fuel. Most, if not all, pretty much all, of the high level waste in this country is contained within the spent fuel. Sometimes through reprocessing it gets separated and the stream known as high level waste is then solidified and made into glass blocks and left to cool for some time. If you do not reprocess it then all that high level waste is contained within the matrix of the spent fuel. The

19 June 2006 Professor Gordon MacKerron

amounts of waste you produce are very similar, we think, to any potential new reactors from the amounts of waste that you produce from existing reactors, it is just the form in which they show up and need to be managed is different if the choice in the future is not to reprocess them.

Q451 Chairman: You did also say, if I heard you correctly, that new build would need its own waste assessment, I think that was the phrase used. Can I just ask you to clarify that.

Professor MacKerron: The very minimum thing you can say is that there is an existing statutory requirement to justify any new radioactive practice which requires an assessment of the justification for that practice. Clearly one of the things that would be done if there was new build would be the creation of radioactive waste and the existing legislative framework requires that that be assessed. How big that assessment would be and what form it would take would clearly not be for us to determine, but what we do want to be sure is all our recommendations are not, as it were, a green light to saying it is easy, you can just stick it in the CoRWM repository because we know that people may wish to argue the ethics and the politics of the creation of new waste because there is always the alternative in relation to new wastes of not creating them, of using some alternative energy source which creates no new wastes, and that is ethically and politically a different question from the inevitable need to manage existing wastes.

Q452 Chairman: It means by a process of *reductio ad absurdum* that the work you have been doing up to now, quite understandable—again this is not a criticism of you—refers entirely to the legacy waste, which has to be dealt with anyhow, and is therefore completely irrelevant to the main Energy Review itself.

Professor MacKerron: I do not think it is completely irrelevant because clearly if it were the case that Government decided in favour of our recommendations and moved ahead with them there would be some movement in the management of legacy wastes and it would be foolish to imagine that would not have some impact on the political debate, and I would expect it to do so. We are keen to say, because it was the basis of our being set up, that fundamentally our recommendations are in specific terms about legacy wastes.

Q453 Chairman: Of course, how you charge for any additional use of a very expensive capital facility is quite an interesting decision for the Government too between marginal costs.

Professor MacKerron: It is a very interesting decision and one that will have political as well as economic elements, I imagine.

Q454 Chairman: The cross-subsidy could go in either direction.

Professor MacKerron: Undoubtedly it could.

Q455 Mr Weir: On what you were saying about the impact of new wastes, would that make a difference in the way the repository was formulated and how a community might look at it if they were looking at whether to take a repository? I imagine that with historic waste there would come a point where that would be it, there would be no more going on, but if a repository was taking new wastes for many, many decades to come you could have new waste coming in, transported into that repository, and ever growing.

Professor MacKerron: That is an issue which we have looked at. We looked at the case of Finland quite closely. We are very strongly of the view that if a community is negotiating a package in which it agrees to be the host for a deep repository, it would need to know the extent of the inventory they were signing up for, how much waste they were going to get. If there was then a decision later that more waste would be created and there was a desire to use the same facility for those wastes then we are saying you would have to go back to that community and try to renegotiate the total inventory and accept that you may or may not be successful. The Finland analogy is that the initial negotiation with a community that has agreed to host the waste is purely for legacy wastes. Subsequently Finland decided to build a new reactor and another negotiation took place in which the community then made a second decision that it was willing to accept the waste from the fifth Finnish reactor as well. We think the process in the UK would be an analogy to that in negotiating with host communities here.

Chairman: That is very interesting. You may need to put your different hat on for these questions.

Q456 Mr Wright: I think this might be one that you have not got a hat for. This is on wider new build issues. Quite clearly this is an important topic we are concerned with within the Committee. Witnesses have emphasised the importance of long-term carbon pricing and the creation of a level playing field for creating the incentives for nuclear. The industry in particular has said that it does not want Government subsidies or guaranteed prices. Do you think that carbon pricing is the way to finance new nuclear build? Do you not think it will prejudice investors against technologies that are not market-ready but could play a role in the longer term?

Professor MacKerron: I will take off my CoRWM hat now and put on my hat as the Director of Research Group at the University of Sussex, and let me make that absolutely clear. I have not been studying this issue for the last several months because I have been very busy with CoRWM but I have looked at some of these issues in the past. It is very difficult to say what would work and what would not work. It is very difficult to calculate what the financial risks would be of new nuclear build. I have also heard that industry representatives say they do not wish to have subsidy and I imagine that Government would not be anxious to offer such subsidy. I have said, and on the public record, that I

do think there are important questions of the kinds of guarantees or, for example, the capping of liabilities that private investors might wish to see if they were willing to make such investments, but I am not in touch with that community. I have not researched it recently but I imagine there would be an important question on the terms under which an agreement might be made if private investors were to be willing to reduce the risks to a level that was commensurate with the return they thought they might get.

Q457 Mr Wright: The Sustainable Development Commission has told us how it fears a decision in favour of nuclear will lock us into a centralised grid network. Is it possible for the Government to pursue a policy in favour of both nuclear power and also microgeneration?

Professor MacKerron: It is possible to pursue both, and up to a certain point. A lot depends upon the extent of any future commitment there might be. If there was a commitment in any way like that which the French Government made in the 1970s which ended up with about 80% of their electricity coming from nuclear then you would have to say once one got anywhere near the level of commitment to nuclear it would be impossible. You could run the two things in parallel in my opinion for some years, as long as you did not commit very large amounts contractually to the construction of a large number of nuclear power stations upfront, and whether the Government would ever do that or not I cannot tell you.

Q458 Mr Wright: What sort of percentage would you consider would be a large number in terms of electricity generation?

Professor MacKerron: It is very difficult to give you a number. If it were the case that the Government made an upfront commitment to the building of 10 large reactors, which is the kind of thing that elements of the industry have said for some years might be desirable, then that would clearly be a serious discouragement to other ways of managing networks if it were really a contractual commitment that was adhered to. I would have thought that would be a fairly financially and economically risky path, but of course it might be taken. Anything significantly short of that would allow you to pursue different options simultaneously for some time to come, and a reasonably risk-averse government probably would not wish to close too many options too quickly.

Q459 Mr Wright: Finally, do you think a programme of new nuclear build would displace current efforts on renewables and energy efficiency?

Professor MacKerron: Well, it is very hard to say. It depends on the context. A programme of new nuclear build might be accompanied, and I speculate entirely here, by some reinforcement of the incentives given to renewables precisely because Government might fear that commitment to a nuclear programme might act on its own as a disincentive. It is very difficult to say because

Government is likely, one hopes, to think of these things as a package and not just a commitment, if it is inclined to make it, to nuclear power. I think energy efficiency is more likely to be some sort of discouragement because I do think that in cultural and social terms a message that somehow nuclear power will look after the problem and it will be done in a centralised way with lots of Government involvement might seem to send a message that personal and individual responsibilities, and community responsibilities for carbon emission reductions, including energy efficiency, were less important. These are difficult things to contemplate. I would say as a basic answer that much depends on whether Government reinforces the material and other incentives for things like renewables and energy efficiency at the same time because I do not imagine it will make any commitment in a policy vacuum.

Q460 Chairman: Those were very helpful general answers at the end. Before I ask my final question, is there anything else that you would like to share with the Committee wearing whichever hat you choose to put on to make your point?

Professor MacKerron: Thank you very much for that liberal offer, but no.

Q461 Chairman: I say this to a former adviser of the Committee so you know the form.

Professor MacKerron: I do. Thank you very much for the opportunity. With both hats I have covered all the issues I wanted to communicate to you and I thank you very much for the opportunity to do so.

Q462 Chairman: Can you just indulge me in one last detail. I have been intrigued by some of the press reports I have read about the difficulties involved in these long-term waste issues, communicating to future generations hundreds, nay thousands, of years hence what actually lies beneath their feet in the deep repositories, and speculation of the need for nuclear priesthoods that pass on the secret from generation to generation, new languages, new iconography to warn future generations. Has CoRWM spent much time looking at this issue?

Professor MacKerron: The short answer is no. If I may expand on it slightly. Clearly CoRWM would not have had as clear a view as it has broadly had in favour of geological disposal as a kind of endpoint to the process had it not had quite robust confidence in long-term safety. We know that there is no way in which you can guarantee priesthoods or other communities in existence for even a few hundred, let alone a few thousand years. I think our recommending geological disposal is based on the notion that you would not need such a priesthood or such a system of iconography or other things because, although one can never be certain of anything, there is pretty good assurance that the risks to generations literally hundreds of thousands of years into the future are so small that they would not need those kinds of systems which, again, as I say, nobody in this generation could remotely guarantee would still be in existence.

19 June 2006 Professor Gordon MacKerron

Q463 Chairman: So memory fades, paper perishes, CD-ROMs decay, you are not concerned at all about the historic record of what lies there?

Professor MacKerron: We are concerned and we will almost certainly recommend that for as long as institutional control persists there should be a monitoring system to show, and hopefully reassure, people that there is no impact on their health from the existence of a deep repository, but we also know that it is impossible to guarantee it. The only thing I would say is that radioactivity decays as well. Beyond a very few thousand years into the future, long as that may seem, the total level of radioactivity coming from such a repository would have declined

very significantly, and in a million years—a long time—it will have decayed to levels that are of almost complete insignificance. One should bear in mind that although it is a very hazardous material it does actually decay and the hazard does reduce gradually over time.

Q464 Chairman: So no CoRWM based competition for some new design to warn people of the dangers?

Professor MacKerron: We have other internal competitions but that is not one of them, no.

Chairman: I would love to pursue that with you but I think I had probably better not. We are very grateful to you, thank you very much indeed.

Tuesday 20 June 2006

Members present:

Peter Luff, in the Chair

Mr Peter Bone
Mr Lindsay Hoyle

Mr Mike Weir
Mr Anthony Wright

Witnesses: **Mr Alastair Buchanan**, Chief Executive, and **Mr Steve Smith**, Director of Markets, Ofgem (Office of Gas and Electricity Markets), gave evidence.

Q465 Chairman: Gentleman, it is a long way away for such small numbers on both sides of the abyss, but I am sure that you, being expert witnesses, are not put off by the distances. Despite the fact that we know you both so well, would you please do the usual courtesy of introducing yourselves for the record?

Mr Buchanan: I am very happy to do so. My name is Alastair Buchanan and I am the Chief Executive of Ofgem.

Mr Smith: Steve Smith, and I am Managing Director of Markets at Ofgem.

Q466 Chairman: This is an important evidence session to us, because obviously you touch on all the issues that we are looking at as part of the Energy Review, but, nevertheless, I think it is quite a straightforward one. Can I ask a sort of philosophical question first, I think philosophical with a small “f” (*sic*), in the sense that you were set up primarily to engender competitive markets, it is competition that lies at the heart of your business, but here we are now with energy that deals with other issues, carbon reduction issues, security of supply issues, which seem to be at their heart. Do you see a conflict between your perceived main function to keep prices down for the competition and these other issues which lie at the heart of the Energy Review? What is your response to that?

Mr Buchanan: Thank you for the question, Chairman. You are right to point out that Ofgem in the last five years has really changed shape. It had to change shape quite a lot. If you just look at some of the events in the last five years: in 2003 we were given guidance by both secretaries of state of DTI and Defra on environmental and social issues and then, in 2004, we were given a sustainability duty and there is a private Member’s bill, which you are well aware is working its way through, where microgen will get more emphasis than it has in the past from Ofgem. Therefore, our statutory remit has changed, and we often ask ourselves: do we feel competent to handle the range of economic and also environmental and social issues, and we feel, in a way, that we are quite happy to be judged on what we have done rather than give you platitudes about, “Yes, we find that very easy.” As far as our bread and butter work, which as a regulator is to set the prices for the wires and the pipes, we feel that we have shown that in the last couple of years, but particularly on the sustainability front. In order to facilitate the Government’s desire for renewables, we fast-forwarded the price regulation for four major

upgrades on the network. £600 million has basically been put down by Ofgem as a front-up payment. The fact that there are planning problems delaying the delivery of that upgrade of the network to deliver essentially the renewable power from Scotland to the demand load in England is an issue of planning, but the money and the work that Ofgem has to do have supported that. In the other price review that we have done in the last couple of years, which is on the low-voltage electricity network, there, for the first time, we took account of undergrounding as well as overgrounding, we took much more account of losses and we also made specific provision for distributive generation, local generation, we have created a greater incentive within the package now, a higher rate of return, for companies who are looking at those kinds of issues. So, in our bread and butter work, which, as I say, is pipes and wires regulation, I think we have been very minded to it. If I can pick up your first comment and confirm that competition, which under section (3) of the Utilities Act is our primary driver, where appropriate, remains very much alive and well within UK energy markets. I looked at the most recent figures that we had from Steve’s team a few days ago and we are now looking at around 600,000 consumers switching gas on a monthly basis and about 450,000 electricity consumers. That is a very attractive churn rate. It is encouraging, because obviously the prices have gone up, and one of the messages we wanted to give domestic consumers is that given that your bill has gone up (and obviously this is not good news) from around £700 towards £1,000 for dual-fuel families, the ability to take advantage of that by going out and switching your supplier is good news. So, on the retail end, we think there are still active signs of competition. At the wholesale end, again, the good news is that we have got a lot of investment coming into the gas infrastructure network, as you are aware, we have got effectively nearly 100% more investment for gas inward infrastructure being put in, £10 billion worth of investment, from a range of players, but we also have a range of players wanting to come into our market place ranging from Sonatrach in Algeria, Gaz de France, Electricite[acute] de France, DONG in Denmark, of course, and Gazprom have opened up a trading arm as well. So, when we look at the marketplace, do we see active competition? Yes, we do at both ends of the market, but in terms of trying to espouse our additional duties, we also take that very seriously and feel that we can point to examples, as I have given you already, where we feel that we are doing

20 June 2006 Ofgem

that. We feel fairly comfortable and, as we say in our executive response to the beginning of our submission, we feel that our duties make us fit for purpose. I would be very interested in your views as to whether you think that is a fair statement by us.

Q467 Chairman: One question to make that clear. Six hundred thousand gas customers a month are changing supplier?

Mr Buchanan: Yes.

Q468 Chairman: That is 7 million a year.

Mr Buchanan: We are seeing that switching rate at the moment, and it has shot up. What is very interesting, if you look at the chart—I could not bring the chart with me but it will be in our next report which is due out quite soon—you will see over the period from September through to March, a very encouraging shoot up in the chart, and I have assumed, and Steve will be able to confirm that, is that the price increases that went through last September, which you will remember were in the region of 20%, I think have generated a much more active approach to switching than we have previously seen.

Q469 Chairman: That was a very interesting expostulation, but I am not entirely sure you have answered my question. I think probably you did, but I want to tie you down specifically. You see no conflict between your primary duty of bringing more competition and the main objective of the Energy Review, security of supply and carbon reduction?

Mr Buchanan: We have not felt constrained by that to date, no.

Q470 Mr Hoyle: Do you think the price spikes of recent years reflect a failing electricity market?

Mr Buchanan: I think what has happened in terms of the price spikes is it has effectively been driven by the gas market, and I think what we have seen within both markets is a degree of anxiety premium coming into the marketplace. Why are you getting that anxiety premium? Quite crudely, on the gas side, as sadly we know through last winter and potentially through this winter, we are going through a period of tightness in terms of supply and demand. This winter's prognosis would effectively read 100 bcm of demand—100 bcm of supply in the tight scenario, if you wanted to take a tight scenario—so we know that there is a degree of tightness and, therefore, to a certain extent, you look at the trading up within a traded marketplace of the premium, the traded premium, and when we look at the price increases between last winter and this winter, it is essentially 64 pence a therm up to, as of yesterday, 85 pence a therm for next winter, about half of that you can accommodate for the increase in oil price, but the other half looks as if it is a traded anxiety premium, which you do get within a marketplace. I have long felt that possibly within the energy markets there has been a lag effect from the collapse of a number of traders like Enron, like Mirant two or three years ago, which made the credit agencies set some quite tight controls and, therefore, I think that has a

squeeze effect, because above a certain price (and typically it has been 40 to 50 pence a therm) there is not that much liquidity, therefore what liquidity there is becomes even more affected by the physical price squeeze. When we look at the price movements in recent years, you can generally see what has caused the price increase. One of the hobby horses of Ofgem, and I think an area, I hope, where you would agree we have done some good work, is that we have been profoundly confused and concerned, as far back as November 2003, as to why the arbitrage between Europe and the UK has not worked, but the best example I can give you of that arbitrage not working happened in March of this year. On March 13 this year, which I am sure a number of your previous speakers have spoken about, the National Grid was effectively forecasting a demand of 386 mcm with a demand to meet that of 377. That was for the following day. What was interesting was that the following day what we saw in that moment was effectively a price increase of 100p a therm; so you are looking at prices of around 185 pence a therm. What was staggering was that coming across the interconnector at that time was just 25 mcm. If you went back two weeks earlier, no crisis, no squeeze, the interconnector was delivering around 40 mcm a day and the price was just 58 pence a therm. So, you look at that and say, "What on earth was going on?" If you are a European supplier, and we know that the interconnector can carry 40 mcm across, why did it not? There may be very good reasons, but one of the reasons that Steve and his team have been going round Europe and knocking on doors and trying to find answers and trying to push the Commission is because we have not got the answers, and when an arbitrage that is so bizarre like that is effectively being ignored, then it does lead to some fairly major questions. To answer your question succinctly, I think when we look at the prices that we can take a judgment on, we can normally find a reason as to why it occurred. When we come to Europe, frankly, we are left asking questions and seeking answers. Steve, do you want to answer a bit more about what you found on your recent trip around Europe?

Mr Smith: Sure. I think that there are plausible stories from many of the European suppliers on the point of particular problems at particular times, or problems on pipelines or things they wanted to do with storage, but it is very difficult to get cold, hard data from them, and in the absence of cold, hard data that are published that are auditable, in some sense you are taking what they are telling you at face value, and that is why our drive has been to get the same level of transparency on the major European networks as with the UK network. On the UK network you can see how much gas is flowing and it flows on particular pipes, and if it falls below levels you see historically, you can pick up the phone to BP, or whoever owns the pipe, and say, "What is going on?" The trouble is you do not have that same level of transparency in Europe. We have heard plausible stories, but, as I said, we are taking a lot of trust in those discussions.

Q471 Mr Hoyle: Would part of it not be that, in fairness, in Europe there is much greater storage facilities with gas, and, therefore, the spikes have the

20 June 2006 Ofgem

output capacity use the reserves, where we do not have that, and this policy of ‘just in time’ that seems to operate in the UK works against the consumer and in favour of the energy companies?

Mr Buchanan: Your statement is right insofar that, as far as storage facilities are concerned, we use about 100 bcm and we have got storage for four. France has storage of about 12 for a gas demand of about 47. So you are right. If you look at Germany or France, there is more storage facility. One of the concerns that Steve was touching on just now is that we do not know what happens within that European storage. One of the encouraging features of DG COMP’s progress in Europe in the last couple of months is that they are clearly focused now on finding out whether gas is being hoarded, whether there are contracts that are dubious, and that is where DG COMP is going at the moment to try and identify that. In terms of the ‘just in time’, I think one of the lessons that we take away from this winter and last winter is that you have got to look at it in terms of trying to get some lessons, and we have raised as one of our proposals in the submission that the analytical report preparation going forward, with a view that we may have a similar situation with electricity in eight to 10 years’ time, should start to be much more wide-ranging in its scenario analysis. Had we four or five years ago had a range of scenarios, had we got information, frankly, from the North Sea (and last winter was the first winter we had information from the North Sea players), then it could well have been that we could have taken a view on the tightness of supply of last winter and this winter four or five years ago. Therefore, what we are trying to say is there are lessons to be learnt from this. The tightness has created high prices for consumers, which is not comfortable. Let us try and learn some lessons from that, and we think better analysis, more wide-ranging analysis, without diverting the market is the key. You can do it. You can offer a range of scenarios. What you are not doing is saying, “We, Ofgem, are telling the market what it is going to look like in 10 years’ time.” We are saying, “Take a range of possibilities: microgen being very successful, nuclear being rebuilt, possibly, or other scenarios, and present them to consumers, present them to the public, present them to yourselves, so that people have a much better judgment to make about what is going forward.” In terms of trying to give consumers comfort from this winter and going forward, as you will have heard many times, we are 100 bcm demand, 100 bcm supply, but we will be 180 bcm supply and 103 bcm demand within two years. So, the facilities are there, they have just arrived—let us hope not—potentially a little bit late, and, therefore, we have got to learn the lesson from that going forward.

Q472 Mr Hoyle: Why do the electricity generators not have an incentive to maintain the excess capacity needed to control volatility within the market?

Mr Buchanan: I think this is a question on should the generators have a capacity credit, which we do not feel is something that the market needs. We believe that the generators—and, of course, Centrica on

Friday announced that they are going to build at Langage—we believe that the generators will see the market signal, the spark spread in power in Europe today is about £9 for the UK going forward and, consequently, we believe that the generators will make a decision about their own customer requirements, about their own hedging on supply generation requirements and on pricing requirements to build the power stations in time. There is a large amount. We have added up potentially 15 gigawatts of power plant could be lined up to be built in the next 10 years. A lot of that is section 36 already and, consequently, we do not believe a capacity credit needs to be brought into play. If a capacity credit were to be introduced, I do think you would have to be very, very careful about the mechanics of such a credit. Will it be introduced for all players? What do you do if a generator takes the capacity credit and, effectively pays that capacity credit by way of dividend to its shareholders? There are a whole range of issues that you need to address but we do not think it is needed, and, as I say, I think the Centrica announcement on Friday was extremely timely in terms of saying, “Look, there is a reserve margin of 21% in this country at the moment, so last winter, on the coldest day of the year, you had 60 gigawatts of demand, you had 75 gigawatts of kit but there were three gigawatts of mothballs beyond that”. That is not a tight situation for supply and demand on power stations, so do you need to give the generators, who somewhat unkindly although possibly fairly say, “We have already done extremely well out of free allowances on the EU ETS scheme”, yet more money to do their job, which is to build and run power stations?

Q473 Mr Hoyle: That leads me into the next question. Why did you abandon the capacity provisions under the previous electricity Pool arrangements?

Mr Buchanan: Effectively the old Pool mechanism was made up of both a capacity and a variable element, but I think the real concern about the old Pool market was that it was effectively giving the generators, who were striking the variable price off their marginal plant, too much control over the price against the consumer. Therefore, what the new electricity market arrangements, which are now, what, six years old, effectively did was to create more of a bilateral arrangement between the consumer and the generator, thereby effectively giving more power to the consumer but under the old Pool mechanism.

Q474 Mr Hoyle: You mentioned what could come on-stream within the next 10 years. You did not mention what is going out of the grid within the next 10 years, whether that is coal or nuclear. Therefore, it is slightly a false picture you have given us because you did not give us the downside; you have only given us the upside.

Mr Buchanan: What we do talk about in here is the potential for an electricity supply gap in the mid teens, but you are absolutely right, there are a number of really big issues to be addressed. On the

20 June 2006 Ofgem

nuclear side, I think one of the main issues to be addressed is the fact that if you look at the DTI's original Energy Review paper from January, they effectively were making the assumption that we will go from 20% nuclear to 7% nuclear broadly by 2020 and that only Sizewell will be left from 2023 onwards. That is a very interesting analysis, because it is assuming no life extension at all. Dungeness, which has not had the greatest track record as a power station, has recently been given a ten-year extension of life, that is 2008 to 2018, and the next two plants which are Hunterston and Heysham B, will be looking equally for life extension. What is interesting is when you look at the life extension of the AGRs, unless there is a profound problem with the graphite core, and I was up at Torness a couple of weeks ago and there is no evidence of that. We are still looking at UK nukes closing in the broad band of 30 to 40 years. If you look internationally, America has now effectively 35 power stations licensed for another 20 years, running to a 60-year life. In Holland recently the Bessel nuclear power station is seeking life extension from 2013 to 2033. I think one of the first jokers in the pack is the supply and demand through the next 10 to 15 years. Will the nukes get another ten-year life? In fact, will they get more beyond that, or will there be a problem with the graphite core? At the moment the assumptions are based on the plants closing on their accounting date. The second issue is on coal. I think there has been a lot more clarity recently on coal. What we have got effectively is a fleet of 24 gigawatts of coal-fired power plants and, broadly, 11/12 gigawatts of that have flue gas desulphurisation (FGD) equipment on it, another seven gigawatts have been acknowledged to have FGD pull on it and, therefore, you are right to say we are going to see coal closure, but it is not going to be the 24 less 12, and we are going to have to see how that that coal-fired plant tails off as we go beyond 2015, 2016 with the LCPD cutting in on the coal-fired plant that did not opt to put emission control equipment on it. Just as a fillip to that, two things that have caught my eye recently. One is that Scottish Power have said that Longannet is going to run well beyond 2020—I would be very interested how many analysts have got that in their calculations—and Scottish and Southern announced yesterday they are looking to increase the capacity of Fiddlers Ferry. I think it is very difficult looking forward, but this is exactly the reason why (and if Ofgem is to blame we are happy to take some of that blame) I think the forward looking analysis has not been broad enough and it has not been forward looking enough in order to have this kind of debate so that we can come to a sensible view looking at the range of scenarios as to what is likely to happen in the next 10 to 20 years.

Q475 Mr Hoyle: Because it is interesting, on that point, that Powergen and people like that are trying to extend and get another 15 maybe 20 years out of coal-fired power stations in order to appease the shareholders, at the same time ensuring that they have got a further electricity decline without it being taken into account. Is that fair?

Mr Buchanan: I did not get the beginning.

Q476 Mr Hoyle: Powergen. Obviously the life expectancy was more or less that they should be up now?

Mr Buchanan: Indeed.

Q477 Mr Hoyle: But because they were so well built they are extending that by another 15, 20 years. One it appeases the shareholders, but obviously it is more electricity into the grid that was not expected?

Mr Buchanan: And maybe pieces of plant that we are very glad to have, given the renewables and the intermittency of renewables that we have. Steve worked at Fiddlers Ferry and Ferry Bridge and one of the things he has always talked about is how well the plant was maintained.

Mr Smith: There is a common misconception, as you allude to, in a lot of these plants that just because they were built 40 years ago— Fiddlers Ferry and Ferry Bridge, pretty much every moving part that is there has been replaced over a period of 20 or 30 years. The only thing in the power stations that are genuinely 40 years old or 35 years old are the chimneys, and most architects and engineers will tell you that the chimneys made of brick will probably quite happily stand there an awful lot longer. I think you have to be careful. The date that a station was built tells you very little about the condition of the station. The real issue is how much CAPEX has gone in. As Alistair was just saying, if you look at Fiddlers Ferry there are a huge number of plans there and things you can do onsite to bring additional generation on. I think SSE has recently announced for two units that it is fitting FGD, it is looking at super critical boiler technology and it is relatively easy to retro-fit things like that. I think you are right, there is huge optionality in the fleet and you should not just look at the age of assets and say blindly they are going to come to an end of their working lives because they are 35 years old. It is just too simplistic.

Q478 Chairman: We have got a few more questions to ask you about this before we come to supplementaries, but what you have just said is very significant. We have had hints of the extension of plants in evidence up to now, but you are actually painting a very optimistic picture of possible plant extensions which changes the whole basis of the Energy Review?

Mr Buchanan: I am not trying to paint an optimistic picture, I am just trying to provide a scenario, and there is another scenario that is linked to that, which is that British Energy might be able to achieve longevity of its assets by actually reducing its terawatt hours output on the plant. In other words, if you reduce the pressure on the plant you might get longevity from that, let alone the from the NNI saying, "Yes, we can give that another 10 years." So there are two aspects of longevity of a plant, one is simply "This is still a silver-plated plant, you can have another 10 years." The other is, "We are going to reduce the pressure on the plant to give it a further life." I think there are two aspects.

20 June 2006 Ofgem

Q479 Mr Wright: You have given very full answers to the questions, but merely in terms of clarification a couple of points. In terms of the excess capacity, what level do you think the market should hold? You talk about in the future it has got to be 100 bcm supply with 103 bcm demand. What sort of level do you think there should actually be within the market itself?

Mr Buchanan: I think the interesting feature here is, if you look at some of the analysis done by the specialists in the area, the extent to which the 180 bcm versus 103 is going to create downward pricing pressure. Then I think the question that is being asked in houses like Woodmac specialists or in the cities is will the price fall to the European level, which would be very nice because there is a 20 to 30p differential, or will, in fact, the price, because of the sheer weight of supply, go lower? At the moment I think it is fair to say that our stopping point is that we think the price will go to the European price and then I think features like global LNG pricing could come into play as to what is going to drive the price thereafter. Will we become linked to a European price? Then, the really important mandate which the Commission has taken on, and it has always been our beef, is that because of the decline in North Sea gas we have had to take in European gas which is linked to an oil indexation and effectively a super profit contract for the Europeans. We have had to pay that price. Our anxiety has been that in 1997 we restructured the British gas industry to ensure that those margins were driven out of the gas contracts, and what we are very hopeful that the Commission is doing—as you know they have raided E.ON and RWE and, in fact, they have gone back to E.ON for a second bite—is that they are looking at those contracts in detail and both the Federal Cartel Office within Germany and the Commission are clearly focused on these contracts. Why that is important for UK consumers is that, if we do find that our price is becoming linked to a European price, what we then want to see is that the European price is the genuinely best price or the finest price rather than a long-term contract structured with a margin inside that long-term contract which the British consumer is then having to effectively honour in order to get hold of gas from Germany.

Q480 Mr Wright: Is there a particular level that you think the capacity, the market, should actually have? As I said, we have talked about 180. Do you think it will find its own level in terms of the pricing structure?

Mr Buchanan: I think to a certain extent it will. One of the important features about forward analytical work, if Ofgem becomes involved in that, as our recommendation to DTI, is that we do not actually come out with what the right answer is. What we do say is these are a range of scenarios going forward, but I think it would be quite inappropriate for an organisation that is meant to get the best deal for consumers through competition in markets to actually tell the market how it should sort itself out. Quite clearly from the consumer point of view, we want the best price.

Q481 Mr Wright: Following on from that, I take it that you do not believe that the market or the industry itself needs any incentive; it is already there?

Mr Buchanan: I do not. I had the good fortune to chat to some Scottish Power senior managers a few weeks ago at one of their conferences. At the moment looking at the price increases for consumers you can see the externalities within that price increase. One of the interesting pressure points, I think, for the utilities in particular to understand is that when prices start to fall because of this forward supply/demand relationship in gas, which will feed through to electricity, if the retail prices do not fall, that is when Ofgem become very interested in what is going on in the marketplace.

Q482 Chairman: We have been veering between gas and electricity in the last 20 minutes or so. Can I ask you the questions Tony Wright has asked you about gas in relation to electricity? What level of excess capacity do you think the electricity generation market should have in it?

Mr Buchanan: To a certain extent we can use a bit of empirical evidence for electricity, given that we have had the market now in place for six years. In 2003, actually when I came into this job, which was a wonderful welcoming present, as you can imagine, the prices had fallen from around 28MWh down to 14MWh, which obviously caused British Energy severe distress. What also happened with that price decline, and it will not surprise you, is that the reserve margin had fallen from around 30% and bottomed out at 16, and at that moment the market commentators were saying, “We have made a terrible mistake. This new market is going to carry on below 16. There is a problem.” In fact what happened was that the price, you may remember, picked up quite quickly and bounced back from the £14 base up north of £20, and literally within a few weeks we had plant coming back on to the system and, since October and November 2003, the National Grid has continually reported reserve margins of 21 to 23%, and that is where we are at the moment.

Q483 Chairman: Given what you said earlier about possible life extensions of generating capacity, you are not as pessimistic as some people about the problem that excess capacity will be there in the future?

Mr Buchanan: I think how Ofgem can help going forward is either working with the Government or working on its own to provide scenario analysis going forward so that the market can take its view.

Q484 Chairman: You say “the market”. We have had very compelling evidence from Dr Dieter Helm, you might be aware of it, where he argued that we should create a capacity market and attach it to the emissions trading round, because there was no logic in a capitalist providing excess capacity because that was just a waste of money. You are obviously not in agreement with that.

20 June 2006 Ofgem

Mr Buchanan: I do not agree with Dieter at all in that area. We fundamentally agree with him on carbon trading, as we say in our report, but I am afraid when it comes to the market I am very unhappy with Dieter and we had a bit of a set-to in Paris a few weeks ago on this. Dieter's argument going forward is largely based (if you listen carefully, as I am sure you did, to his arguments) on the fact that there was very little investment in generation post the CEGB's demise with the argument, in fact, that Sizewell was virtually the last bit of kit built. That ignores the 40% of power station capacity today which has been built since 1990, and it is also predicated on us, the network side, having a network that is about to fall apart. Again, there has been effectively 30% more investment in the network in the 15 years post-privatisation than the 15 years before, and Ofgem and its predecessor body Offer have effectively nominated £20–24 billion worth, perhaps nearer £24 billion worth, of capital expenditure into the system. So, when I look at Dieter's argument, it can only work on the generation side if you effectively put forward a case that the market is bust. If the market is bust, then you have to do something pretty dramatic, and it may be a lot more than just capacity credit, which is a rather nice thank you for the generators. My view is that the generators on the current sparks spreads, given their responsibility for those that are vertically integrated, given that it is a market that they understand, I would be amazed if the generators do not build. We have got Marchwood on the stocks, we have got Langage now on the stocks and we have got plenty of other plant. If I can slightly draw from where I spent 20 years of my life, which was analysing companies from a financial point of view, and I do not know if you have seen their profits recently, but the companies are making handsome profits. The companies understand how the market works. The companies are going to have an extremely difficult conversation to have with their shareholders if they create a crisis in capacity going forward, because their shareholders are simply going to ask: why did they create a crisis which has led to probably both political and regulatory intervention with almost certainly a new settlement or structure for the industry put upon them? Unless they can argue that a marketplace is so broken that they had to behave in that way, I would be amazed that that is in the interests of their capital providers. So, as you can probably guess, we feel quite strongly about capacity credits. We do not think the generators need it.

Q485 Mr Weir: I was very interested in what you were saying about if prices do not fall later on when there is greater supply available, even if you are interested in it, but if you go to a gas company or an electricity company just now and say, "Why are you putting up your prices?" and they say, "We are making a loss on our consumer division, we are only making money on our wholesale division", or

some other division, as some excuse for it, how confident are you that prices will fall in the future? What time would you give them to reduce these prices before taking action?

Mr Buchanan: You have asked me a question as to how we would react in the future. I think what I wanted to flag up and register with you is that we are on this case and we will be watching this very carefully. In terms of the price increase, one of the unfortunate things, and I am sure the companies who have been to see you have explained this, the companies do have a lagging effect in terms of their prices going up. The companies will also argue that they have not put up the full amount. For example, I may have the figures slightly wrong, but if I do Centrica an injustice I apologise to them, but they calculated that they could have put their prices up by about 25% and they put them up by about 14 or 15% instead. So, the companies will argue that they have tried to take some of the pain. Quite clearly, when you are looking at a company like Centrica, you are also looking at a company that has Rough storage, and storage capacity has been worth a huge amount during tight years and, therefore, the profitability from Rough storage has helped the overall British Gas Centrica Group quite markedly. Therefore, when you look at the numbers you do have to break them down to see where they are coming from, but I think the important message that we can leave with you is that when we are at that point of substantial excess capacity and assuming that a relativity does still exist between Europe and the UK (i.e. Europe is somewhat cheaper than the UK), one would imagine that at a minimum, the price for the UK should drift towards the European price, and you actually see it already on the companies and it is quite encouraging, Scottish and Southern have made a price promise for the year. Quite frankly, within a competitive market you would be expecting some of the sharper companies to be looking to make a proposition to this because, quite clearly, consumers are still switching.

Q486 Mr Weir: I am not sure I fully understood that answer, to be perfectly frank. Are you accepting then the argument put forward by Centrica in particular that we must look at their profit from the consumer position separate from their other profit and decide whether they are overcharging?

Mr Buchanan: We do not analyse the companies' margins from the different parts of the business, what we look at is the behaviour of the marketplace, the behaviour of the retail market, the wholesale market, but I will be comfortable with what is going on within those markets. If we are looking at a retail market where we know that there is massive surplus capacity and we know that the price is substantially above the European price, then, if prices are not falling in that environment, it should lead to some quite interesting questions being asked in a regulatory way.

20 June 2006 Ofgem

Q487 Mr Weir: So the determining factor is the market, not the profits the company have been making at any given time?

Mr Buchanan: That is correct.

Q488 Mr Weir: So, Centrica could be making massive profits, ever increasing profits, but if you thought the market was reflecting the price they were charging, you would be quite happy?

Mr Buchanan: Effectively we would assume, and you may say that is naive, that a competitive marketplace would not allow a very large margin to exist for a long time because another company would come in and undercut them and take their customers away.

Mr Smith: That is what is going on. We publish an analysis every quarter on retail pricing, and Centrica at the moment is the most expensive dual fuel provider for direct debit and PPMs across every region of the country; so the simple answer is that we have done a lot of work on the media, as have energywatch, and we are saying to people, "If you do not like Centrica's pricing, there is a simple thing you can do as a customer, which is to switch, and you will save." In Centrica's defence, there are some of Centrica's customers who went into some of their fixed-term pricing who are now doing very well, and people who a year, 18 months ago took advantage of their offers of fixing their prices for two or five years are now getting a very good deal. The simple fact is that if Centrica's profits are going up and you are worried about their pricing, go and have a look as a customer, see what they are charging, and our recently published analysis suggests, particularly with Centrica, that you can do better by switching away, especially if you are a good customer, and you can save £100, £150. As Alistair is saying, you would expect over time customers to do that. I do not think there is any secret, in the last year to 18 months Centrica has lost about 6 or 7% of the market, which is 10 to 15% of its market share. So, customers clearly are voting with their feet and at some point Centrica is going to have to ask the question how it positions itself and how it prices in that competitive market when you have got three or four companies that are quite aggressive at the retail end, and pricing is significant when it comes to Centrica, and are attracting customers. SSE in its recent results announced it has gone from 2.2 to 6.7 million customers in four years just through having an aggressive pricing policy; so there is quite a lot of evidence in the domestic sector that there is a lot of churn and some quite dynamic pricing and the competition is real and, in fact, affects the companies' profitability and their decisions.

Chairman: These are important issues but they are just a little bit outside our narrow remit.

Q489 Mr Bone: I want to take you back to some evidence you have just given to make sure that I get it clear. First of all, in the evidence you said the European price was different. I always thought we were in Europe, so that is a point you might like to clarify. You are talking about Continental Europe.

Mr Buchanan: Yes.

Q490 Mr Bone: You also mentioned the price differential of 30p. Thirty pence does not sound much, but if it is between 30p a unit and 50p a unit, that is a huge amount. Could you tell me what the pattern was? Could you deal with those points?

Mr Buchanan: Yes, in terms of what happens for the price, because of the churn, basically, what you do is take the UK North Sea price and that will take you up to about 30 pence, and we saw that last winter. If you had demand in the market of around 300 mcm in a day, you saw the price of around 30 to 35p. What you then do is suck in the European gas, which has the oil indexation, in it. In a tight couple of years, which we have got, you then get the adding machine sucking in European gas to fill our expensive storage facilities, so that the final price you are paying is something more like 64 pence a therm rather than that British price of 30 pence a therm. That is where that differential comes into play, and so that is why. It may sound counterintuitive, but British North sea prices are lower than European and yet the overall prices paid by British consumers are higher. I hope that explains how that works.

Q491 Mr Bone: I think that is probably one of the best explanations that we have had on that point. You are actually saying, "Gosh, it is more than 100% between the two price hurdles"?

Mr Buchanan: It can be because of the storage impact, yes.

Q492 Mr Bone: You talk about this wholesale super price possibly indicating price fixing. This is the bit I have never understood. There was lots of capacity in Continental Europe. We needed to buy it and yet, for some method or otherwise, our European colleagues were paying half of what we were paying. How did that come about, because that clearly is not a normal market situation?

Mr Smith: I think it is about the interaction about the UK liberalising first. Europe went and struck a series of long-term contracts over the last five, 10, 15 years that were on a different pricing basis. Basically, they took a price from Norwegian producers or the Russians and they agreed that that price would be indexed to oil. For a number of years those prices were unattractive for the UK, where the price, even for long-term gas contracts, began to be indexed to the spot price of gas, which is driven by how much gas is there around the UK in any particular day. For a number of years that meant that we were getting lower prices than them. I think, candidly, had people foreseen the rapid decline in the North Sea, then they probably would have been asking the question they are now asking: should they be striking a long-term contract with other supply sources, and some of the European pricing, although probably not oil indexation, began to look attractive, and so you are saying, "Actually let us buy our gas under a long-term contract at a fixed price." I think it is that dislocation between for a long period the UK method of pricing worked well

20 June 2006 Ofgem

for UK customers, it worked well for UK suppliers, but once the North Sea began to decline and we moved into a different pricing world, it ceased to work so well, and we are in that transition period between the two.

Chairman: Peter, pricing is not really the main thrust of our session. I want to quickly pass on.

Q493 Mr Bone: It was not the pricing. It is to do with the capacity here really. It looks as though somewhere someone took their eye off the ball and did not see the decline in the North Sea quick enough. If they had, we would not be quite in the mess we are today?

Mr Buchanan: There is a kind answer and a less kind answer. The kind answer is that the North Sea decline is an art and not a science. The less kind answer is that had we been doing broad-based analysis four or five years ago, we might have seen that. That is why the lesson learnt here for electricity means that we should be starting to try and do that kind of analysis so that we do not get into this position in 2014.

Q494 Mr Wright: In respect of carbon emissions, we ought to look at how we should cover the cost of the carbon emissions, and some people suggest perhaps carbon taxes, carbon contracts, even a nuclear obligation. What are your views on this?

Mr Buchanan: Our opening position, as you would expect, given that we are an organisation that is required by statute to see markets as the solution, is to say that we would very much like to see EU ETS Phase 3 work and for the details of that to be known as soon as possible to provide certainty for the marketplace. You will have heard from virtually every generator, the main reason they are saying they are not going to build is because they do not know what is going to happen to the EU ETS programme after 2012, but what we have then gone on to say in our submission, and it is in some ways similar to Dieter—I did mention that there are some things that we agree upon—is that if, effectively, the carbon agenda is such a strong agenda for the Government, then they may have to take their own action, and we recommend, and I will ask Steve to give you the details of this scheme, a scheme that is somewhat different from Dieter's. We recommend basically a unique UK scheme, but the difference between Dieter's scheme and our scheme is that we have the Treasury acting as the operator of the system but operating effectively with collateral. We have outlined within this report where that collateral comes from. We do not know how popular it is, but we have outlined two sources. The Treasury, effectively, will be sitting on a pot of money as it opens itself up as a market banker. One way is to have an auction from 2008 to 2012 and effectively to take money through auction. The other way is to have a windfall tax, because these are free allocations, and you effectively cull money back from the generators and give that to the Treasury. I think Dieter's scheme, which has a lot of merit, has the possible risk of the Treasury saying, "We are not

prepared to be like a city market-maker taking on this kind of risk of trading between buyers and sellers." Steve, do you want to give a few figures?

Q495 Chairman: Before you bring Steve in, you have referred to that document on a number of occasions. I do not think the Committee has seen it, so could you arrange for us to have a copy?

Mr Buchanan: I am very happy to, yes.

Mr Smith: I think the basic idea is based around Dieter and, indeed, before Dieter, the UK Government with its own UK Emissions Trading Scheme. It is for the Treasury to offer a long-term contract, and it would not just be restricted to the electricity industry. Any company that could demonstrate that it could reduce carbon emissions—it could be large transport companies who were willing to invest in a fleet of low emissions vehicles—would come to the Treasury and say, "These are the demonstrable carbon savings we can offer you and this is how much CO₂ we will save and this is what we want to be paid." The Treasury will then, with its fixed pot of money that it will have from the auction of the emissions permits, buy as many of these contracts as they can at the prices being offered, so taking the cheapest ones, and that would allow us to secure carbon savings over and above the Emissions Trading Scheme alone. Over time, as the Emissions Trading Scheme grows in its coverage and as people get more confident and get longer term allocations, the need to do this will fall away, but it would allow the Government to keep on its path of getting to where it wants to be, and they also have other positive benefits because it encourages innovation in carbon capture and storage or encourages us to invest in technologies that are experimental at the moment. Then, when the Emissions Trading Schemes begins to bite, we may have a technological lead, but that is in essence the simplicity of the scheme. As Alastair said, the main thing we need to know is that there is potentially a pot of money you can access, which is that under the existing Emissions Trading Scheme you can auction up to 10% of permits. We are saying do not give those permits free to generators, take the full 10% off the generators, auction that and, with whatever money you get, buy as many of these contracts as you can.

Mr Buchanan: Rightly or wrongly, we have also put a fuel spin on this, which is by culling some of this money we can potentially use that in some of fuel poverty schemes, which I am sure the Government will be looking at in its response.

Q496 Chairman: Have you recommended that within your document?

Mr Buchanan: Yes, we have.

Q497 Chairman: Do you think the Government should have a role in promoting sustainable development?

Mr Buchanan: I do not say I am cheating, but we have a duty set by you for us in the 2004 Energy Act to be minded to sustainable development, and therefore, frankly, virtually in everything we do now it is a question that we ask. The Authority will ask it

20 June 2006 Ofgem

on most policy issues that we deal with. In fact, on the environmental side, within our cost benefit analysis for every project there is a step which we have to go through which identifies what the environmental aspects are on particular policy issues. So, it is completely ingrained into the organisation now. As I say, I think it is something that we do now. I think one of the things that in a way is incumbent upon myself and Steve and others at Ofgem is to explain that a bit more, because there is a sense that, if you go back five years, we were a pure economic regulator. I think we have to give comfort that we can handle sustainability within that economic remit. Why I feel quite strongly about this is that I believe you can have sustainable development within the market, and, therefore, it is incumbent upon us to show that that can work.

Mr Smith: The only thing to add is the discussion about our primary duty. Let us not forget our primary duty is to protect the interests of customers and, it is clear, present and future customers. So, driving down prices today and driving up emissions that are going to harm the future energy customer is going to conflict with the primary duty. I think the primary duty is often misunderstood as being to protect the interests of customers through competition and lower prices. It is not; it is much more balanced than that already. We have to look to the future as well as the current, and so criticism that we are too short-term or just seeking to drive prices down, we would quite properly be brought to account if that is what we were doing, because we would not be behaving consistently with our other existing duties.

Q498 Chairman: Before we move on can we go back to the capacity issue and talk about low-carbon technologies. We have heard from the National Grid this morning that a move to wind power would require an increase in the capacity margin of generation because of the intermittent nature of wind generation. You said you were confident in the market delivering the excess capacity required to give security of supply. Given the massive increase in wind generation, do you think the market would also generate that additional capacity too to cope with that uncertainty?

Mr Buchanan: Yes, I do. I suppose the crude answer is that the market will deliver a price to ensure that that situation will pertain, so, yes, I do.

Chairman: That will do. We are a little short of time, so thank you very much. That is fine.

Q499 Mr Weir: It seems that a decision in favour of nuclear would lock the UK into a centralised energy grid at the expense of decentralised forms of generation. Can you help on that, please?

Mr Buchanan: I feel as if I am coming in on the end of somebody else's conversation. I suppose that part of the issue there is going to be the degree to which it is one nuclear power station, six nuclear power stations, what the configuration is. Is it an extension of the Hunterston site, Hunterston C, for example? I think my honest answer to this is one of the things that we can do to assist this debate is not only on the

market side (and, in fact, I think virtually every submission to the DTI certainly from the companies has asked Ofgem to do this and they have asked us directly, which is on the network side, which we have not done in the past, to effectively one year before we set-off on a price review period) is to produce a 20 to 25-year forward looking review. We do that anyway when we are doing our price reviews, and perhaps one of the things we do not explain is that we have taken a 20-year, or even longer, framework into consideration, and therefore what we have recommended again as part of our solutions to the Energy Review (and this is an Ofgem issue) is that we will produce a long-term looking network report, and within that we provide scenarios (and we work very closely with the National Grid on this) on how the network would look if you had a replacement of the nuclear fleet, as an example, or if you had microgen being 15% of demand by 2020 or 2030, so that we could have a look at what the impacts are on the grid going forward. I think that is the way we would approach that.

Q500 Mr Weir: Your existing pricing and transmission costs have already caused problems, particularly with renewables, in the North of Scotland and the cost of transmission there.

Mr Buchanan: Yes.

Q501 Mr Weir: Obviously there is a concern that microgeneration will run into similar problems with access to the grid. Have you got that on board and will you take that into account in meeting that microgeneration in new build, or is that asking too much?

Mr Smith: I think that the principles that sit behind transmission charging are that basically the longer the line that it has to travel between where you generate the power and where it is consumed the more you pay, reflecting the resource costs. So, the existing transmission charging principles would actually encourage microgeneration because, in certain areas of the grid, the grid company would actually pay you to install microgeneration because it would save it having to build new transmission assets or potentially distribution assets. So, if anything, the existing transmission charging, which is the biggest single incentive to do microgeneration, similarly on losses, if you are talking about domestic or distribution level microgeneration, and if you add together the transmission losses and the distribution losses, you are losing 10 to 12% of the electricity in transmission alone, so it is the extent to which you would save that in the existing transmission charging. It all points in one direction, which is that if this form of generation is cost competitive to within a reasonable margin, then you will put it in, because you will be able to save lots of costs. So I think, unlike in the renewables debate, where transmission charges are potentially seen as a barrier, microgeneration is a positive boon and if we have non-cost reflective pricing people will say, "This is unfair because it is going to save all this investment and I am not capturing that benefit."

20 June 2006 Ofgem

Q502 Mr Weir: We have had a lot of discussion about new nuclear stations and the possibility of them being sited on existing sites. How will transmission charges work in these situations, given that almost all new generation capacity requires some sort of grid update? Would not the transmission charges for new nuclear stations on an existing site be different from new nuclear stations on, if you like, a greenfield site?

Mr Buchanan: I think it would depend on the configuration of the site and the quality of the connection. I think there are a number of considerations. It is very difficult to give an answer to that, because if a station closes and you build a new station immediately after that which connects on the same connection, then that works very neatly, but if you have got an overlap of plants, then you are going to have to look at a potential upgrade of connection quality. I think it will depend on the site. As I say, it is just like saying there is a new coal-fired station next to a gas-fired station, what are you going to have to do?

Q503 Mr Weir: To your knowledge, did the existing sites have excess ability to transmit energy?

Mr Buchanan: I do not have an answer to that. Steve might have an answer.

Mr Smith: One of the issues is that our existing fleet of nuclear power stations tend to be constructed around units that are 600 or 800 megawatts when the standard design of the new pressurised water reactors, be it the Canadian, the European or the US designs, is for 1600 megawatt units; so actually you would not be replacing like with like, because our biggest unit at Sizewell is 12–1,300. The bigger issue is, even if you were putting them on the existing site, you might actually be putting on something that is twice the capacity, so the grid may well turn round and say, “Well, if you were just putting in one of the existing sites, we could accommodate it, but if you are putting in something twice as big, you have got to put a lot more investment in”, and I know that is something that the grid are looking at actively at the moment. One of the things we have asked for it to do, and they publish in an annual statement, is to publish what charges might be in the future at different sites depending on, as I was saying, different scenarios, to allow people to work out what their charges will be in the future, but I do think there are issues with UK nukes just because they are likely to be twice the size or one and a half times the size of existing stations.

Mr Buchanan: Steve, do we have any evidence that we know of as to whether particular nuclear sites have spare capacity within their connection?

Mr Smith: I think what National Grid would say is that at the moment there are sites with spare capacity but it is quite a movable feast, because if you get masses of offshore wind or other renewables, then they may well be using up their spare capacity, so it is your answer that at the moment here and now, if you get in quickly, there may be spare capacity, but within two to three years, with other developments on the system, that capacity may have been used up.

Q504 Mr Weir: How will you prioritise your pricing decisions without prejudicing particular types of generation?

Mr Buchanan: It is a very timely question that, because we are coming out with our consultation document on Monday on the Transmission Price Review, and one of the key issues, as you well know, that has caused much angst is the ‘first come first served’ basis to keying the connections onto the system, and we effectively are still seeking more evidence and more input as to whether we should be changing that in November, when we come out with our deliberations. We are also looking for evidence on whether we should change what is called the final sum liability. At the moment, if you want a connection, you have got to put down a wedge of money to the National Grid upfront, and we question whether that is the right way to go ahead. So, these two issues, both of which I know are extremely raw in Scotland, are very much open for review.

Q505 Mr Weir: Finally on microgeneration, you have answered this, I think, perhaps in a way already, but what sort of issues have been thrown up by your consultation on regulatory barriers to microgeneration? You did suggest that there might be barriers.

Mr Buchanan: I am going to ask Steve to answer that because we had our first workshop going through the issues arising from the various consultation reforms.

Mr Smith: Not a lot has come out. In terms of the physics, the basic news seems to be that people do not see issues on the networks in terms of distribution companies having problems if people connect these up. You need to get to a large degree of penetration before the distribution companies start to worry. There are issues around metering and you clearly need a two-way, a more sophisticated meter, because you become a producer and a consumer at different points of the day. Again, people are not seeing that as insurmountable. If you are going to the time and trouble of installing a new piece of equipment, then having a meter installed at the same time is probably not a big issue. I think there are issues with the existing supply of interactive microgeneration, and I think that, candidly, is because it is an emerging technology. I think if you phoned up your supplier today and said, “I am thinking of installing a wind turbine or one of these domestic boilers, then one or two of the suppliers would struggle to know how to respond. So, what we have said is the suppliers have got to raise their game in this area and begin to think about how they are going to offer tariffs to customers, so how much do you get paid when you are exporting electricity. As you would expect in any competitive market, one or two of the suppliers are much further down that track. British Gas now, for example, are marketing roof turbines. Powergen are offering combined heat and power boiler systems. We will keep an eye on that. We have set up this forum that meets quarterly, where all the big players in the microgen industry can come and talk to us. If there are problems with

20 June 2006 Ofgem

suppliers, we will act in that facilitation role because ultimately suppliers should want to make this work if that is what their customers want. We are just keeping a watching brief to make sure that, if they are not and we need to do something about it, we will step in.

Q506 Mr Weir: Smart metering is a very big issue in microgeneration. There are different types of smart meters. Is it part of your remit to look at whether we need to standardise the type of smart metering and who will bear the cost of installing smart metering?

Mr Buchanan: We are very much on the cusp of coming out with a major document on smart metering. To a certain extent we are just putting together our final views on this. Standardisation is obviously one of the key issues that needs to be addressed: the extent to which the recommendations of Ofgem have been taken over after the Budget by the Government setting aside monies for a pilot scheme. We believe that there are other departments of government who want to join the DTI in that pilot scheme. The extent to which our findings and recommendations will tie into that pilot scheme is something that we are trying to work through. Standardisation is quite clearly one of the issues that we have to address. One of the things that we have found is that the more intelligent the meter, sadly, the more expensive the meter and the bigger the cost benefits from smart metering. Therefore, as an Authority, we have been minded to go down the route of saying that if we are going towards smart meters let us go for the most intelligent meters now. Sadly for the gas consumer, the cost of that kind of smart metering is around a little more than £100. With electricity it is in a range of £50 to £80. That is £200 a household. That is a consideration that we have to bear in mind. On the analysis that Steve and his team have done, I certainly feel quite confident that if you are going to go down this route, it may require a degree of policy blue sky vision because it has been done in so relatively few environments. Italy, Ontario and South Australia all have some fairly unique features to them; and if you are looking for empirical evidence you do not have a lot to tell you that this is going to be a cost benefit. Steve and his team have done a lot of work. Personally, I am convinced that, if you are going to go down this route, you go for the intelligent meter. Give the consumer as much information as possible and make it as interactive both ways on the grid as possible.

Q507 Mr Bone: I want to touch on infrastructure investment in this country. Some of your opponents will say you failed dreadfully. They are going to say that in the last couple of years we have seen energy prices go through the roof. At the same time, we were told the lights were about to be switched off. Is this not a total failure of the market and, as you are responsible for the market, therefore is it not all your fault?

Mr Buchanan: I have quite a strong answer to that. First, the quality of service since 1990 has gone up markedly. In the first decade you effectively saw a

30% cut in duration of power cuts at the local level and also a 16% reduction. Since 2002 we have seen a 16% a year improvement on customer minutes lost and therefore, when we look at the quality criteria, we are very pleased with what has happened. If we look at the technical criteria, it is covered in the DTI's report in January. Only the Netherlands have anywhere near the quality of the National Grid that we have. The National Grid will have extolled their own virtues to you but they are running at 99.999% performance now and performing at such a high level that a couple of years ago when we came to the Trade and Industry Select Committee they warned us to be very careful about how far we should be taking the standards of the National Grid because they were at such a high level. For the next 0.001% you are paying a vast amount of consumer money, so we did get that warning to make sure, in carrying out our duty on behalf of the consumer, we get the right cost/benefit balance. We have a very superior grid. On technical grounds, I am comfortable. On quality grounds, I think there has been a marked improvement since 1990. Quite candidly on cash grounds—this brings me back to the comments I made earlier—up until the price review in 2004 the monies were 30% up on the 15 years pre-privatisation. In 2004 we did the electricity distribution network price review. It was a very important moment for regulation because we had to prove we could move from the concept of RPI minus X equals straight saving—ie, getting the inefficiency out of the companies—to RPI equals spend. In that price review in 2004 we gave the local network companies an increase of 48% on capital expenditure. That works out at six pence a month per customer over the next five years. We are now looking at even bigger numbers for the transmission price control reviews that we are doing this year. That is the national system for gas, the National Grid system for electricity and the two Scottish systems. The companies have a regulated asset base on the electricity side of around £6 billion. They have put in to spend in the next five years between £5.5 billion and £7 billion. They are looking to double their asset base. We will be looking at this with a fair mind, I believe, in that many of the assets were built 40 to 50 years ago and do genuinely need replacing. We need to look at the load requirements, partly generated by the renewables demand, so that we get that right as well. I feel that we are quite happy to be judged by our recent actions on whether we are alive to that but, in particular on the renewables side, effectively what we have said is that Ofgem does not want to be seen as a drag on the government's renewables programme. Therefore, for four of the big schemes, Beaulieu Denning, broadly, Inverness/Glasgow, the interconnector between Scotland and England, Kendoon and Sloy, to bring renewables power south, we gave a fast forward of £600 million to the companies to get spending. Unfortunately, the majority of that spend was for the Beaulieu-Denny line and that is 250 miles through some very beautiful countryside. It is on a track that is already there and is basically upgrading the network, but there have been 6,000 complaints on that application

20 June 2006 Ofgem

so far. We are going to have to see how long that line takes through the planning process. You will remember that the North York line, which is the best part of 25 miles of wire, took the best part of 12 years to get through planning in the 1990s.

Q508 Mr Bone: I am sorry for the way I put the question. I am not allowed to express a view but if I were I would agree entirely with what you are saying. One of the arguments put by your opponents is that, because of competition, because you have to encourage competition, by some means—I do not quite follow the argument entirely—you are reducing security of supply. I guess what they are trying to say is, if you had some national government plan, you could have oversupply, but what would you say to that?

Mr Buchanan: Quite candidly, the best thing to do in these situations is to go to international benchmarking. We have almost a platinum system. We certainly have a gold system and I therefore feel that technical quality up and investment up sharply in the last 15 years ticks the boxes on the network side. We feel quite strongly about the network side because obviously that is our bread and butter business. We want to ensure we do get that right and that we do, at the same time, get a good deal for the consumer.

Q509 Chairman: I was glad to hear you talking about increased investment in local distribution networks bearing in mind the problems with mine in the past. I hope there is a brighter future for the rural constituents of Worcestershire over the next few years.

Mr Buchanan: One thing that could give you additional comfort is that in 2002 we introduced our liP scheme, which is a quality criteria scheme. That is a carrot and stick scheme. We have 3 to 4% carrot and stick swing on performance levels which we monitor every year.

Q510 Chairman: Quite a lot of our witnesses have emphasised that it is very important that the review is technologically neutral and does not support one particular technology over another. Ofgem historically has tended to that view itself and perhaps felt that the Renewables Obligation got in the way sometimes of neutrality. What is your view on that aspect of the energy review?

Mr Buchanan: We are unchanged on that view.

Q511 Chairman: Neutrality, neutrality, neutrality?

Mr Buchanan: Yes.

Chairman: Thank you. We are very grateful for your time and trouble. We are very grateful for your time and trouble. We would like a copy of the submission we have not received. Thank you very much once again for giving such clear and compelling evidence.