



House of Commons
Science and Technology
Committee

**Devil's bargain? Energy
risks and the public**

First Report of Session 2012–13

Report, together with formal minutes, oral and written evidence

Additional written evidence is contained in Volume II, available on the Committee website at www.parliament.uk/science

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Science and Technology Committee

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2 Devil's bargain? Energy risks and the public

Summary

On 11 March 2011, one of the largest earthquakes on record occurred off the coast of Northern Japan, triggering a tsunami and the destabilisation of one of the Fukushima nuclear power plants. This was the first time that a natural disaster had caused a nuclear accident. Subsequently, some countries, such as Germany, Italy and Switzerland, decided to phase out nuclear power whereas others, such as France, Finland, China, the USA and the UK, continued to hold the view that nuclear energy should be part of the energy mix. Public reactions varied from country to country: in the UK there remain as many people in favour as are opposed to nuclear power.

The Government considers nuclear power to be an essential part of the UK's energy mix. Interestingly, while around half the population supported this, it appeared to be a reluctant support for the least worst option, or a "Devil's bargain". Public risk perceptions must be understood and taken into account when policies are developed, but as one factor that must be balanced against political, ethical and scientific considerations. When public opinion diverges from the evidence on objective risk, policies and decisions should be primarily based on scientific evidence on risk and safety.

Public trust is key to how risks are perceived. The Government's position as an advocate for nuclear power makes it difficult for the public to trust it as an impartial source of information. However, regulatory bodies that are independent of Government and technically competent are in a unique position to engender public trust and influence risk perceptions. In addition to providing risk information for technical audiences, regulators should also make greater efforts to communicate risk to the public and develop their role as trusted sources of information for lay people.

Our inquiry found a lack of coordination across Government in risk communication. A senior individual in Government should be visibly responsible for overseeing risk communication, research and training across Government and drawing together existing expertise within Departments and public bodies, by leading a Risk Communication Strategy team which should sit at the centre of Government.

Although it is useful to have a scale to enable the public to make informed comparative assessments of risk, the International Nuclear and Radiological Event Scale (INES) is not an adequate communication tool for conveying risks. The International Atomic Energy Agency, in reviewing the INES, should pay particular attention to (i) the technical basis of the scale and whether it incorporates sufficient information about risk as well as hazard; (ii) how to better represent orders of magnitude; and (iii) how to make the scale comprehensible to non-technical audiences. The IAEA and UK Government should also consider whether the INES, or its successor, should communicate the likely impacts of a nuclear accident on people and the environment, as well as quantifying the release of radioactive materials. Consideration should be given to the best method of communicating acute and chronic impacts.

Community benefits are an important way of building trust and negotiations can enable the public to feel a greater sense of control, choice over and ownership of energy projects.

We encourage the further use of current community engagement processes led by energy companies, working with local government and the public, for building trust around nuclear new build proposals.

We were impressed by a citizen partnership model being developed in Germany for wind farms and suggest that enabling communities to feel more ownership of local energy infrastructure by offering shares in projects could be conducive to building trust and acceptance. Partnership models could form part of community benefits discussions for new nuclear build and other energy infrastructure.

The Government must ensure that lessons are learned from decades of risk communication and dialogue experiences in relation to nuclear energy when developing other energy technologies and infrastructure, particularly carbon capture and storage (CCS), shale gas and geo-engineering, which will continue to be hot topics for public debate. If the Government intends to rely on carbon capture and storage (CCS) as part of emissions reduction strategies, it should examine the difficulties experienced in Germany due to public concerns.

1 Introduction

The inquiry

1. People face a range of risks in everyday life and therefore become adept at managing most of them. However, public reaction to novel or unfamiliar risks may run counter to scientific evidence. Understanding, assessing and communicating risks is of central importance to the Government and public bodies. This was evident to us when we conducted our inquiry into *Scientific advice and evidence in emergencies*. The report, published in March 2011, made several recommendations aimed towards improving public confidence in Government's risk management processes for emergencies, looking at past emergencies such as the 2009–10 swine flu pandemic and the 2010 volcanic ash disruption to aviation.¹

2. On 11 March 2011, just nine days after we published our report, one of the largest earthquakes on record occurred off the coast of Northern Japan, triggering a tsunami and the destabilisation of one of the Fukushima nuclear power plants.² The Government's emergency-response machinery swung into action, with scientists, headed by the Government Chief Scientific Adviser (GCSA), advising UK nationals abroad on the risks posed by events at Fukushima. We took evidence on the Government's response to the emergency in June 2011.³ Public and political reactions to Fukushima around the world were mixed, with some countries continuing with their civil nuclear programmes and others withdrawing. We were interested in how public reactions to the same risk could vary so markedly. We therefore decided to conduct an inquiry looking into public risk perceptions in relation to energy infrastructure. On 9 November 2011, we issued a call for evidence on the following matters:

- a) What are the key factors influencing public risk perception and tolerability of energy infrastructure facilities and projects?
- b) How are public risk perceptions taken into account in the planning process for energy infrastructure?
- c) How effectively does local and central Government communicate risk and could it be improved?
- d) To what extent can public perceptions be changed by improving risk communication? (please provide examples)
- e) How does and should the Government work with the private sector to understand public perceptions of risk and address them?

¹ Science and Technology Committee, Third Report of Session 2010–12, *Scientific advice and evidence in emergencies*, HC 498

² Science and Technology Committee, Fourth Special Report of Session 2010–12, *Scientific advice and evidence in emergencies: Government Response to the Committee's Third Report of Session 2010–12*, HC 1042

³ Oral evidence taken before the Science and Technology Committee on 15 June 2011, HC 1059–i

f) How do risk perceptions and communication issues in the UK compare to those of other countries?⁴

3. As anticipated, almost all of the written submissions we received focused on nuclear energy. We held five evidence sessions with witnesses including social scientists, the nuclear industry, media experts, safety regulators and the Department for Energy and Climate Change (DECC). A full list of written submissions and witnesses can be found at the end of this report. We would like to put on record our thanks to those who provided written or oral evidence to this inquiry.

4. As part of this inquiry we visited Germany, to explore perceptions of risk associated with nuclear and other energy infrastructure. We visited a carbon capture and storage (CCS) research facility in Brandenburg and met a number of stakeholders with diverse viewpoints on nuclear power, CCS and electricity grid expansion. It was an insightful experience and we would like to thank those we met and particularly extend our thanks to the British Embassy in Berlin for organising and hosting our visit.

5. Our inquiry did not explore the pros and cons of nuclear energy or other energy sources and focused instead on public risk perceptions. In this report we refer to “the public” and “public perceptions”, however, we recognise that this is a generalisation and that individuals react differently to risk. We have attempted to identify and refer to specific sections of the public where possible.

6. This Report contains three further chapters. Chapter 2 outlines risk perceptions and the factors affecting them. Chapter 3 delves into risk dialogue and the final chapter draws on lessons learned from risk perceptions of nuclear energy for public debates about new energy technologies.

⁴ “Committee announce new inquiry into risk perception and energy infrastructure”, Science and Technology Committee press release, 9 November 2011

2 Nuclear energy risk perceptions

Significant nuclear incidents

7. During and following the Second World War, nuclear research in the UK was mainly focused towards military applications. In 1947, the site of the former Sellafield ordnance factory—renamed Windscale—was announced as a new atomic energy site and in 1953, following the government announcement that the country would begin a civil nuclear power programme, construction began there. In 1956, the world's first commercial nuclear power station opened at Calder Hall on the Windscale site.⁵ In October 1957, a reactor overheated and caught fire, releasing radioactive materials into surrounding areas. The Windscale fire remains the most severe nuclear accident in UK history and led to the 1959 Nuclear Installations Act. This required that civil nuclear power stations which were then under construction and those planned for the future be licensed by the newly formed Nuclear Installations Inspectorate (NII); a regulator whose sole responsibility would be safety.⁶ The NII's functions are today carried out by the Office for Nuclear Regulation (ONR), an agency of the Health and Safety Executive (HSE).

8. Three incidents at nuclear power stations in other countries have had a particular impact on public and political discourse in the UK. In 1979, a cooling malfunction caused part of a reactor core to melt at the Three Mile Island site in the USA. Radioactive gas was released, but investigations concluded that “in spite of serious damage to the reactor, most of the radiation was contained and that the actual release had negligible effects on the physical health of individuals or the environment”.⁷ However, the incident at Three Mile Island was accompanied by communications problems that led to conflicting information being made available to the public, contributing to public fears.⁸ As a result, “public confidence in nuclear energy, particularly in [the] USA, declined sharply following the incident”.⁹ Echoing the aftermath of the Windscale fire, nuclear regulation in the USA became more robust after the Three Mile Island incident.¹⁰

9. The world's worst nuclear accident occurred in 1986 at the Chernobyl plant in the Ukraine. A sudden surge of power destroyed the nuclear reactor and the explosion released massive amounts of radioactive material into the environment, causing severe radiation effects almost immediately.¹¹ Major releases of radioactive material continued for ten days and contaminated more than 200,000 square kilometres in Europe.¹² A 2005 United Nations (UN) report estimated that a total of up to 4,000 people could eventually die of

⁵ “Nuclear development in the United Kingdom”, *World Nuclear Association*, March 2012, world-nuclear.org

⁶ “The History of the HSE”, *Health and Safety Executive*, hse.gov.uk

⁷ “Backgrounder on the Three Mile Island Accident”, *United States Nuclear Regulatory Commission*, March 2011, nrc.gov

⁸ “Three Mile Island Accident”, *World Nuclear Association*, January 2012, world-nuclear.org

⁹ “Three Mile Island Accident”, *World Nuclear Association*, January 2012, world-nuclear.org

¹⁰ “Backgrounder on the Three Mile Island Accident”, *United States Nuclear Regulatory Commission*, March 2011, nrc.gov

¹¹ “Backgrounder on Chernobyl Nuclear Power Plant Accident”, *United States Nuclear Regulatory Commission*, April 2012, nrc.gov

¹² “Chernobyl: the true scale of the accident”, *World Health Organization*, September 2005, who.int

radiation exposure from the Chernobyl nuclear power plant.¹³ There was “initial secrecy and confusion about the accident” and “the people living in the affected areas learned about the event mainly from hearsay rather than from authoritative reporting”.¹⁴ After the Chernobyl accident in 1986, “there was a very high level of opposition to nuclear energy in many countries across the globe”.¹⁵ Professor Nick Pidgeon, Director of the Understanding Risk Programme, Cardiff University, noted that “if you went back 20 years and asked people whether they thought nuclear power had benefits, you would get a uniform ‘no’ after Chernobyl”.¹⁶

10. In March 2011, Japan suffered its worst recorded earthquake, known as the Tohoku event. The epicentre was 110 miles offshore from the site of the Fukushima Daiichi power station. Reactor units 1, 2 and 3 on this site were operating before the event and shut down safely on detection of the earthquake (reactor units 4, 5 and 6 were not operating). On-site power was initially used to provide essential cooling, but an hour after shutdown a massive tsunami from the earthquake swamped the site, taking out electrical power capability, and alternative back-up cooling was lost. With the loss of cooling systems, Reactor Units 1 to 3 overheated as did a spent fuel pond¹⁷ in building of Reactor Unit 4. This resulted in several explosions. Major releases of radioactivity occurred, “initially by air but later by leakage to sea”.¹⁸ It was “the first time that a natural disaster had caused a nuclear accident”.¹⁹ Although tens of thousands died as a result of the earthquake and tsunami, to date nobody has died, or received a life-threatening dose of radiation, from the Fukushima nuclear accident and no one is expected to.²⁰ Decontamination efforts continue.

11. In the UK, the Government requested a report on the implications of Fukushima for the UK nuclear industry. The investigation was led by Dr Mike Weightman, HM Chief Inspector of Nuclear Installations and Head of the ONR. The report was produced in September 2011 (an interim report was published in May 2011).²¹

Support for nuclear energy

12. The Nuclear Industry Association (NIA) stated that “in 2010 nuclear energy had its highest support in over a decade. Favourability fell following the accident at Fukushima, but is now again rising towards 2010 levels”.²² Recent polls show that “support for nuclear

¹³ “Chernobyl: the true scale of the accident”, *World Health Organization*, September 2005, who.int

¹⁴ “Chernobyl – Ten years after”, *IAEA BULLETIN*, March 1996, iaea.org

¹⁵ Q 13 [Professor Nick Pidgeon]

¹⁶ Q 7

¹⁷ Spent fuel ponds are storage pools for spent fuel from nuclear reactors. Spent fuel may be radioactive and produce heat, requiring active cooling.

¹⁸ Office for Nuclear Regulation, *Japanese earthquake and tsunami: Implications for the UK Nuclear Industry, Final Report, September 2011*

¹⁹ “Fukushima nuclear accident: one year on”, *World Nuclear Association*, world-nuclear.org

²⁰ “Fukushima nuclear accident: one year on”, *World Nuclear Association*, world-nuclear.org

²¹ “Fukushima and the UK nuclear industry”, *Health and Safety Executive*, hse.gov.uk

²² Ev w23

power in Britain has risen over the past year, despite the events at Fukushima”.²³ A YouGov poll conducted on behalf of EDF Energy found that:

despite Fukushima, 61% of the public believe nuclear should be part of the energy mix. In fact, the results show that support for nuclear new build has broadly held up, with 47% supporting new nuclear power stations to replace ones that are being retired (and 28% against). This compares with 52% a year ago [2010], and 46% in March [2011].²⁴

13. However, Professor Pidgeon cautioned: “it is too early to reliably judge the full impacts of the Fukushima Disaster on public perceptions in the UK or internationally”.²⁵ He considered it to be “genuinely puzzling that in the UK (and the USA) there remain as many people in favour as are opposed to nuclear power in such polls” and surmised “this may be due to Fukushima’s spatial distance, and/or because people here attribute the primary cause to an overwhelming natural disaster, or because climate change and energy security discourses remain important for British people”.²⁶ Dr Mark Henderson, former Science Editor at The Times, suggested that the best explanation might be “that a natural disaster of biblical proportions had thrown everything it had against a 40-year-old power station and nobody died”.²⁷ Nevertheless, major nuclear accidents can have profound, long-term impacts on public concerns about risk. Professor Tom Horlick-Jones, University of Cardiff, stated that “despite the many gains associated with nuclear power, the accidents at Three Mile island and Chernobyl, and the associations with nuclear weapons arguabl[y] continue to resonate in the public imagination”.²⁸ The British Geological Survey stated that public concerns were “confirmed and reinforced” by such incidents.²⁹

14. Public support for nuclear energy in the UK is shown by opinion polls and surveys, although such information may not explain the reasons for such support. Social scientists have been researching public attitudes towards nuclear power for many years in the UK. Professor Horlick-Jones cautioned that while polls are “good at gathering large amounts of data on things with which people have some familiarity”, they are “not so good when people do not understand the issue in question, or perhaps have mixed feelings about it”.³⁰ Delving further to understand why people are opposed to or support nuclear energy reveals how people might balance various personal concerns. Professor Horlick-Jones suggested that pragmatic support for nuclear power technologies might be “grounded in the everyday practical experience of [...] rising energy bills and [people’s] worries about energy security”.³¹ The Applied Policy Sciences Unit, University of Central Lancashire, considered that the perceived risks of climate change “have undoubtedly influenced public

²³ Ev 45 [Department of Energy and Climate Change], para 7

²⁴ Ev 56, para 19

²⁵ Ev 68, para 17

²⁶ Ev 68, para 17

²⁷ Q 50

²⁸ Ev w18, para 3.3

²⁹ Ev 49, para 2

³⁰ Ev w18, para 3.4

³¹ Ev w19, para 4.2

opinion at the national level”.³² Professor Pidgeon stated that “a large proportion of recent support remain[s] conditional - a ‘reluctant acceptance’ at best” and added that “while many more in Britain have indeed come to support nuclear power over the past decade they do so while viewing it only as a ‘devil’s bargain’, a choice of last resort in the face of the threat of climate change”.³³ He concluded that, given the choice, “individuals still show very clear preferences for renewable electricity generation”.³⁴

15. People living in the vicinity of nuclear power stations and waste facilities additionally balance the risks with benefits to their community, such as jobs and improved transport infrastructure. These issues are explored in more detail in chapter 3.

International differences

16. Since Fukushima, polling internationally has shown large declines in support in countries including Germany, France and Japan.³⁵ Sense About Science highlighted an Ipsos survey showing that “three in five global citizens (62%) oppose the use of nuclear energy and that a quarter (26%) of those have been influenced by the recent nuclear disaster in Fukushima”.³⁶ Some countries such as Germany, Italy and Switzerland have decided to phase out nuclear power whereas others, such as France, Finland, China, the USA and the UK, continue to hold the view that nuclear energy should be part of the energy mix.³⁷

17. As part of our inquiry we visited Germany, which provided a useful case study for comparison with the UK. Opposition to nuclear energy has historically been stronger in Germany than in the UK. The anti-nuclear sentiment had started and grown during the Cold War, driven in part by the fear of nuclear missiles stationed in Germany. Professor Allison, Emeritus Professor of Physics at Oxford University, stated that Germany “suffered from being on both sides of the front line in the Cold War, so fear of radiation is deeply [i]ngrained”.³⁸ In 2000, the German Government established timetables for phase-out of existing nuclear power stations but in 2010, made the decision to prolong the life of existing nuclear power stations—this was the first U-turn in nuclear energy policy.³⁹ While meeting with Professor Ortwin Renn, Member of Germany’s Ethics Commission for a Safe Energy Supply, we heard that pre-Fukushima, around 65% of the German public had been in favour of phasing out nuclear power. Professor Renn explained that the German Government’s decision to prolong the life of existing plants had been achieved with difficulty, but that many had appreciated the benefits of slower phase-out in order to develop renewable energy sources. However, after the reaction to Fukushima, which he described as “a slap in the face” for the German Government, the decision was made to

³² Ev 59, para 19

³³ Ev 67, para 11

³⁴ Ev 67, para 11

³⁵ Ev 68 [Professor Nick Pidgeon], para 17

³⁶ Ev 66, para 4.5

³⁷ Ev 45 [Department of Energy and Climate Change], para 6

³⁸ Ev w12, para 7.3.1

³⁹ Ethics Commission on a Safe Energy Supply on behalf of Federal Chancellor Dr Angela Merkel, *Germany’s Energy transition – A collective project for the future*, 30 May 2011

withdraw from the nuclear programme, representing the second policy U-turn (often referred to as the “Energie Wende”, or energy turnaround). The Ethics Commission for a Safe Energy Supply was established on 22 March 2011 by Chancellor Angela Merkel to consider the technical and ethical aspects of nuclear energy, pave the way for a social consensus on phasing out nuclear energy and consider proposals for a transition to renewable energies. In May 2011, the Ethics Commission produced a report that stated “the risks of nuclear energy have not changed since Fukushima, but the perception of the risks has”.⁴⁰

The science of risk perception

18. An understanding of the factors that affect risk perceptions is crucial for anyone who communicates risks to the public or engages in risk dialogue. It is sometimes the case that public acceptability does not correspond with the objective risks as understood by scientists and engineers. In fact, perceptions of risk can be remarkably inaccurate when compared to the objective risks, even when uncertainty is taken into account. As the House of Lords Science and Technology Committee noted in 2000, “when science and society cross swords, it is often over the question of risk”.⁴¹

Objective risk

19. It is worth giving some examples that illustrate the objective risks of nuclear energy. A technical note from the ONR contains a comparison of risk data from different energy sources which shows that nuclear power has statistically been the safest form of energy generation in terms of immediate deaths from major accidents.

Table 1: Comparison of Major Accident Risk Data from a Range of Energy Sources⁴²

Energy Chain	OECD Nations ⁴³ (Fatalities/GWy ⁴⁴)	Non-OECD Nations (Fatalities/GWy)
Coal (inc. China)	-	6.169
Coal (except China)	-	0.597
Coal (total)	0.157	0.597 ⁴⁵
Oil	0.132	0.897
Natural Gas	0.085	0.111
LPG ⁴⁶	1.957	14.896
Hydro	0.003	10.285
Nuclear	-	0.048

⁴⁰ Ethics Commission on a Safe Energy Supply on behalf of Federal Chancellor Dr Angela Merkel, *Germany's Energy transition – A collective project for the future*, 30 May 2011

⁴¹ House of Lords, Science and Society, Third Report of the Select Committee on Science and Technology, Session 1999–2000, HL Paper 38 para 4.2

⁴² Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011, page 5; a hyphen (-) indicates there is no available data (or in a few instances, the data is not considered credible)

⁴³ There are 14 member countries of the Organisation for Economic Co-operation and Development (OECD)

⁴⁴ GWy, or GigaWatt year, is a measure of electricity production.

⁴⁵ Data for “coal (inc China)” is not included in this figure

⁴⁶ Liquefied petroleum gas

However, such data does not capture the latent health and environmental effects of nuclear accidents, which are difficult to quantify⁴⁷—long term effects of exposure to radiation can be a source of anxiety.⁴⁸ Other energy sources can also pose long-term health risks, for example, from particulates released by coal combustion. The ONR's technical note highlighted OECD data suggesting that “pollution from fine dust particles may kill as many as 960,000 people a year worldwide [...] of which around 30% derives from energy production”.⁴⁹ This means that “latent deaths worldwide from normal operations at combustion power stations each year are many times larger than the latent deaths from the Chernobyl accident (around 290,000 every year versus between 9,000 and 33,000 over 70 years)”.⁵⁰

20. Risk comparisons are a popular way of explaining the magnitudes of risks objectively, and nuclear radiation is often compared to other sources of radiation such as naturally occurring, or background, radiation. The ONR states, for example, that:

Though [the Chernobyl accident led to] a very large release, with serious local consequences in Belarus and Ukraine, it equates to only 5% of the annual dose the world's population receives from natural background radiation each year. Over [...] 70 years [...] the additional radiation from Chernobyl will add just 0.06% to humanity's collective dose.⁵¹

21. Comparisons are often made with radiation exposure from flying and medical applications. Professor David Spiegelhalter, Royal Statistical Society, noted that “in Fukushima, the analogy [...] is that there was a bigger radiation dose as a result of people evacuating [by air] from Tokyo than if they had just stayed there”.⁵² Public concerns about the radiation risks from nuclear power generation primarily relate to major accidents, but also extend to concerns over the day to day risks from radioactive emissions and discharges.⁵³ In the UK, the legal limit for radiation exposure from sources such as nuclear plants for members of the public is 1 millisievert (mSv) a year, based on recommendations from the International Commission on Radiological Protection.⁵⁴ Professor Allison stated “the public welcome moderate radiation levels [...] for medical imaging [...] with a single acute dose of about 5–10 millisievert”,⁵⁵ whereas public exposure to levels from routine

⁴⁷ Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011

⁴⁸ Ev 49 [British Geological Survey], para 2

⁴⁹ Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011, page 11

⁵⁰ Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011, page 11

⁵¹ Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011, page 8

⁵² Q 25

⁵³ Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011, page 11

⁵⁴ “Q&A: Health effects of radiation exposure”, *BBC News*, 21 July 2011, bbc.co.uk/news/health

⁵⁵ Ev w10, para 3.1

operations of nuclear sites are significantly less than one mSv per year—the highest UK level is calculated to be 0.38 mSv per year, near Sellafield.⁵⁶

Fright factors

22. Faced with such facts, it is tempting to characterise perceptions that nuclear energy is dangerous as irrational or a result of poor scientific understanding. However, Martin J Goodfellow and Adisa Azapagic, researchers at the University of Manchester, cautioned:

there is a real danger in believing that people simply need to be ‘shown the truth’, or convinced that their perception of risk is incorrect, either through provision of facts or persuasive argument. Many perceptions of risk are based on distorted or inflated views of real risks. In some circumstances presenting facts in a simple, clear and logical way can assist in reducing such distortions or inflations; but in other circumstances this may be ineffective.⁵⁷

23. Our 2011 report *Scientific advice and evidence in emergencies* explored public risk communication and factors that affect risk perceptions. During that inquiry, we found the Department of Health’s 1997 guidance *Communicating risks to public health: pointers to good practice*⁵⁸ to be particularly informative. The guidance explains that public perceptions of risk are influenced by “fright factors”, meaning that some risks trigger more alarm than others.⁵⁹ In addition to fright factors for health risk perceptions, Professor Pidgeon provided additional factors affecting public concerns about technological and environmental risks.⁶⁰ In summary, the factors influencing risk perceptions and acceptability of risk include:

- a) *Level of individual control and choice*: whether a risk is seen as uncontrollable, involuntarily imposed, inescapable by taking personal precautions or inequitably distributed (some benefit while others suffer the consequences);
- b) *Characteristics of the hazard*: for example the perceived nature of “worse case” accidents, whether the hazard is from man-made, unfamiliar or novel sources, threatens a form of death, illness or injury arousing particular dread, poses danger to small children, pregnant women or future generations; causes hidden and irreversible damage (for example through onset of illness many years after exposure) or promotes a general feeling of insecurity or fear;
- c) *Scientific understanding*: how well the risk is understood by science (including knowledge about future impacts) and whether unintended consequences of complex and rapidly moving scientific enterprises will be controlled; and

⁵⁶ Office for Nuclear Regulation, *Japanese Earthquake and Tsunami: Implications for the UK Nuclear Industry, Technical Note: A Comparison of Risk Levels for Different Sources of Energy*, 22 June 2011, page 11

⁵⁷ Ev w16, para 16

⁵⁸ Department of Health, *Communicating about risks to public health: pointers to good practice*, 1 January 1997

⁵⁹ Department of Health, *Communicating about risks to public health: pointers to good practice*, 1 January 1997

⁶⁰ Ev 67, para 7

- d) *Risk governance*: transparency, whether the responsible decision maker and/or regulation is competent, fair and caring; whether the risk is subject to contradictory statements from information sources (or, even worse, from the same source), the historical context within which a hazard arises (for example, links between civilian nuclear technology and its military uses) and the social commitments that a technology entails (the form of society and organisation required to keep a technology safe).⁶¹

24. The fright factors provide a logic for why people are more accepting of some risks than others. They explain, for example, why someone may choose to smoke cigarettes and thus live with an increased risk of developing cancer, but be unhappy about a nuclear power station being built near their home, because that person chooses to be exposed to the former risk but not necessarily the latter. Looking at these factors it is clear that nuclear energy provides a good case study for examining risk perceptions because it “ticks most of the boxes for ‘fright factors’ that influence risk perception”.⁶² Essentially, “the public fears nuclear energy because of what the radiation might do”.⁶³ Linking to the fright factors, this may be, for example, because “radiation is feared and unknown, appears out of personal control, affects the vulnerable and unborn, is complex and the information sources may be untrustworthy”.⁶⁴ Germany’s Ethics Commission for a Safe Energy Supply identified significant factors for the change in German risk perceptions, including:

- a) the fact that the reactor disaster occurred in a high-tech country like Japan which caused people to lose faith that such an event could not happen in Germany;
- b) the sustained inability for weeks after the accident to see an end to the catastrophe, to come to a final estimate on the damage, or to specify a definitive geographical boundary for the affected area;
- c) the concept that the extent of damage from accidents was limited and could be sufficiently ascertained, enabling damage to be compared with the disadvantages of other energy sources in a scientifically-based assessment process, lost a considerable amount of its persuasive power; and
- d) the fact that the disaster was triggered by a process that the nuclear reactors were not “designed” to withstand. These circumstances shed light on the limitations of the technical risk assessments.⁶⁵

Trust

25. When we asked Professor Pidgeon what the most significant factors affecting the public perception of nuclear power in the UK were, he responded that “the most important thing is distrust”.⁶⁶ He explained that “if you do not trust the parties who manage the risk, you

⁶¹ Ev 67 [Professor Nick Pidgeon], para 7; Department of Health, *Communicating about risks to public health: pointers to good practice*, 1 January 1997

⁶² Ev 51 [Royal Statistical Society], para 4

⁶³ Ev w9 [Professor Wade Allison]

⁶⁴ Ev 51 [Royal Statistical Society], para 4

⁶⁵ Ethics Commission on a Safe Energy Supply on behalf of Federal Chancellor Dr Angela Merkel, *Germany’s Energy transition – A collective project for the future*, 30 May 2011

⁶⁶ Q 7

are not likely to have confidence that the risk is being safely managed”.⁶⁷ Amongst other things, trust is subject to perceptions of competency (whether risk managers have sufficient expertise), and impartiality (in whose interests a risk manager or communicator is acting).⁶⁸ Greenpeace explained that:

People are, quite reasonably, much more wary of risks that are uncertain, intergenerational, involuntary and indiscernible though conventional senses. Under these circumstances people have no choice but to rely on the institutions that create and govern them. If these institutions are seen to be [...] unreliable, secretive and not to be acting in the public interest then the public would, frankly, be irrational not to be risk-averse.⁶⁹

26. Who do the public trust? Various views were offered to us, and some common themes emerged. It appears that the Government and nuclear industry are generally less trusted by the public because their impartiality is in question. When Government works with the nuclear industry it may be perceived as collusion and therefore “it is very difficult for the Government to present risk information to the public and be trusted (by many) to be impartial”.⁷⁰ Public distrust of governments as providers of risk information is evident across Europe.⁷¹ Collaboration with the nuclear industry also affected risk perceptions in Germany, where we noticed that researchers with links to the energy industry suffered strong distrust from members of the public. Conversely, public trust in scientists is relatively higher, depending on their perceived impartiality and independence. Professor Pidgeon summarised the situation:

When you ask who people trust, it is independent scientists. If it is an environmental question, it would be environmental organisations; it may be consumer organisations; and friends and family. Government scientists tend to be in the middle. Industry tends to be towards the bottom. [...] politicians are seen as representing various interests, whereas scientists are seen as more independent.⁷²

27. Charles Hendry MP, Minister of State for Energy, stated clearly that “there is an important role for new nuclear in our [energy] mix going forward. We want to see that happen and we want to facilitate it”.⁷³ He stated that the Government needed “to work closely with industry” and create the right environment for investment, adding “if people want us to deliver on [nuclear energy] policy, they would expect us to have a close working relationship with industry”.⁷⁴ He was aware that independent experts enjoyed a greater degree of public confidence and added “much as we would like as politicians to believe that we are right up there at the same level, realistically we accept that we are probably not”.⁷⁵

⁶⁷ Q 7

⁶⁸ Q 30 [Professor Nick Pidgeon]

⁶⁹ Ev w30

⁷⁰ Ev w17 [Martin J Goodfellow and Adisa Azapagic], paras 21–22

⁷¹ Ev w17 [Martin J Goodfellow and Adisa Azapagic], paras 21–22

⁷² Q 30

⁷³ Q 137

⁷⁴ Q 137

⁷⁵ Q 135

The Minister emphasised that “the security and safety standards, the assessment of the new reactors and the generic design assessment programme should be carried out at arm’s length from us as a Department so that it can never be suggested that the people who are regulating have a vested interest in the outcome”.⁷⁶ He added that “in the aftermath of Fukushima, everything that we have done [...] has been guided by scientific evidence”.⁷⁷ The Minister stated:

We have very clearly separated out the scientific advice from Government and industry advice, where people would understandably believe that we have an agenda, whereas they accept that somebody of the level of Mike Weightman, with his professional standing, and our own chief scientist are people who are not part of that agenda. They are there because of their scientific credibility.⁷⁸

28. Media sources and campaigning organisations are an influential source of information for the public. Professor Pidgeon stated that “environmental organisations, rightly or wrongly—they have a stake as well—are seen in relative terms as working in the environment’s interests, which people value”.⁷⁹ The Royal Society of Chemistry had a slightly different explanation for high levels of trust in campaigning organisations and stated that they were “often perceived to be more trustworthy than Government because they often disseminate simplistic explanations that are conceptually easy to understand”.⁸⁰ On trust in the media, we heard from Dr Mark Henderson, former Science Editor at The Times, that “it is [...] interesting that people say in every survey they do not trust the media but trust family and friends. From where do they think their family and friends get their information in the first place?”⁸¹ Dr Henderson explained that information from the media communicated to family and friends “then acquires trust by being transmitted through a trust figure”.⁸² We explore the role of the media further in para 52.

29. We were interested in the position that regulators would occupy on the scale of public trust. Dr Andrew Bloodworth, British Geological Survey, considered that “the regulators are nowhere on this [the issue of trust]; the public are not aware they even exist”.⁸³ However, Fiona Fox, Director of the Science Media Centre, told us that these “arm’s length, trusted experts” were seen by the media as independent,⁸⁴ an important precursor for trust. Professor Pidgeon explained his research on the profile of the Health and Safety Executive (HSE):

a few years ago we did work on how people viewed [the HSE]. It was very interesting. They were quite well known. People did think they worked in people’s interests and were experts in health and safety at work. It was also because they had observed

⁷⁶ Q 138

⁷⁷ Q 137

⁷⁸ Q 137

⁷⁹ Q 30

⁸⁰ Ev w8, para 3

⁸¹ Q 42

⁸² Q 49

⁸³ Q 10

⁸⁴ Q 61

inspectors over many years in the workplace coming in to sort things out and do things; so there was a track record. [...] competence, care and track record are all really important.⁸⁵

We asked some of the regulators about public awareness of their work. Dr Paul Leinster, Chief Executive of the Environment Agency stated “it depends on which bit of the public you are talking about”.⁸⁶ He continued: “if you are talking about the community around Hinkley where there is now talk about the construction of a new facility, the awareness of the relative roles of the different organisations is much greater, but, in general, if you went out on the street and asked people, unprompted, most probably they would not say our names”.⁸⁷ Geoffrey Podger, Chief Executive of the HSE considered that “what HSE does in the high hazard industries is well known, not simply to those who work in them but also to public bodies who have an interest in and around them”.⁸⁸ However he added “conversely, at the lower hazard end, where we share our responsibilities with local authorities, there is no doubt that the public often have great difficulty in working out who is responsible for what”.⁸⁹ Dr Mike Weightman, Head of the ONR (an agency of the HSE), stated “we are not well known to the general public”.⁹⁰

Conclusions

30. When public risk perceptions diverge from the scientifically objective risks it should not necessarily be characterised as irrational or anti-scientific. Public concerns may be influenced by the level of scientific understanding, but are also likely to be influenced by other affective (that is, feeling or emotion-based) factors that may not be changed by explaining risk in scientific terms.

31. It is possible for some of the fright factors affecting risk perceptions to be mitigated, for example by building public trust, communicating effectively, improving risk governance and operating in a transparent manner. We make further recommendations on how risk communication should be coordinated in the next chapter.

32. The Government considers nuclear power to be an essential part of the UK’s energy mix. The evidence shows that around half of the population support this, even though it may be a reluctant support for the least worst option. The Government’s position as an advocate for nuclear power makes it difficult for the public to trust it as an impartial source of information. In our view, this perceived lack of impartiality further emphasises the importance of Government demonstrating that all energy policies are strongly based on rigorous scientific evidence.

33. We have summarised the complex social issues governing risk perceptions briefly in this chapter. The next chapter focuses on risk communication and dialogue.

⁸⁵ Q 30

⁸⁶ Q 103

⁸⁷ Q 103

⁸⁸ Q 103

⁸⁹ Q 103

⁹⁰ Q 103

3 Risk communication and dialogue

34. Risk communication is often thought of as a one-way process of disseminating information, often from experts to non-experts. However, modern definitions describe a two way process, for example, the World Health Organization (WHO) describes it as “an interactive process of exchange of information and opinion on risk among risk assessors, risk managers, and other interested parties”.⁹¹ A journal of the International Atomic Energy Agency (IAEA) explained the development of risk communication in nuclear technology:

Risk communication began in the late 1970s with efforts by the nuclear and chemical industries in the United States to counteract widespread public concern about those technologies. It was believed that clear, understandable information was all that was needed to make people see that the risks were lower than many feared. To this day, many still believe risk communication is just a matter of making information understandable. This is particularly true in fields like nuclear technology, strongly influenced by people with scientific and engineering backgrounds.

For decades this approach has failed, and most risk communication experts say it is inadequate. The perception of risk, and the behaviors that result, are a matter of both the facts and our feelings and instincts and personal life circumstances. Communication that offers the facts but fails to account for the affective side of our risk perceptions is simply incomplete.⁹²

The Department of Health’s guidance on *Communicating about risks to public health: Pointers to good practice* also noted a “progressive change both in the research literature and in the practice of risk communication” from “emphasis on ‘public misperceptions of risk’, which tended to treat all deviations from expert estimates as products of ignorance or stupidity” via “investigation of what actually does cause concern and why” to “approaches which promote risk communication as a two-way process in which both ‘expert’ and ‘lay’ perspectives should inform each other”.⁹³

35. Several of the written submissions we received emphasised the importance of risk communication as a two-way dialogue rather than a debate. For example, Professor Wade Allison, University of Oxford, stated that “the media and public figures speak of a ‘nuclear debate’ and the need to present both sides” but explained that “a dialogue between fear and science should not be described in that way. Scientific understanding is not achieved through the cut and thrust of adversarial challenge”.⁹⁴ The Nuclear Industry Association (NIA) considered it important that “both Government and the industry should continue to engage, inform and discuss the issues of nuclear energy with the public in an open and honest dialogue”.⁹⁵

⁹¹ “Risk communication”, *World Health Organization*, who.int/foodsafety

⁹² “Risk communication: more than facts and feelings”, *IAEA Bulletin*, iaea.org

⁹³ Department of Health, *Communicating about risks to public health: pointers to good practice*, 1 January 1997, p4

⁹⁴ Ev w11, para 7.1

⁹⁵ Ev w23

Risk information for the public

Government

36. During our inquiry on *Scientific advice and evidence in emergencies*, we noted that there was no lack of guidance on risk communication for Government departments, including from the Treasury, Cabinet Office and Department of Health.⁹⁶ Overall, the Government has established five principles of risk communication: (i) openness and transparency; (ii) involvement (engagement in decision processes); (iii) proportionality and consistency; (iv) evidence (basing decisions on evidence); and (v) responsibility (allocating responsibility for risk management appropriately).⁹⁷ In addition, the Health and Safety Executive (HSE) has sponsored research on risk communication in the workplace and on major accident hazards⁹⁸ and reviews of crises such as the Bovine Spongiform Encephalopathy (BSE) outbreak have highlighted lessons on risk communication.⁹⁹

37. Nonetheless, existing Government guidance drew criticisms. Professor Nick Pidgeon, Director of the Understanding Risk Programme, Cardiff University, stated that “currently there is no unified approach to risk communication either within central or local government in the UK. Efforts have tended to remain fragmented and tailored to the needs of individual Departments”.¹⁰⁰ The Royal Statistical Society (RSS) criticised the lack of risk information available to the public from Government and the accessibility of information provided by regulators on energy risks. It considered that “the public is currently desperately ill-served by the lack of ready access to up-to-date balanced and trustworthy information on the possible risks associated with different energy sources” and added “those that exist appear to be either reassuring propaganda or are limited to a particular hazard”.¹⁰¹ The NIA highlighted that a key issue for public dialogue was that all energy sources involve risks¹⁰² and the RSS highlighted the lack of information enabling comparative assessment of the magnitudes of energy risks, drawing attention to the failings of the Department of Energy and Climate Change (DECC) in particular.¹⁰³

38. In 1991, an Interdepartmental Liaison Group on Risk Assessment (ILGRA) was established with a remit to promote consistency and disseminate best practice in risk assessment in Government.¹⁰⁴ ILGRA produced a series of reports on risk issues identifying areas of weakness, highlighting how a more strategic and consistent approach to risk assessment could be pursued and prompting further inter-departmental activity on risk

⁹⁶ Science and Technology Committee, Third Report of Session 2010–12, *Scientific advice and evidence in emergencies*, HC 498

⁹⁷ HM Treasury and Cabinet Office, *Principles of Managing Risks to the Public*, hm-treasury.gov.uk

⁹⁸ Ev 69 [Professor Nick Pidgeon], para 24

⁹⁹ *The BSE Inquiry: Findings and conclusions*, October 2000, Volume 1, Chapter 14, section 1301

¹⁰⁰ Ev 69, para 24

¹⁰¹ Ev 51, para 2a

¹⁰² Ev w23, para 5

¹⁰³ Ev 52, para 6

¹⁰⁴ Science and Technology Committee, Seventh Report of Session 2005–06, *Scientific advice, risk and evidence-based policy-making*, HC 900–I, para 149

management.¹⁰⁵ In its third and final report, in 2002, ILGRA noted that many departments had risk frameworks, which were becoming embedded in their policy work and culture. Our predecessor Committee considered that “the replacement of ILGRA in 2002 by a high level group based in the Treasury and reporting directly to the Prime Minister could be seen as an implicit recognition that the group’s useful work had not had a sufficiently strong impact across Whitehall”.¹⁰⁶ ILGRA recommended that:

to improve risk communication across Government, a central resource is necessary to assemble registers of risk communication research and training programmes, and promote joint research to identify good risk communication practice and encourage its adoption by Departments.¹⁰⁷

A decade later, there is still a demand for strategic capacity in risk communication. For example, Professor Pidgeon stated “individual proposals for a risk information centre have been raised in the past (e.g. by the Hazards Forum) but there is no one entity in the UK dedicated to research, communication and policy support for risk”.¹⁰⁸

39. While it is commendable that individual Departments have embedded risk frameworks, coordination of risk communication across Government is lacking. A senior individual in Government should be visibly responsible for overseeing risk communication, research and training across Government. This individual should lead a Risk Communication Strategy team, drawing together existing expertise within Departments and public bodies, which should sit at the centre of Government, either within the Cabinet Office, which houses the Civil Contingencies Secretariat and the Behavioural Insights team, or the Treasury, which provides cross-Government risk management guidance.

40. While comparisons of risk from different energy sources can be useful for engaging with some audiences, experience has shown that such factual information does not always change risk perceptions because they don’t take the influence of “fright factors” into account. The Risk Communication Strategy team should evaluate whether it would be possible and beneficial to publish risk comparisons where fright factors have been controlled (for example, not comparing voluntary risks with involuntary risks).

Regulators

41. The Office for Nuclear Regulation (ONR) is an agency of the Health and Safety Executive (HSE) and is responsible for all nuclear sector regulation across the UK.¹⁰⁹ Under the Nuclear Installations Act 1965, a site cannot have a nuclear plant on it unless it has been granted a site licence by the HSE. This licensing function is administered on HSE’s

¹⁰⁵ Science and Technology Committee, Seventh Report of Session 2005-06, *Scientific advice, risk and evidence-based policy-making*, HC 900-I, para 149

¹⁰⁶ Science and Technology Committee, Seventh Report of Session 2005-06, *Scientific advice, risk and evidence-based policy-making*, HC 900-I, para 150

¹⁰⁷ United Kingdom Inter-Departmental Liaison Group on Risk Assessment (UK-ILGRA), *Third report prepared by the Inter-Departmental Liaison Group on Risk Assessment*, 2002

¹⁰⁸ Ev 70, para 28

¹⁰⁹ “About us”, *Office for Nuclear Regulation*, hse.gov.uk/nuclear

behalf by the ONR.¹¹⁰ The Environment Agency is responsible for overseeing how UK nuclear sites dispose of their radioactive waste by granting site permits to the operators who run them. It is the Environment Agency's responsibility to "check-up on sites to ensure they're not exceeding their limits and releasing as little radioactive waste as possible into the environment".¹¹¹ Dr Paul Leinster, Chief Executive of the Environment Agency, explained that "we regulate those aspects of radioactivity that leave a site boundary: emissions to air, discharges to water, and waste when it comes outside the site boundary" and clarified that "waste on the site will be within the HSE's responsibilities".¹¹²

42. A key HSE document is the 1992 report on *The tolerability of risk from nuclear power stations*, originally published in 1988 following a recommendation in the 1986 Sizewell B public inquiry, that the HSE should "formulate and publish guidelines on the tolerable levels of individual and social risk to workers and the public from nuclear power stations".¹¹³ However, existing guidance on energy risks, such as from the ONR, was considered by the Royal Statistical Society (RSS) to be aimed at a professional or informed audience.¹¹⁴ Geoffrey Podger, Chief Executive of the HSE agreed that "in communication terms, most of what HSE does is probably aimed at a relatively technical audience" and explained that this reflected demand.¹¹⁵ However, Mr Podger added that the HSE did "a lot, particularly for small businesses, at an easier level of understanding", that it carried out "pioneer studies" on emerging technologies, and participated in public meetings on land use planning.¹¹⁶ The HSE had also been working on updating risk communication and a review of the HSE had found that it was "good at communicating on a technical level with technical people, but there were areas where [it] had been less successful when it was necessary to communicate with a wider group of people".¹¹⁷ According to the RSS, the review had "supported the HSE's 'consensual' approach to risk communication", but "suggested that in highly contested areas it could improve by being more proactive and engaging with people's concerns, exploiting wider expertise".¹¹⁸ The HSE should also focus "on becoming a trusted source which is seen as understanding the social context".¹¹⁹ The review also concluded that "the HSE's documents, although a clear exposition of their regulatory approach, do not provide the public with a basis for judging the risks".¹²⁰

43. We also explored the role of the Health Protection Agency (HPA) which provides information for the public, albeit not as a regulator. The HPA is a non-departmental public body (NDBP) which will be reconstituted as part of Public Health England from April 2013.¹²¹ Dr Jill Meara, Deputy Director of the Centre for Radiation, Chemical and

¹¹⁰ "About ONR – Background", *Office for Nuclear Regulation*, hse.gov.uk/nuclear

¹¹¹ "Nuclear", *Environment Agency*, environment-agency.gov.uk

¹¹² Q 99

¹¹³ Health and Safety Executive, *The tolerability of risk from nuclear power stations*, 1992, para 1

¹¹⁴ Ev 52, para 7

¹¹⁵ Q 101

¹¹⁶ Q 101

¹¹⁷ Q 115

¹¹⁸ Ev 52, para 9

¹¹⁹ Ev 52, para 9

¹²⁰ Ev 52, para 9

¹²¹ "About the HPA", *Health Protection Agency*, hpa.org.uk

Environmental Hazards, HPA, stated that the HPA was “reasonably well known, particularly for its infectious diseases work” and added “when you ask people who have heard of us which hazards they think we cover, [...] radiation comes into it”.¹²² She highlighted a 2009 poll, carried out after the swine flu pandemic, that showed that “44% of people had heard of the HPA; 63% thought that its advice would be trustworthy and competent; and 88% would follow its advice”.¹²³ The RSS stated that the HPA provided “popular, reassuring information on ‘Nuclear Emergencies’”.¹²⁴

44. During the Fukushima emergency, the HPA’s radiation protection experts kept the situation in Japan under close review and advised the UK Government.¹²⁵ The HPA also provided weekly statements on the results from radiation monitoring stations around the UK.¹²⁶ The emergency response involved a number of other public bodies: the Environment Agency “worked with [...] partners such as the Office for Nuclear Regulation, the Met Office and the Health Protection Agency to provide advice to Government” in order to “assist in understanding how this incident affected the UK, and how this may need to be managed”.¹²⁷ It also published guidance on how to deal with items contaminated by the Fukushima incident.¹²⁸ The HSE and HPA were represented on the Scientific Advisory Group for Emergencies (SAGE), set up to provide advice to Government during the emergency.¹²⁹

45. However, the low public profile of regulators drew criticisms from Fiona Fox, Director of the Science Media Centre (SMC), who stated:

Sadly, there were many, like the Health Protection Agency, the Met Office and the National Nuclear Laboratory, who told us they were not allowed to speak [to the media] during that phase. They were giving advice to Government but they did not want to do media interviews. There is a big lesson there about arm’s length independent experts being made available to advise Government but also the media and the public.¹³⁰

If you have any information or expertise to brief Government, do it, but also brief the media, who will brief the public [...] I would like the message to get out that we need to use our independent agencies, which are trusted and respected.¹³¹

Mr Podger, HSE, explained that the regulators had been heavily involved in understanding the emergency and advising the Government, adding that while “it is entirely legitimate to

¹²² Q 103

¹²³ Q 103

¹²⁴ Ev 52, para 6–10;

¹²⁵ “Statement on the Fukushima incident”, *Health Protection Agency*, 17 March 2011, hpa.org.uk

¹²⁶ “Weekly update on the Fukushima incident”, *Health Protection Agency*, 7 April 2011, hpa.org.uk

¹²⁷ Environment Agency, *Fukushima incident: keeping and disposing of items contaminated by the Fukushima incident*, 7 April 2011

¹²⁸ Environment Agency, *Fukushima incident: keeping and disposing of items contaminated by the Fukushima incident*, 7 April 2011

¹²⁹ “Minutes from SAGE update meeting”, *Government Office for Science*, 13 March 2011

¹³⁰ Q 50

¹³¹ Q 61

argue that people like us should [...] turn out quickly with the media in circumstances where there is a need to do so”, some of the requests were for “sofa pundits” such as Dr Weightman, who was otherwise “engaged 24/7 in advising the Government”.¹³² Dr Meara, HPA, acknowledged that the HPA had been approached by the media and had “explained very carefully what we were doing and why, in the very early stages before radiation was detected in the UK, we were not putting up press spokesmen”.¹³³ She highlighted the HPA’s “regular press statements” and added that “the moment we knew radiation was detected in the UK we [...] put press spokesmen out”.¹³⁴

46. The public profile of scientific advisers to Government was a key focus of our inquiry on Scientific Advice and Evidence in Emergencies, where we noted that as experts in the scientific issues of an emergency, SAGE members had an exceptional value as public communicators.¹³⁵ When we held a follow-up evidence session in June 2011 and discussed the Fukushima emergency, we were pleased that Professor Sir John Beddington, Government Chief Scientific Adviser, stated “it was important to engage fairly quickly with the media”.¹³⁶ However, even Sir John was criticised for his limited engagement with the media during Fukushima.¹³⁷ Attempting to address this issue in our previous inquiry, we recommended that a code of practice for SAGE and its members be developed, and the Government, in its response to our report, agreed to produce “Amplified Science Guidance on SAGE” by summer 2011.¹³⁸ To date, this guidance has not been published.

The Weightman review

47. Following the events at Fukushima, the UK Government responded to nuclear safety concerns by requesting that Dr Mike Weightman, HM Chief Inspector of Nuclear Installations and Head of the ONR, examine the circumstances of the Fukushima accident to see what lessons could be learnt to enhance the safety of the UK nuclear industry.¹³⁹ DECC stated that “it was important that we established the facts before making any decisions on policy”.¹⁴⁰ The report *Japanese earthquake and tsunami: Implications for the UK nuclear industry* (the Weightman review) was published in October 2011 and concluded that there were “no fundamental safety weaknesses in the UK’s nuclear industry but [...] by learning lessons it can be made even safer”.¹⁴¹ The review recommended that “both the UK nuclear industry and ONR should consider ways of enhancing the drive to ensure more open, transparent and trusted communications, and relationships, with the

¹³² Q 126

¹³³ Q 126

¹³⁴ Q 126

¹³⁵ Science and Technology Committee, Third Report of Session 2010–12, *Scientific advice and evidence in emergencies*, HC 498, para 172

¹³⁶ Oral evidence taken before the Science and Technology Committee on 15 June 2011, HC 1059–i, Q 14

¹³⁷ Q 61

¹³⁸ Science and Technology Committee, Fourth Special Report of Session 2010–12, *Scientific advice and evidence in emergencies: Government Response to the Committee’s Third Report of Session 2010–12*, HC 1042, para 7

¹³⁹ “Statement from HM Chief Inspector of Nuclear Installations on the implications of the Fukushima nuclear accident”, *Office for Nuclear Regulation*, 29 March 2011, hse.gov.uk/nuclear

¹⁴⁰ Ev 46, para 13

¹⁴¹ “Chief Nuclear Inspector’s report on lessons from Fukushima”, *Office for Nuclear Regulation*, 11 October 2011, hse.gov.uk/nuclear

public and other stakeholders”.¹⁴² Dr Rick Wylie, Executive Director of the Applied Policy Sciences Unit, University of Central Lancashire, commented that “the Weightman report was profound and very significant, and the role of the regulator is key” but in his view it was “a rigorous technical and scientific risk underpinning of so much of what goes on, and it is very important, but it does not address perceived risk”.¹⁴³

48. Good communication is essential for allaying public fear during an emergency, but time spent by key experts briefing the media must be balanced with the primary responsibility of producing scientific advice and advising Government. We commend the work of the Government Chief Scientific Adviser and SAGE during the Fukushima emergency and consider the UK’s scientific response to have been exemplary. However, the Government should publish the long overdue “Amplified Science Guidance” on SAGE as soon as possible, which should include protocols for SAGE members’ engagement with the media.

49. In principle, anyone providing scientific advice to Government during an emergency, including public bodies, should also consider adhering to media engagement protocols in the “Amplified Science Guidance” on SAGE when dealing with high profile events.

50. Not everyone is interested in understanding energy risks and the roles of various stakeholders. The Government, via the proposed Risk Communication Strategy team, should evaluate the public appetite for risk information and consider how this information would be best disseminated. We recommend that information should be disseminated using existing sources, with a focus on developing the public profile of independent regulators as trusted and authoritative information sources.

51. We consider that regulatory bodies such as the Health and Safety Executive, Environment Agency and Office for Nuclear Regulation, that are independent of Government and technically competent, are in a unique position to engender public trust and influence risk perceptions. The impact and profile of the Weightman review in the UK is a testament to the importance of independent, evidence-based evaluation of risks. In addition to providing risk information for technical audiences, regulators should also make greater efforts to communicate risk to the public and develop their role as trusted sources of information for lay people.

The media

52. In paragraph 27 we noted that while information from media sources was often not trusted by the public, it acquired trust by being transmitted through trusted figures, such as friends and family. Risk information provided by the media formed an important part of our inquiry because of the media’s influence on public opinion. Ms Fox, SMC, cited a survey carried out by MORI for the Department for Business, Innovation and Skills (BIS) which showed that “the media as a whole, including television, is the main source of

¹⁴² Office for Nuclear Regulation, *Japanese earthquake and tsunami: Implications for the UK nuclear industry, Final Report*, September 2011

¹⁴³ Q 92

information about science for the overwhelming majority of the population”.¹⁴⁴ She added that “all the media have a huge influence on public opinion on science and risk”.¹⁴⁵ Dr Henderson, former Science Editor at The Times, added more detail on the survey findings and stated:

I believe the question they asked was, “What is your main source for science in general?” About 64% said it was television and about 25% said it was newspapers. The internet was surprisingly low, including only about 2%, who said that science blogs and that kind of thing were the main source.¹⁴⁶

Despite the Internet’s apparent low ranking as a source of information, Tracey Brown, Managing Director, Sense About Science, stated “a new phenomenon is that in similar surveys 80% of people say they get health information on the internet”, including “pull[ing] up old news stories and materials in a proactive fashion”.¹⁴⁷ This means that “there is a circulation that continues beyond the day the newspapers are published or the programmes broadcast”.¹⁴⁸

Fukushima coverage

53. Unlike the Three Mile Island and Chernobyl accidents in 1979 and 1986 respectively, a vast amount of information on the Fukushima accident was available online and people were able to seek information and actively engage in risk discussions through blogs and social networking.¹⁴⁹ The Internet also provided opportunities for traditional news sources, such as newspapers, to publish more information and detailed graphics.¹⁵⁰ Online coverage of the unfolding events at Fukushima exceeded coverage of the widespread devastation caused by the Tohoku earthquake and tsunami. In April 2012 a Google search of the term “Fukushima” returned 62.7 million hits whereas the term “Tohoku Earthquake” returned 6.3 million hits. Ms Brown, Sense About Science, highlighted the same differences in newspaper coverage of events in Japan, giving the example of The Independent, which had “eight pages [...] sensationalising nuclear stories” and “not one mention in eight pages of the 20,000 people who died and the hundreds of thousands who were displaced”.¹⁵¹ She contrasted this with coverage in the Daily Mail where “the front page had a picture and put across a story, [...] where 20,000 people were dead or missing, with massive displacement of people from their homes, and dysentery [returning] to an industrial nation”.¹⁵²

¹⁴⁴ Q 42

¹⁴⁵ Q 42

¹⁴⁶ Q 42

¹⁴⁷ Q 42

¹⁴⁸ Q 42

¹⁴⁹ Sharon M Friedman, “Three Mile Island, Chernobyl, and Fukushima: An analysis of traditional and new media coverage of nuclear accidents and radiation”, *Bulletin of the Atomic Scientists*, vol 67 no. 5 (2011)

¹⁵⁰ Sharon M Friedman, “Three Mile Island, Chernobyl, and Fukushima: An analysis of traditional and new media coverage of nuclear accidents and radiation”, *Bulletin of the Atomic Scientists*, vol 67 no. 5 (2011)

¹⁵¹ Q 55

¹⁵² Q 56

54. We explored whether some news sources were better at communicating risks than others, and an important point was made by several witnesses: that “it is always a mistake to see the media as a whole”¹⁵³ and that “we have the worst and best of journalism within the same newspapers”.¹⁵⁴ Different media approaches to the same issue will depend on whether the goal is to attract an audience using “a more sensational approach” or “through a reputation for trustworthiness and accuracy”.¹⁵⁵ Even so, the Daily Mail, often accused of sensationalism, was held up as an example of balanced risk coverage of events at Fukushima.¹⁵⁶ Ms Fox stated that “our science, health and environment reporters in the UK are among the best journalists in the world and care passionately about accuracy and measured reporting” but highlighted the pressures put on science correspondents by editors:

One of our big problems is what happens between the article and the headline, which is usually devised by the sub-editor, and the pressures from the news desk. During Fukushima we had various journalists [...] coming to [Science Media Centre] briefings with experts saying, “My editor wants a scare story.” Newspaper journalists were even taken off this story because they were giving a more measured, balanced, accurate narrative than the ones the news desks wanted.¹⁵⁷

Ms Fox highlighted an interesting disjuncture between what information the public desire and what the media consider to be the public appetite, stating “the media believe that the public want to be informed about every possible risk”.¹⁵⁸ She added:

[Surveys show] quite surprisingly, that, when asked whether they would like to hear about every possible risk to the environment and health, immediately the public say they do not want to hear. They would prefer to hear about the risk when it has been proven several times and other experts have replicated those studies. There is a real disjuncture between what the news editor thinks [...] and the public’s desire for the much more cautious approach.¹⁵⁹

55. However, it would be simplistic solely to blame the media for reporting stories that do not accurately reflect risk. High profile figures such as politicians may also misrepresent risk and the media duly report this. For example, in the days following explosions at the Fukushima plant, Guenther Oettinger, Europe’s Energy Commissioner, stated “there is talk of an apocalypse and I think the word is particularly well chosen. Practically everything is out of control. I cannot exclude the worst in the hours and days to come”.¹⁶⁰ Ms Brown

¹⁵³ Q 47 [Mark Henderson]

¹⁵⁴ Q 57 [Fiona Fox]

¹⁵⁵ Q 47 [Mark Henderson]

¹⁵⁶ Q 37 [Professor David Spiegelhalter]

¹⁵⁷ Q 47

¹⁵⁸ Q 45

¹⁵⁹ Q 45

¹⁶⁰ “Japan nuclear plant disaster: warning of an ‘apocalypse’ as fallout hits danger levels”, *The Telegraph*, 16 March 2011, telegraph.co.uk

queried: “when a senior official says something really irresponsible what are the media supposed to do?”¹⁶¹

The Science Media Centre

56. Following the House of Lords Science and Technology Committee’s 2000 report on *Science and Society*, the Science Media Centre (SMC) was created in 2002. The SMC is an independent body supported by donations capped at 5% from industry, professional organisations, media groups and individuals.¹⁶² The SMC considers itself to be “first and foremost a press office for science when science hits the headlines” and puts journalists in contact with scientists, organises press briefings and workshops and provides media training for scientists.¹⁶³ The SMC’s work was widely praised, for example the Society for Radiological Protection considered it to be “an important objectively-based way of resisting ‘quackery’ and providing good quality information to the media, should they choose to use it”.¹⁶⁴ Professor Pidgeon stated that the SMC “has been a very good development in this country. They have connected the journalists with the scientists and engineers in a very effective way over many years on many issues”.¹⁶⁵

57. We commend the work of the Science Media Centre in connecting journalists with scientists, but consider that more could be done to improve risk communication of scientific matters in the media. The Science and Society Programme within the Department of Business, Innovation and Skills was created in 2008 and includes an expert group on Science and the Media.¹⁶⁶ In January 2010, this expert group produced a report detailing recommendations to improve the accurate reporting of science in the media.¹⁶⁷ **The Government should clarify what progress has been made in the consideration and implementation of the recommendations made in 2010 by its expert group on Science and the Media. We may return to this matter in the future.**

The International Nuclear and Radiological Event Scale

58. A key tool for conveying the severity of nuclear accidents is the International Nuclear and Radiological Event Scale (INES), which is “a worldwide tool for communicating to the public in a consistent way the safety significance of nuclear and radiological events”.¹⁶⁸ Since 1990 the scale has been applied to classify events at nuclear power plants and by 2006, it had been adapted to meet the growing need for communication of the significance of all events “associated with the transport, storage and use of radioactive material and radiation sources”¹⁶⁹ Events are classified on the INES at seven levels: Levels 1–3 are called

¹⁶¹ Q 49

¹⁶² “About us”, *Science Media Centre*, sciencemediacentre.org

¹⁶³ “About us”, *Science Media Centre*, sciencemediacentre.org

¹⁶⁴ Ev w25, para 17c

¹⁶⁵ Q 37

¹⁶⁶ “Science and the media expert group”, *Department for Business, Innovation and Skills*, bis.gov.uk/scienceandsociety

¹⁶⁷ “Science and the media expert group”, *Department for Business, Innovation and Skills*, bis.gov.uk/scienceandsociety

¹⁶⁸ International Atomic Energy Agency, *The International Nuclear and Radiological Event Scale*, iaea.org

¹⁶⁹ International Atomic Energy Agency, *The International Nuclear and Radiological Event Scale*, iaea.org

“incidents” and Levels 4–7 are “accidents”. Events without safety significance are called “deviations” and are classified Below Scale/Level 0. The scale is designed so that the severity of an event is about ten times greater for each increase in level on the scale.¹⁷⁰ The Windscale Fire and Three Mile Island incidents are classified as a Level 5 “accidents with wider consequences” and Chernobyl is classified as a Level 7 “major accident”.¹⁷¹ A level 7 rating is defined as “an event resulting in an environmental release corresponding to a quantity of radioactivity radiologically equivalent to a release to the atmosphere of more than several tens of thousands of terabecquerel (TBq)¹⁷² of Iodine-131”.¹⁷³ The Fukushima accident was initially classed as a level 5 incident and later revised upwards to level 7. While the Chernobyl accident released 5.2 million TBq, it is estimated that the Fukushima accident released approximately 770 thousand TBq,¹⁷⁴ an order of magnitude less.

59. Dr Henderson, former Science Editor at The Times, criticised the INES scale, stating that it was “difficult for reporters to convey the nuance of what was happening at Fukushima versus what had happened previously at Chernobyl, because the scale was not fit for purpose”.¹⁷⁵ He noted that classifying Fukushima as level 7 put it in the same category as Chernobyl, although the two were very different in scale.¹⁷⁶ Professor David Spiegelhalter, Royal Statistical Society, stated that “we have a scale, intended for popular use, whose technical definition has little relation to the phrase used in its media communication, and whose use has required repeated clarifications”.¹⁷⁷ We asked Dr Weightman, Head of the ONR, whether he agreed that the INES was not fit for purpose, and he concurred.¹⁷⁸ He stated that “in terms of its purpose, it is there to provide clear communication to people and the media about a nuclear event [...] Did it do that? No, it did not” and explained that part of the difficulty was that Fukushima was “a long event, which meant it escalated with time” and also for Level 7 events “you can get a difference by a factor of 10 in the level of release”.¹⁷⁹ Dr Meara, HPA, added that the INES “takes account only of the hazard—what has flown over the site boundary—and, in order to define the importance of it for the population, you have to think about the risk” because “what the public are interested in is the risk to them, not just the raw nature of the hazard that has gone from the site”.¹⁸⁰ She also considered that the scale “does not cover enough orders of magnitude”.¹⁸¹

¹⁷⁰ International Atomic Energy Agency, *The International Nuclear and Radiological Event Scale*, iaea.org

¹⁷¹ International Atomic Energy Agency, *The International Nuclear and Radiological Event Scale*, iaea.org; “The International Nuclear and Radiological Event Scale”, *International Atomic Energy Agency*, www-ns.iaea.org

¹⁷² Radioactivity is measured in becquerels (Bq); a million million of these is a terabecquerel (TBq).

¹⁷³ International Atomic Energy Agency, *The International Nuclear and Radiological Event Scale: User's Manual, 2008 Edition, May 2009*, Page 17

¹⁷⁴ “Fukushima fallout greater than thought”, *New Scientist*, 7 June 2011

¹⁷⁵ Q 50

¹⁷⁶ Q 50

¹⁷⁷ “A disastrous piece of risk communication?”, *Understanding Uncertainty blog*, 13 April 2011, understandinguncertainty.org

¹⁷⁸ Q 120

¹⁷⁹ Q 120

¹⁸⁰ Q 120

¹⁸¹ Q 120

60. The inadequacies of the INES have been recognised by the International Atomic Energy Agency (IAEA) “as part of its action plan post-Fukushima to review that event”.¹⁸² According to Dr Weightman, the IAEA “will also have to review the basis of it, because at the moment it is based on technical opinion about the level of defence or defeat of barriers” and “if you are trying to communicate with somebody, you have to think about whether that is the best basis on which to do it”.¹⁸³ **Although it is useful to have a scale to enable the public to make informed comparative assessments of risk, we agree that the International Nuclear and Radiological Event Scale (INES) is not an adequate communication tool for conveying risks. The IAEA, in reviewing the INES, should pay particular attention to (i) the technical basis of the scale and whether it incorporates sufficient information about risk as well as hazard; (ii) how to better represent orders of magnitude; and (iii) how to make the scale comprehensible to non-technical audiences. As a member state of the IAEA, the UK Government should influence the review of the INES in this direction.**

61. **The IAEA and UK Government should also consider whether the INES, or its successor, should communicate the likely impacts of a nuclear accident on people and the environment, as well as quantifying the release of radioactive materials. Consideration should be given to the best method of communicating acute and chronic impacts.**

Radiation exposure thresholds

62. As mentioned previously, the UK legal limit for radiation exposure from sources such as nuclear plants for members of the public is 1 millisievert (mSv) a year, based on recommendations from the International Commission on Radiological Protection.¹⁸⁴ Professor Allison, Emeritus Professor of Physics, University of Oxford, stated:

Non-medical international safety standards have been established to appease popular concerns by specifying levels found in nature, As Low As Reasonably Achievable (ALARA) [Also referred to as ALARP – As Low As Reasonably Practical]. Modern biology has demonstrated that no harm comes to people from radiation levels up to 1,000 times higher.¹⁸⁵

Tracey Brown, Sense About Science, also criticised thresholds and explained that:

there is a particular issue to do with people’s perception derived from safety guidelines. Safety guidelines are necessarily very conservative about levels of exposure. What happens in a situation like the Fukushima plant in Japan is that there are very low thresholds. Japan sets the threshold for exposure through the water supply very low indeed, but then the news becomes that you have exceeded that. For example, iodine 131 levels in Tokyo’s water supply were about 210 becquerels per kilo. That is more than the limit set by Japan for infant exposure but less than adult

¹⁸² Q 120 [Dr Mike Weightman]

¹⁸³ Q 120

¹⁸⁴ “Q&A: Health effects of radiation exposure”, *BBC News*, 21 July 2011, bbc.co.uk/news

¹⁸⁵ Ev w9

exposure. The context is that the adult exposure level set in Japan is about 10 times lower than the level worldwide set by the World Health Organisation as the point of intervention, which is 3,000 becquerels per kilo. Japan sets the adult limit at 300.

You end up with a situation where you are trying to explain to a worried population. You have media headlines saying that recommended levels have been exceeded, but there is no evidence that at that level it will cause anybody any harm or anybody will suffer from that. But, of course, it is very worrying for people. What is set out as a precautionary measure to protect the public becomes a source of concern and also a source of alarming newspaper stories.¹⁸⁶

63. Ms Brown considered that “there is certainly a job to be done to explain why we set exposure thresholds for environmental hazards at a very low level, and exceeding those does not necessarily mean that people are at risk”.¹⁸⁷ Professor Allison went further and suggested that:

the UK, through academic and other channels, should bring every influence to bear on ICRP and IAEA to ensure that internationally recommended ALARA “safety” levels are replaced by real safety levels (AHARS) without delay, so as to ensure that the world does not continue to be “spooked” by the one major energy source that could support future economic stability without damage to the environment.¹⁸⁸

64. Radiation exposure thresholds based on reducing exposure to levels that are as low as reasonably practical (ALARP) should be retained, as they are key to maintaining public confidence that risks are being stringently managed. However, the Government, regulators and other information sources must emphasise that exceeding ALARP levels may not pose any risk to people or the environment, and that there is a difference between operational thresholds (which are purposely set very low) and safety thresholds (based on scientific evidence) that may allow for significantly greater radiation exposure to occur without significant risk to health or the environment.

Public engagement in planning processes

65. The final part of this chapter looks at risk dialogue as part of public engagement in planning processes.

Risk perceptions at existing nuclear sites

66. In paragraph 22 we outlined the general factors affecting risk perceptions. Professor Pidgeon stated that “views become more complex at existing nuclear locations [...] the response of people in such communities does not always mirror that obtained from national samples”.¹⁸⁹ EDF Energy stated that “risk perception is likely to differ between the national and local level, with the latter forming views based on local knowledge—which

¹⁸⁶ Q 45

¹⁸⁷ Q 46

¹⁸⁸ Ev w9

¹⁸⁹ Ev 67, para 13

may be either positive or negative”.¹⁹⁰ Sedgemoor District Council stated “in our experience local communities are more objective in their perception of risk. They perceive that there is a potentially high impact yet low likelihood of a catastrophic event at the power station”.¹⁹¹ Professor Pidgeon cautioned: “a common assumption is that people in these locations will be overwhelmingly positive about nuclear power, because of long-standing experience with the local station and local economic benefits” but “while it is true that surveys conducted at such locations tend to be somewhat more positive about nuclear power in aggregate compared with samples living elsewhere, detailed research again suggests a more complex picture and the need to look beyond the headline statistics”.¹⁹² He considered that geography, history and socio-economic factors were important, and that “in this respect the existing UK nuclear sites vary enormously in social, economic and historical circumstance”.¹⁹³

Planning processes

67. According to the British Geological Survey (BGS), planning processes have generally evolved from the “Decide-Announce-Defend’ (DAD) approach to [nuclear] site selection” which “has been used extensively in the past in France and the UK” to the “Review-Decide” pattern currently used in the UK.¹⁹⁴ The BGS explained that the DAD approach “has not been particularly successful in its goals and has generated considerable suspicion of the nuclear industry”.¹⁹⁵

68. Sedgemoor District Council, representing a local authority adjacent to the Hinkley Point nuclear power stations, stated that:

The consideration of risk and tolerability is best placed within the planning process as it is the process that is best understood and actively engaged in by communities and individuals. The placing of the consideration of risk and tolerability in the more technical and less familiar scientific processes of other regulatory considerations, does not adequately deal with legitimate community concerns.¹⁹⁶

69. EDF Energy stated that “good developers would always aim to build a constructive relationship with consultees, particularly the most immediate community around the development, ahead of a planning application being submitted”.¹⁹⁷ Richard Mayson, EDF Energy, stated “we work very hard to make sure we have a full engagement process. We fully support the massive engagement that has happened on nuclear policy over the last eight to 10 years”.¹⁹⁸ Whereas the importance of public engagement was recognised by the nuclear industry and others, plenty of criticisms were offered in the written submissions we

¹⁹⁰ Ev 55, para 9

¹⁹¹ Ev 61, paras 1-2

¹⁹² Ev 68, para 13

¹⁹³ Ev 68, para 14

¹⁹⁴ Ev 49, paras 5 and 10

¹⁹⁵ Ev 49, paras 5 and 10

¹⁹⁶ Ev 63, para 3.6

¹⁹⁷ Ev 56, para 13

¹⁹⁸ Q 70

received. Greenpeace considered that “there are regrettably few opportunities for the public to have a say in the planning process”.¹⁹⁹ The Applied Policy Sciences Unit (APSU) at the University of Central Lancashire expressed concerns about the nuclear industry’s emphasis on quantitative risk assessments that failed to “appreciate or accommodate the constructed and contextual nature of perceived risk”.²⁰⁰ Academics at the University of Manchester stated that safety information provided during the Generic Design Assessment (GDA)²⁰¹ process showed transparency but considered that “it is unlikely that the public will be in a position to understand the large volumes of deeply complex technical safety documents” and “therefore, the government should think about [...] ways to provide relevant information in a format more suited for the general public”.²⁰²

70. The balances between risk perception, trust and community benefits were highlighted and interesting difference of opinion emerged. Sedgemoor District Council defined community benefit as “the internationally accepted form of compensation paid to communities hosting large impactful infrastructure projects, particularly nuclear power stations”.²⁰³ Bob Brown, Corporate Director, Sedgemoor District Council, stated “the Government see [community benefit] as an important issue in terms of the long-term relationship and building of trust”.²⁰⁴ He stated that:

In Hinkley the experience of our communities is that they are more understanding; they live with it [...] they understand what would happen if there was a catastrophic event [...] but they live with the risk and understand it because of the benefits that it brings, and has brought to them, and the benefits more widely to the nation from low-carbon energy production.²⁰⁵

Similarly, in reference to the West Cumbrian community near the Sellafield site, Dr Rick Wylie, APSU, stated “I cannot stress enough that people in these communities do not support the nuclear industry or a new facility [...] because they trust the operators but because of the extrinsic benefits that the facility will bring to their community”.²⁰⁶

71. During our visit to Germany, we learned that the views of the public were sought during planning processes, but this tended to happen late in the process. There was a desire to increase public participation and new “citizen partnership” models were being developed whereby communities could take shares in new projects, for example, a community wind farm. We heard that public hearings could be viewed as insufficient as they tended to be “an orchestration of power versus disempowerment”.²⁰⁷

¹⁹⁹ Ev w30

²⁰⁰ Ev 57, para 6

²⁰¹ The GDA process allows the generic safety, security and environmental aspects of new nuclear reactor designs to be assessed before an application is made for licences and permits to build particular designs of reactor on a particular sites.

²⁰² Ev w16 [Martin J Goodfellow and Adisa Azapagic], paras 10–11

²⁰³ Ev 63, para 4.1

²⁰⁴ Q 88

²⁰⁵ Q 76

²⁰⁶ Q 86

²⁰⁷ Meeting with Professor Ortwin Renn, Member of the Ethics Commissions for a Safe Energy Supply

72. The Government, working with industry, regulators, social scientists and communities, should produce guidance on best practice in risk communication for those living near existing or proposed nuclear facilities. The guidance should address how to present risk information in accessible formats and language. Complex, technical documents should continue to be available in the interests of transparency.

73. Community benefits are an important way of building trust and negotiations can enable the public to feel a greater sense of control, choice over and ownership of energy projects. We encourage the further use of current community engagement processes led by energy companies, working with local government and the public, for building trust around nuclear new build proposals.

74. We were impressed by the citizen partnership model being developed in Germany for wind farms and suggest that enabling communities to feel more ownership of local energy infrastructure by offering shares in projects could be conducive to building trust and acceptance. Partnership models could form part of community benefits discussions for new nuclear build and other energy infrastructure.

4 New energy technologies

Carbon capture and storage (CCS)

75. Although most of our inquiry, and subsequently this report, has focused on nuclear power, there are useful lessons to be learned for new energy technologies. Carbon capture and storage (CCS) is important because, as Professor Nick Pidgeon, Director of the Understanding Risk Programme at Cardiff University, stated, “[energy] policy in the EU and UK depends very heavily upon CCS technology working”.²⁰⁸ CCS is one of a number of mitigation technologies important to tackling global warming, and ensuring a secure energy supply. It involves capturing carbon dioxide (CO₂) from fossil fuel power stations and transporting it via pipelines to be stored in deep underground structures such as depleted oil and gas reservoirs, and deep saline aquifers. In the UK, captured carbon would be stored offshore.²⁰⁹ However, in Germany and other countries, onshore storage is being explored.

76. Professor Pidgeon highlighted “evidence that there are some severe public perception issues about the storage of carbon dioxide certainly onshore in other countries” and warned that “the CCS industry, if it is not careful, is about to repeat the mistakes that the nuclear industry made 50 years ago”.²¹⁰ Dr Andrew Bloodworth, Head of Science, Minerals and Waste, British Geological Survey (BGS), agreed that the CCS industry “has not necessarily shown it is learning the lessons that the nuclear sector has learned very hard”.²¹¹ Pilot work is yet to start in the UK, but in Germany, pilot CCS projects are underway, including a carbon capture facility at the Schwarze Pumpe power station and a carbon storage research project in Ketzin, Brandenburg. We visited the Ketzin site and met researchers there, followed by meetings with Dr Carsten Enneper, Director General of Economic and Energy Policy at the Economics and Europe Ministry, State of Brandenburg, and citizen groups opposed to CCS. The strength of opposition to CCS in Germany was compared to nuclear power opposition. Interestingly, while safety and environmental concerns were often presented as reasons to oppose CCS, there were suspicions that the underlying reasons included distrust of industry and concerns that CSS would provide a means for fossil fuel dependency to continue. Dr Enneper believed that the Ministry had underestimated the resources committed by anti-CCS lobby groups and that it could have made greater efforts to engage with the public. This echoed comments by Mr Bloodworth, BGS, that campaigning groups were very good at getting their message across and “will pick a very narrow issue, go for that very strongly and throw lots of resources at it. They have embraced the internet and the new media very well”.²¹² **The Government and regulators should make better use of their resources to communicate and engage with the public via the internet and social media. Lessons could be learned from the communication strategies employed by campaigning organisations.**

²⁰⁸ Q 24

²⁰⁹ “Carbon capture and storage”, *Department of Energy and Climate Change*, 3 April 2012, decc.gov.uk

²¹⁰ Q 24

²¹¹ Q 29

²¹² Q 40

77. Mr Carsten also told us that the Ministry could have encouraged more people to visit the Ketzin project. Dr Michael Kühn and Fabian Möller, researchers at the Ketzin project, considered that public outreach was important, and the site had around 800 visitors to open days in 2011. These open days were primarily for researchers to engage with the local community, without a media presence. The researchers had been able to discuss local people's concerns such as carbon dioxide leakage, saltwater contamination and induced seismicity (earthquakes). Whereas the wider perception of the energy industry was that it was distant and "faceless", the local community near Ketzin knew the researchers. As a result, the community felt more able to engage with the research site. **The UK is yet to develop a pilot CCS project and UK public concerns may be different to those in Germany. However we consider that public outreach, such as site visits, should be considered a vital part of the Government's public engagement strategy for CCS and other novel energy infrastructure.**

78. Carbon capture and storage is not the only area where early risk dialogue and public engagement will be essential. During our inquiry the examples of shale gas extraction²¹³ and geoengineering²¹⁴ were also raised,²¹⁵ both of which have already courted controversy. **We hope our inquiry will highlight the importance of risk dialogue and understanding public risk perceptions. The Government must ensure that lessons are learned from risk communication and dialogue experiences in relation to nuclear energy when developing new energy technologies and infrastructure.**

79. **If the Government intends to rely on carbon capture and storage (CCS) as part of emissions reduction strategies, it should examine the difficulties experienced in Germany due to public concerns.**

²¹³ Shale gas is gas found in shale rock. It is usually extracted by hydraulic fracturing ("fracking"), which involves pumping water at high pressure into the rock to cause fractures, thus releasing the gas

²¹⁴ Geoengineering involves two types of technique to change the climate on a large scale: (i) carbon dioxide removal from the atmosphere and (ii) solar radiation management, which involves reflecting the sun's light back into space

²¹⁵ Q 54 [Fiona Fox]

5 Conclusions

80. This inquiry has enabled us to explore two key questions: (i) what the risk perceptions associated with energy infrastructure are; and (ii) how they should be factored into policy processes. Changes to energy policy in Germany after Fukushima illustrate an important point, which was also highlighted by Professor Tom Horlick-Jones who stated that “no matter how safe an industry can be made, [...] ultimately its acceptability [depends on] whether the society in question can live with possible failures”.²¹⁶ The Nuclear Industry Association considered that “policy on new nuclear developments should not be driven by the perception of risk, but by an evidence-based approach that enables an appropriate level of risk to be determined”.²¹⁷ Concerns about climate change and energy security drive the development of energy technologies and infrastructure, and public opposition must be balanced against these concerns and the UK’s energy and emissions targets. Germany’s energy policies appear to have been significantly driven by public opposition to nuclear power, including distorted views of risk, yet as Sense About Science highlighted, “Germany [...] plans to significantly decrease carbon dioxide emissions but it has been estimated that these will increase [after the energy turnaround] with an extra 300 million tonnes of carbon dioxide until 2020”.²¹⁸

81. We consider that public risk perceptions must be understood and taken into account when policies are developed, but that public views are one form of evidence that must be balanced against political, ethical and scientific considerations. However, when public opinion diverges from the evidence of objective risk, policies and decisions should be primarily based on scientific evidence on risk and safety. In our view, basing policies firmly on evidence from independent, impartial, scientific sources and engaging in robust risk dialogue at local and national levels, are the best way to ensure public confidence.

²¹⁶ Ev w18, para 2.6

²¹⁷ Ev w23

²¹⁸ Ev 66, para 4.7

Conclusions and recommendations

The science of risk perception

1. When public risk perceptions diverge from the scientifically objective risks it should not necessarily be characterised as irrational or anti-scientific. Public concerns may be influenced by the level of scientific understanding, but are also likely to be influenced by other affective (that is, feeling or emotion-based) factors that may not be changed by explaining risk in scientific terms. (Paragraph 30)
2. It is possible for some of the fright factors affecting risk perceptions to be mitigated, for example by building public trust, communicating effectively, improving risk governance and operating in a transparent manner. (Paragraph 31)
3. The Government considers nuclear power to be an essential part of the UK's energy mix. The evidence shows that around half of the population support this, even though it may be a reluctant support for the least worst option. The Government's position as an advocate for nuclear power makes it difficult for the public to trust it as an impartial source of information. In our view, this perceived lack of impartiality further emphasises the importance of Government demonstrating that all energy policies are strongly based on rigorous scientific evidence. (Paragraph 32)

Risk communication and dialogue

4. While it is commendable that individual Departments have embedded risk frameworks, coordination of risk communication across Government is lacking. A senior individual in Government should be visibly responsible for overseeing risk communication, research and training across Government. This individual should lead a Risk Communication Strategy team, drawing together existing expertise within Departments and public bodies, which should sit at the centre of Government, either within the Cabinet Office, which houses the Civil Contingencies Secretariat and the Behavioural Insights team, or the Treasury, which provides cross-Government risk management guidance. (Paragraph 39)
5. While comparisons of risk from different energy sources can be useful for engaging with some audiences, experience has shown that such factual information does not always change risk perceptions because they don't take the influence of "fright factors" into account. The Risk Communication Strategy team should evaluate whether it would be possible and beneficial to publish risk comparisons where fright factors have been controlled (for example, not comparing voluntary risks with involuntary risks). (Paragraph 40)
6. Good communication is essential for allaying public fear during an emergency, but time spent by key experts briefing the media must be balanced with the primary responsibility of producing scientific advice and advising Government. We commend the work of the Government Chief Scientific Adviser and SAGE during the Fukushima emergency and consider the UK's scientific response to have been exemplary. However, the Government should publish the long overdue "Amplified

Science Guidance” on SAGE as soon as possible, which should include protocols for SAGE members’ engagement with the media. (Paragraph 48)

7. In principle, anyone providing scientific advice to Government during an emergency, including public bodies, should also consider adhering to media engagement protocols in the “Amplified Science Guidance” on SAGE when dealing with high profile events. (Paragraph 49)
8. Not everyone is interested in understanding energy risks and the roles of various stakeholders. The Government, via the proposed Risk Communication Strategy team, should evaluate the public appetite for risk information and consider how this information would be best disseminated. We recommend that information should be disseminated using existing sources, with a focus on developing the public profile of independent regulators as trusted and authoritative information sources. (Paragraph 50)
9. We consider that regulatory bodies such as the Health and Safety Executive, Environment Agency and Office for Nuclear Regulation, that are independent of Government and technically competent, are in a unique position to engender public trust and influence risk perceptions. The impact and profile of the Weightman review in the UK is a testament to the importance of independent, evidence-based evaluation of risks. In addition to providing risk information for technical audiences, regulators should also make greater efforts to communicate risk to the public and develop their role as trusted sources of information for lay people. (Paragraph 51)
10. We commend the work of the Science Media Centre in connecting journalists with scientists, but consider that more could be done to improve risk communication of scientific matters in the media. The Government should clarify what progress has been made in the consideration and implementation of the recommendations made in 2010 by its expert group on Science and the Media. We may return to this matter in the future. (Paragraph 57)
11. Although it is useful to have a scale to enable the public to make informed comparative assessments of risk, we agree that the International Nuclear and Radiological Event Scale (INES) is not an adequate communication tool for conveying risks. The IAEA, in reviewing the INES, should pay particular attention to (i) the technical basis of the scale and whether it incorporates sufficient information about risk as well as hazard; (ii) how to better represent orders of magnitude; and (iii) how to make the scale comprehensible to non-technical audiences. As a member state of the IAEA, the UK Government should influence the review of the INES in this direction. (Paragraph 60)
12. The IAEA and UK Government should also consider whether the INES, or its successor, should communicate the likely impacts of a nuclear accident on people and the environment, as well as quantifying the release of radioactive materials. Consideration should be given to the best method of communicating acute and chronic impacts. (Paragraph 61)
13. Radiation exposure thresholds based on reducing exposure to levels that are as low as reasonably practical (ALARP) should be retained, as they are key to maintaining

public confidence that risks are being stringently managed. However, the Government, regulators and other information sources must emphasise that exceeding ALARP levels may not pose any risk to people or the environment, and that there is a difference between operational thresholds (which are purposely set very low) and safety thresholds (based on scientific evidence) that may allow for significantly greater radiation exposure to occur without significant risk to health or the environment. (Paragraph 64)

Public engagement in planning processes

14. The Government, working with industry, regulators, social scientists and communities, should produce guidance on best practice in risk communication for those living near existing or proposed nuclear facilities. The guidance should address how to present risk information in accessible formats and language. Complex, technical documents should continue to be available in the interests of transparency. (Paragraph 72)
15. Community benefits are an important way of building trust and negotiations can enable the public to feel a greater sense of control, choice over and ownership of energy projects. We encourage the further use of current community engagement processes led by energy companies, working with local government and the public, for building trust around nuclear new build proposals. (Paragraph 73)
16. We were impressed by the citizen partnership model being developed in Germany for wind farms and suggest that enabling communities to feel more ownership of local energy infrastructure by offering shares in projects could be conducive to building trust and acceptance. Partnership models could form part of community benefits discussions for new nuclear build and other energy infrastructure. (Paragraph 74)
17. The Government and regulators should make better use of their resources to communicate and engage with the public via the internet and social media. Lessons could be learned from the communication strategies employed by campaigning organisations. (Paragraph 76)

New energy technologies

18. The UK is yet to develop a pilot CCS project and UK public concerns may be different to those in Germany. However, we consider that public outreach, such as site visits, should be considered a vital part of the Government's public engagement strategy for CCS and other novel energy infrastructure. (Paragraph 77)
19. We hope our inquiry will highlight the importance of risk dialogue and understanding public risk perceptions. The Government must ensure that lessons are learned from risk communication and dialogue experiences in relation to nuclear energy when developing new energy technologies and infrastructure. (Paragraph 78)

20. If the Government intends to rely on carbon capture and storage (CCS) as part of emissions reduction strategies, it should examine the difficulties experienced in Germany due to public concerns. (Paragraph 79)

Conclusions

21. We consider that public risk perceptions must be understood and taken into account when policies are developed, but that public views are one form of evidence that must be balanced against political, ethical and scientific considerations. However, when public opinion diverges from the evidence of objective risk, policies and decisions should be primarily based on scientific evidence on risk and safety. In our view, basing policies firmly on evidence from independent, impartial, scientific sources and engaging in robust risk dialogue at local and national levels, are the best way to ensure public confidence. (Paragraph 81)

Glossary

ALARA/ALARP	As Low As Reasonably Achievable/Practical
APSU	Applied Policy Sciences Unit
BGS	British Geological Survey
BIS	Department of Business, Innovation and Skills
CCS	carbon capture and storage
CO ₂	carbon dioxide
DAD	Decide-Announce-Defend
DECC	Department of Energy and Climate Change
GCSA	Government Chief Scientific Adviser
GDA	Generic Design Assessment
HPA	Health Protection Agency
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
ILGRA	Interdepartmental Liaison Group on Risk Assessment
INES	International Nuclear and Radiological Event Scale
MP	Member of Parliament
mSv	millisievert
NDPB	Non Departmental Public Body
NIA	Nuclear Industry Association
NII	Nuclear Installations Inspectorate
OECD	Organisation for Economic Cooperation and Development
ONR	Office for Nuclear Regulation
RSS	Royal Statistical Society
SAGE	Scientific Advisory Group in Emergencies
SMC	Science Media Centre
TBq	terabecquerel
UN	United Nations
WHO	World Health Organization

Formal Minutes

Wednesday 27 June 2012

Members present:

Andrew Miller, in the Chair

Jim Dowd
Gareth Johnson
Stephen Metcalfe
Stephen Mosley

Pamela Nash
Graham Stringer
Hywel Williams
Roger Williams

Draft Report (*Devil's bargain? Energy risks and the public*), proposed by the Chair, brought up and read.

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

Paragraphs 1 to 81 read and agreed to.

Annex and Summary agreed to.

A Paper was appended to the Report as Appendix 1.

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

Ordered, That the Chair make the Report to the House.

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

Written evidence was ordered to be reported to the House for printing with the Report (in addition to that ordered to be reported for publishing on 19 December 2011, 18 January 2012 and 25 January 2012.

[Adjourned till Monday 2 July at 11.00 am

Witnesses

Wednesday 18 January 2012

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Andrew Bloodworth, Head of Science, Minerals and Waste, British Geological Survey, **Professor Nick Pidgeon**, Director of Understanding Risk Programme, Cardiff University, and **Professor David Spiegelhalter**, Royal Statistical Society

Ev 1

Wednesday 25 January 2012

Tracey Brown, Managing Director, Sense About Science, **Fiona Fox**, Director, Science Media Centre, and **Mark Henderson**, former Science Editor, *The Times*

Ev 11

Bob Brown, Corporate Director, Sedgemoor District Council, **Richard Mayson**, Director of Planning and External Affairs for Nuclear New Build, EDF Energy, and **Dr Rick Wylie**, Executive Director, Applied Policy Sciences Unit, University of Central Lancashire

Ev 20

Wednesday 1 February 2012

Dr Paul Leinster, Chief Executive, Environment Agency, **Dr Jill Meara**, Deputy Director of the Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency, **Geoffrey Podger**, Chief Executive, Health and Safety Executive, and **Dr Mike Weightman**, HM Chief Inspector of Nuclear Installations and Executive Head of the Office for Nuclear Regulation

Ev 27

Monday 19 March 2012

Charles Hendry MP, Minister of State for Energy, **Professor David MacKay**, Chief Scientific Adviser, and **Hergen Hays**, Head of New Nuclear, Department of Energy and Climate Change

Ev 37

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7	Sense About Science (Risk 17)	Ev 64
8	Professor Nick Pidgeon (Risk 21)	Ev 66

List of additional written evidence

(published in Volume II on the Committee's website www.parliament.uk/science)

1	PACH (Parents Concerned About Hinkley) (Risk 01)	Ev w1
2	National Physical Laboratory (Risk 02)	Ev w6
3	Royal Society of Chemistry (Risk 03)	Ev w8
4	Professor Wade Allison (Risk 04)	Ev w9
5	Mr Fred Dawson (Risk 06)	Ev w13
6	Martin J Goodfellow and Adisa Azapagic (Risk 07)	Ev w15
7	Professor Tom Horlick-Jones (Risk 08)	Ev w17
8	Georges Mercadal (Risk 10)	Ev w20
9	Nuclear Industry Association (Risk 11)	Ev w22
10	The Society for Radiological Protection (Risk 13)	Ev w23
11	The Geological Society of London (Risk 16)	Ev w26
12	Greenpeace (Risk 18)	Ev w29
13	Energy Networks Association (Risk 19)	Ev w31
14	Engineering the Future (Risk 20)	Ev w34
15	Charlotte Newall (Risk 22)	Ev w35

List of Reports from the Committee during the current Parliament

The reference number of the Government's response to each Report is printed in brackets after the HC printing number.

Session 2012–13

First Special Report	Science in the Met Office: Government Response to the Committee's Thirteenth Report of Session 2010–12	HC 162
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Session 2010–12

First Special Report	The Legacy Report: Government Response to the Committee's Ninth Report of Session 2009–10	HC 370
First Report	The Reviews into the University of East Anglia's Climatic Research Unit's E-mails	HC 444 (HC 496)
Second Report	Technology and Innovation Centres	HC 618 (HC 1041)
Third Report	Scientific advice and evidence in emergencies	HC 498 (HC 1042 and HC 1139)
Second Special Report	The Reviews into the University of East Anglia's Climatic Research Unit's E-mails: Government Response to the Committee's First Report of Session 2010–12	HC 496
Fourth Report	Astronomy and Particle Physics	HC 806 (HC 1425)
Fifth Report	Strategically important metals	HC 726 (HC 1479)
Third Special Report	Technology and Innovation Centres: Government Response to the Committee's Second Report of Session 2010–12	HC 1041
Fourth Special Report	Scientific advice and evidence in emergencies: Government Response to the Committee's Third Report of Session 2010–12	HC 1042
Sixth Report	UK Centre for Medical Research and Innovation (UKCMRI)	HC 727 (HC 1475)
Fifth Special Report	Bioengineering: Government Response to the Committee's Seventh Report of 2009–10	HC 1138
Sixth Special Report	Scientific advice and evidence in emergencies: Supplementary Government Response to the Committee's Third Report of Session 2010–12	HC 1139
Seventh Report	The Forensic Science Service	HC 855 (Cm 8215)
Seventh Special Report	Astronomy and Particle Physics: Government and Science and Technology Facilities Council Response to the Committee's Fourth Report of Session 2010–12	HC 1425
Eighth Report	Peer review in scientific publications	HC 856 (HC 1535)
Eighth Special Report	UK Centre for Medical Research and Innovation (UKCMRI): Government Response to the Committee's Sixth Report of session 2010–12	HC 1475
Ninth Report	Practical experiments in school science lessons and	HC 1060–I (HC 1655)

	science field trips	
Ninth Special Report	Strategically important metals: Government Response to the Committee's Fifth Report of Session 2010–12	HC 1479
Tenth Special Report	Peer review in scientific publications: Government and Research Councils UK Responses to the Committee's Eighth Report of Session 2010–12	HC 1535
Tenth Report	Pre-appointment hearing with the Government's preferred candidate for Chair of the Technology Strategy Board	HC 1539–I
Eleventh Special Report	Practical experiments in school science lessons and science field trips: Government and Ofqual Responses to the Committee's Ninth Report of Session 2010–12	HC 1655
Eleventh Report	Alcohol guidelines	HC 1536 (Cm 8329)
Twelfth Report	Malware and cyber crime	HC 1537 (Cm 8328)
Thirteenth Report	Science in the Met Office	HC 1538
Fourteenth Report	Pre-appointment hearing with the Government's preferred candidate for Chair of the Engineering and Physical Sciences Research Council	HC 1871–I
Fifteenth Report	Engineering in government: follow-up to the 2009 report on Engineering: turning ideas into reality	HC 1667

Oral evidence

Taken before the Science and Technology Committee

on Wednesday 18 January 2012

Members present:

Andrew Miller (Chair)

Stephen Metcalfe
David Morris
Stephen Mosley

Pamela Nash
Graham Stringer

Examination of Witnesses

Witnesses: **Andrew Bloodworth**, Head of Science, Minerals and Waste, British Geological Survey, **Professor Nick Pidgeon**, Director of Understanding Risk Programme, Cardiff University, and **Professor David Spiegelhalter**, Royal Statistical Society, gave evidence.

Q1 Chair: Welcome, gentlemen. Thank you very much for coming in this morning. Perhaps for the record you would kindly introduce yourselves.

Andrew Bloodworth: I am Andrew Bloodworth, Head of Science for Minerals and Waste at the British Geological Survey. Part of my direct responsibility is for research into radioactive waste disposal.

Professor Pidgeon: I am Professor Nick Pidgeon. I am an applied psychologist at the School of Psychology at Cardiff university.

Professor Spiegelhalter: I am David Spiegelhalter, a statistician from the university of Cambridge. I am here representing the Royal Statistical Society.

Q2 Chair: Thank you very much. Generally speaking, how would you define risk?

Professor Spiegelhalter: Risk is a tricky topic to define. There are many technical definitions. I am a statistician and we have our own technical definition, but it is used very widely in terms of ordinary public discourse. I tend to think of it as just the possibility that something bad might happen, and that is usually deconstructed into the likelihood of something happening and the impact if it actually does. I am sure we will come on to this, but some attempt is made to quantify the magnitude of these two dimensions.

Q3 Chair: You would put it as something bad might happen as distinct from uncertainty.

Professor Spiegelhalter: I think of it as uncertainty, but people tend to use the word “chance” when it has an upside to it and there is an opportunity for something good to happen. In usual public discourse, risk is associated with rather negative events that might happen.

Professor Pidgeon: A number of years ago I reviewed this for the Royal Society. Initially, they were taken aback that, when you look into the literature, there are a number of definitions of risk. Some people call it purely uncertainty and likelihood; others would say it is a combination of uncertainty and consequence that you can measure in various ways. There are also other definitions. There is no single definition of risk. It becomes more complicated when one starts to talk about deeper forms of uncertainty, which are less measurable.

Sometimes we view things as risky even though maybe there have not been negative consequences yet. Thinking of quite complicated technical systems with the potential for failure, if all the safety systems, be they soft, human, or technical, have failed, or all but the last one have failed, or the main assumptions used to keep the system safe have failed, even though nobody has actually died at this point in time—we would think of that as a risky situation. The Fukushima accident is interesting in this respect. We do not know what the consequences to individuals will be in the long term of radiological exposure, but all the safety assumptions—that power would be kept on to working reactors—were undermined by that event. I would say that was a full failure of a complex system and a very risky situation.

Andrew Bloodworth: As a geologist and not a specialist in risk, the interesting thing to come out of Fukushima is the re-emphasis of interest in low probability, high consequence events like tsunamis. The nuclear sector has been aware of these things for some time, but the community has woken up to the fact that, every now and again, these very low probability events happen and they can have extremely serious consequences. It is a change in the mindset of the community. Until the tsunami in the Indian ocean in 2004, very few people had heard the word “tsunami” and did not really know what it was. Like London buses, two have come along quite close together and, all of a sudden, people have woken up to the fact that these things can happen. There are other low probability, high consequence effects which might impact on installations.

Q4 Chair: Indeed. I guess this is one for the statistician, Professor Spiegelhalter. Can any risk be measured by purely quantitative methods, or will it always be subject to qualitative assessments?

Professor Spiegelhalter: There is always a quantitative and qualitative aspect. Any number that is put on anything is always dependent on some assumptions that you make. You narrow down your focus to an average case or particular class of individual. The normal ones that people feel they can put numbers on are everyday risks to do with the sort of things against which you insure yourself: car

accidents and risk of getting diseases. I have about a 12% chance of getting a heart attack or stroke in the next 10 years according to my medical condition. I can put a number on that, but that is not my true risk; it takes into account only a few of my features. You cannot open me up and read my risk. In many ways, people would argue that these numbers do not really exist; we construct them on the basis of our knowledge and judgment. There is always a qualitative element to do with the quality of the evidence available and the robustness of the number you put on it. As a statistician, I am keen that we try to put numbers and magnitudes on things. However, we have to be aware of the limitations in how far we can go, the sorts of qualifications we have to add to those numbers and acknowledge the fact that we cannot put numbers on everything.

Q5 Chair: One of the inquiries we have been conducting recently caused us to go and see the Met Office. It was very interesting that they were arguing that probabilities should be dealt with in a different way by the media. Is it the way the numbers are dealt with that causes confusion in the minds of the public?

Professor Spiegelhalter: I have been working with the Met Office on communicating uncertainty about weather forecasts on a daily basis. I think it is absolutely vital. The empirical evidence—Nick will know this better than I—is that, given the appropriate form of communication, the general public are able to take on board ideas of chance and probability. However, they are very ill-served at the moment with the way these things tend to be explained. An increasing amount of research has been done on the best way to explain things to people. In the medical world, where there is the development of the idea of shared care in which an informed joint decision is made about medical treatments, it is becoming increasingly important that numbers like the one I quoted—my 12% chance—are communicated in a clear way to an individual, and also it is recognised that, if I take statins every day for 10 years, there are side-effects and a trade-off of risks and benefits, and that those should be communicated in a transparent and consistent way. There is big emphasis on that in medicine; it is called uniform reporting of benefits and harms. The submission of the Royal Statistical Society essentially argues in this context that, in any decision making, whether by an individual or Government, there should be uniform transparent reporting of benefits and harms. You cannot always put numbers on everything, but we could have a good go.

Professor Pidgeon: There is now a large research base out there built up over about 40 years based on work by statisticians and psychologists. Economists have also done work in this area. David is absolutely right that risk communication and presentation of numbers has to be done using the right formats. To give you a good example, it might be said that a procedure doubles your risk of x . That is a risk comparison. It is quite easy to understand, but it may be completely misleading if the baseline is very low. One of the first lessons from all this research is that trying to simplify things risks getting you into trouble, and it is better to try to get across the risk estimates as they are.

Therefore, rather than double the risk, we say it goes from one in 200,000 to two in 200,000. That said, you would want to use various techniques, maybe visual diagrams and contextualising of the risk. What does one in 200,000 mean in terms of one person in a large town or small city? All these techniques have been researched. The problem is that many of the people who try to communicate risks do not connect with that research evidence. There is a problem in getting the research evidence into the policy domain, and to the communicators in practical situations.

Andrew Bloodworth: I am not sure I am desperately well qualified to talk on this topic, so perhaps I will pass on the use of numbers in communicating risks.

Q6 Chair: There are responsibilities in the world of geology. Just think of the volcanic ash episodes and the tsunamis. How do you as a geologist get your message across to the public?

Andrew Bloodworth: It is colossally difficult sometimes to deal with very long periods of time. Recently, somebody made the point that, although the volcanoes in Iceland have been very active over the last 200,000 years, there has been a period of quiescence since the second world war and up until last year, which has coincided almost entirely with the major growth in aviation across the north Atlantic. It is very difficult to communicate to people that that is quite an unusual event geologically.

As to risk and hazard of tsunamis, they happen all the time but usually in places where people do not live. It is only when an event like that comes up against a densely-populated coastline of the Indian ocean or Japan that you start to see real problems. It is complicated. As geologists, we can attempt to communicate the science, although I might mention a few things about that later, but sometimes that is extremely difficult to do when dealing with very complex systems, like radioactive waste disposal.

Q7 Pamela Nash: Professor Pidgeon, in your written evidence you helpfully explained different factors that affect public concern which are not in traditional risk assessments. Will you illuminate us a little on what you think are the most significant factors that affect the public perception of nuclear power in the UK?

Professor Pidgeon: If I may answer it in a generic sense first, perceptions are moved by a number of factors. You have to take into account that as to the risk issue, if something is thought to be hazardous, that will come into the equation, and whatever benefits are attached to the risk also come into it. In nuclear power it is interesting because, if you went back 20 years and asked people whether they thought nuclear power had benefits, you would get a uniform “no” after Chernobyl. That has changed over the last 10 years or so as the discourse about climate change and energy security has entered the public realm.

Stepping back with nuclear power, we know there are generic factors which make things seem more risky: whether the risk is unknown and uncontrollable by the individual, and the idea of radiation, or potential large accidents, which we cannot control.

There is also a kind of “dread” factor which has now been theorised, more carefully than when it was first

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studied, in terms of an 'affective response'. It is always open to interpretation to say it is an emotional response, but it is. We do not like something, and that then affects your perception of risk. The research evidence shows that emotional responses are very important, because we would not be good decision makers if we did not have those responses to things in the environment. You need analytic reasoning and emotion, or affect as it is now called.

Probably underlying all this, the most important thing is distrust. If you do not trust the parties who manage the risk, you are not likely to have confidence that the risk is being safely managed. Distrust comes from a number of sources. With the nuclear industry, it has happened over a very long period of time. There was this initial hubris, almost, around the industry: it would be too cheap to meter; it would be a wonderful technology; and it was safe. For many years people felt that was the case. We then had the accidents at Three Mile Island and Chernobyl, so faith in management of risk was undermined. Distrust is a rather more subtle and social factor.

Interestingly, on local nuclear sites where we have done a lot of work over the years, many local people say they have confidence in their local plant because they know the people who manage it. They meet them in the pub; their kids go to school with the kids of the operators; and they believe they are doing a good job managing the risk at the plant. A trust factor comes into why local populations tend to be more positive about nuclear power compared with national samples. I hope that answers that question.

Q8 Pamela Nash: It is interesting that you talk about those people who live in close proximity to the plants. Are there any other specific population groups you have looked at that are affected differently by these factors?

Professor Pidgeon: Generally, if you look at things like values and age, there is not a huge effect. The one effect, which is not confined to nuclear power, is the gender difference. There has always been a gender difference, and it is documented in the literature. If you look at hazards like nuclear and chemical pollution—local environmental hazards that would affect a community or town—women tend to be more cautious than men about technologies that pose those risks. There has been a lot of theorising about this. It is not a biological difference as far as I can see. It is to do with the way women and men are socialised, or are taught in school, to think about technology and how high-technology solutions to energy or environmental problems, say, are seen as the preserve of the male. There must be an engineer in this room? That is why there are not many women in engineering because, it is not seen as the type of role for women to go into. That probably puts off some girls from going into engineering very early on. That spills over into the way people of different genders interpret risk, particularly if it is a high-tech risk question. Gender is a very interesting question. That is the main one.

Interestingly, in the response to Fukushima, it is not the case that nothing has changed. In the UK, the polls show there has not been a collapse in support for nuclear energy, but some things underlying that have

changed. Women again have become more cautious than they were before about nuclear energy as a result of Fukushima.

Q9 Pamela Nash: That is in the UK?

Professor Pidgeon: Yes; there is some data in the UK to show that. That is the main demographic factor. There are other demographic factors one would take into account aside from familiarity and location in relation to an existing nuclear facility.

Q10 Pamela Nash: Do you have anything to add to that?

Professor Spiegelhalter: No.

Andrew Bloodworth: Our experience of trust is that it is a huge issue with nuclear. People are very suspicious, particularly of the industry and also of Government on this issue. That is our experience as a body that has worked in the middle of all that. The regulators are nowhere on this; the public are not aware they even exist. That is quite an interesting point. What Nick said about local trust of existing operations is quite true. If you look at the approach taken by radioactive waste management organisations particularly in Scandinavia, one of their deliberate tactics is to base themselves in the communities which may take this material. They set up an office and come to live there. That is a deliberate tactic on their part to build trust. It takes a long time, but certainly in Finland and Sweden that is very much the approach they have used.

Q11 Pamela Nash: Is there evidence to show that there is a higher level of trust in Scandinavian countries than in the UK?

Andrew Bloodworth: I do not know whether there is any poll evidence, but certainly the fact that the site in Finland is going ahead and the site in Sweden is likely to go ahead, with the acceptance of the local population, shows that perhaps they have succeeded in building a level of trust. These sites are located in areas where there is already a nuclear site. Again, there are lessons to be learned there.

Q12 Pamela Nash: Are you aware of any other evidence to show that there are any significant differences between the perception of the UK population of nuclear power compared with other countries? Are there significant global differences?

Professor Pidgeon: There is quite a lot of polling evidence, but as soon as you start to do cross-national comparative polls you tend to get very simple questions asked, so you cannot dig much below the surface—that this percentage is for or against. The best study I can quote was completed about 20 years ago and was a comparison between France and the United States. The reason you can use the US as a good comparator with the UK is that there are quite similar cultural views on technology; and the views on nuclear have been fairly similar in the two countries for many years. Comparing France and the US, it was quite clear that there was greater faith in the nuclear industry in France at that time. One of the key variables they found was greater trust in the risk management and engineering process in France

compared with the US. That is a good example of that. It would be interesting to do a big cross-national survey now, that had more than just headline for or against questions on it.

Q13 Pamela Nash: Do you feel that the factors that affect people's perception of nuclear have changed over time? I am thinking about climate change as a new factor. Have any other factors changed perception in your view?

Professor Pidgeon: These things ebb and flow. It is a strange way to put it, but there is a core set of constructs that nuclear has built up over time: association with atomic weapons; initial secrecy; hubris in the industry; and accidents. Therefore, can we trust it? Do we need it? I guess that would have been the question 20 years ago that people would have asked, given the potential risks and perhaps what they had seen about Chernobyl. In the last 10 years the discourse, certainly in the UK, about reframing the industry, as it is called, in terms of climate change and energy security has clearly impacted perceptions; they are less negative. But, underlying that, our research has shown that there is a sense in which they are still ambivalent.

I will give you a very good quote. In 2002, when we first started doing work on this and we asked, "Would you want climate change or nuclear power?", our respondents said, "That's a bad choice, because if I am going to run my car into a truck or a tree and kill myself—it would be nuclear versus climate change, because they both have bad risks—"I guess I would choose the tree, but I don't want either." Nuclear is seen as a kind of devil's bargain, which is a phrase I use. I do not think anybody quite used that in our focus groups, but it summed up what many people said. There is essentially an ambivalence still about the case for nuclear energy in many people's minds.

The other thing that has ebbed and flowed is that, if you went back a year ago and asked what the top 10 concerns were about nuclear energy, radioactive waste, maybe disposal, or local things such as transportation of fuel and so on would come up. Accidents would be way down. As a result of Fukushima, we now see accidents are right at the top again. Accidents have become prominent again in the public mind. That is important if there were to be another accident anywhere in the world. Let us hope not. Three Mile Island and Chernobyl came very close to each other in terms of media reporting and public response. That is why, after Chernobyl, there was a very high level of opposition to nuclear energy in many countries across the globe. One of the lessons is not about communication at all but about risk management. The industry as it goes forward in this country and elsewhere has to make absolutely sure it manages its nuclear plants as safely as possible.

Q14 Pamela Nash: Just looking at recent events, has terrorism become a high-risk factor?

Professor Pidgeon: It did following the events in the United States and also London. If you look now at the polling, it has become less important. In the last three or four years the thing people worry most about is the economy. I do a lot of work on climate change beliefs.

That has certainly subsided in people's minds in relation to day-to-day worry about jobs and how ends will be met. The economy and personal finances are much more important to people. That has suppressed a number of other concerns that people had about the environment.

Q15 Stephen Metcalfe: What is the overall purpose of risk communication? Professor Pidgeon, you talked about the dread factors. Is it to mitigate those, or is it to be open and transparent and put the information out so that the public can make their own decisions?

Professor Pidgeon: The simple answer is that it is absolutely the latter. I am sure my colleagues will back me up when I say that the former view was the one 40 years ago, when opposition to nuclear started in this country, the US and elsewhere. The simple view was, "We'll just tell people the facts about the engineering and technical side of it and how safe it is, and everybody will come along and be very happy about it." That clearly failed. The House of Lords held an inquiry about 10 years ago, and their analysis now is as robust as it was then. It has shown that that thinking—a very simple, one-way deficit model of science communication, as it is called—just does not work. What actually happens is that the quality of the debate goes up, but you also get polarisation. Some people become more positive about something; others become extremely upset if you just try to throw science at them. The received wisdom from the research now is that it is much more about a dialogue between people, generating informed discussion and choice about science, technology and the risk issues. You cannot force an opinion on people, particularly about a hotly-contested technology.

Andrew Bloodworth: It has had a huge impact on my part of the business, which is the approach to radioactive waste disposal. Ten years ago, the general model in the west was: decide, announce, defend. You decide where you are going to put it for scientific and technical reasons; you announce it to the local population; and then you defend it. That became: decide; announce; defend; abandon. All those plans for nuclear waste failed. The Americans, the UK and the French failed.

Q16 Stephen Metcalfe: Failed in what sense?

Andrew Bloodworth: Failed in the sense that sites were announced for more investigation and it attracted enormous levels of opposition.

Q17 Stephen Metcalfe: Was that a failure to communicate the risk adequately or effectively and engage in that two-way conversation?

Andrew Bloodworth: It was a failure to engage in the two-way conversation. The approach now is: inform; review; decide. You inform the general population that this is what you want to do and basically ask for volunteers. That is what the Scandinavians and French have done and what the Japanese are doing, and that is what we are doing now through DECC's MRWS process.

Q18 Stephen Metcalfe: Has that resulted in a change in the way that the risk is perceived by the public?

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Andrew Bloodworth: I think it has. Nick will know more about this than I do, but it seems to me that, if you involve people more in the decision making, their emotional response to the risk changes because of a whole range of factors. The previous paradigm was to fire lots of scientific information at people. There is some evidence that the more information you give them the more risk-averse they become.

Professor Pidgeon: It depends on the issue, but yes.

Q19 Stephen Metcalfe: You talked about how this has worked in other countries. Are there any particular factors in this country that make it more difficult to communicate a balanced risk?

Andrew Bloodworth: My experience of public acceptance of, say, difficult uses of land is much more on the mining side. My experience from that is that the big factor that is different in this country from most others is that we are a very densely populated island. That makes it difficult for two reasons. One is that in some countries you can find places to put things away from people, whether they are nuclear installations or other things people do not like. We do not have that option in this country. The other big thing is slightly more subtle than that, which is that, because we live in a densely populated country, we value our landscape very highly. That is the general public perception of landscape or things like national parks. If you look at West Cumbria, for instance, you are right next door to the Lake District national park. The previous attempts at deep disposal of radioactive waste in West Cumbria attracted enormous amounts of opposition from people who live near or, more correctly, value the park because they visit it. It is not just about coming up against the direct population; it is also about the perception of the rest of the population about what you are doing.

Q20 Stephen Metcalfe: How much importance should policymakers place upon that perception, even if it is inaccurate, when determining policy?

Andrew Bloodworth: As somebody who has been very intimately involved with land use planning over the last decade, policymakers take enormous account of people's feelings.

Q21 Stephen Metcalfe: Is that right?

Andrew Bloodworth: I think it is right. It is incredibly hard to get a balance between economic development, which is what we are talking about—energy security—and people's feelings about where they live. This country has one of the strongest land use regulatory regimes in the world, and almost all of the reason for it is that a lot of us are living in a very small space.

Professor Spiegelhalter: I would like to draw a medical analogy. In the past, risk communication medicine was seen largely as a way of trying to persuade people to do what you thought was best for them. That paternalistic approach is undergoing a deep change to the idea of transparent communication in which it is felt there is an ethical duty to communicate clearly but also to enhance trust and improve dialogue. Basically, I feel that is desperately needed in this area as well, because this information is just not available

in order to have a reasoned debate. People will still be affected by emotions, feelings and their cultural beliefs. There is no way of avoiding that, and quite right too, but I regard the provision of information in a transparent way, which is not propaganda—as some of the sources are at the moment, frankly—not as a sufficient condition to have a reasoned debate but certainly a necessary one.

Q22 Stephen Metcalfe: But, to be able to have a reasoned debate, do you not need to make sure that the emotional reaction to the risk is not so great that you cannot get beyond that to start to be able to debate it?

Professor Spiegelhalter: As Nick said, it is unavoidable that it will be there and it has to be respected. We have all got it. This is not just something the poor ignorant public out there have; we are all subject to our feelings in this area. It is unavoidable; it is there; it has to be acknowledged and respected. However, it must also be balanced by an analytic approach as far as we can go, but without the pretence that this is the only way and this will tell people what is best for them.

Professor Pidgeon: Not to confuse matters even further, one of the definitions of risk used by a colleague, a geographer from the United States, is whether it is something that is 'a threat to people and things that they value'. Landscape absolutely explains why we have issues over renewable energy projects as well as nuclear. If something is seen as being out of place in the landscape, which is part of your personal identity on which a very high value is placed, you will question why somebody is coming in to develop it in this way. Remember that, in any debate that involves a political or other issue, or a simple question of whether you should vaccinate somebody, questions of value are not about science; they are questions of what people believe and want. They are a legitimate part of the debate about how you take a decision.

Professor Spiegelhalter: Even if it is difficult to put an immediate number on these things, they need to be acknowledged; they are part of the balance.

Professor Pidgeon: This is why sometimes a purely technical view of risk and risk communication fails. It completely neglects the value questions that people want debated. That is why a process approach is better because, even though it might take longer and more resources, you are opening up the space to have a properly rational debate with all the people involved.

Q23 Stephen Mosley: In answer to Pamela, you went into a lot of depth about the perception of risk in regard to the nuclear industry. I do not intend to revisit that ground. Perhaps we may focus on changes in attitude post-Fukushima. Why do you think that in some countries there have been huge shifts? For instance, Germany almost turned its back completely on nuclear power since Fukushima compared with the UK, where we seem to be proceeding.

Professor Pidgeon: There is a sense in which this sets a little puzzle, so it is a research question. That is not a very good answer, but there are some key things over the next few years that the researchers who have studied Germany, here, and other countries will try to

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unravel in more detail. Part of the answer to your question is that you have to look at the history of the particular country, and how the energy issue has been positioned, and how views on energy have built up over time.

In Germany, you have had a very strong environmental movement. The experience of devastation in the war, and the link with what happened at the end of the war in Japan, has always been there in people's minds in a way that it was not in the UK. Nuclear was always a more touchy subject in Germany from the off—from 1945 onwards. There has always been much greater political pressure against nuclear energy in Germany; there has also been a lot of political momentum for it, because Germany has a very well developed industry too. The decision that has been taken in Germany is an interesting one for energy policy, because it charts a completely different decarbonisation course, if it can be done. There is an experiment going on there that lots of people will be watching with some interest. It goes back to the history of the way the industry was positioned. The support for the nuclear industry was never as stable in a country like Germany as in the US, the UK and France.

Austria is another good example. It has always had a lot of internal opposition because of plants just over the border. They have always felt that those plants threatened the Austrian population, so there has been quite strong anti-nuclear feeling there as well. It is quite complicated to work out in each country why you get particular opposition or support on that. You have to look at the history.

Andrew Bloodworth: There may be more prosaic reasons that I don't know. I am not an expert on Germany's energy security, but they may have more energy choices than we have. They have very large resources of brown coal for electricity generation, for instance, which are not particularly environmentally friendly but at least they are available to them. They are much more integrated into the European gas grid than we are. The reasons Nick cited are very powerful ones, and I am sure they are the more powerful ones in this case. It is also the fact that Germany had a lot of nuclear weapons based on its soil during the cold war. There may be a perception here and in countries like France that we have fewer choices in terms of energy security. From a technocratic point of view, it may have been easier for the German Government than our Government to make that choice.

Q24 Stephen Mosley: You have talked about a devil's bargain between climate change and nuclear energy. There is a third option, which is increased use of renewables. Is there a perception that that is not a realistic option anyway in the UK?

Professor Pidgeon: That is interesting. We have done quite a lot of national surveys on this. If you put renewables against nuclear power, you can ask two questions with which 70% of your sample will agree. 'We may need nuclear in the future mix because renewables will not be enough for energy security and climate change', but you can also ask 'we do not really need nuclear power because we would like to have a renewable energy future'. Those two look

contradictory but in a way they are not. If you do the qualitative work, there is still a very strong belief among the population that we should move to a renewable future. It is seen as the future in the long term, but the devil's bargain comes up in the medium term. People will then say "Realistically, but maybe we need some nuclear in the medium term because we can't just suddenly change our energy system overnight."

As to whether it is feasible, that is a complicated engineering question that I am not sure I am fully qualified to answer. To go back to Germany, watch that space very carefully because they are now trying to move to a decarbonised future using very high levels of renewables. It will be very interesting to see how they deal with that. One of the technical problems, as I understand it, is that renewables are more intermittent. That does not necessarily mean they are bad. It is just that you need other systems in place to deal with the situation when the wind is blowing too much or there is not enough wind; or there is not enough solar, let us say; or it is the cup final and there is not enough solar—it is a grey day. As I understand it, energy policy must always have a mix of generating sources, which will probably include some fossil fuels with carbon capture and storage—that is the policy choice—to cover the peaks and troughs that a highly renewables-based system will not be able to deal with.

I am not sure whether you want to talk about carbon capture and storage. It was mentioned in the written evidence that the British Geological Survey submitted and is one of the outstanding questions we do not know about. We can focus on nuclear for the time being because of the events of the last year, but policy in the EU and UK depends very heavily upon CCS technology working. We already have evidence that there are some severe public perception issues about the storage of carbon dioxide, certainly onshore in other countries. In a way, the CCS industry, if it is not careful, is about to repeat the mistakes that the nuclear industry made 50 years ago, and in a sense that is an even bigger question for this Committee and for UK energy policy.

Q25 Stephen Mosley: Perhaps I may bring you back to nuclear for the moment. You mentioned perceptions in Germany and Japan because of the war, the use of nuclear weapons, the basing of nuclear weapons there and so on. When it comes to nuclear power, that is one thing people do associate with it. However, we also use radiation and other forms of nuclear products in medicine. People are quite happy to go to the hospital and have x-rays and various treatments. Should greater emphasis be placed on the more friendly forms of radiation or use of nuclear to try to defeat the poor image that nuclear power may have?

Andrew Bloodworth: It is a voluntary and involuntary thing. You choose to have an x-ray. You may choose to travel by air and receive a higher radiation dose, but perhaps you do not choose to live next door to a nuclear power station.

Professor Spiegelhalter: This was done in the risk communication at the time of the Fukushima incident with various lists provided by the BBC and also

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derived from the HPA on the effects of radiation exposure from everyday occurrences. I have mentioned the bag of Brazil nuts and so on, which represents 0.01 millisieverts; a banana represents a microsievert. In Fukushima, the analogy being made is that there was a bigger radiation dose as a result of people evacuating from Tokyo than if they had just stayed there. Those sorts of comparisons can be made, but they are subject to the problem that people view very differently risks imposed upon them from those they take voluntarily, but when you look at these things you get some quite shocking results.

If you accept the sort of linear no-threshold theory for radiation exposure, basically the risks of radiation go down like *that*, but even low doses from x-rays carry a small chance of some damage. The calculation shows that, for example, there are 70 million CT scans done every year in the USA. People from the National Cancer Institute reckon that those voluntary CT scans in the US are expected to cause 29,000 cancers in the future. It is a staggering imposition. Many people in radiology question the excessive use of diagnostic imaging. I would not have a whole body CT scan unless it was absolutely necessary for my health. I think you are right, but it has to be handled quite carefully. I view this as one part of a full and transparent communication of possible harms and benefits of treatments.

Q26 Chair: Is that not a pretty daft position to adopt? You would not have a full body scan, but I bet you have flown in a few aeroplanes.

Professor Spiegelhalter: Yes. It is not so large with that. Those are risks I am prepared to take because I want to go somewhere. I am not going to pay 800 quid for a whole body CT scan just to check up on me.

Chair: It is not for fun; you do it for a purpose.

Professor Spiegelhalter: Yes. If I was ill I probably would have one, but I try to avoid them, and quite rightly. A lot of screening is not done in the health service because it can lead to more harms than benefits. People recognise that—not from radiation but from prostate screening and so on. We have to weigh these up the whole time, and there are ways to do this in a much more transparent way.

Q27 Stephen Metcalfe: I want to turn to the topic of communication, in particular how good the Government are at communicating. You talked about carbon capture and storage and the public perception of it. It is likely that there will be a trial project based very much on the “decide, announce and defend” model. Have you seen any improvement in the way the Government communicate risk to the public?

Andrew Bloodworth: Given the way DECC approached Managing Radioactive Waste Safely, after the White Paper in 2008, the volunteerism approach they announced is very much based on best practice taken from elsewhere in the world and is much more consensual; it is inform, review, decide. That is DECC. DECC are running the CCS side as well. My colleague Julie, who submitted evidence to this inquiry, has some concerns that the CCS side of things is not learning the lessons that the nuclear sector has learned very hard in the past regarding deep disposal

of CO₂ in this case and, in the case of nuclear, radioactive waste, but many of the issues are similar. As to public perceptions, there are very difficult technical issues to get across; there are difficulties about siting. The choices about siting CCS projects are quite hard to make.

Q28 Stephen Metcalfe: I think what you are saying is that where parts of the Department have had a lot of experience of trying to do something in the past, whatever it was, they have learned the lessons.

Andrew Bloodworth: Yes.

Q29 Stephen Metcalfe: But those lessons are not being shared across the whole of Government so that other Departments do not make the same mistakes. I am putting words into your mouth.

Andrew Bloodworth: Certainly, the CCS industry—you might include the CCS part of DECC in that—has not necessarily shown it is learning the lessons that the nuclear sector has learned very hard. One thing the CCS side of things is concerned about is contamination. It does not want to be seen to be associated with the nuclear sector in the public’s mind.

Q30 Stephen Metcalfe: The point I am trying to get at is whether the machinery of government, not just this Government, is learning to communicate better about the potential risk. Before you answer that, who do the public trust when it comes to communicating risk? Is it scientists, the Health and Safety Executive, the nuclear industry, or even the media? Professor Pidgeon, you said that women were a particular group who were more susceptible to being swayed by discussion about risk. Where do they come in communicating risk? Are they more reassuring when communicating with the public?

Professor Pidgeon: In terms of trust, a number of factors have been studied. We know the factors that underlie trust in risk management organisations, whether it be Government, industry or elsewhere. One factor would be that people have to believe you are competent; you have some expertise in the area. They also have to believe that you are working in their interests, so there is a stake issue in all this. You can think of it as care for the recipient of the communication. As to whether there is any suggestion that you as the communicator in Government are working with the industry, interestingly this is one of the questions asked in this Inquiry. I would not advise Government necessarily to link up fully with industry. They would be immediately linking up with one of the stakeholders, and people would then legitimately ask whose interests are being served? You have to look as independent as you can, although, in truth, there is no fully independent body. You must also have a track record of working in people’s interests. To take the Health and Safety Executive as an example, a few years ago we did work on how people viewed them. It was very interesting. They were quite well known. People did think they worked in people’s interests and were experts in health and safety at work. It was also because they had observed inspectors over many years in the workplace coming in to sort things out and do things; so there was a

track record. Most other Government Departments are not well known at all, for the obvious reasons that they have obscure names which are quite recent and do not get into the public realm. Therefore, competence, care and track record are all really important.

When you ask who people trust, it is independent scientists. If it is an environmental question, it would be environmental organisations; it may be consumer organisations; and friends and family. Government scientists tend to be in the middle. Industry tends to be towards the bottom. I hate to say that politicians are also towards the bottom. You can split 'Government' up into the Executive and politicians. Once you start to think about why those judgments are being made in terms of those factors, you can see that politicians are seen as representing various interests, whereas scientists are seen as more independent, say. The environmental organisations, rightly or wrongly—they have a stake as well—are seen in relative terms as working in the environment's interests, which people value. Trust is therefore quite a complicated thing, and building it cannot be done overnight. Best practice on the radioactive waste question is to try to build trust over a very long period of time. It is a process of engagement that involves dialogue with people. There is no simple answer to who people trust and who you would ask to do the communication for you.

Q31 Stephen Metcalfe: Where are scientists on that list?

Professor Pidgeon: They are quite high.

Q32 Stephen Metcalfe: How important therefore is it that they are seen as independent and evidence-based?

Professor Pidgeon: Very important.

Q33 Stephen Metcalfe: When people try to pit one scientist against another with perhaps differing views, is that helpful?

Andrew Bloodworth: I think it is helpful, in the sense that it is useful for people to see that there are often two points of view. Scientists do disagree. I am a physical scientist. Physical scientists disagree with one another all the time.

Q34 Stephen Metcalfe: But does that not have the potential to confuse if you have two trusted individuals arguing from different standpoints?

Andrew Bloodworth: Equally from where I sit, it is useful to present pros and cons. Often this is about balancing good things against bad things. If people can say, "We are going to put radioactive waste in your community; it will be there for 100,000 years, but it will be 1,000 metres underground with all the containment we can put around it, and it will provide 150 jobs for the local community for the next 100 years", that is a range of good and bad things. Scientific debate is useful. One of the problems the nuclear sector has had in the past is that it has been very dogmatic about certain scientific issues—for example, that nuclear power is good for you—and has tended to downplay the downsides. I think trust arises

where people can be adult about this and can see there are pros and cons. As a Government scientist, I firmly believe that we should not always be seen to be presenting one view, because the honest truth is that very often there is more than one view.

Professor Spiegelhalter: In terms of Government documents, the guidance on risk communication is extremely good. How much notice is taken of them is another matter, but everything we are saying has been very well expressed within Government documents. In terms of trust, I suppose we cannot get David Attenborough out all the time to say things, but he is the archetypal trusted individual. However, Government agencies, or at least arm's length ones, can do it. I think the Food Standards Agency under John Krebs got a particularly good reputation for risk communication. He would just get up and say, "We don't know, but we are going to do this. This is what you can do, and we are going to find out." He was extremely good and set a very good standard for openness and transparency about the uncertainty in the science.

As to conflicting science, as long as the two scientists have substantial support in the community and they are not maverick scientists—even senior scientists can be very maverick and really odd—I believe they will generally have more in common than the things on which they differ. When an argument has been set up, they can end up agreeing on many things; although they will not agree on everything. It is right to have differing views, and we have argued very strongly that, when there are differing views in science, that fact must be expressed. One of the best pieces of communication has been by David MacKay in his book on sustainable energy. In that book, he clearly reports the different safety assessments made by energy sources and tries to identify why they have different opinions. This is part of the dialogue.

Q35 Stephen Mosley: I met people from the nuclear industry yesterday. They said that one of the key things about the UK and why it is so well regarded internationally when it comes to nuclear safety is that we have a regulatory environment where Government, the regulator and the industry are all separate. We have Dr Weightman as regulator, who is internationally recognised as an expert in his field. Industry, Government and politicians all trust the opinion of the regulator, which then allows us to sell that to the wider public. Is that a particular advantage we have in the UK compared with elsewhere in Europe or the world?

Professor Spiegelhalter: My understanding is that the HSE have a good reputation. Their risk communication has recently been reviewed and considered as being sound, but they could engage in even more dialogue. When I was looking at the HSE site I was disappointed that they made a substantial effort to explain the regulatory framework, their risk assessment and risk management procedures, but that was just explaining their work. There was almost no effort, partly because, presumably, it is not their job, to communicate the possible risks and benefits of the different energy sources.

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Q36 Pamela Nash: To explore further the responses that you gave to Stephen, do different media outlets provide different opportunities for the industry to get its messages across, or do you think the media have a large influence on public risk perception in general but particularly that relating to nuclear energy?

Andrew Bloodworth: There is some evidence that after Fukushima in Japan the Government and industry were very much behind the curve with the new media, and the people who were extremely concerned about what was going on there were very much using the new media: Facebook, Twitter and all those sorts of things. The industry has been very slow to embrace the internet, and a lot of the stuff on the internet is pretty turgid. There are opportunities, but there is no doubt that the broadcast and print media have a huge influence on the way people think about this. Certainly, our experience in dealing with them is that they want a story, and they want conflict.

Q37 Pamela Nash: Have you noticed any particular offenders in the press or even anyone who shows best practice in how to report?

Andrew Bloodworth: I do not have enough direct experience to be able to comment on that.

Professor Pidgeon: One thing I would say about the UK is that a recommendation in the report of the House of Lords 10 years or so ago was that there should be a central body, which is now the Science Media Centre. When a key science story is about to pop up in the media, they will attempt to connect key scientists with the key journalists. That dialogue then goes on between the science, environment or technology reporters and the scientists. That was not there before. It is not there in many countries. It is almost hidden in the science reporting on technical issues. Certainly, they were very active during the first two or three weeks of Fukushima. They talked to a number of us and said, "Could you speak to some of the journalists, because they want to hear evidence about public perception or statistical presentation of risk?" That has been a very good development in this country. They have connected the journalists with the scientists and engineers in a very effective way over many years on many issues. It is unseen because you just read the report, but that work has gone on behind the scenes.

Andrew Bloodworth: We work with them quite a bit, and the Science Media Centre are excellent.

Professor Spiegelhalter: One of the problems is that it is very difficult to characterise the media. If I may mention the *Daily Mail* as an example, during Fukushima its science correspondent wrote extremely good articles, which were surprisingly supportive of the nuclear industry. You get that from the science correspondents, but, at the same time, you can have the *Daily Mail* campaign against GM and its reference to Frankenstein foods, which is enormously influential. I would hazard a guess that it was not being driven by science correspondents but by news editors. They can be contradictory, even within the same newspaper. It is very difficult to characterise even what a single newspaper line is, let alone the media line.

Pamela Nash: It is very dependent on the individual journalist.

Professor Spiegelhalter: Within newspapers there is frequently conflict between the science editor, science correspondents and general news writers.

Q38 Pamela Nash: You mentioned the Science Media Centre. I am not familiar with it. Do you believe that at the moment scientists have the communication skills to get the messages across? Would it be helpful to have more media training, and is that something the Science Media Centre help with at all?

Professor Pidgeon: They do carry out media training, and the Research Councils also lay on media training. Not all scientists go to media training, because the incentives are not necessarily there to do the public communication work. All the incentives are to do good science and get published in *Nature*, or whatever the appropriate journal is. There has always been this difficulty in getting scientists engaged with the media. Quite rightly, they get worried because they think that, if they talk to the press, somebody will distort their results and it is a process they cannot control. There is always a nervousness among scientists and engineers about talking to the media. Getting them involved is a perennial problem. The Science Media Centre has done that very effectively. It has tried to say to many scientists, "How would you do this? What is the best way to do this? Do it once, and then once you have talked to the media it is all right."

Andrew Bloodworth: I worked for the Natural Environment Research Council. I have done their media training, which is extremely useful. I would absolutely echo what Nick says. It is difficult to persuade some scientists to do it, and I am not surprised. You guys deal with the media all the time and you know they do not always report what you say. The Science Media Centre has been fantastic in helping us get more professional in terms of the way we present stories to them.

Q39 Chair: Surely this is an area where there is a responsibility both upon our universities and the industry to ensure that scientists are properly equipped to communicate their message to the broader public. Whether it is through the media or one to one in the pub makes no difference.

Professor Spiegelhalter: Absolutely. The Science Media Centre is doing a grand job. I do not think every scientist should be expected to do that. I would not stick some of my colleagues in front of anybody to talk about anything, mentioning no names. I was working on a Science Media Centre workshop before Christmas. There were hundreds of young people who wanted to engage. They are already tweeting and blogging, and they want to engage and do more. This is absolutely vital. For example, I got media training from the Medical Research Council, which was excellent, and I have always been grateful for that. This is an absolute necessity.

Q40 Pamela Nash: It is interesting that you talk about new media and social media, and obviously campaigning organisations use this as well. Are

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scientists starting to use this to get their message across, and also traditional broadcasters, media and the press? Do you feel that perhaps too much time is given to campaigning organisations or are scientists getting a fair share of air time?

Andrew Bloodworth: Campaigning groups are very good at this sort of thing; it is almost what they do. They will pick a very narrow issue, go for that very strongly and throw lots of resources at it. They have embraced the internet and the new media very well. I think the rest of us are a bit behind the curve. I echo what David says. My younger colleagues definitely have no fear of going on Facebook, Twitter or whatever to talk about what they do. It just reflects changes in society generally. Scientists are human beings—well, some of us are anyway.

Professor Pidgeon: In my written evidence, I made the point that some of these issues were of such national importance, thinking about the debate on

climate change, the UEA e-mails, for example, and how that has impacted British climate science, that just giving a few scientists media training is not necessarily going to grapple with all the risk issues involved. I have argued there is a need for a more strategic approach and that there is currently no appropriate organisation or body to do this within the universities or elsewhere. Whenever the issue of risk is raised, they will ring David first and then me, but there are not many other people in the UK they can call. That is not to say we are the only experts on this, but it is just a fact that the capacity is not there. There is an interesting question for the Research Councils, as to how capacity in risk communication work could be put in place.

Chair: Gentlemen, thank you very much for your attendance this morning. It has been extremely interesting.

Wednesday 25 January 2012

Members present:

Andrew Miller (Chair)

Stephen Mosley
Pamela Nash

Graham Stringer
Roger Williams

Examination of Witnesses

Witnesses: **Tracey Brown**, Managing Director, Sense about Science, **Fiona Fox**, Director, Science Media Centre, and **Mark Henderson**, former Science Editor, *The Times*, gave evidence.

Q41 Chair: I realise that several people in the room have very busy diaries this morning, so I want to get straight in. I would be grateful if the three of you would introduce yourselves.

Mark Henderson: I am Mark Henderson. Until December I was science editor of *The Times*. Since then I have started working as head of communications at the Wellcome Trust, though I should stress that my appearance here is in a personal capacity and I am not giving evidence on behalf of that trust.

Fiona Fox: My name is Fiona Fox. I am chief executive of the Science Media Centre, an independent press office for science set up in 2002.

Tracey Brown: I am Tracey Brown, director of the UK charity Sense about Science.

Q42 Chair: Welcome. Mr Henderson, I realise you have to go. At the point you have to go, please leave; we will not be affronted by it. I guess the media sources are the principal sources of information for the public on nuclear risks. Which parts of the media have the most influence over public risk perceptions?

Fiona Fox: I think the most recent survey on this was by BIS, which was published a few months back. It continues to show that the media as a whole, including television, is the main source of information about science for the overwhelming majority of the population. Despite the advent of new media and blogging, incredibly that is still the case. They specify that television is probably the biggest source but that newspapers are still 30% to 40%. All the media have a huge influence on public opinion on science and risk.

Mark Henderson: Those statistics came from the MORI survey for BIS, which I am sure we can get you if you do not have it. I believe the question they asked was, "What is your main source for science in general?" About 64% said it was television and about 25% said it was newspapers. The internet was surprisingly low, including only about 2%, who said that science blogs and that kind of thing were the main source, not that they are unimportant in other ways. It is also interesting that people say in every survey they do not trust the media but trust family and friends. From where do they think their family and friends get their information in the first place? Very often there is a cascade of information from the media to other sources that can sometimes become recycled.

Tracey Brown: A new phenomenon is that in similar surveys 80% of people say they get health information on the internet. This is a different kind of information seeking. Whereas the news sets the agenda for

discussion, when people have a concern, for example, about radiation exposure and whether to holiday in Japan, they look for information and pull up old news stories and materials in a proactive fashion. They gather it themselves using news portals and things. That is a different phenomenon, which means there is a circulation that continues beyond the day the newspapers are published or the programmes broadcast.

Q43 Chair: In your judgment what are people most concerned about: proximity to power stations, accidents or waste?

Mark Henderson: It is a difficult question, because in the context of nuclear I am sure it varies a great deal by people. One interesting observation about radiation in general—Professor David Spiegelhalter, from whom I hope you will be taking evidence, wrote a very good piece on this in *The Times*—is that it ticks all the boxes of risks that people find particularly difficult, in that it is invisible; you can't actually see it. It is not something that is very easily understood; it has had a bad press over the years and is readily connotated with nuclear explosions—Hiroshima, Nagasaki and so on. It is also a risk that appears to be imposed on people rather than one they choose to undergo voluntarily for a clearly defined benefit. In a different context, it is very similar to the risk from GM food in that respect, in that all those factors apply to the same issue.

Q44 Chair: It is the same principle that people have a different view about death on roads from death on railways.

Mark Henderson: Absolutely. The other counter-analogy I often like to make is with mobile phones. People are much more willing to undergo potential risks from mobile phones—not that there is any proof of such risks and, indeed, I think the evidence is poor—because there is such a clearly defined personal utility to them of having the mobile phone that the benefit outweighs the risk.

Q45 Chair: Every MP has scars on his or her back about the location of masts.

Fiona Fox: You ask what scares the public. For me, one interesting thing is the disjuncture between what the media think scares the public and the public. I do not know what really scares the public, but the media believe that the public want to be informed about every possible risk. A really good question for this Committee is whether that is the case. We have done

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our own survey—I have seen another one—which shows, quite surprisingly, that, when asked whether they would like to hear about every possible risk to the environment and health, immediately the public say they do not want to hear. They would prefer to hear about the risk when it has been proven several times and other experts have replicated those studies. There is a real disjuncture between what the news editor thinks—Mark said that radiation was uniquely terrifying; let’s splash it on the front page—and the public’s desire for the much more cautious approach, “When many scientists in many countries and in many studies have proven that coffee gives me cancer, then tell me, but don’t tell me about a study that includes three mice and it has not been proved before or replicated since.”

Tracey Brown: In relation to radiation and some of the concerns about nuclear power, there is a particular issue to do with people’s perception derived from safety guidelines. Safety guidelines are necessarily very conservative about levels of exposure. What happens in a situation like the Fukushima plant in Japan is that there are very low thresholds. Japan sets the threshold for exposure through the water supply very low indeed, but then the news becomes that you have exceeded that. For example, iodine 131 levels in Tokyo’s water supply were about 210 becquerels per kilo. That is more than the limit set by Japan for infant exposure but less than adult exposure. The context is that the adult exposure level set in Japan is about 10 times lower than the level worldwide set by the World Health Organisation as the point of intervention, which is 3,000 becquerels per kilo. Japan sets the adult limit at 300. You end up with a situation where you are trying to explain to a worried population. You have media headlines saying that recommended levels have been exceeded, but there is no evidence that at that level it will cause anybody any harm or anybody will suffer from that. But, of course, it is very worrying for people. What is set out as a precautionary measure to protect the public becomes a source of concern and also a source of alarming newspaper stories. I think that was what happened in that example.

Q46 Chair: Is that an argument for not using becquerels and millisieverts and using multipliers of days on the beach at Benidorm, or something like that, as a way of getting the information to the public more clearly?

Tracey Brown: Those things are always helpful to people to give them some kind of understanding. A similar example is the scanner people go through at airports and then pointing out how much they will be exposed to in the plane after take-off. That puts in perspective their exposure in the scanner. It does help people to give them some context. Whether or not it is enough to stop the kind of reactions and concerns about nuclear, I do not know. There is certainly a job to be done to explain why we set exposure thresholds for environmental hazards at a very low level, and exceeding those does not necessarily mean that people are at risk.

Q47 Chair: Turning back to the media, are there examples of good practice? What are they?

Fiona Fox: Absolutely. I continue to make the point, which I really believe, that our science, health and environment reporters in the UK are among the best journalists in the world and care passionately about accuracy and measured reporting. One of our big problems is what happens between the article and the headline, which is usually devised by the sub-editor, and the pressures from the news desk. During Fukushima we had various journalists—I cannot mention their names or where they are from—coming to our briefings with experts saying, “My editor wants a scare story.” Newspaper journalists were even taken off this story because they were giving a more measured, balanced, accurate narrative than the ones the news desks wanted. There are thousands of examples of wonderful reporting. We rely on these science journalists to convey very complex, important science stories every single day, but things happen between the story, the editing process and it being splashed on the front page.

Mark Henderson: This brings me to a caveat I want to make to Fiona’s last set of remarks. It is always a mistake to see the media as a whole. There is so much diversity within the media to their approach to questions such as this. I think papers like *The Times*, *The Guardian*, the *FT* and large parts of the BBC take a very different view on this from certain other papers. All of these organisations have as their end goal effectively to sell a product to attract readers, viewers or listeners. They can do it in different ways; they can do it via a more sensational approach or one where they are trying to attract people through a reputation for trustworthiness and accuracy.

During the Fukushima disaster, on which I reported extensively at *The Times*, I could not have asked for better support from my editor, James Harding, and my head of news, David Taylor, in that from a very early stage they made it clear to me and my colleague Hannah Devlin, who was also covering it, that they wanted a balanced, measured and accurate approach to the risks involved, and they were simply not interested in sensationalising it. They wanted to take a lead from their science specialists, who were more comfortable with some of this risk information than they were, as to what was correct. The approach of taking the lead from the specialists who know a bit more about it is tremendously valuable.

Q48 Chair: As a science editor you will appreciate this question. You said you could not have hoped for better support. That implies you have something against which to measure it. I take it that at some time in your career you have experienced or observed the other end of the spectrum.

Mark Henderson: By and large, I was pretty lucky at *The Times*, but there were incidents where you had a disagreement with the news editor over that kind of thing. I have certainly observed it elsewhere. Some of my colleagues on other papers have not been as fortunate in that regard. While they may well have wished to provide a measured and evidence-based line, it is unequivocally true that they are often placed under pressure from elsewhere in the organisation.

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Q49 Roger Williams: It is one question where the public get their information from and whether they trust it or are able to filter it, so to speak, and make their own judgment. In general, do you think the public trust the media to give a balanced view on risk and also to represent the uncertainties where issues are not entirely clear at the moment?

Mark Henderson: I suspect probably not, by and large. I am not familiar with the latest polling, but, generally speaking, it is the case that journalists come just above you guys on the trust register. That said, to go back to what I said right at the beginning, although people say they do not trust the media, they repeat to their family, friends and so on a lot of statistics and information they read in the media. It then acquires trust by being transmitted through a trust figure. Very often, the media, while people say they do not trust it, is the original source of information given to people by figures they do trust.

Fiona Fox: It would be amazing to get some rigorous research on this. As Mark says, the truth is that we do not know. Very often, the MORI polls just ask the straight question, as BIS did, “Do you get your information about science from the media?”—end of question. Somebody needs to invest in some real research into whether Mark is right and that, even though they say they do not trust it, it becomes their main source of information. I believe Emily Shuckburgh, who is doing some work on climate at the minute, has run quite a few focus groups with the public about that subject. She tells me that they are very literate about the media; they say, “I never read the headlines any more because I know they are sensational.” If true, that is fantastic for us, but it is just a few focus groups. There is research about 20 years old, which keeps being cited and I hope is not true, that people read only the headline and the first two lines and then get bored and give up. That is terrible for us, because usually the nice accurate and measured bit from the third-party expert the Science Media Centre has offered is toward the bottom. We do not know. There is a real gap in the whole public engagement work for some proper research as to the impact of these things.

Tracey Brown: We need to be quite careful. There are a couple of caveats about the media and the communication of risk. One is that we should not assume that the public’s perception of risk is the same as the media story. People are fairly canny about how they read things. Many people who read *The Sun* for its football news know very well how biased it can be in the report of a football match. Everybody recognises that is the case. People take what they want from the media; they do not consume it in a very passive way, but, as Fiona says, that needs research. I am not trying to let the media’s responsibility slip away here, but when a senior official says something really irresponsible what are the media supposed to do? Commissioner Oettinger called it “the apocalypse”. He said, “I think the word is particularly well chosen”, describing the situation at Fukushima in Japan. One could argue that it would be irresponsible of the media not to report to us that the person in charge of energy in Europe is saying that this is the apocalypse. What can you do? It is the right thing to

do to tell us what people in that kind of senior position say. I was very frustrated by that experience because it led to huge numbers of headlines. I am afraid that to this day the commissioner and his staff have refused to recognise that that was an irresponsible approach. When we finally got them to answer the question, they said they preferred not to dwell on semantic details, which is a very flippant approach to risk communication. When that happens, you cannot look at the role of the media but at the commentators the media report to us.

Q50 Roger Williams: Once it gets into the public mind these things can have very serious implications. I was at Syngenta on Friday. Its GM plant-breeding operation has moved to America, and I understand that about a month ago BASF’s GM operation in Germany also moved to America, so they have real implications. In general, who do the public believe most? Is it Government, campaigning organisations, the media, independent scientists—people who pop up and have an individualist view on matters?

Mark Henderson: The polling out there suggests that independent and academically-funded scientists do quite well on the trust spectrum. Industry-funded scientists are lower. As to NGOs, it depends. Some people hang on their every word; some are very sceptical of them. With regard to the Fukushima incident specifically, to pick up something Tracey said, a very interesting poll was published last September by the British Science Association. It showed that public support for nuclear power at least in the UK had gone up since Fukushima, the best explanation for which seemed to be that a natural disaster of biblical proportions had thrown everything it had against a 40-year-old power station and nobody died. That suggests, as Tracey said, that very often the public can work it out for themselves by weighing up all the different sources mentioned by you, Roger, and come to a reasoned, measured decision.

Something else that was desperately unhelpful during the Fukushima incident, just like the commissioner’s remarks, was the IAEA’s scale for rating the seriousness and severity of a disaster which only went up to seven. Once it got to seven it was as serious as Chernobyl. I do not think even Greenpeace would claim that the Fukushima accident was as serious as Chernobyl. That scale made it tremendously difficult for reporters to convey the nuance of what was happening at Fukushima versus what had happened previously at Chernobyl, because the scale was not fit for purpose.

Fiona Fox: There is probably a range of sources that people believe. Again, there is not very rigorous research, but a few years ago the Association of Medical Research Charities looked into this and discovered that when people came to their focus group they came with a cutting from the *Daily Mail* that their mother-in-law had sent them, a piece from *The Guardian* that their father-in-law had sent them, and stuff from the internet. People look to a range of sources, especially when it is a risk that affects them. The thing the Science Media Centre was really proud of during Fukushima was that it almost physically pushed out hundreds of experts into every single

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media outlet. Richard Wakeford, Jim Smith and Paddy Regan, very good experts with 30 or 40 years' expertise, did back-to-back television programmes. Estelle Morris, whom all of you know, said recently how much she and her partner had learned about the basics of radiation at the end of Fukushima from access to all of these experts. Within all these things there is an opportunity. Mark is right. At the end of Climategate there were polls. Everybody in the scientific community was in despair that they were losing the argument and were all going down. Then all these polls said that 90% of the British public think that the climate is warming, despite three months of headlines saying it is all a hoax. That was what did not happen in GM. In GM you had the headlines and the frenzy, but you did not hear from the wonderful plant scientists who were doing the research. There was a huge gap.

As to whom we believe, we know from lots of surveys that independent scientists are believed. John Beddington and Mike Weightman played a really important role in this. I think we could have heard more from them. People trust John Beddington, who is independent. He was being advised the whole time by SAGE, and yet there were only a couple of occasions during the whole two or three months on which John came out and spoke. When he did, it was powerful and influential. Journalists packed into the briefing with Mike Weightman and trusted and respected what he had to say. These were arm's length advisers to Government. Sadly, there were many, like the Health Protection Agency, the Met Office and the National Nuclear Laboratory, who told us they were not allowed to speak during that phase. They were giving advice to Government but they did not want to do media interviews. There is a big lesson there about arm's length independent experts being made available to advise Government but also the media and the public.

Mark Henderson: To be fair, John Beddington was pretty visible during the first few weeks.

Q51 Chair: He certainly was in Japan.

Mark Henderson: Yes.

Q52 Pamela Nash: Just before we move on from public trust, we have been concentrating on national media and stories, to which I understand the Science Media Centre was set up to respond. Last week it was highlighted by Professor Pidgeon that there was evidence to show that populations living near nuclear sites and nuclear power stations, for example, had much more trust in their local power station than might be seen elsewhere. I found that quite interesting. I do not believe that for local populations that is always the case with new projects. Have you had any experience of local press and how they respond to science stories? Are they geared up to make that response in a way that the public can understand? In what way do you think we can give them greater support to do that when there is a wide range of campaigning organisations with whom they will have links that may have different or varying levels of scientific knowledge about the project they are looking at?

Tracey Brown: Do you want to say something about the local press?

Fiona Fox: I think they are incredibly important, but it is the same issue that we have nationally. Where the local paper is big enough and has enough resources to employ a specialist, the coverage is better. We have the names of every science or health specialist on every local paper, but there are probably only about 20 out of hundreds and hundreds. They take a lot of copy from PA, so they still get good coverage of science where the scientists make themselves available, but it is mostly local correspondents with no knowledge of how the science works and who the local scientists are, and they are very much led by campaigning organisations. You are right that, in the local areas where there are nuclear power stations, people love their local nuclear power station because it has given them employment and a high standard of living for many years. They have a different attitude. Equally, the local papers are almost singly responsible for the scares about mobile phone masts and so on. I think we should be doing more to support them, but it is quite difficult to know how to do that.

Tracey Brown: There are lots of other kinds of media. I would extend that even to intermediaries. There are lots of other places from which people get their information or supplementary information. One area of publication that is often neglected is the professional press. All health and safety officials in their staff rooms have copies of the professional weeklies; midwives have their midwifery magazines and news; nurses have the *Nursing Times*. Professionals have a press that often reflects that broader news agenda, usually on a weekly but sometimes monthly or bi-weekly basis. That is another opportunity. We are talking about an audience of people who are themselves communicating on to many others. I was always very frustrated in terms of communication of risk issues during the early part of the MMR debacle that so little attention was paid to it and communicated through papers like the *Nursing Times*.

To take the example of nuclear power, we also have an opportunity through a lot of online discussion, including the traditional media. You can get people to set the agenda of questions they still have. Having read those articles, what questions do they still have? We put Paddy Regan on Mumsnet. People asked questions like, "Is it okay to take my children on holiday to Japan?" They were trying to weigh up the implications for themselves. They said, "My husband is working away in Japan. Should he come home?" "Should I buy pills from NukePills.com?", which was a particular fashion, or, "Should I buy salt?" Those were the sorts of questions people were asking as a result of looking at the coverage. I know that a lot of newspapers—certainly the BBC sometimes do it—will run a Q and A. It is almost like a radio phone-in but online. It is now becoming quite common for people to take part in those kinds of things.

Q53 Stephen Mosley: I think all of you have mentioned the word "sensationalist" at some point during the presentation so far. There seems to be the perception that the media do sensationalise things. Are

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there any particularly good examples where Government and media work together well, or does sensationalism tend to take over and lead the way?

Mark Henderson: I know Fiona will say exactly the same thing. There have been some very good examples that spring to mind, not so much in risk but perhaps in communication of difficult and potentially controversial areas of research. Partly through organisations like Fiona's and Tracey's, scientists have increasingly tried to get out in front of the issue and communicate with the media, parliamentarians and the public before something comes to a head in a sensational crisis.

There are a couple of very good examples of that. One is the Human Fertilisation and Embryology Bill a few years ago, on which many of you will have voted. In that case scientists engaged very proactively in all of those issues from a very early stage. One of the big issues was the question of whether or not one should be allowed to create hybrid embryos. People like Steven Minger and Robin Lovell-Badge got out in front and explained what the research was and was not. That meant the rationale for it and the scientific accuracy of what was being proposed led the debate for most of that period and was tremendously influential at the end of it. That was a very good example of how it can be done well in a slightly different context. I realise it is not a direct example of risk communication as such, but it is analogous in different ways.

Fiona Fox: I would refer to the recent debate on shale gas. The narrative on shale gas looked really grim. We talked to quite a few people and ran a background briefing. There was no announcement or news story; there was nothing shocking or sensational. The room was packed. All the science and environment journalists of the national newspapers came, even though there was not a story. We had two of the leading experts in the UK. All of the headlines next day were about the low risk from shale gas. You would assume that in a room like this they would find something scary to say, but they did not; they even had headlines about the low risk.

Q54 Chair: So Blackpool tower is not going to fall down.

Fiona Fox: Apparently not—not because of fracking anyway. It was very honest. There are risks; there are earthquakes. These were independent geologists, not with the company, and they were very open about the risks. Every journalist in that room—they are the ones who will cover shale gas over the next couple of years—got to hear a balanced, accurate and measured view. At the end I felt very strongly that we had to push those experts out there because this could be another GM. We could end up saying no to shale gas and import it from Poland or wherever. That is fine if it is justified, but, if we are saying no to it as a society based on exaggerated risks from campaign groups and poor science, that is what we want to avoid.

Q55 Stephen Mosley: What you are suggesting is that, looking forward, you need to get the expert opinion behind it before you can work on the public opinion, or do you need to do it the other way round?

Do you need to make sure you have the experts there before you come up with policy and go out to the public?

Fiona Fox: Lots of people have the right to a say in these debates. What we must not do is ever have these debates without the expert voice of the people who have spent 30 years working on them and know most about the risks. In the case of GM we had celebrity scientists weighing in to defend GM, and good for them. Susan Greenfield and Robert Winston saw these attacks on GM as anti-science, but they were not plant scientists and so they were not doing experiments in a lab which showed that GM presented potential risks to the environment. Therefore, it looked like pro and anti-science. The key thing is to get expertise into the debate and for the media, policymakers and the public to have easy access, and then they can make their judgment. That is democracy.

Mark Henderson: In the case of risks specifically, a lot can be done, first, through risk literacy education, which is quite important. I do not think we get taught at school to think productively in weighing up risk and benefit and assessing risks against one another. David Spiegelhalter has done some very good work on using things like the Premiership football table, national lottery and things like that to communicate what risk and probability actually are.

Tracey Brown: In a sense this is what Sense about Science is trying to do but reaches the limits of this, but there is a limit to inoculating the public in preparation for a media frenzy. If the media go into a frenzy about something, they will usually set it out in terms that will reach past whether or not you had a science education and will capture people's imagination in some way. In those situations you have to do all you can to get through. Every paper has frenzies. Everyone wants to talk about the *Daily Mail*. There are eight pages in *The Independent* sensationalising nuclear stories. There is not one mention in eight pages of the 20,000 people who died and the hundreds of thousands who were displaced. A potentially different sensational story, a very real one, could have been there. When they go into that it is hard to get through.

We must not assume that it is always like that in trying to get across the message. Among policymakers and scientists I often find there is an overstatement of how much the media only want bad news or a sensational story. The examples given by Fiona and Mark are just some of the many that show that is not the case. Whatever the issue, whether it is the risk of schizophrenia from drug use or whatever, it is difficult in a frenzy, and a paper goes into that kind of world. I suspect there is editorial pressure behind a lot of those things, but that is not to say it is always like that or there is not scope for an enormous amount of risk communication based on sound evidence.

Mark Henderson: Andrew, I give my apologies.

Chair: Thank you, Mark.

Q56 Graham Stringer: You have actually answered a lot of the questions I was going to ask. I would like to know what were the best and worst examples of media reporting on the Fukushima incident.

Tracey Brown: To elaborate a little on the one I just mentioned, I found an interesting contrast. I think the *Daily Mail* has an awful lot to answer for in communication, but, to its credit, on the day after, the front page had a picture and put across a story, which was an incredibly important one, where 20,000 people were dead or missing, with massive displacement of people from their homes, and dysentery had returned to an industrial nation. In these eight pages we have “Nuclear explosions”; “Nuclear mistrust”; “Thousands told to stay inside as plant leaks radiation”; “Decades of lies”; “Nuclear reassurances fall on deaf ears”; “Clean-up crews who risk everything”; and “Safety checks on nuclear power station”. It is page after page. I did not realise it was possible to write that many headlines on one story.

Q57 Graham Stringer: I take it that is your worst example.

Tracey Brown: Yes. There are times when a strong editorial line seems to take things off in a certain direction. I think that was one of the worst examples. I am sorry to keep harping back to it, but I found it to be one of the most inexcusable examples because it was happening at a time when there was a very reportable story. Even from the science and health side of things, it was of great interest to look at what was happening in terms of the logistics, dealing with the issues and the health effects of the mass displacement of people. I find it amazing that that can be thoroughly ignored in favour of this. It was not a quiet news day is what I am saying.

Fiona Fox: It is a good question. I read Alastair Campbell’s evidence to Leveson the other day. In his introductory comments he makes the point that we have the worst and best of journalism within the same newspapers, which is absolutely true. This was one of the lowest days for my team in 10 years. The earthquake and tsunami were on the Friday. We lined up earthquake and tsunami experts—we have many on our database—and called an emergency briefing for the Tuesday morning. It was packed with journalists. By Saturday literally the only story in town was Fukushima, so we had to drop all of the earthquake experts, apart from one poor guy, who was not asked a single question, and we gave them five nuclear experts on everything on the engineering and radiation side. We covered every possible angle. It was a fantastic briefing and it was absolutely packed. We then sent some of the scientists in to the BBC to do a further briefing. On Wednesday we got all the newspapers. Every one of us was riffling through them, and it was the same day as the “apocalypse” comment. We could not find anything from the briefing. There were a couple of little fact boxes. Don’t let the facts get in the way of a good story. Those journalists had all those facts and measured, accurate information, but very little of it was in the papers.

Equally, over the next couple of weeks we saw some amazing journalism, for example, from Richard Black on the BBC News website. There were incredible articles. You would understand lots about the way we build our nuclear power stations. Fergus Walsh had bits of radiation with references to millisieverts and

the fact that you would have greater exposure in Cornwall. It was amazingly good public education. The media say they do not do that; they entertain, but there was some really good journalism. Kate Kelland fought within Reuters to get incredibly good journalism, as did *The Guardian* as well. There was a real mix. It may be that Mike Hanlon, science editor of the *Daily Mail*, has given evidence to this Committee. He made a fantastic analysis of some of the trends and opportunism being displayed very early by anti-nuclear activists, sweeping in on this tragedy to make an argument against nuclear. There are some great examples and some depressing days.

Q58 Graham Stringer: Both in answer to this question and previously, we have been through the mechanics of how things worked in this country. How difficult was it getting information from Japan, which is a long way away, and having faith that what came in was reliable? How did that work?

Fiona Fox: It was almost impossible. One of the biggest challenges in risk communication is talking about risk situations in the absence of information. There was no information. On the day to which I referred, when there was a panel of six experts, the lead expert opened his remarks by telling 35 journalists, “I’m really sorry but all the comments we are going to make today are based on what we have seen on Sky News”, at which stage the journalists laughed and pretended they were going to walk out. The difference, of course, was that that was true; they did not have any source of information that was any better than the journalists in front of them, but they did have 30 or 40 years of expertise, so they did know what they were talking about. There was not a single question about that, but it is about intelligent speculation and saying, “I can’t answer that question based on information coming from Japan, but I can tell you about the level at which these nuclear power stations were built and what they are capable of withstanding”, so imparting a huge amount of information.

In addition to lack of information, the other problem was different kinds of experts. People said to me, “Yes, but my mother said that scientists don’t agree on this.” There was an incredible amount of consensus among mainstream science, but there were some scientists who did not declare they were working for campaign groups. They were saying very different things and were being much more alarmist and apocalyptic. There is an issue to do with the media being open about the sourcing of these scientists.

Tracey Brown: Sometimes it can just be a matter of luck. The American press put across some really good stuff about risk. One of the reasons, I suspect, was that a day or two after the earthquake a Japanese American professor flew back from a visit to Japan. There were crowds at the airport to meet people coming from Japan looking for information about their experience, whether they had been in the area of the tsunami, and so on. They seized upon him as a Japanese face. It turned out that he was a professor of risk and was able to hold forth to the assembled media on the likelihood of all the things they were worried about. I suspect that was a rather lucky situation, the States not having

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an active science media centre in quite the same way, but it led to some very good communication of the risk issues.

Q59 Graham Stringer: It has been mentioned before that people's trust in nuclear power has increased slightly. That might be English/British phlegmatism, or is it Fukushima fading from view? Things that are immense and catastrophic one week are forgotten about three months later. Is it still in people's minds?

Tracey Brown: There are a couple of things that perhaps give some context to that. One is that, as Mark mentioned earlier, the big fears around nuclear are about the invisible menace and the idea of a proposal to expose ourselves to something that is not very tangible. In a bizarre way, what happened at Fukushima made it all very tangible and physical. Here is a physical installation to which you must do physical things in order to control an out-of-control situation. It throws at us ancient machinery, problems with inspections and everything else, and we realise that as a result there is not an apocalypse. Then it makes it all much more tangible. That is one element of it.

However, we have to account for the fact that there is quite a big difference between how that has been experienced in the UK and people's attitude to nuclear and places like Germany, for example. In Germany it happened during election time, which was rather awkward because people were grandstanding politically around the issue in order to win the green vote. They have cancelled their nuclear programme. I do not know, but I would be interested to find out whether at the same time as this discussion there has been an escalation of concern about measures being taken to reduce reliance on coal as an energy source, and whether the environmental agenda and concerns about climate change are also what is driving people to think that nuclear is an option they need to look at. There was at the time quite a lot of commentary on the need for nuclear on that basis. Germany has cancelled its nuclear power programme, and we have seen similar things around the world. I think I have put in my evidence the calculation of the increased CO₂ emissions as a result of that. That led to a commentary about the implications and dangers of cancelling the nuclear programme in this country; it might also have influenced the discussion.

Q60 Graham Stringer: You may not be able to answer this question, but do you think the German decision has influenced public perceptions and opinions in this country?

Tracey Brown: Conversely, though, because it has been a discussion. I hesitate to say it has happened in a wide, popular way because I think it has been perceived at the level of readers of the *Financial Times*. I think it has led to a discussion about the impact of the German decision in terms of the increase in CO₂. Not just Germany but seven other countries have reviewed their nuclear programmes.

Q61 Graham Stringer: You mentioned the Weightman report earlier. His briefing has been very useful. The report came out in phases, did it not? Do

you think the fact there was a period of cooling off and waiting and then an objective assessment helped in that?

Fiona Fox: The interesting thing, as you have just said, is that when we ran the interim report at the Science Media Centre it was packed with hundreds of journalists with international interest. The final report we did not run, in part because we did not think we would have enough space for all the people they wanted to invite, and it got hardly any coverage. It was hopefully an influential report within Government and other circles, but by that time the media interest had moved on.

I would like to emphasise one point to this particular audience, which goes back to the issue of people like Weightman, who are arm's length, trusted experts and are seen by the media as independent. They do not say, "They would say that, wouldn't they?", which might be said of Government and industry.

The only point on which I disagree slightly with Mark is that we could have heard a lot from those at the coal face. Every day we were using about 40 independent academics, who were doing a brilliant job but who had no official information. Yet John Beddington, Mike Weightman, the National Nuclear Laboratory, the Met Office and the Health Protection Agency were very reluctant to speak. You are absolutely right that Beddington did a wonderful job, but in Japan. We sent out an interview he had conducted with a Japanese journalist that got loads of coverage. We read it, found it brilliant and sent it to every UK journalist. I do not think his Government press office sent it out. The fact that he played such a good role, as Mark said, makes me want him to play a bigger role. There was reluctance with people saying, "Sorry, Fiona. We are briefing Government but not the media." That is crazy. If you have any information or expertise to brief Government, do it, but also brief the media, who will brief the public, because then Government might have a much more balanced assessment but a public who are demanding the end of nuclear because of their less balanced view. I would like the message to get out that we need to use our independent agencies, which are trusted and respected. They do not know exactly what is happening, but they know a heck of a lot.

Q62 Graham Stringer: My final question arises only because it was on the "Today" programme last week. Do films like "Dr No" influence people's perception of the risks from nuclear power and installations?

Tracey Brown: I think they become part of our common language in a way that is perhaps less direct than that. Some films do influence people. For example, people are very influenced about the environmental risks by film, but what happens is that words start to enter our language and take on a different meaning in a popular sense. For example, there is now almost a jokey reference to "genetically modified". Anything that is large, misshapen, or a real baddie in a superhero film, will be described as "genetically modified". Radiation has taken on the same kind of usage; it is used to describe all the bad things that bad people do in films without any proper scientific explanation. Sometimes you are suffering a little with those wider perceptions when talking about

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these issues quite seriously and scientifically, but by and large I think people are pretty good at distinguishing fiction from reality.

Q63 Stephen Mosley: Has the Science Media Centre found it generally easy to get scientists to put themselves forward to you on the media? I know you said some of them were saying, “We are briefing Government and not the media.” Was that because they did not want to or did not feel they could brief the media? Was it the case they were not able to because they had signed the Official Secrets Act or something?

Fiona Fox: Correct. I do not know the answer to that. You never know why it is a scientist doesn’t want to speak out; whether it’s because the topic is controversial, if they have been asked not to speak publicly or if it simply the usual antipathy many scientists about speaking to the media. With the official agencies, the fact that this time so many were saying the same thing indicates they had been asked not to speculate in the absence of information but were having regular meetings in Government and sharing more general information. My point is that that is general information, even if they had just given it to us to impart to the 25 independent scientists who were on Sky News every hour.

We are celebrating our 10th birthday this April, and I can honestly say there has been a dramatic change during those years. When we opened, I remember massive stories and tearing my hair out. When Prince Charles said nanotechnology was grey goo, I phoned every nanotechnology expert on the database and struggled to find anyone willing to speak to the media. It was controversial; it was Prince Charles and the *Daily Mail*. Now I think they would be queuing up. There are many scientists out there who have watched what happened on GM and the way failure to engage can lead to no research. I imagine that anybody who thinks shale gas is a possible option in this country now will realise there is a debate. Although “Gasland” is not a movie but a documentary about shale gas, it has been very influential. The media quite often show a little clip of it before they run their piece on shale gas, so there is a real debate to be had. Scientists recognise that, if they do not engage, the public will not hear and the outcome is decided. I am very positive about that. We do not have a shortage, but when there is a shortage it is at moments like this. It is when the frenzy is on.

As to Climategate, I think we were eight years into our existence. As a team we said, “Gosh, this feels like 10 years ago.” People said, “What if they ask me if Pachauri should resign? What if they ask me if Phil Jones was a liar?” I do not want to ask these questions. We were back to the basics of saying, “Refuse to answer them. Go on television and say you cannot tell them whether Pachauri should resign, but this is what you know about the mounting evidence of climate change.” The more the political it is and the greater the frenzy, the more reluctant scientists are, but it is not a problem.

Q64 Stephen Mosley: I understand that you run media training courses for scientists. How many

people have gone through those courses in the past 10 years?

Fiona Fox: We have run quite a lot. One of the reasons we do not run more is that now all the universities, research councils and the Royal Society run them. Twice a year we run an event called Introduction to the Media, which is the stage before the media training. We have 200 scientists—don’t tell them this—who are there because somebody has identified that they are hostile to the media, scared of the media or are just not media savvy. Therefore, they are identified as people who need that kind of four-hour introduction. We have a panel of people like Mark Henderson, Ian Sample from *The Guardian* and Mike Swain from the *Daily Mirror*. They get a basic introduction to the fact that science journalists in our newspapers and broadcasting institutions want to get it right, and then they move from that to the more intense one-to-one media training.

Tracey Brown: We involve people from the Science Media Centre in running Voice of Young Science workshops with early career researchers. There are two issues. One is that, quite often, if you still have somebody in a senior position in your department who is not a fan of going out and talking to the media, it can be quite difficult to argue against all their negative experiences, for example, “Look what happened to Fred when he tried it; look at the front page that that led to”, and that kind of thing. It is about giving them a bit of confidence about how it works and forming those relationships directly with journalists themselves.

The other point is that it also tries to give them a sense that it is not all or nothing. It is not that you wait to the twilight years of your career, when you are the world’s leading expert and you are giving after dinner speeches, to appear on a panel or briefing session, and so on. There are many other forums in which you can cut your teeth. You know your local radio station is advertising that this afternoon there will be a phone-in and questions like, “Are you worried about Japan?”, or, “Are you cancelling your holiday?” Phone them and find out whether they have somebody who will be able to talk sensibly about the risk, the radiation aspects of it and so on, and make sure there is someone there. There are so many places in which you can interact with people and a wider audience without necessarily having to start with a major national issue that is breaking and so on. It is quite important for people to try other ways of getting across, experiencing and communicating science at an early stage in their career.

Q65 Stephen Mosley: Most of the things you have talked about have been in the past so that you can say with hindsight what happened and whether or not it worked. I was interested in what you said about shale gas. You are looking forward. Are there any other major areas looking forward on which you think Government, Government Departments and scientists should be focusing to build up their knowledge and experience, because you think that in the next five years this might be an issue and you need to start getting the message across now?

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Fiona Fox: We need to reopen the GM debate. I do not think very many people in this country are proud of the way we did it. It could well have the same outcome, but I think we should conduct the debate differently. Geo-engineering is a big one for the SMC. That has all the ingredients of becoming a big scare story. Engineering our planet to adapt to climate change is pretty scary stuff. Already coverage of some of the projects, like SPICE, has not been brilliant. That is a really important one for Government to get their head round. None of the scientists engaged in these geo-engineering products is saying we should geo-engineer the planet, but we need to do the research. If we cannot manage our emissions, we have this in our back pocket, which is really important. We have already heard various campaigning organisations calling for a moratorium on the research. Governments should always be nervous at the moment people say, "Let's not even ask these questions or do the basic research on a whole area of science", closing the door to it. I think those two would be appropriate.

Tracey Brown: I agree about GM, although I do not think we should keep referring to it in future as "the GM debate", because the only thing that will be useful to people is to put GM back in the context of plant breeding. The problem in the first place was that it was taken out artificially and looked at in an isolated way, with no sense of the history and problems of plant breeding, the radiation that is used in a hit-and-miss fashion and the way this would become a much more precise technique, and that it is one technique among a whole range of things that need to be achieved in plant breeding, with lots of public sector scientists working on it. That is the context that is needed. Any discussion about GM in this kind of "Isolate it and talk about it" way will put us in the same intractable situation with lots of misconceptions. I think that is important.

Preparedness for disaster needs to be revisited. Swine flu was a good example of this discussion. We had panic-buying responses and stockpiling. There were discussions in the media about whether the Government were stockpiling enough of anything or had prepared enough for things. Often, it was really driven. You can see the phones ringing off the hook in departmental press offices, with people saying, "What have the Government done to protect us from this, or make sure we have vaccines for that, and so on?" Then you have all the retribution that comes afterwards because the Government have spent millions on doing something that is never needed. I think that Departments in Government have not worked out how to handle effectively those kinds of pressures. That needs to be looked at.

In personalised medicine we are going to see real challenges about risk calculation and communication. They will become much more clearly differentiated for different populations, for example, whether the NHS should provide certain treatments perhaps for only certain groups and so on. We have already seen the trouble in trying to explain why Alzheimer's drugs were not originally approved and made available on the NHS. It caused all kinds of reactions and problems. It will become much more complicated, and that has a strong risk element to it.

Q66 Chair: Both of your organisations have done a sterling job in helping better understanding. What do you do when things slip through the net? Fiona Fox talked about nanotechnology. I remember in September 2009 speaking to a conference of nanotechnologists about public understanding. Very conveniently, *The Guardian* had published a letter from the Soil Association, the gist of which was that there had been an accident in a paint factory in China. The conclusion of the letter was, therefore, to close down all nanotechnology research rather than ask why we were importing from China paint made in such dangerous circumstances. When you see things like that what do you do about it? Do you try to influence the editor or write to the letters page?

Tracey Brown: As to that example, we did not do anything ourselves.

Q67 Chair: Nobody did, and that was why I found it so frustrating. I told 300 nanotechnologists that all of them should have written letters.

Tracey Brown: That is the next meeting and discussion with my staff. Do you mean those times when you are chasing an issue that has already come up and you have had no role in it?

Chair: Yes.

Tracey Brown: There are times when you can reset the discussion, even on pretty emotive things. For example, we have had experience working with cancer charities to respond to something that came at us completely from left field, which was celebrities raising money to send very ill children to the US for treatments that were not founded in evidence and were quite risky things to do, although you have to look at risk in the context of very ill children, which is a very different issue. In that case we managed to get quite a lot across. We were running after the story. There are other things where it raises issues. Sometimes it is almost impossible and you have to wait for a period. For example, when food additives research was published, which, from a very preliminary study, came to all kinds of big conclusions about the risks of exposure of children to colorants and so forth, it was impossible to change much about the nature of that discussion. It became possible to do that after about three weeks. Sometimes it is possible, even in a frenzy, to reset the discussion.

Fiona Fox: When we started, our philosophy was that the media would do science better when scientists started to do the media better. The reason we came up with that philosophy was that there had been a real culture of complaints. Lots of scientists went to the PCC and wrote to editors. What they had not done was make themselves available. Therefore, the editor of the "Today" programme had hundreds of letters from scientists complaining about the narrative, whether it was MMR or whatever, but had not had many scientists on the programme at that stage because they would write angry letters but not make themselves available. These things will happen, and in some ways they should.

This is not about closing down debate about risks. Many environmental NGOs have put the spotlight on important risks and got good policy changes. We are not about closing down debate. I do not think the

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SMC has ever said that we should not have the debate on shale gas, GM or nuclear. These debates are opportunities. The key thing is that, within that opportunity and alongside all the stuff we do not like and deem to be inaccurate, the voice of accurate evidence-based science is heard. I go back to Estelle Morris's point. It is fantastic that, at the end of that horrible time when lots of people despaired of the media with all those apocalyptic headlines, some people out there learned a lot about the real risks of radiation hearing from scientists who communicated that.

Q68 Chair: That is very interesting. We have a letter from a lay person to this inquiry expressing, in exactly

the terms Mark used, that she had started off anti-nuclear but, because the power station had not caused deaths following the natural disaster, she had become pro-nuclear. That was good reporting.

Fiona Fox: You have the famous Jeremy Clarkson column saying, "I would build one in my underpants." We do not necessarily want to quote Jeremy, but there is an element of thinking, "My god, in spite of that level of tsunami and earthquake, there was no explosion."

Chair: It was extraordinary. Thank you very much indeed for your attendance. It has been very enlightening.

Examination of Witnesses

Witnesses: **Bob Brown**, Corporate Director, Sedgemoor District Council, **Richard Mayson**, Director of Planning and External Affairs for Nuclear New Build, EDF Energy, and **Dr Rick Wylie**, Executive Director, Applied Policy Sciences Unit, University of Central Lancashire, gave evidence.

Q69 Chair: Good morning, gentlemen. Thank you for coming. Perhaps I can ask the three of you to introduce yourselves.

Bob Brown: I am Bob Brown from Sedgemoor District Council. We have Hinkley Point power station on our doorstep and it will be the first of the new breed of nuclear power stations to come our way.

Richard Mayson: I am Richard Mayson, director of planning and external affairs at EDF Energy. I am a nuclear lifer. I have spent 35 years in the industry, the first 25 on safety and the last 10 on new nuclear.

Dr Wylie: I am Rick Wylie, the executive director of the Applied Policy Sciences Unit at the University of Central Lancashire. I look after their Westlakes Campus near Sellafield in West Cumbria.

Q70 Chair: Thank you very much. Perhaps you could all briefly describe how you influence, or, alternatively, are affected by, the Government's nuclear policies? Clearly, you all have different perspectives on this. Mr Brown, you and I met at another forum recently in which you expressed how your council is seeking to influence the agenda. Perhaps you would start there.

Bob Brown: Indeed. Risk is a key issue in the process, and our communities understand that because they have lived with Hinkley for some time. That said, there is a significant proposal to build two new reactors, which will have a big impact on our communities. One thing we seek is community benefit in order to help engage those communities in the process of assessing what it means to have a nuclear power station in their area. Those communities will carry the risk, and clearly there is some risk because those living immediately adjacent to the nuclear power stations carry iodine tablets. The parish councils know full well from their engagement with the civil contingency agencies that having a nuclear power station is a risk over and above the risk presented by other energy producers. One link we see is a mechanism for engaging in a wider discussion on risk with the communities and, hopefully, building

trust through the community benefit model with some compensation for those communities in that way.

Richard Mayson: You raise a wide question in relation to Government policy. In general, the key thing for us is to make sure that our operations remain safe. Safety is our top priority, and openness and transparency in delivering that is key. We work very hard to make sure we have a full engagement process. We fully support the massive engagement that has happened on nuclear policy over the last eight to 10 years. I have been involved in it since 2001, and clearly it has gone through many shades of grey in that period. In relation to local communities, we have engaged in an enormous amount of debate with them over the last three years on the proposals for Hinkley Point C. That has led to our recent application to the Infrastructure Planning Commission.

Q71 Chair: Do you get beyond the elected council and so on and into the heart of the community?

Richard Mayson: Very much so. We have held over 100 meetings in four official rounds and one preliminary round of consultation. Those meetings comprised 37 exhibitions and 67 public meetings involving parish councils and others, so there is an enormous amount of engagement. We have had over 2,000 responses from the public to our consultations. That amounts to about 33,000 individual points raised. It is perhaps worth mentioning that, of those points raised, roughly 95% of them are not related to nuclear matters—nuclear safety or nuclear waste; only 5% related to nuclear safety and waste. The vast majority of issues that concern the public in the area are about transport and the socio-economic effects of the development. We put an enormous effort into mitigating those risks, as will be seen as we go through the planning process. I believe our mitigation costs alone add up to about £500 million.

Dr Wylie: The Applied Policy Sciences Unit has been in existence at the Westlakes Campus for almost 20 years in one form or another. The themes of our work are quite relevant to this: public opinion; perceived

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risk; attitudes towards the UK civil nuclear industry at local and national levels; and also the importance of community in helping people understand, appreciate and accept, if you will, even nuclear issues. One of the paradoxes we have come up with in our research over almost 20 years is that of proximity. People living close to these things seem to like them. Even though they do not trust them and think they are very risky, they still like them. We are particularly interested in Government policy in this area, particularly with respect to new build and radioactive waste issues, and perhaps even whispers one hears of new reprocessing facilities based, as we are, adjacent to the Sellafield site in the West Cumbrian community, of which I feel I am a member.

Q72 Chair: But what are the folk living near existing or proposed sites most concerned about?

Dr Wylie: We need to distinguish “public” in a number of ways. We talk holistically about “the general public”. There is no such thing in terms of nuclear. One has to think about this very carefully. If one asks the West Cumbria community, as we did some years ago, what it is really concerned about, the answer is, “Well, it’s employment, gov. It’s where we and our children are going to work.” Of course, there are other issues as well. The West Cumbria area is a very special community. It has been there for 60-odd years under the code name Tube Alloys, in one form or another, from the end of the second world war and the start of the cold war. They are certainly concerned about the nuclear industry, but it is very complex. Nuclear issues and beliefs are amalgamated, if you like, and seen through the lens of the local community of their relationship with where they live and where they are.

Q73 Chair: In your judgment, is there a difference between communities like West Cumbria, which by any standards is fairly remote—it is a long way from the M6 to Sellafield, and I have driven it many a time—and places like Hinkley Point, which today are much more accessible to people in a bigger radius?

Dr Wylie: That sense of isolation is a particular part of the psyche or the Zeitgeist of West Cumbria. It is very connected; it has the internet, things like Westlakes Science Park and new facilities, and multinational organisations operate the Sellafield site.

Q74 Chair: We are not here to advertise the site. I am trying to pin down whether there is any difference between those sites that have bigger connectivity problems and others.

Dr Wylie: That is not something I have researched specifically, but the fact that the area is isolated gives the perception that there is not much else on the map in terms of opportunity. You can overstate that. It is geographically closer to London than Glasgow and it is less far to drive there.

Q75 Chair: Yet the point made by Mr Brown we would see also in Heysham, for example, with people saying they would be happy to see a next generation station.

Dr Wylie: Yes, absolutely.

Richard Mayson: I believe that is the case. We have seen a lot of support for new nuclear and a strong desire to attract the enormous economic benefits that would accrue from it. Having worked in Cumbria, lived near Heysham and been very heavily involved in Hinkley, I think I can comment on all three. They would all like a new nuclear power station in the area, principally because of the massive economic benefits.

Q76 Roger Williams: The perception of people living locally differs from the general national perception of these matters. Is that because the people living locally have a better understanding of the risk, or is it because they are committed already in terms of economic opportunities and are more accepting of the risks? Is it a better understanding or more acceptance?

Bob Brown: In Hinkley the experience of our communities is that they are more understanding; they live with it. The parish councils receive iodine tablets and know what they are to be used for. The civil contingency agencies and other experts engage widely with the local communities so that they understand what would happen if there was a catastrophic event. People do understand that, but they live with the risk and understand it because of the benefits that it brings, and has brought to them, and the benefits more widely to the nation from low-carbon energy production. Clearly, there will be a significant impact on those communities again. As Richard rightly says, mitigation is being provided through the planning process, but there is also significant impact in terms of the infrastructure required on which that mitigation will go.

In engaging the wider communities, moving back from those immediately adjacent to Hinkley, the issue is about understanding the risk from a new and larger facility and engaging in that constructively. The planning process does not deal with that. If you look at the national plan, it says that risk and those issues should be dealt with by the other agencies, and it is outing that issue and allowing people to engage in that. One of the issues for our communities would be community benefit as a hook to allow people to understand those risks and see a level of compensation coming to them for accepting them. They are different from the risks associated with, say, wind energy, where there is direct compensation to communities for having wind farms but very little risk. It is low both in terms of its impact but also in terms of its likelihood, whereas these communities understand the low likelihood of nuclear risks, but the impact is of a different magnitude altogether.

Richard Mayson: We put an enormous effort into community relations. We establish community forums around each of our power stations. We are doing a lot of active work online to improve our communication processes. We believe that it is openness and transparency that help to improve people’s perception of risk.

Having said that, I would take issue with one thing Bob said in relation to the planning process. My understanding is that it is a legitimate part of the planning process to consider the perception of risk by the local community. The Government’s national

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policy statement makes quite clear that they expect the safety regulator to deal with the detailed mechanics of risk in relation to the level of protection provided by the plant, but broader issues in relation to the perception of risk are a legitimate part of the planning process, and that has been manifest in a number of recent inquiries.

Dr Wylie: As to these different levels of analysis of communities in the vicinity of nuclear sites and the perceived risk, in the West Cumbria area—alias Allerdale and Copeland boroughs—the work we did some years ago reveals that people are very risk aware. They think these things are risky, as indeed in some respects they are, but they have something to balance against it. With regard to this proximity in terms of public opinion formation, if something means something to you, you evaluate it quite thoroughly. Our colleagues in the previous session to a certain extent skated over, quite rightly, the issue that for most people this is not very important to them, but, locally, in the vicinity of these things, it is very important. APSU does not think it is just jobs and wealth; we think it is more about the embedding of the relationship, the heritage of the community, over half a century certainly in the West Cumbria area. I guess it would be the same for Dounreay. It is embedded in all elements of the community; it is part of that. It is not just the past of the community but its future as well. People see the importance of these facilities. If you ask a West Cumbrian where he lives, he will say, “Just near the Lake District”, or, “Near Whitehaven”, or, “Near Sellafield.” It is part of the identity. That was revealed when the Calder Hall cooling towers—harmless condensate, they tell me, came out of those—were demolished at Chapelcross and Sellafield. It was a local event for people and they went there. It was sad. Something had changed about the area when the cooling towers were felled, and that was part of it. It is not just about jobs. It is very important, but what did Ruskin say? He said, “There is no wealth but life.” It is not just about jobs; it is about people’s living and their daily lives. That is the thing about the West Cumbria area and areas around nuclear facilities. The longer they have been there, the more you get the community dynamic about perceived risk.

I do not think people are reassured about risk to a great extent; it is just that they have something to balance against it. It is like driving a fast motorbike. It is about the risk; that is what it is there for. You do not affect risk; you range things against it. You can diminish risk slightly, but I do not think you can take it away. Our colleagues in the MRWS process have revealed that among the community there is significant support even for the construction of a nuclear waste repository in the West Cumbria area. It would be difficult to think of that in Lewisham, would it not? There is something about the community in these areas. It is like a rhizome, the nuclear industry is underneath so many things.

Q77 Chair: What has changed since the Nirex debate?

Dr Wylie: One change since the Nirex effect is the sharpening of the economic situation. Another issue

that emerged from our colleagues in Nirex some 20-odd years ago is that they were perceived as outsiders. They did not live there and did not listen to them. It was an invisible process. It was what I would call a science-led process, and undoubtedly a lot of very good science was done there, but one of the main criticisms was that it was an “outsider” process. If you look at public opinion—I did some work with Nirex many years ago at that time—depending on how you asked the question, a majority of the public of West Cumbria, if they were assured on safety issues, were not against that. Those were the bald polling figures. Now it is a much easier process. The MRWS process has learned specifically from the Nirex process. It is stepwise; it is an open and transparent process and it has learned from that experience, but there is still the issue of the insider status.

As to the issue of radioactive waste, we talk of the community of Copeland borough, let’s say. It is very interesting to look at the new build locations. Sellafield is a potential site; Braystones is almost within sight of Sellafield, yet it is not contiguous with the site; and there is Kirksanton. There are significant public opinion issues, some of which are related to perceived risk for a site that is almost a mile from the Sellafield site; and certainly Kirksanton is some miles south of the Sellafield site, but still in the amalgam of Allerdale and Copeland boroughs, West Cumbria. When one looks at the perceived risk, it is the relationship with the heritage and the social, economic and political community of the area that is so important, because it keeps it where it is and what it is now, if you see my meaning. For the community of Braystones, if it had a nuclear facility adjacent to it, however safe it was, they did not want it. It just makes the way these sites have been and are set up very special. One could say it has taken 50 or 60 years to get there.

Q78 Roger Williams: Mr Brown, in the last session of evidence we heard about the press and media frenzy that can be generated by the Fukushima event and pressure groups latching on to that to promote their ideas. Does that have a smaller effect at local level where people have had experience of nuclear facilities and look forward to nuclear facilities in the future?

Bob Brown: Our experience of that debate is that that is the case. People understand their own communities; they have lived there for a long time. They understand the geological differences between Hinkley Point in Somerset and Japan, and the fact we are not regularly subject to earthquakes. They know friends who work at the site and understand the safety issues associated with that. The debate is different and definitely more reasoned because there is a deeper understanding of the risks and issues that may exist more widely in the public.

Given the planning process as it is, the range of issues is significant and detailed and affects different people in different ways. Risk and its perception is a small part of a massive evidence and impact base for such a significant new development. It is a matter of getting the time and space to have a discussion and a debate about that other than issues immediately in front of

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people as to what the impact will be on the junction to their main A road from the village, and whether they will be able to get across it and into town to do their shopping. We have a disproportionately large elderly population in our area that may not see the benefit of the jobs because they are past working age, but they will see the impact. It is those issues that are playing out for them as well. Finding time and space to have a wider discussion within the bigger and rigorously constrained time frame of the new IPC process is an issue.

Q79 Roger Williams: Mr Mayson, have you had any experience of greater political opposition at sites other than the ones you are dealing with now across the UK? If so, why are there differences between different sites?

Richard Mayson: Most councils we come across on our new build sites are generally very supportive of the principle of the development, but, understandably, they want the best deal possible for the local community, and we fully respect and value that. Earlier, I contradicted Bob about the issue of community benefits. It can be dealt with through the planning process. We very much support the notion that the council should have a slice of the business rates we pay. We will be paying an enormous amount of tax locally, which obviously goes straight to central Government. We think it is only right, proper and fair that the local communities get a slice of that. We believe that should be about promoting growth; it is not for risk perception. We support the Government's growth agenda, but we think it is important that that is also targeted at communities that host these sorts of facilities. Generally, we have not seen a huge difference in support. Having said that, the further you get into the planning process, not surprisingly tensions tend to rise a little. We find that on sites where we have not yet taken the development forward very far there are more open arms, but I imagine that as the process goes forward a few tensions may arise.

Q80 Graham Stringer: Mr Mayson, you said earlier that it was quite legitimate for the local perception of risk to be taken into account in planning applications. Can you give any examples where the perception of risk has modified planning decisions?

Richard Mayson: The key issue is the extent to which the perception of risk has weight. It is legitimately regarded as a material consideration in planning, but the question is to what extent that has weight. The example I looked at was King's Cliffe for the development of a very low-level waste facility. The inspector made some interesting remarks about the consideration he had given to the perceptions of risks and the fact that those perceptions were raised by the very act of talking about them in a public inquiry. Nevertheless, he had to take the view—I apologise for paraphrasing, but we can give you the correct words—that what really mattered was the scientific evidence of whether there was a real risk. It was an objective assessment of risk as distinct from a perceived risk. The amount of weight he attached to it was driven exclusively by an objective view of risk, recognising that perceptions are real.

Q81 Graham Stringer: A sensible interpretation of that would be that the inspector or local authority would not rule it out of their discussions and submissions but would then take no notice of it, because they would look at the hard evidence base of what the risk levels were. Is that a fair summary of what you are saying?

Richard Mayson: I do not think that is a fair summary.

Q82 Graham Stringer: Why not?

Richard Mayson: It is a question of whether the perception has any basis in fact. We have heard from the media this morning how people's perceptions can be influenced, and what really matters is whether there are any facts behind it. For example, looking at opinion polls, we heard this morning from Mr Henderson about Fukushima and the fact that opinion had bounced back within a matter of months of the event. Perceptions change.

Q83 Graham Stringer: They do. On a similar but different point, how should democracy—local and central Government—balance public views with the scientific evidence?

Richard Mayson: The issue is one of healthy debate and airing and sharing issues at inquiries. That is the way it is done. We come back to openness and transparency. The more the issues are discussed, the better people's perceptions about the objective facts become. Rick would say it far more eloquently than I can.

Bob Brown: From our perspective, it is about objectivising the discussion rather than leaving it as subjective, and the resources you can bring to the community to allow that to support them in having that understanding and discussion so that they can air their issues in a way that is supported but objectivised with assistance from specialist or scientific advice. It is about getting that capacity for those who represent the communities, whether it is at parish or district level, because they are not the decision makers; it will go on to the IPC. You assist those communities in having the resources to do that so that they can accept it and perhaps understand it, rather than it being left to other organisations or agencies that may have a particular view and want to assist them in a specific manner. What assists communities and developers to get the right proposal in the right place is a discussion of these issues that is as objective and reasoned as possible so that the decision makers can take that into account.

Dr Wylie: It is a difficult question. They are categorically different. What is scientifically proven risk might have little bearing at all on perceived risk relating to a topic. To package these together is challenging since they are a publicly perceived risk by individuals. It is very much related to people's relationship with that particular object and issue. Let us say you have a local authority area and you want to put a low or high-level nuclear waste storage facility there. Somebody will get it in their back yard, so their relationship with that particular object or infrastructure development would be completely

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different from that of people elsewhere in the community.

One thing about perceived risk relating to facilities—somebody will get this thing near them—is that it is very personal. One issue of planning that we saw at the inquiry into the low-level waste disposal site at Buldoo near Dounreay is how difficult it is for people locally to express these issues. There are not many of them and there is an awful lot of everybody else. It is very difficult to get across those particular meanings. For a generic matter like mobile phone use, where everybody has got one, the perceived risk is a public issue, but with these lumpy goods in a small corner of somewhere or quite a large corner—I notice that the Bure facility (in France) will be 15 sq km—quite large—it is a great challenge. I do not think there is a satisfactory way of doing it.

Q84 Graham Stringer: In the context of risk, nuclear safety and nuclear power, people in the business use quite technical terms. What is the best way to go about communicating these complicated concepts to the public?

Dr Wylie: The likelihood of a nuclear event is put as 10 to the minus six. I do not know what that really means in the public sense. Without putting it too strongly, the critical thing is that communities in the vicinity of nuclear sites do not support the facilities because they perceive them as not risky. They perceive them as risky. The regulators, the companies that run them, the local authorities and various organisations that are charged with dealing with them are very important. Yet in a Eurobarometer poll conducted at the very end of last year, a majority of a representative sample of the UK public asked about this category of organisations would not trust any of them in terms of their communication about nuclear power. People make up their own minds about these things. It is easier in a community like Hinkley or West Cumbria around the Sellafield facility because you know the people to ask, and they are there; it is not a faceless organisation. The challenge comes when you try to build a site in an area *de novo*—from the new. That is one of the things that make these areas so special in those terms. It is very difficult to build that balancing against perceived risk. Look at a national opinion poll. In a sense, it is important policy because it is a very wide poll. It purports to be the UK public, but they are not getting it in their back yard. If you ask those people who are going to get it in their back yards, it would be a very different figure. It is very challenging to do this.

Q85 Stephen Mosley: I was interested in the last point you made about trust. Trust is, surely, the difference between perceived risk and the objective risk. If people have trust in the organisation, they tend to believe the objective risk; if they do not have trust, the perceptions of risk can increase. Mr Mayson, do you think there will always be an element of distrust in the operators of nuclear power stations because there might be a public belief that you are more interested in making profits than in the safety of the site?

Richard Mayson: No. We always make it very clear that safety is the number one priority, and that is in our blood as part of the nuclear industry. We must never be complacent about that. We have to work at it, work at it, work at it. I think people generally respect that, particularly those in the local communities. We live and breathe it. The workers at the plant live in the community, their kids go to the schools in the community, and therefore they are all seen to be part of the community. It is not just about the messages we give as an organisation but the messages the workers give in the pub to their friends and what their kids talk about at school. That is where trust, openness and transparency have to come from. If we were not living and breathing our values in respect of safety, openness and transparency, it would soon cascade into real problems in the community and a real lack of trust.

Q86 Stephen Mosley: On that, we have Bob from one of the local authorities and Dr Wylie.

Bob Brown: Our experience is that those who run the power stations and the operatives live in the communities, and that first-hand experience passed on to people who live around there shows the level of trust in the way they are managed and the way they are operated. Obviously, a new round of power stations is coming our way. They are significantly larger and more powerful. They will be on adjacent sites and there will be new employees and operations that have not been run potentially in this country before. With that comes an additional set of issues that needs to be considered by the host communities. It is slightly different; it is not exactly the same. The local communities have views and concerns. I think the developers deal with those very well through the process so that people get information, but it is such a huge task. The amount of information about the development of new sites is such that it makes it difficult for people to get under the key issues potentially about risk and to see past the individual issues for them about the impact of the development. There is trust, but we need to see how it plays out as the process goes through because it will be different and new.

Dr Wylie: We did some work some years ago in the old BNFL days. A majority of the West Cumbrian community regarded with some scepticism much of the communication from BNFL for all sorts of reasons. I cannot stress enough that people in these communities do not support the nuclear industry or a new facility—I am thinking particularly of the West Cumbrian community—because they trust the operators but because of the extrinsic benefits that the facility will bring to their community. I just leave with you the thought that 13,000 people work at Sellafield and the population of West Cumbria is 165,000.

Q87 Stephen Mosley: Nuclear power stations are long-term projects. Sellafield has been there for 60 or 70 years, so you have to build these relationships over a long period of time. Mr Mayson, how much emphasis do you place on those long-term relationships in the local areas?

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Richard Mayson: It is absolutely fundamental. We emphasise that we are part of the community to stay. Probably one of the best examples I can give is in relation to what we currently plan for Hinkley Point C in relation to skills development. We have already announced massive investments in the local colleges in Bridgwater, in Sedgemoor and West Somerset to develop skills that will be there not just during the construction phase but the 60-year operation phase. We are here to stay. We have also announced a big investment in relation to a management and leadership college in Bridgwater as well. It is all part of our desire to demonstrate that we want to be part of the community going forward for the long term.

Q88 Stephen Mosley: Do you think there is anything the industry could do to operate in a more open and transparent manner?

Richard Mayson: I felt some frustration personally, going back to the 1970s when I joined it, because the Official Secrets Act meant you could hardly say anything about what happened on site; it was very strict. We went through a phase when it got progressively more open. Then 9/11 happened and suddenly the shutters came down again on information. Fortunately, in the last few years we are seeing a better balance emerge. We will be reopening our visitor centres at all our nuclear power station sites, which I am sure many of you will be aware were closed shortly after 9/11 because of the security risks associated with them. Those are the sorts of activities.

Bob Brown: From the council's perspective, another issue is long-term trust. We have been working collectively with the other local authorities that have proposed new builds in their areas. We have been looking at the issue of community benefit. Obviously, we have been holding discussions with EDF and Richard about community benefit. The Government see that as an important issue in terms of the long-term relationship and building of trust. They included relevant paragraphs in the national infrastructure plan through the Treasury and made a commitment to renewing community benefit by 2012. We have not seen anything from that. I have had discussions with those who prepared the national infrastructure plan. They could not tell me what those proposals were, but clearly the Government think that is an issue and the community benefit is important from that perspective. As Richard said, we were looking to see whether business rate retention would be an avenue. In the consultation, the response from the Government dismissed out of hand business rate retention on new nuclear or low-carbon energy, saying that it was a matter for renewables only. We felt it was disappointing, but that indicates from our perspective that the national infrastructure plan intended there to be a community benefit in the long term for those communities, probably through the proposals that we have been making, if it is not going to come through the business rate retention model.

Q89 Chair: In the previous discussion we heard about the role of Mike Weightman as the regulator. The witnesses suggested there was a high degree of trust. Do you agree with that analysis?

Richard Mayson: I think the safety regulator is trusted because the evidence of the good safety record in nuclear in the UK is very stark.

Q90 Chair: The point being made was that it was his perceived independence that helped him gain that trust.

Richard Mayson: I think you are right. It is fundamental that safety regulators and environmental regulators are independent of Government and are seen to be independent of Government.

Q91 Chair: Stemming from that, would you see it as important for the regulator to engage more proactively in providing better risk information to the public?

Richard Mayson: They do a lot already. All parties have a duty. It is hard to single out whether the safety regulator is worse or better than any other party. You heard the media side of it. A lot depends on where people extract their information. We heard this morning it was the media that was the primary place from which people extract it. The message for me is that everybody can always do more. It would be good if there were more opportunities for people such as Mike Weightman to present the safety case.

Q92 Chair: What about from your perspective, Dr Wylie?

Dr Wylie: The Weightman report was profound and very significant, and the role of the regulator is key. It is a rigorous technical and scientific risk underpinning of so much of what goes on, and it is very important, but it does not address perceived risk. It is like a hybrid; it is so many things. I cannot stress enough that you can still accept something even though you think it is risky. There needs to be a closer look at the relationship of communities to nuclear facilities, or other facilities, and at people who are sick and to whom that issue is salient and proximate.

Q93 Chair: But would you give that function to the independent regulator rather than an arm of government?

Dr Wylie: It is difficult to make it happen. Over the 60 years of the Sellafield operation, nobody went out and said, "We are going to have a long-term community safety/trust relationship with Sellafield." It just happened. How that happened and its parameters, and how it would seem to be done, needs to be looked at very carefully. Perhaps there is a role there for local government, or other levels of government, even parish, because these facilities are very localised. The backdrop of all of that in terms of scientific and technical risk are people like Mike Weightman or my colleague at University of Central Lancashire, Laurence Williams when he was at the NIL. They are the backstop of technical and perceived risk, but it is not the same as perceived risk. You can think something is very risky but still support it.

Q94 Chair: I can see that. I am trying to separate, if there is a reason for separating it, the role of government from that of the independent regulator.

Dr Wylie: The regulator is important, but my feeling is that it would be more to do with locality and place,

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and wider issues than perceived risk relating to the future.

Q95 Chair: Local leadership is the key.

Dr Wylie: Yes—even sub-local leadership. Some local authorities are quite large and a nuclear facility is relatively small. You need to look at perceived risk at different levels of analysis.

Q96 Chair: Let us go to the very practical and ask Mr Brown. Historically, you have had experience of this. What has impacted upon perceptions and better understanding of risk? Has it been locally-led issues where you have brought in experts, or has it been the external expert who has stepped in uninvited? I think the answer to that is fairly obvious.

Bob Brown: What affects the perception of risk in our communities is the whole range of organisations engaged in this issue. Parish, district, county, the regulators, the Health and Safety Executive and, importantly, the operators of the sites are collectively working with the communities on a regular basis to identify the real risks, the mitigation and the solutions. It is that which builds up trust in the communities, because they get a genuine understanding of the risk because there are real people in those organisations who understand the local issues and can communicate those and access communities and individuals in a real way about real issues. I suppose the issue is how you take that out more widely away from the immediate sites.

Chair: Yes.

Bob Brown: I think it is about all of those agencies working together and being resourced to do that. The further you move away, the less of an issue it becomes for the local authorities, the parish councils and the others. It is a matter of moving that issue with the operators away from the immediate site where it has built up.

Q97 Chair: I take it from those two responses that a fair summary would be that leadership is critical at the local level, but in terms of getting the broader message out to folk living in Manchester or Birmingham—the consumers of electricity—that is where DECC and others have an important role to play.

Bob Brown: Yes.

Dr Wylie: Public opinion about nuclear has moved upwards in the context of messages about security of supply, low carbon and cost control. There is no doubt that that has moved public opinion up at national level, but at a local level public opinion recently in West Cumbria seems to have moved upwards also and become more pro-nuclear. That might be due in part to that, but the key thing is that the bulk of support locally is about specific local issues, perhaps even below the level of a local authority. That is the key thing, I would say.

Chair: Gentlemen, thank you very much for an informative session.

Wednesday 1 February 2012

Members present:

Andrew Miller (Chair)

Stephen Metcalfe
Stephen Mosley

Graham Stringer
Roger Williams

Examination of Witnesses

Witnesses: **Dr Paul Leinster**, Chief Executive, Environment Agency, **Dr Jill Meara**, Deputy Director of the Centre for Radiation, Chemical and Environmental Hazards, Health Protection Agency, **Geoffrey Podger**, Chief Executive, Health and Safety Executive, and **Dr Mike Weightman**, HM Chief Inspector of Nuclear Installations and Executive Head of the Office for Nuclear Regulation, gave evidence.

Q98 Chair: Good morning, everyone. Thank you very much for coming in. I would be grateful if the four of you could introduce yourselves for the record.

Dr Leinster: I am Dr Paul Leinster, Chief Executive of the Environment Agency.

Dr Meara: I am Dr Jill Meara, deputy director of the Health Protection Agency's Centre for Radiation, Chemical and Environmental Hazards.

Geoffrey Podger: I am Geoffrey Podger, Chief Executive of the Health and Safety Executive.

Dr Weightman: I am Mike Weightman, Her Majesty's chief inspector of nuclear installations and executive head of the Office for Nuclear Regulation, an agency of HSE.

Q99 Chair: I start by inviting each of you to outline your roles in regulating or advising on UK nuclear sites; how you relate to each other; whether you consider yourselves to be genuinely independent of Government and the industry; and what type of risk information you communicate to the public.

Dr Leinster: We are an NDPB and therefore have an independent board to which I report. That makes us independent from Government. We have to work closely with Government, and we do. Government sets our policy framework. We do not write our own regulations within the Environment Agency; those are written by Government, but we implement them. We believe that we are transparent and open. We regulate those aspects of radioactivity that leave a site boundary: emissions to air, discharges to water, and waste when it comes outside the site boundary; waste on the site will be within the HSE's responsibilities. We regulate by issuing permits. For the standards in those permits we rely on the International Commission on Radiological Protection, and those get translated through European legislation into domestic legislation. We base all our understanding on those standards and apply those to the situation of a particular site and set permit limits. As part of the permitting process, we usually communicate with the local community and stakeholders before we start permitting and receive their comments. We will hold open surgeries and also discuss things with the local community in public meetings. We then get in the permit application and, depending on that application, we might also consult on it. We then determine the permit in its draft form and issue that draft for public consultation. Again, we engage widely with both the local communities and statutory consultees, including

just now the Health Protection Agency and the HSE. We then determine the permit and write a decision document based on that, and we will issue the permit. Through that process there is a considerable amount of public engagement, and then we regulate against the conditions of the permit.

We seek to be as transparent and open as possible. We have a training course within the agency called building trust with local communities. This helps and trains technical staff in the ability to communicate with local stakeholders, green groups and anybody else who has an interest in this. We have moved to a more consultative rather than decide-and-defend approach, which in the past was probably how we did things. There is now a much more engage, deliberate and decide-type approach in our work.

Q100 Chair: Before I ask the others to answer, you mentioned the way things were done previously. Am I right in assuming that about eight years ago there was a fundamental shift in the way you worked from imposing to consulting?

Dr Leinster: Yes; it would be around that time.

Q101 Chair: I noticed that shift as one of the consultees in relation to Capenhurst.

Dr Leinster: That was a deliberate look at how we were doing things. We did a whole lot of research at that time to understand how we could do it better.

Dr Meara: The Health Protection Agency is also at the moment a non-departmental public body, which gives us statutory independence and our own board. We do not have any regulatory role. We are advisory to the whole community—organisations, Government and the public—for protection against infectious diseases and other environmental hazards to health. A lot of our work is in the area of infectious diseases. In our Act we have the specific requirement to advise anybody who needs advice, so it covers the whole population. The way we work is to produce guidelines and advice, based on internationally agreed advice, which can be fed into regulatory processes even though we are not a regulator.

I will give a couple of examples. A dose constraint is applied to nuclear power stations, old and new, and in 2009 we reduced it to make the regulations tighter. The reason for that was twofold. First, there is remaining uncertainty about non-cancer effects of radiation. We want the public to be protected as well as possible. We knew from discussions with the

nuclear industry that these new constraints were perfectly possible for new plant; so they apply to new plant. Secondly, thinking about potential emergencies, we publish things called emergency reference levels that would help to define the public exposure doses to people at which we would want to recommend sheltering or evacuation if there was an emergency. These are very powerful, because, once you get an emergency situation, usually you do not have a great deal of time to start doing the maths and thinking. We publish them in advance and they are fed into the local emergency response and resilience arrangements.

As to new nuclear build, the Health Protection Agency takes the clear stance that it is neither for nor against any type of technology, but we are there to explain the potential risks to the public and quantify them based on the information we get and internationally agreed models. We will do that for anyone. We have been turning up at some of the consultation meetings related to new nuclear build; we answer questions from individual members of the public, MPs or anyone. Although we have limited resources, we try to turn up wherever possible. There is a recent example in Scotland. I would note that we cover the whole of the UK for certain matters, but before Christmas we went up to Scotland to speak to residents near Dalgety Bay where there has been a problem of radium contamination from old wartime activities.

Geoffrey Podger: In relation to HSE, it is probably easier if I answer generically and ask Mike to answer specifically in relation to nuclear regulation, if that would be okay. Like my colleagues, we are also a non-departmental public body, in our case of the Department for Work and Pensions. We are slightly different from the other two organisations in that we act as policy advisers within Government on health and safety as well as being the regulator and, as part of our regulatory duties, we are also the prosecutor. We very much see our independence in terms of the expert technical advice we offer and the individual regulatory decisions we take, but quite deliberately we spend a lot of our effort working within Government to meet the needs of Ministers who are dealing with wider issues where there needs to be a health and safety component of that advice. That is not just an issue of accountability. In terms of communication, very often one finds it is essential that the people who have calculated the risk should also involve those who have to do the risk management so that at the end of the day you can answer the question about what the risk is but also what will be done about it. We do not see this as inhibiting.

You will be aware that we have quite strong relations with duty holders and industry at various levels. We believe that is essential in doing our work, but we do not regard ourselves as in any way industry-captured; indeed, as is inevitably the case in such relationships, from time to time we have significant disagreements. Nevertheless, the system works—and works well—because our duty holders recognise the need for us. Equally, we recognise their difficulties and try to meet them at an acceptable level of risk.

In communication terms, most of what HSE does is probably aimed at a relatively technical audience, and

you have had evidence to that effect. To be frank, that rather reflects demands. As some of you may know, I came here from the food safety world where there is a great deal of consumer demand for information, which we met in the Food Standards Agency and the European Food Safety Authority, of which I was the head. In HSE we provide more advice than usual at the technical level, but we now do a lot, particularly for small businesses, at an easier level of understanding. We do pioneer studies, which we put into the wider domain, which we have done on emerging technologies, and we participate in public meetings on land use planning, for example.

Dr Weightman: We are an agency of the Health and Safety Executive and were created as such on 1 April last year from the previous Nuclear Directorate of the Health and Safety Executive. That is part of a process in line with the Government's intention to create a separate independent nuclear regulator subject to parliamentary scrutiny and so on. The powers in the Nuclear Installations Act are delegated from the chief executive of the Health and Safety Executive to me as chief inspector to grant nuclear site licences and, indeed, to attach conditions to them. Those conditions have the force of criminal law and can be changed overnight, if need be. Essentially, we are a goal-setting regime.

The positioning of ourselves as an agency of the Health and Safety Executive puts us further away from Government than perhaps it is, although we provide advice to Ministers if needed. I have direct access to Ministers for those areas for which we have responsibilities in order to inform them of our views, if need be. Our range of responsibilities covers not only the nuclear civil side—both nuclear safety and security regulation—but also the nuclear safety regulation of the defence nuclear sector, not the design of nuclear weapons or submarine reactors but their manufacture, assembly, disassembly and maintenance at various sites in the UK.

We are independent of Government and industry. While we recover over 95% of our costs from industry through a charging regime, in essence, that can act as a fine on industry. The more aggro they cause us, the more their costs go up. It makes us further independent of Government and industry in so doing, both in the way in which we are set up legally but also in the way it works in practice.

Q102 Chair: You have also had a very public and welcome role recently in Fukushima. Was that part of your statutory duties, or did you do it because it was needed in terms of public confidence?

Dr Weightman: In terms of our duty to provide advice to Ministers, I was asked to produce an interim report in the middle of May and a final report in September/October for lessons learned for the UK nuclear industry. That is part of my provision of advice to Government. I saw it very much as part of my normal role, but I made sure it was done independently, and I also took independent advice from a technical advisory panel in so doing.

Q103 Stephen Metcalfe: You have made very clear to us this morning your individual roles in this field.

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While I suspect the public have heard of many of your organisations, do you think they are aware of the work you do in this field?

Dr Leinster: I think it depends on which bit of the public you are talking about. If you are talking about the community around Hinkley where there is now talk about the construction of a new facility, the awareness of the relative roles of the different organisations is much greater, but, in general, if you went out on the street and asked people, unprompted, most probably they would not say our names. When prompted, they have some recognition of our roles in these areas.

Dr Meara: The Health Protection Agency is reasonably well known, particularly for its infectious diseases work, although, when you ask people who have heard of us which hazards they think we cover, both ionising and non-ionising radiation comes into it. A MORI poll we did in 2009 showed that 44% of people had heard of the HPA; 63% thought that its advice would be trustworthy and competent; and 88% would follow its advice. That is across all of our hazards, and there are probably more detailed findings related to specific hazards. We are not completely known, but I think 44% is quite good. That was after swine flu, when we did get quite a lot of publicity.

Geoffrey Podger: I am tempted to say that the Health and Safety Executive is well known sometimes to the point of infamy, but the truth of the matter is that what HSE does in the high hazard industries is well known, not simply to those who work in them but also to public bodies who have an interest in and around them. That is quite a secure relationship. Conversely, at the lower hazard end, where we share our responsibilities with local authorities, there is no doubt that the public often have great difficulty in working out who is responsible for what. We make some effort not simply to redirect people but, also on our website, to explain exactly where people should go for what. There is no doubt at all that, although we are well known, inevitably people find the borderlines between regulators slightly difficult to understand, and there is a duty on all of us to try to help people, as we do, to get to the right person. We do not just say, "You've come to the wrong bloke; go away." We say, "We've contacted Mr X from the local authority. If you ring him up—here's his number—he'll be able to help you."

Dr Weightman: As to ourselves, the simple answer is that we are not well known to the general public. In terms of the workers on the sites, which we visit very regularly, the local communities round them, the stakeholder groups and perhaps experts in the field, yes, we are well known, and we are also well known internationally in that sort of stakeholder group. But I have to admit that the general public do not know us very well at all.

Q104 Stephen Metcalfe: That is probably a fair comment. People are particularly suspicious of the nuclear industry. Do you think there is a duty on your organisations to do more to communicate with the public generally about your role in this specific area to reassure them that there is a group of regulators and advisers who are acting in their interests? Taking the

point about the HSE, they are aware of its role, but I am not sure they are aware of it in relation to this particular industry and what powers you have, and I suspect that is true. Do you think we need to do more, and what could be done?

Dr Leinster: One of the things we are doing in conjunction with the HSE is the generic design assessment of new reactors. As part of that process, we are looking at how we can make available as much information as possible on the web and inform people that we are doing that work. If people are interested in nuclear as an issue, they can easily find the information from us and we can get into dialogue. There is a general understanding that most probably the Environment Agency would do stuff around those sorts of sites, wouldn't it? It is then quite difficult to go further. If people do not want to engage, and do not feel a need to engage, on a topic, it is quite difficult to communicate some of these issues. However, if people want to engage and find out more about the new nuclear build programme, we are engaging actively in that. There is always more to do, but I think we are taking steps.

Dr Meara: The HPA would say there is always more to do and it would welcome more resources to do that. We have a very big web presence and turn up at public meetings and answer loads and loads of questions, but it is quite difficult to take that next step to being at the forefront of people's minds rather than reactive. That is the positive side. On the negative side, HPA covers a wide range of hazards, and hazards from nuclear power are not among the most serious that the public face. Therefore, within our organisation we have to give priority where the health need is. It is not always in this area, although there can be a lot of public concern and maybe fluctuating levels of concern. Perhaps we have to be a little more fleet about moving resources so that when there is concern we can leap in and help, but it will never be at the top of the health protection agenda.

Q105 Chair: Is that because the risk is low or it is a well-managed industry?

Dr Meara: It is because the risk is low, and the risk is low because it is a well-managed industry.

Q106 Chair: The potential risks are high but it is a well-managed industry. That is the official position of the HPA.

Dr Meara: Yes.

Geoffrey Podger: From HSE's perspective, we are not aware of a huge unmet demand in this area. As you will all know, when there are particular events and developments at nuclear sites there is inevitably a lot of interest in the local community as to what is going on, and we participate in that. I notice that Mike has a regular round of meetings where local people are able to interact with HSE inspectors. There is a meeting scheduled for Sizewell A and B, which seems perfectly sensible. Like other colleagues, we have a very extensive website that provides a lot of information, precisely because—Mike might like to comment—we tend to be very open about relatively small malfunctions at nuclear sites. Sometimes we find that these are blown out of all proportion. More

than once I have seen Mike appear in the media and very ably put them in perspective. But we have taken the view, and I think Mike also takes this view, that precisely because there is this “yuck factor”, if I may use that technical term, surrounding nuclear issues it is better to be more open and tell people more things, even though it may give rise to some alarm, than to do anything that gives rise to the suspicion that things are being withheld from the public. If anything, we tend to have a very open communication policy precisely for that reason.

Dr Weightman: You asked whether we felt we had a duty to be open and extend our openness. I think we do. In the past the nuclear industry and we as regulators have been too secretive and careful of how we interact with people, not that we should not be careful about security matters, obviously. One of the things on which I have been trying to push forward the organisation is openness and transparency over the last few years. Indeed, we designed the GDA process—the generic design assessment process—precisely with that thought in mind in 2005 and 2006 when we took it forward. We are moving the organisation forward. We make many decisions. It is a very dynamic regulatory system, although it is goal-setting, and they are very technically-based decisions. But we make sure that those decision documents, which we call project reports, are put into the public domain so that people can make up their own minds as to whether we are doing our duty effectively. There is always room to improve in that area. Some of it is about cultural change in a very technically-based organisation and also how you effectively communicate with people and listen to them. So I am not complacent.

Q107 Stephen Metcalfe: Do you think that being open and transparent with the public has built trust with the public?

Dr Weightman: I think it is about earning trust. One of the messages I try to give the organisation is that we have to earn trust and confidence. It is difficult to earn and easily lost, and, therefore, it is a never-ending responsibility for us to maintain our regulatory and technical integrity, give people information, listen to them and try to answer their questions as best we can.

Q108 Stephen Metcalfe: Perhaps I may address that question to the other three. Do you feel that you have earned, or are earning, the public’s trust? Would you agree that it is easily lost?

Dr Leinster: Absolutely, it is easily lost. As others have said, I think it is about being open and making decisions available. We, like them, are involved in some of the site consultative committees where there is that engagement. It is important for me within that engagement that the public, the company and the regulators together engage in those discussions. There needs to be an active discussion between the operator and the community, and the regulators should be seen in their proper role, not as managers and not coming in between that relationship, because the real building of trust has to be between the operators and the community in which they are operating.

Q109 Stephen Metcalfe: I am more interested in how the wider general public perceive the trust issue away from the site rather than those actively affected by it.

Dr Leinster: As Geoffrey said, in a lot of these areas there is not a huge unmet desire for further information about this. For most of the public who are not living close to these sites and do not have an interest in nuclear, they are going on with the belief that these risks will be properly managed. The only time they will think about it is if a Fukushima or Chernobyl happens.

Q110 Stephen Metcalfe: Do you have anything to back that up? Is there any evidence through surveys? Dr Meara has talked about surveys that you have conducted.

Dr Leinster: In exactly the same way, we do MORI surveys about the issues in which people are interested. For example, in the case of the Environment Agency you will get a high level of recognition about flood risk and other processes, or, if you talk to one group, about angling. It all depends on where within that grouping people sit.

Q111 Stephen Metcalfe: Does anyone want to add anything?

Geoffrey Podger: From HSE’s perspective, because worker protection is so great a part of what we do, much of the pressure on us, which is very proper pressure, comes from the trade unions. For example, if we look at the extraction of oil from the North Sea, which is an inherently risky activity, it is not that we have a lot of the general public in Aberdeen who are “on our backs”, but, quite properly, there is quite a strong element of challenge to us from the trade unions representing the workers on the rigs, with whom in general we have very good relations. That is how the concerns about whether the regulator is doing enough manifest themselves. Generally speaking, for us it is much less in the area of the general public.

Dr Leinster: One thing that is sparked off in my mind is that in this area some of the green groups and green NGOs play that role of the trade union in health and safety in the workplace. You have people arguing this case who are the ones who are interested, and there is a lot of engagement with those groups on these issues.

Q112 Roger Williams: In terms of the public, what assessment would you make about the key risks as they see it of nuclear energy and the nuclear energy industry?

Dr Leinster: The difference between ourselves and regulation and the HSE is that we deal with things that are coming out from the installation. We are concerned about discharges to water, emissions to air and waste. Waste is a particular issue that concerns particularly those communities that might be the place where waste finally ends up.

Dr Meara: As we understand it, it is about what comes out of sites that might pollute the environment and lead to health consequences in the long term. The basic fear is the long-term legacy and people being poisoned by things they cannot see.

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Geoffrey Podger: To add to both those considerations, which I share, rightly in the public mind there is the memory of things that have gone wrong worldwide: Chernobyl, Fukushima, Three Mile Island and so on. These are in the public consciousness, and there is a perfectly understandable fear that that might be replicated here or that we might suffer the consequences of a similar incident that arrived here. As I said earlier, the difficulty with nuclear power is that you cannot see nuclear energy. It has all these curious triggers for alarm. People are rightly sure that it is generally well managed, which it is, and we hope well regulated, but it is always something which must have a level of public disquiet hanging over it simply because of these other factors.

Dr Weightman: Clearly, it is radioactive waste; post-Fukushima, nuclear safety has risen in the public mind. Both of those are based upon a fundamental fear of ionising radiation and the impacts that may have, the fact they cannot see it, feel it and sense it, and it also has long latent effects. They fear that they are not in control of it and it is not a voluntary risk to which they are being exposed. Essentially, it will vary with time. Fukushima raised concern about nuclear safety, and radioactive waste is always there. Nuclear safety took a more obvious role after Fukushima, but it is fundamentally based on the fear of ionising radiation.

Q113 Roger Williams: It has been suggested to us that, after the Fukushima incident, the public's understanding of the risk and dangers has improved and people are more accepting now of nuclear energy. Is that your experience and also your view?

Dr Meara: We have not ever asked that question, but the assault that happened to those six reactors was of an almost unimaginable proportion. They did not survive unscathed, but, in comparison with what nature did, the additional impact of the problems because of the tsunami was small. That has perhaps changed the balance of what people have thought about. People are not so inherently scared by other forms of power generation. The North sea is a very dangerous environment in which people are working—those are workers, not the public—but people just do not see it in the same frame. When they saw what happened in Japan, where 20,000 people were bowled over by a wave and something happened at a nuclear power station, maybe it helped to balance some of those different fears. To go back to what Mike Weightman said, a lot of people have a risk-averse attitude towards ionising radiation.

Geoffrey Podger: I do not think I have any evidence which would enable me to answer your question. I would regard it as an open one.

Dr Weightman: I have seen, as probably others have, the articles in *The Guardian* and elsewhere that show some of the polling. It appears as though people's tolerance of nuclear energy has gone back even above where it was before Fukushima. Some analyses have been made on that and it appears as though it has recovered in that way. There are differences in terms of how that recovery has come about, so there is some evidence that it has recovered. It is not something we have initiated ourselves because that is not our role.

Dr Leinster: It is certainly an issue that will be raised in a public meeting or surgery being held where the public come in and ask questions, so it heightens that awareness and leads to conversation.

Q114 Roger Williams: Generalisations have been made that men are more blasé about these risks and women more cautious, and that people living in the vicinity of a nuclear facility are more understanding or objective about the risks. When you are trying to communicate the information and expertise you have on risks, how do you take into account those differences in the population?

Dr Leinster: I do not think that we would overtly take them into account. When you are in a situation having to explain either the process we go through or why we came to the decisions we did, you tend to deal with it as part of that conversation. I do not think we have ever analysed and looked at how you would communicate in a different way to those different groups.

Dr Meara: I do not think the HPA has ever done it like that, but the issue potentially with regard to women is that it is probably to do with their fears for children. When we give out risk estimates, we tend to be very conservative and give those that will be good for the most vulnerable person, who is sometimes but not always a young person. We always get questions coming back such as, "Does that apply to my little Johnnie?", or, "I'm pregnant. Does that apply to me?" We have to be quite careful to ensure that we say we are protecting everybody and that, in general, the calculations we make, where we have data, would protect the most vulnerable general groups within society. Perhaps we need to do more to publicise that, because we do get a lot of questions coming back.

Geoffrey Podger: I would be hesitant to go too far down this route, though I agree with Jill because it is true across other areas, including food safety, that women are always particularly concerned in relation to children, and rightly so. That is what nature intended. One thing we do know is that communities living round higher-hazard installations, whether nuclear or other kinds—it is equally true for chemical or petrol storage—tend to become rather used to the risks and may start to discount them slightly. In their minds it can affect the work force when it enters the plant. After a time you just get used to working in that slightly strange environment and you can let your guard fall; you can forget the really serious things that can go wrong. We see that from time to time. It is certainly true—I know you have had evidence on it—that, even when people are concerned, they also see the economic advantage of having the plant. Clearly, that also plays into people's perceptions. In our own communications we would not seek to distinguish on a gender basis, but we are alive to the need in these communities, without in any way over-alarming people, to maintain an understanding of the inherent risk and that everyone will remain safe only if they continue to manage it properly.

Dr Weightman: We do not have an institutional approach to trying to target particular groups, but one thing I try to encourage is very active listening. The way you really communicate with people is to try to

understand their questions and concerns and try to address them in a way that helps them assimilate the language that you might otherwise use. Part of the approach is very much one of trying to listen actively to people, or groups of people, and ensure you are also communicating effectively in relation to their frame of reference.

Dr Leinster: When we are carrying out our assessments, one thing we do is look at the total exposure. For example, in some places people who are eating sea food or shellfish will be getting multiple exposures. Therefore, when we carry out our assessment, we look at those different groups. We would then communicate specifically with some of those people just to explain that situation.

Q115 Roger Williams: Perhaps I may ask Mr Podger and Dr Weightman about some documents the HSE has produced that show recognition of risk perceptions. How do you use this recognition in decision making and risk communication? Perhaps you could give us some examples.

Geoffrey Podger: Perhaps I may deal with the generic position and then pass it to Mike for nuclear again, if that makes sense. Recently, we have invested in some updating on risk communication. The Royal Statistical Society in its evidence mentioned to you the review done by Löfstedt and Boudier, which basically said—it was also our own view—that we were good at communicating on a technical level with technical people, but there were areas where we had been less successful when it was necessary to communicate with a wider group of people.

The specific area where that has arisen is not so much the nuclear industry but in the area of land use planning. What has tended to happen—I suspect Members of Parliament are aware of instances of this in their constituencies—is that we have spent a lot of time with local authorities and developers, who are key players in this, but rather less time explaining to the local community, in terms which are comprehensible to it, precisely the nature of the risk about which we are concerned. That should then allow for a more informed decision to be taken at the end of the day, recognising that these are always very awkward areas.

You cannot do a mathematical equation balancing long-term low risk but high impact against short-term but considerable commercial and community advantage, but somebody has to make that judgment, which in our view is properly a local authority one. We are trying to work towards shifting the balance of our activity in that area, not trying always to force the decision that we want but to communicate better to more community-based partners in future development exactly what the issue is. I think that is an area where we have not done as well as we might have done in the past.

Dr Weightman: Specifically on nuclear, we have to go back a little in time to a document produced by my predecessor before last—it goes back a little way—about tolerability of risk in relation to nuclear power plants. The concept was to try to get over that we recognise people do tolerate nuclear energy, given that the risks are managed down to very low levels, and

they see benefits. They do not accept it; they tolerate it because of the perceived benefits. Therefore, that is an important consideration when you are trying to communicate. They also said they tolerate it when there is a highly effective regulator, which we aspire to be.

Q116 Roger Williams: Each of your organisations will have contacts with different governmental Departments, each of which has its own chief scientific adviser. How do you work with those scientific advisers, and perhaps how could that be improved in communicating risk?

Geoffrey Podger: If I may start, HSE has its own chief scientific adviser, who is fully plugged in to Professor Sir John Beddington's network; indeed, I know he was there yesterday. We very much try to get involved in overall projects that are going on, particularly in risk communication. Professor Sir John Beddington has visited us; he knows us well. We feel quite well plugged into that network.

Q117 Roger Williams: What about the chief scientific adviser to the DWP?

Geoffrey Podger: Yes, indeed. The chief scientific adviser at DWP has also been the sponsor of HSE, so there has been quite a close linkage, but, inevitably, because, as you will appreciate, he has other concerns, we have acted mainly through our own chief scientific adviser.

Dr Leinster: We are part of Sir John Beddington's network but we also interact closely with the DEFRA chief scientist and have some interactions with the DECC and BIS chief scientists because we spread across a number of Departments, as well as Welsh Government science.

Dr Meara: We also work across Government Departments and the nations in the UK. We find it very easy to have interactions. When there are emergencies the right groups of people can be pulled together very quickly; when work is done in slower time that can also be done, so there do not appear to be many barriers.

Q118 Graham Stringer: Dr Leinster, I was interested when earlier you said you treated green groups in the same way as trade unions. Trade unions have a legitimate interest to represent their members; green groups are political organisations. Surely, you do not put them on an equal footing. They have particular agendas that may or may not be to the general good.

Dr Leinster: Most probably I used inappropriate shorthand in terms of whether the public are engaging. I was asked about the general position. Around specific sites, the public will engage on these topics. In general, if you are trying to get views to see what the public are concerned about as part of openness and to review the way we are thinking, one of the groups with which we do engage is the NGOs. I fully accept that they are different in status and interest from trade unions.

Q119 Graham Stringer: It sounded to me as though you are giving groups with particular views—which

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they are entitled to have in an open, liberal and democratic society—privileged access that they do not necessarily deserve.

Dr Leinster: I do not think we give them privileged access. We are open to them and they have views that will inform the general public. They will have views that are communicated widely, and, therefore, I believe we need to engage with them on the views they are expressing.

Q120 Graham Stringer: Last week we heard Mark Henderson, the previous science editor of *The Times*, and discussed public perceptions of what had happened at Fukushima. He was of the opinion that the international nuclear and radiological events scale—that is a mouthful—was not fit for purpose because it put Fukushima on the same level as Chernobyl. A lot of people died at Chernobyl; nobody died at Fukushima because of the nuclear event. He thought it was not fit for purpose. What is your opinion?

Dr Weightman: I agree. In terms of its purpose, it is there to provide clear communication to people and the media about a nuclear event in which they have confidence. Did it do that? No, it did not. Some of it was because of a long event, which meant it escalated with time, but, also, because of the wide range of the way it is put together in terms of the level 7 events, you can get a difference by a factor of 10 in the level of release. I do not believe it is fit for purpose, and that has been recognised internationally by the International Atomic Energy Agency as part of its action plan post-Fukushima to review that event. It will also have to review the basis of it, because at the moment it is based on technical opinion about the level of defence or defeat of barriers. If you are trying to communicate with somebody, you have to think about whether that is the best basis on which to do it.

Dr Meara: It takes account only of the hazard—what has flown over the site boundary—and, in order to define the importance of it for the population, you have to think about the risk. Are there any people there who will be breathing it in at the site boundary? What the public are interested in is the risk to them, not just the raw nature of the hazard that has gone from the site. The scale does not cover enough orders of magnitude. Ionising radiation is terribly easy to measure, and we can be dealing with measurable amounts of radiation where there are 12 orders of magnitude difference between the worst possible nuclear accident and what you might get from an airport backscatter body scanner. That is very difficult even for scientists to conceive when there is such a huge logarithmic scale. If hazards are large, they are measurable only at intense concentrations. For chemicals, you would never be able to measure them at the very low levels of hazard at which you can measure ionising radiation. That is both its beauty but also its problem when you are communicating risk because you can measure something that is patently not going to be harmful in any normal meaning of the word.

Q121 Graham Stringer: How should we do it then? This is one specific example of a numerical scale that,

in this case, is not fit for purpose. You use the words “logarithmic” and “exponential”. Scientists throw them about and they have very specific meanings.

Dr Meara: I am sorry.

Q122 Graham Stringer: The perception of the public of “exponential” is probably not the same as a scientist’s. How should we go about communicating risk? Should we continue to try to do it quantitatively, or should we do it in a different way?

Dr Meara: There is evidence that people do not understand quantities very well. You can make the quantities a bit more realistic by using one in a street, a village, a town, a city, a country and in the world, for example. The other thing you can do is make valid comparisons. One example of that was when we were giving advice on airport backscatter body scanners that use ionising radiation. We compared the radiation dose from the scanner with the extra cosmic radiation dose you get from flying at altitude. That was quite a useful comparison, because it is all related to the same flight. People are going through the scanner and then the flight, so it is valid. The problem with comparisons is that, if they are not valid to the public, you can do more harm than good. You should never say that one Fukushima is equal to smoking one cigarette once in your life. People do feel, for good or ill, that smoking is elective but that pollution coming from an industrial accident is not.

Q123 Chair: But, in the case of Fukushima, the advice that Sir John Beddington and Dr Weightman gave to British citizens in Tokyo was communicated by Sir John in the form of saying that one would get a bigger dosage flying home than staying there. Do you not think that is a fairly tidy way of communicating something?

Dr Meara: Yes. The best comparisons are very directly related to the thing that people are doing. If you knew about the hazards from other pollutants, from other forms of energy generation, you could make comparisons there, but unfortunately we do not know those data and we have to be a little more inventive.

Q124 Stephen Mosley: I was interested to hear Dr Weightman say that the IAEA is looking at its scale. One of its other problems was that the scale used by the Japanese meant that the safe adult level was 300 becquerels per kilo, which is about one tenth of the World Health Organisation’s guidelines. Are international organisations or the Japanese looking at that particular level and moving it to a more realistic level, just to avoid some of the scare headlines that occurred?

Dr Weightman: Every nation has its own responsibility to set the levels it believes are correct in its circumstances. I would have said there is a national responsibility to take account of international agreements. I think further work will be done internationally on the levels in water and food and what that means after Fukushima. As far as I can remember, there is no very specific aspect of that in the IAEA plan, but, internationally, that is one area that will be looked at in due course.

Q125 Stephen Mosley: Dr Weightman, last week we heard that, while you and Sir John Beddington came in for a lot of praise for the work you did after Fukushima, there were concerns that other independent regulators could have done more to handle the media. Would you agree with that, and what do you think could have been done?

Dr Leinster: We were part of Mike's investigation. Therefore, we believed that all the health messages should properly be focused through the HPA, as they were, and there was an updated website, so there was one agreed place to communicate on health issues. For the rest of the communication we were there at the release of Mike's report for support, if necessary, but we did not feel that in the circumstances it was necessary to come out with an independent voice, because we believed it was being properly communicated by those other regulators.

Q126 Stephen Mosley: But Dr Weightman's interim report was about four months afterwards and the main report was six months or so afterwards. In the days and weeks following the event how involved were you?

Geoffrey Podger: If I may make a general comment, which I suspect applies to all of us, it is important to understand that, when the explosion occurred, all the regulators were heavily involved in trying to discover what had happened so they could do calculations on which to advise the Government. I think it is entirely legitimate to argue that people like us should, as it were, turn out quickly with the media in circumstances where there is a need to do so. Some of the argument you heard previously was much more around, "Well, we were looking for sofa pundits, and it would be really good to have Mike Weightman." Mike was engaged 24/7 in advising the Government and it was the outcome of that which was announced to the public as and when needed.

Not being immediately involved in this, I spent quite a lot of time watching the media coverage. We did not detect issues that we felt would mislead people as to what they need or need not do and would have required an immediate intervention by HSE. I think Paul is saying the same thing from the point of view of EA. But I am absolutely of the view that, if you get into a situation where people have an erroneous view that they need to do more than they are doing or, conversely, that they absolutely need to be advised to do something, the issue would be different and the regulators would be happy to play their part. But I come back to what I said earlier. Government have to give a consistent message—it is the point Paul made earlier—and, therefore, there has to be a consistent working out within Government who will act as spokesman, and you have to have everything in a row so that people can see there is coherent policy and science behind it.

Dr Meara: The HPA was approached by the media. We explained very carefully what we were doing and why, in the very early stages before radiation was detected in the UK, we were not putting up press spokesmen. We explained that we were doing scientific work with the general Government group and putting in advice, but early on we did not have

enough information to put up somebody to defend any information. We were working particularly with Mike Weightman and others on potential worst case scenarios, and from that emerged our advisory 80 km from Fukushima where we were advising UK citizens should not go. But, because that was not based on real information, we did not feel we could put up anybody to have their information challenged. We were putting out regular press statements; we put up a website; we were clear about the precautionary advice when that had been decided on; and the moment we knew radiation was detected in the UK we put that up and put press spokesmen out, but we felt we had to be in control of what we knew and for it to be something that was happening within the UK.

The other point that has not come out is that we have a lot of links with Japan through all the international organisations with which we work. We knew very well that they had a competent system of radiological protection that protects the public in the same way that the public are protected here. You mentioned the slightly more stringent water regulations. Our first advice, if you go back to the first of our 11 press releases, was, "We do not know what is happening"—we admitted that—"but follow what the Japanese are doing; we trust them." That was in a very difficult situation. Japan was devastated for all sorts of other reasons. We knew that Japan would be doing the best it could for its citizens and, by inference, any UK citizens who were there. Obviously, as we knew more, we could say more specific things, but in those early days not a lot was known.

Q127 Stephen Mosley: Mr Podger, at the end of your comment you said we need to have a unified voice, essentially. Do you think that is done at the moment?

Geoffrey Podger: Yes, and I think that Fukushima was rather successful given that we started from a point of very considerable uncertainty. I saw no evidence that public concerns rose to a level at which we should have intervened to seek redress. In any incident what you choose to do must depend on both the resources you have but also what action you need to take. I am not suggesting that the Fukushima approach should be the way you approach any incident. You can get into positions where a particular view that you know to be wrong as a regulator is in danger of taking hold. Then I think the regulator either has to intervene very quickly itself or do it through a Minister, reflecting the regulator's advice.

That situation did not arise in Fukushima. We did not see great difficulties in terms of communication, and for that reason it was much better to concentrate the effort. There was an enormous amount of effort to deal with the immediate problem, which was particularly the work of Mike and his colleagues and others who were involved in the safety of British citizens in Japan, rather than everybody sitting on the sofa in the TV studio saying, "Actually, we don't know anything, but when we do we'll let you know." I think that in that particular situation absolutely the right thing was done. There are always challenges to Government, as there are to regulators, to get its act together, and very often that is the key issue in handling these situations successfully.

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Dr Meara: Where it is relevant, HPA will take the lead. For example, in the polonium incident in London we were working cross-Government. All the other Government Departments stood back and HPA was on the platform doing all the press releases. You have to decide, sometimes early on, who will lead. There is evidence that if you have one consistent voice providing authoritative advice—it was Pat Troop for polonium, Bob Maynard for the volcanic ash health effects and John Beddington for Fukushima—that is probably the best way to do it, but we cannot fill all the TV studios.

Q128 Stephen Mosley: Commissioner Oettinger used the word “apocalypse”. How do you as regulators handle it when a non-scientific politician or political-type person makes a quote like that? Are you able to don your independent hat and stand up to them?

Dr Weightman: I have had meetings with the commissioner on some matters about European levels. We have been very clear that we as regulators in Europe will take our own independent view on matters and give our best technical, honest opinion when we see things. I think that is the best way we can respond to any such circumstances. As I said earlier, it is also a matter of earning trust and confidence, and that is not done overnight or in a certain circumstance when something happens. You have to work hard to do that over a longer period of time. Therefore, my response to those sorts of matters is to say what we understand to be the situation based on our technical expert view.

Dr Meara: Remember we are not a regulator, but we tell it like it is by an impartial view of the whole scientific evidence, and we reproduce a summary of what the science says for the public in a way that is as easy to understand as is appropriate in the situation.

Q129 Chair: You are saying that the word “apocalypse” was not appropriate.

Dr Meara: Yes.

Geoffrey Podger: I think that if any of us use it, you should run immediately!

Q130 Graham Stringer: Can you tell us what your communication strategy was when you were producing the two reports? How important was the scheduling of those reports? Did you do it as quickly as possible, or did you have other factors in mind?

Dr Weightman: The scheduling was in response to the request of the Secretary of State to have the first report within two months of the incident, and the next one within six months. To my mind, it was also important to get the lessons out early for the industry and others so that we could take action and start to learn the lessons as early as possible. That was important.

As to the communication strategy itself, it was clear to us that we had a duty to try to explain what we were saying, and the best way to do it was through a press conference, thereafter giving media interviews as need be. We also made it available, along with other information, on our website. We used a variety of means to try to get the information out there, but

we also thought it was perhaps of sufficient interest to warrant a press gathering.

Q131 Graham Stringer: What lessons have been learned from producing the report? Do you think you have learned better how matters of risk should be communicated? Have you learned more about being open in the nuclear industry, or anything else?

Dr Weightman: Clearly, one of the recommendations both for us and the industry was to be more open and transparent. One of the lessons from Fukushima was that there was great distrust of the Japanese industry from past events and the way some of those had apparently been handled, and also it did not appear there was as much trust in a regulator that was not seen to be independent of Government. The Japanese Government are taking action to realign their regulatory body. There were clear lessons about openness and transparency about Fukushima from what was happening in Japan. I think we will also reflect on our handling of it. We have taken forward a series of public discussions at regional level and we are learning from that process about our Fukushima reports. Some have been very well attended—the one in north Wales was an interesting one—and others have had little interest, and we will also try to find out what we can learn from that.

Q132 Stephen Metcalfe: I want to put a question to Dr Leinster and Mr Podger in particular. I would like to return to risk perception but move away from the nuclear industry. Have the Government learned from their errors in the past when communicating the risk of the nuclear industry? Have they learned how to communicate the risks of some of the other energy technologies, like carbon capture and storage and shale gas? Is it communicating those risks better now than it has in the past? What is your role in assisting them in communicating those risks?

Dr Leinster: One of the things we have been trying to do is make sure that all of our communication work on risk-related issues informs the rest of our work. We do a lot of work on flood risk, and the big challenge in communication there is how you get people who have not yet been flooded to take action before they are flooded. It is a huge challenge. There is work we are doing and perception studies on energy from burning waste and what the issues are in that context. We use all of that information to inform how we deal with some of the newer issues as they come along. On shale gas in particular, we are about to carry out a participative environmental assessment of all the issues. We shall be sharing that information with DECC to look at what is the appropriate approach going forward. The other thing we do in that situation is look across to the States where there is much more work on shale gas. We are actively working with a group in the USEPA who are carrying out assessments at the present time. How do they communicate and what learning comes from that?

Often, it takes just a little while to understand that this is an issue that needs to be addressed in that sort of way. Better recognition of the issues that need to be addressed in that way is most probably the first bit on which we need to work. Once you get your head

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round the fact that it is something about which there will be public concern and interest, we are much better. We need to improve recognition of those issues that will run in that way.

Geoffrey Podger: I would echo that. We in HSE have done quite a lot of work, which is published, on the potential risks in relation to various emerging energy technologies beyond nuclear, what needs to be done and how manageable they potentially are. We have also tried to engage with the companies that are pioneering these technologies in the early stage so that they do not get into a position where the regulator turns up at the 11th hour and says, "No, you can't do that." Conversely, it gives them an input, though not an exclusive one, into helping to inform our view as to the proper way to regulate it. Like Paul, we have very much sought to anticipate more and be very open with the public about this. All of these reports can be found on our website.

We have a continuing need, which all regulators have, to look at things again in the light of experience. To

give one example that I know is of interest to the Committee, we have commissioned an independent report about the safety of wind turbines, which we will be launching shortly at a conference and we will publish. Again, these are matters of perfectly proper, legitimate concern to the public and to us also. We are trying to pick up these things and engage in public debate and, to the maximum extent we can, to be objective and not take one side or the other but to say, "This is how it looks to us. Having heard everyone, these are the facts. It seems to us the best way forward is to do x and y but not z." The more we keep that going, the more we recognise that as things move on you learn things, so issues have to be revisited. In our view, those are the essential lessons that Governments and we as regulators have learned.

Chair: Dr Meara and gentlemen, thank you very much for your time this morning. It has been very valuable.

Monday 19 March 2012

Members present:

Andrew Miller (Chair)

Caroline Dinéage
Gareth Johnson
Stephen Metcalfe
Stephen Mosley

Sarah Newton
Graham Stringer
Roger Williams

Examination of Witnesses

Witnesses: **Charles Hendry MP**, Minister of State for Energy, **Professor David MacKay**, Chief Scientific Adviser, **Hergen Haye**, Head of New Nuclear, Department of Energy and Climate Change, gave evidence.

Q133 Chair: Minister, can I welcome you to this hearing? Before we start, perhaps your two colleagues would kindly introduce themselves for the record.

Professor MacKay: I am David MacKay. I am Chief Scientific Adviser to DECC.

Hergen Haye: I am Hergen Haye. I am Head of New Nuclear at DECC.

Q134 Chair: Welcome, gentlemen. As you know, Minister, we have been looking closely at this interesting issue of the public perception of risk around energy, particularly in connection with proposed new nuclear. Part of our inquiry took us to Germany, where it seems that almost everything that generates electricity finds a higher measure of opposition than here. There is withdrawal from nuclear, resistance to carbon capture and storage, and resistance to growth of the grid and so on. One of the things we are interested in is to compare and contrast the role of respective authorities in engaging with the public.

To start off, how does DECC communicate the risks of energy infrastructure to the public?

Charles Hendry: It depends, Chairman, on the type of infrastructure in question. I am delighted that you are looking at this because it is an integral part of the success of any policy that we are trying to take forward. We have an acceptance in this country that we have an urgent need to rebuild a great deal of our energy infrastructure. We need to secure over £100 billion in the electricity network in the next decade and £200 billion overall in the energy infrastructure by 2025. Those are enormous sums of investment and much greater than anything that has happened in the past. The public recognise that there is an urgent need to get that built. The last coal plant was commissioned nearly 50 years ago and the last nuclear plant about 25 years ago. We simply have not seen the level of investment, and the public recognise that there is a great deal of catching up to be done.

There are also very different perceptions according to the type of technology that is being looked at. I am sure we will come to some of them in more detail. In the communities where we are looking potentially at new nuclear, they are all existing nuclear communities or places where they have had a history and a very long tradition of working in the nuclear industry. Therefore, we have communities that are comfortable with nuclear technologies and are often keen to see that investment coming forward in the future. We have

seen more support than one would have seen if those had been proposed to be positioned in other parts of the country.

As to other technologies, some of them—such as carbon capture and storage—are very clearly at the emerging stages. In Germany, my understanding is that the opposition there was to the proposed site for underground storage of the CO₂—that is what focused the attention of the local community and the politicians on it—whereas, here, we are looking at storage under the North sea and therefore we do not have communities affected in the same way. But right across the energy landscape we are seeing significant amounts of concern when people are being affected locally. That could be for wind turbines or it could be for grid infrastructure. Bizarrely, the larger infrastructures—the nuclear power stations—seem to have less local opposition than the smaller parts of the landscape.

Q135 Chair: In terms of how DECC contribute to risk guidance across Government, we have looked closely, as you are probably aware, at how the National Risk Register is formulated—not the controversial health one, which is another story. In fact, I discussed this with Francis Maude last week, congratulating him on the way in which the 2012 register was compiled following advice from this Committee to change from the 2010 style of presentation. You presumably contribute to cross-departmental information. How do you go about that, and how do you try to get information on comparative risk to the public? That is the one thing that, it seems to me, John Beddington did very well, in terms of the post-Fukushima issue, to explain to people: “You get a fair dose rate flying home. You are better off staying here in Tokyo.” I think that is a fair interpretation of the message he gave to some people.

Charles Hendry: There is no doubt in our minds that when you come to issues like that, it is independent experts who have the greatest degree of public confidence and public trust. Much as we would like as politicians to believe that we are right up there at the same level, realistically we accept that we are probably not. Having a single consistent voice, which John Beddington provided in those circumstances, was integral to the way in which that issue was understood here.

In terms of how we feed into that, you will be aware, of course, that there is a national strategic framework

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for emergency planning and response. We work very closely within that structure. We look at communications as part of that to ensure that when we are looking at an issue, how we communicate—not just to the individual but the physical channels which we use to communicate—will be seen as a core part of that strategy. Communications and making sure that we factor in risk in the right ways are an important part of that process.

Q136 Chair: Finally, before we move on, certainly in my own constituency for the very first time in some years, issues nuclear have been raised with me—not about nuclear power but in the context of what is happening in Iran. People’s general awareness of nuclear weapons has gone up, though not necessarily their knowledge. For example, I have had constituents contacting me and asking how much plutonium there is in Capenhurst, which is next door in Stephen’s constituency. Obviously, I am able to reassure them, but do you think there has been a change as a result of issues such as the Iranian one in public perception?

Charles Hendry: I do not think there has been towards the role of nuclear power in the United Kingdom. It does, to some extent, explain why Germany has come to a very different decision than we have. Whereas, historically, for us, nuclear weapons—an independent deterrent—were part of our safety and our national defence, for Germany, without nuclear weapons, they were seen as the battleground, and they had a very different sense that came with that. Therefore, the public attitude towards nuclear in Germany has always been fundamentally different from that here in the United Kingdom.

With regard to the issues in Iran, I do not see a direct read-across there, but since Fukushima, we have seen that initially there was a dropping off of support for nuclear, though more people still remained supportive than were against it, by a margin of 8%; I think it was 36% to 28%. It has now risen to its highest ever level of support, with around 50% supporting and 20% opposing. That support shows that people have been looking at the issue in its totality; they have been looking at our energy security and have been reassured by the role that Sir John Beddington—our own regulator—has been able to provide in that respect, and to see that whenever we talk about nuclear, there is a very uncompromising message about nuclear security and safety that goes with that as well.

Q137 Stephen Mosley: We have heard evidence that people are very suspicious, particularly of industry but also of Government, and especially when the two are working together. Do you think that the public trust the Government to communicate risk to them?

Charles Hendry: I am tempted to say, of course, that the public trust the Government on everything, but I realise that is not quite as sophisticated an answer as you would require. As a Government, and continuing the approach of the previous Administration, we have said that we believe there is an important role for new nuclear in our mix going forward. We want to see that happen and we want to facilitate it. If you look at the actions that have been put in place since 2007, they

have been about identifying barriers for investment and systematically seeking to remove them. We can legitimately claim that this is now probably the most interesting place in Europe for new nuclear development, and one of the most interesting places in the world. That is an extraordinary shift in five years. Alongside that, therefore, we need to work closely with industry. We need to create the right environment for industry to find us an attractive place to invest. If people want us to deliver on that policy, they would expect us to have a close working relationship with industry.

That said, in the aftermath of Fukushima, everything that we have done since has been guided by scientific evidence. The chief regulator, who is somebody of great international esteem, was asked by the International Atomic Energy Agency to do their investigation post-Fukushima. The role that he has performed, everything he has done and the advice to us has been based on best scientific evidence, and therefore, with the advice that he has made available to us as to how we can be even more robust in our regime going forward, those are the sorts of ideas that we have been very willing to consider, to look at and see how we can adopt them. We have very clearly separated out the scientific advice from Government and industry advice, where people would understandably believe that we have an agenda, whereas they accept that somebody of the level of Mike Weightman, with his professional standing, and our own chief scientist are people who are not part of that agenda. They are there because of their scientific credibility.

Q138 Stephen Mosley: When it comes to specifically gaining public trust not only for nuclear but also for new technologies—you mentioned carbon capture and storage, which of course has its problems in Germany—how do you think that you and DECC should be going out there to gain public trust?

Charles Hendry: We have a role to communicate the energy challenge that we face as a nation, which means the massive rebuilding programme I talked about just now. It means a very uncompromising message that we want that to be done to the highest standards of safety and security. That means putting in place the mechanisms that are going to ensure that, but what is necessary for those standards of safety and security should not be set by us as DECC. We are the sponsoring Government Department, and it is quite right, therefore, that the Office for Nuclear Regulation should come within the Health and Safety Executive as an agency within the HSE at the moment and, in time, we will legislate to make it self-standing. The security and safety standards, the assessment of the new reactors and the generic design assessment programme should be carried out at arm’s length from us as a Department so that it can never be suggested that the people who are regulating have a vested interest in the outcome.

Q139 Stephen Mosley: You started off in the first question answering about the business case for new nuclear. How much Government support will that require and do you think the Government putting

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money into the project will affect people's trust in the safety and the general project?

Charles Hendry: We are not putting money into new nuclear. We have always said that new nuclear would have to be without public subsidy. We are putting in place a new market reform structure for the electricity sector, recognising that for people to invest, to cover the additional costs that low carbon requires—be that nuclear, carbon capture, renewables, or whatever it happens to be—the traditional market structure would simply not deliver that. We are putting in place a system that will secure the levels of investment that are necessary. That is not public funding, and we have been very clear that there is not public funding for the new nuclear programme. I hope that helps to reassure people.

It is worth noting also that half of the spending of our Department currently goes on nuclear clean-up. The decommissioning part of that will rise to two thirds of our spending as a Department in due course. So part of our message is also, "Look, we are going to be doing more than any previous Government has ever done to clear up the legacy issues." That also gives us the grounds for saying, "And therefore we will not compromise on those issues as we go forward."

Q140 Roger Williams: When these difficult planning decisions are being taken, there has to be some balance between the scientific evidence and the risk perception by the local community. How do you, first of all, get the evidence together? Then, how do you get that balance between the two different opinions?

Charles Hendry: We have sought to deal with that through the National Policy Statements. I assume you are particularly talking about nuclear.

Roger Williams: Yes.

Charles Hendry: Looking back at the last nuclear plant, Sizewell, which was stuck in planning for years, a lot of the public inquiry was about the precise siting of it and the precise technology that should be used. We have taken those issues out of the planning process. In the National Policy Statements we have identified eight sites on which industry say they could develop 16 GW of new nuclear power by 2025. That is not a planning consideration within the IPC process or the subsequent one that will come to Ministers. Equally, the choice of technology is not. We have taken that out and it is assessed independently by the Nuclear Installations Inspectorate. They have approved two reactor design types and, therefore, it is not a planning consideration now whether those are appropriate technologies to use.

Those have gone through the regulatory justification process, which went through Parliament with a majority of 520 to 20 for each of the two reactor designs. That is an important part of that process as well. The planning issues should absolutely focus on the planning considerations, but the two issues of type and siting have been taken out of that process and been incorporated more generally in the policy area.

Q141 Roger Williams: Yet we had Sedgemoor district council here, and they said that the risk perception by the public did not have a part to play in

the National Policy Framework, but you do not agree with that, I gather.

Charles Hendry: That has been handled in the parliamentary process. The National Policy Statements were subject to two consultation processes, which included very significant local involvement, local consultation and public meetings where people had the chance to talk about the process. It went through Parliament with a very clear and strong majority in favour of doing so. We have said that we have to do major infrastructure projects in a way that enables investors to get a planning decision in the course of a year. If we were ever to go back to the system that applied to Sizewell B, those who are looking to invest in all major energy infrastructure in the United Kingdom would simply walk away. We have been able to look very carefully, as part of that NPS process, at those issues.

Hergen, you have been directly involved in some of those local consultations and perhaps you can comment.

Hergen Hays: I am not quite sure whether the view Sedgemoor presented is quite correct because, under the new planning regime, it is an obligation of the operator to fully consult with the local community. EDF, over the last two and a half years, has run four major public consultations. The local authority, Sedgemoor, West Somerset and the county have been fully involved in these consultations and in parallel conducted their own consultation and fed that back to the operator, EDF. For the planning application to be accepted by the Infrastructure Planning Commission there was a requirement that this legal requirement of consultation be robustly fulfilled. The IPC has agreed that indeed it has.

Furthermore, this week we see the public hearings of the IPC are to commence. One of the first actions the IPC took was to issue a public statement that anyone who has any concern or an interest can register—whether they are a local authority, another body or an individual in the community—and these issues will be heard during the examination process of the IPC. So there is quite significant involvement of local communities, and their views are very carefully examined.

Q142 Roger Williams: Perhaps I could ask the Minister about another subject. All planning decisions for power stations in Wales above 50 MW are taken in Westminster. Is it still the Government's opinion that that should continue?

Charles Hendry: Yes, it is. We have looked carefully at it. We have heard the suggestions in Wales that it should be devolved. Our view is that people looking to invest in a relatively small island want to have as cohesive a policy as they can. These are plants that are there in the national interest. These are going to be major plants that are often going to be feeding a market well beyond the Welsh population. We believe the structure under the current devolution settlement is the right way of taking that forward as well.

Q143 Roger Williams: Do you think, though, that a policy that was meant to catch nuclear is now catching wind farms? A lot of wind farm applications will be

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determined in Westminster, and if we believe in localism, perhaps that is not the right way forward.

Charles Hendry: It is for plants that are over 50 MW. That is clearly well below a nuclear plant and it is going to catch a significant amount of other large energy infrastructure. We clearly work within the guidelines that have been set by the Welsh Assembly Government, the TAN 8 regions, for example, identifying the sort of areas where they feel it is appropriate for those wind farm developments to come forward. It is not an exclusive issue, but it does steer people towards it. We have made it very clear that if they wish to re-consult on that and they wish to change the TAN 8 structure, it will be a matter for the Welsh Assembly Government to take forward. I very much understand, in a constituency like your own, the strength of feeling that is there because so much of the infrastructure is being looked at to come there, and it is not only the wind farm application but also the grid connections that go with it. We understand within Government the concerns being expressed by Members of Parliament across the House about the structure as it is at the moment.

Q144 Chair: Before we move on, in answer to Mr Williams's first question you referred to the eight sites. Does the news over the weekend suggest that eight has become seven, or are there still eight sites, with EDF saying they are not going to develop Heysham?

Charles Hendry: It has always been clear that EDF could not develop all the ones of which they have ownership and they had identified the ones that would be their priority. That is Hinkley Point, with potentially two reactors there, and for Sizewell, potentially two reactors there. It is up to them how they then handle the rest of them.

Q145 Chair: But it is up to you to determine that the UK's power needs are met. My concern about that approach is whether it is going to leave a gap.

Charles Hendry: From EDF's perspective, if they have an asset that can be developed, they will be looking to see whether somebody else wishes to develop it alternatively. It is a rather expensive bit of land for social housing alternatively. So I can see that they will be looking at what is going to be the best commercial opportunity for them. If they have decided it is not going to be one for them to operate, it is an entirely legitimate commercial decision and then they will be looking to see others who may be wishing to come in in that location.

Q146 Chair: You would expect it to be developed, in the long term, as a site.

Charles Hendry: We have been guided by industry in the approach we have taken, from the locations that they have identified as capable of being developed by 2025. It has not been a Government target. We have been responding to industry's interest in developing those areas. This is not a Government top-down approach. This is us responding to the interests that industry has expressed to us.

Q147 Stephen Metcalfe: Professor MacKay, can I ask you to cast your mind back to March 2011 and the Fukushima emergency? You would have had a fairly key role to play in that in advising both DECC and SAGE, presumably. Can you tell us what types of advice you were giving them at that time?

Professor MacKay: I am not being modest if I say that I did not play a key role. I was in DECC, and the DECC nuclear team led DECC's internal 24-hour rolling response to the situation. I was on the Scientific Advisory Group for Emergencies—SAGE—chaired by Sir John Beddington. I sat in on those discussions and I asked questions, but there were many far more expert people there. I think the right role for chief scientific advisers in such situations is to make sure that the very best advice is getting through to Government, and that is what Sir John Beddington did. The SAGE meeting had in the room or on the telephone line people from all the relevant Departments, such as Defra, the Department of Health, the Environment Agency, RIMNET and the Food Standards Agency. The Chief Nuclear Inspector was there, and scientific expertise was coming in from the National Nuclear Laboratory, from Imperial College, from the Dalton Nuclear Institute in Manchester and from the Health and Safety Executive. Detailed calculations were done on computers by the Health Protection Agency and the Met Office, with those people working together to analyse what was on the site in Fukushima, what could credibly come out and under what circumstances, where it would go depending on the weather direction, and what the health consequences would then be in the reasonable worst case that we were imagining, which, fortunately, did not come to pass at all. My role was to support John Beddington in ensuring that the right questions were being asked. I chatted with the experts who were there in the room and I kicked the tyres on the evidence they were giving. It was excellent evidence and I feel I was hardly needed, to be honest.

Q148 Stephen Metcalfe: Who were you reporting back to as part of that process?

Professor MacKay: My line manager is the Permanent Secretary Moira Wallace and I was on the management board of DECC at the time, so I would have been keeping both of them up to date. The DECC team led the advice to Ministers at that time.

Hergen Hays: Maybe it is worth saying that, particularly in the first few weeks, it was the role of the Cabinet Office and Cobra, where all those different organisations came together. In the first couple of weeks we met twice daily, so that we had all the advice from the Health Protection Agency and all the different organisations we have just heard about. That was then informing the advice, particularly in the first few days, to the Foreign Office that should be given to UK nationals in Japan in terms of what was and was not safe and what one should do.

Q149 Stephen Metcalfe: Do you think the Government did enough to communicate that risk, not just through the Foreign Office but also to communicate the risk here at home as well?

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Hergen Hays: I think we did. The first concern was UK nationals in Japan. We worked very clearly through the Foreign Office and the embassy in Tokyo to get all the information to all UK nationals as required. The second was to have a set of lines we could deploy in the UK media, as the interest grew significantly over the first few weeks, particularly around Fukushima. One of the positive elements was that it was a united message. Then the media turned to independent experts from various universities and the nuclear industry; and we found that, through Science Media and other organisations, they utilised these experts and they, in a sense, amplified many of these messages and explained them. That was a better way than Government officials going out to the news studios to present on what various risks mean or do not mean.

Q150 Stephen Metcalfe: Do you think the reporting of the emergency was pretty accurate and fair in the media because they deployed the experts?

Hergen Hays: I think the UK reporting was remarkably responsible. I was fully involved with the Cobra meetings and followed what was reported during the day, as everyone else did. At night, I followed the German reporting through the computer and it was as if two different events were unfolding. It was very interesting to see how responsibly the media and the scientists in the UK responded, identifying the risks but without a sense of alarming the public, recognising that there were unique circumstances in Japan, and nobody had to fear imminently within the UK.

Q151 Stephen Metcalfe: Do you think that John Beddington and Dr Weightman had an influence on that?

Hergen Hays: Very much so. We in Cobra decided very early on that Professor Beddington would be the suitable spokesperson. It was collectively decided that he should utilise that function. As time progressed, our Chief Nuclear Inspector, Mike Weightman, equally took that role, and we trusted both of these to be authoritative voices that could explain to the public what we were dealing with.

Q152 Chair: Do you think that increased transparency that occurred—certainly compared with, for example, the flu epidemic a couple of years ago—has helped improve the public reaction, certainly, Mr Hays, when compared with your experience in Germany?

Hergen Hays: It did. People in the UK very quickly recognised that Japan was dealing with an exceptional circumstance, with one of the largest earthquakes ever experienced—magnitude 9—plus a tsunami, and there was very quickly an understanding that that is not likely to happen at any moment in the UK. Then there was the understanding, “How can we help Japan, show our support and help UK nationals?” For the UK, it was rather the question, “Are there any lessons that should sensibly be learned in regard to emergency planning or back-up facilities? While not expecting similar trigger points, if something else happened that could create a crisis, are we prepared?” I think

Ministers decided very early on to ask Mike Weightman to make such a study, to look very carefully at our installations, and publish that as an independent nuclear regulator, which gave the added confidence in the safety of our plants.

Q153 Caroline Dinanage: What do you think it was that was done so differently in Germany to have such a different output from the German media? Were there mistakes made or was it just done differently?

Hergen Hays: It is an interesting debate. Fukushima did not create anti-nuclear sentiment. Anti-nuclear sentiment existed in Germany, particularly because the Government had only a few months before changed a consensus on nuclear, to extend the life of existing plants and that had aggrieved many people. There was widespread public hostility. Fukushima was an outlet; it was not a creation of it. The media, understanding where the wider public was, amplified that and it became a cycle in itself. The scientists they then wheeled out were very alarmist. I remember looking at a debate on German television where it was seriously considered whether or not one should hand out 80 million iodine tablets to the German population. You had a sense that Fukushima had happened in Germany and not in Japan. That created all of that anxiety. In factual terms, 90% of all reporting on Fukushima happened in Germany out of all the reporting in Europe. It is the proportionality. While in the UK media there was a lot also about the earthquake and the devastation in terms of infrastructure, with 20,000 people who lost their lives or were missing, Germany immediately homed in on one thing only—the events at the Fukushima plant.

Q154 Gareth Johnson: Minister, Mr Hays has already explained how the media coverage has had an impact on the public, but can I ask you specifically about the Weightman review itself and whether you feel that had an impact on the public’s perception of the risks involved with nuclear power?

Charles Hendry: I would hope so, although I accept that an enormous number of people in this country would not have read it and, therefore, the impact it may have had will have been perhaps at a high level. We are very fortunate in having somebody who has the international credibility that he has. As I said, he did the IAEA’s work for it as well. He therefore comes to this with a tremendous amount of expertise, and that has shown through. Also, there is the thoroughness with which he did it—doing it in two stages. Some intermediate findings followed by the full report was a way of trying to make sure that people could see there were early results coming through from this and that he was not going to duck away from the complicated issues. By taking it away from politicians and away from Government—although clearly it is an arm or an office of Government—it had a credibility that comes from the nature of that post and his own position. For those who were studying it carefully, it was seen as being a very robust and thorough piece of work. Anybody who was looking for a whitewash would have found no ability to take that forward in terms of the substance that was there.

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Q155 Gareth Johnson: We have heard about the impact that the Fukushima disaster, the aftermath from it and the reports that were produced had on Germany and the UK, but are you aware of any other profound impacts there have been on other countries that have nuclear installations and were concerned about any perceived risks as a consequence of what happened in Fukushima?

Charles Hendry: Different countries have reacted in quite different ways. We have seen a number of countries going down the route of saying, “No further nuclear plant”. Italy, Belgium and Switzerland have said that. It is to reinforce the position that is already there in Austria. One of the reasons why there has been a difference is because of the sheer scale of our rebuilding challenge. In Germany it was not a question of building new nuclear plant. It was a case of when you close the ones that are there. Instead of providing greater life extensions, it was a question of bringing that back to 2023, which is when the last one will close. We are stretching ours out to 2023, and in 2023 the only one that is still guaranteed to be open is Sizewell B. The rest, unless they get life extensions, will have closed before that time. So we face a very different set of circumstances.

The public here are acutely aware of energy security. They know that we are becoming gas importers now. Who knows where that will come from in terms of the longer-term outlook? We have seen the area of the world that provides most of it—the Middle East—having a war in the course of the last year. As the public have looked across the energy portfolio generally, they recognise that we need an enormous amount of rebuilding and that our energy security is enhanced by the extent to which that can be done domestically rather than being reliant on imported fuels.

Q156 Gareth Johnson: Minister, if I heard you correctly earlier on in your evidence, you said that support in the public for nuclear power is actually growing in this country. Do you feel that it is the British Government’s job to reassure the public about the risks, or lack of them, from nuclear power, or do you feel it is the British Government’s duty to say, “These are the facts. Make of them what you will”?

Charles Hendry: It is our job to promote nuclear power. We have, after all, said that we want nuclear to be part of the mix and we want new plant to be built. That requires an attitude whereby the public is supportive of that and willing to see it built in their own communities. We are not neutral about this. We believe that nuclear is part of the mix going forward. Clearly that has to be based on evidence and it has to be based on facts, but at the end of the day, we want to create an environment in which new nuclear plants can be built. We are not neutral—we are in favour of it—but we will not use anything apart from factual information in terms of putting that across.

Q157 Sarah Newton: We have spent quite a lot of time discussing nuclear, but some of the written evidence we received from Professor Nick Pidgeon at Cardiff University suggested that some of the new technologies, which are less familiar to people in the

UK—for example, carbon capture and storage—needed very careful risk communication with the public. Then Fiona Fox from the Science Media Centre suggested that we should also be looking at shale gas and geo-engineering as areas where the public would need to be engaged in terms of risk management. As the Minister knows, I have a particular interest in deep geothermal as well, which is quite a familiar technology in some parts of the world but relatively new in the UK. What steps are DECC planning to look at communications relating to risk on these new and less familiar technologies in the UK?

Charles Hendry: One of the most important aspects of this is the separation of policy from regulation. We are the Department that is responsible for creating the right environment in which people will come forward and invest, whereas others—notably the HSE—are there to ensure that the right regime is in place for safety and security. That is a fundamentally important part.

If you look at a different part of the energy sector, the attitude of the American Government post the Macondo disaster two years ago is that in those areas they have said they want it to be more like the British regime in future where you do have that separation of licensing from safety. That is a fundamental part of that. We can then say to people who are concerned about shale gas development that we do have, I believe, the most robust regime in the world for oil and gas development and those exact same standards that apply offshore will be applied onshore. There will be no difference between them in terms of the regulatory approach and the safety regime that is put in place. I hope that if we can be very sensible and practical about that, we can rely on “best in class” in terms of the safety mechanisms that are put there. Then people will see that we are never cutting corners in that respect.

There is one aspect about the British approach to safety and regulation that stands apart from any others. In many other countries they have a tick-box approach. An inspector comes round and says, “I have seen that and that”, ticks the box and then goes away and comes back one, two or five years later. Our approach here requires the industry to use the best standards available. That means that they are constantly pushing for better practices and improvements, and constantly bringing that forward and upgrading it. It is not a question of somebody saying, “Yes, I have checked that and it is all right.” The legal onus is on industry always to be pushing it to be better. That has been a fundamental part of our regulatory regime and it is critical. Certainly, for those in industry and for people looking in from outside, I hope they will see that as being something where Government have said we will always want to see how we can do things better and that the best practices from around the world are, therefore, deployed here in terms of those energy installations.

There will always, though, be this distinction between what people see as being a good technology when they are looking in the UK national interest and how they will react when it is happening near their homes. Therefore, we have to be extremely alive to those

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tensions and go that extra mile in trying to reassure people. Just because we can see that the gas price in the United States is now a third of that in Europe and a seventh of that in Asia due to the shale gas developments, that alone does not justify shale gas developments. It is right that we should seek those economic benefits if we are comfortable that it can be done safely. That will always be our priority. We need a range of different technologies, but safety must be paramount in all of them.

Q158 Sarah Newton: Given what you were saying before in answers to questions about nuclear energy and how important the independent scientific advisers' role is in enabling people to have confidence in the UK in nuclear, by comparison to, say, Germany, do you think the independent scientific advisers in this range of different technologies would play a similar role in helping to promote public confidence in those technologies?

Charles Hendry: Yes, I do, but again I come back to this distinction between the national case and the local case. Some of the scare stories that were put round about how shale gas development could happen are completely divorced from reality. Nevertheless, they have very strong public credence within the communities where they are being considered. We have to work that much harder to reassure people—constantly being on the front foot in terms of saying that we are putting in place the toughest standards anywhere—so that we can try to deal with that. At the end of the day, the chief scientists can perform a fantastic role when it is a national issue on television, but they cannot be involved in every village hall meeting when it comes down to the very small local community issues.

Q159 Sarah Newton: I am sure we would all agree that the best policy is evidence-based policy and that the scientific advisers would be basing their opinions on the relative merits and the safety implications of each technology based on the evidence. You were saying that you did not feel the Government should be neutral on nuclear and it was part of the plans for energy infrastructure. If the evidence was there to support the different emerging technologies—whether it was shale gas, deep geothermal or one of the geo-engineerings—would the Government then not be neutral on those and be promoting them as alternative sources of energy?

Charles Hendry: If we are satisfied they can be done safely. I hope that is, therefore, a very strong marker for the public confidence that we will not allow anything to go ahead unless we are persuaded it can be done safely. If one looks at the shale gas issue, particularly in Lancashire, where there is a link between some of the fracking activities and the minor earth tremors that happened there, we have asked for an investigation to be carried out. That is now being peer-reviewed by both the public more generally but also by experts in that sector. Only when we have seen that will we decide whether we think it is appropriate to allow the fracking activities to go ahead again. We have required them to be ceased until we have that evidence, until we can make that decision. I hope, by

doing it in that way and taking time over this, that we can reassure people that we are not prepared to cut corners.

Q160 Sarah Newton: Looking at, for example, carbon capture and storage, other countries are a bit ahead even though they might well be doing the storage underground and the UK is planning on doing it under the sea. To what extent do you feel you could learn from the experience of, say, the USA or Germany, which are slightly ahead in terms of managing risk perception with the public?

Charles Hendry: Different countries have done different elements of the CCS chain. For example, the Americans have for a long time used CO₂ for enhanced oil recovery, but they have not attached it to a power station and then sequestered it for the longer term. What we are looking at—and I think we can legitimately claim to be leading the world in terms of the projects to take this forward—is that full chain of process from separating the CO₂ from other emissions to then transporting and storing them for the longer term.

With the projects that we are looking at, we are very keen to take account of what is going on elsewhere; we have some of the most outstanding academics in the world working on CCS projects here in the United Kingdom. We are some of the most cited examples anywhere in terms of the academic work that is done. If we can take account of work that is done elsewhere, we are very keen to do so, but we are looking at large-scale plants, commercial-scale plants, and operating the full chain of the process. That is something that has not been done anywhere else so far.

Q161 Stephen Mosley: When we went to have a look at the CCS plant in Germany, one of the things that surprised me was that even if they do roll it out and have the full capacity, it is only enough capacity for 30 years' storage of carbon. Have you made any assessment from the projects you are looking at as to how long you will be able to use CCS before the pockets are full? Have you made any assessment of what happens when they are full and what we move on to then?

Charles Hendry: Some assessment has been made of individual fields. There are two different types of storage. One is depleted oil and gas fields and the other is saline aquifers. In Germany, where they do not have the depleted fields, they have to use the aquifers, whereas we have the choice of both. We have been pumping out oil and gas for 40 years from some of the fields in the North sea, and some of them will last another 40 years as well. So we have very significant fields there that can be used in that respect. There is one thing to be clear about. This would be being able to pump into it for 30 years, but the intention would, therefore, in Germany be to keep it there for the longer term. It would not be the case that after 30 years, a new home would have to be found for it. It is 30 years of pumping-in capacity, whereas here we have much greater capacity. At the same time, we would see this as a transition technology. This is to allow people to make greater use of oil, gas and

 19 March 2012 Charles Hendry MP, Professor David MacKay and Hergen Hays

coal for longer periods than would otherwise be possible. We simply cannot meet our decarbonisation requirements without finding a way of allowing coal and gas to be part of the mix for the longer term. Even with the most ambitious plans for nuclear and low-carbon technologies, they cannot do it on their own.

Q162 Sarah Newton: On that very point of meeting our carbon reduction targets, there are some older newer technologies—I suppose you would call them—like onshore wind, where as we get more experience of that technology, although we have less than Germany in terms of volume, new risks are being perceived by the public; for example, there are health issues related to the proximity of the turbines and the turbines themselves are developing in size and scale. What steps are DECC taking, first of all, to look at the evidence of those public perceptions and then how to tackle them?

Charles Hendry: With a number of those we have taken a more structured approach than was the case before. For one of them—the issue of noise—there was something called ETSU-97; we have not been implementing that in the same way across the country. We have initially commissioned some research to find out how it is being interpreted across the country. We are now asking the Institute of Acoustics to look at the right way for it to be interpreted so that we can have a uniform approach. That is an important starting point. We are also commissioning studies into the flicker effect, which people are concerned about, in that the light reflecting on the blades, they say, can have a damaging effect on health. We are commissioning a report on that too.

We are determined to have a rather different approach going forward. We are concerned that communities have felt powerless about some wind farm developments. They may have been turned down by their own local authority, but at the end of the day, it then went through on appeal and the inspector said, “We have renewable targets we have to meet and therefore it has to go through to meet those.”

We have been clear that that should go and, as part of the Localism Act, those top-down regional targets will go. That will mean that there is more say with the local communities. We are determined, as part of the localism agenda, that local communities should be more involved in deciding how they should evolve over time and that there should be more direct benefits for them as well.

At the same time we have been consulting on reducing the subsidy levels. My concern has been that we have been seeing bigger and bigger turbines in areas of low wind resource, and that is not actually the right way forward. Reducing the subsidy level will ensure that the investment goes where the wind resource is strongest. We are also seeing in the United Kingdom a much greater interest in offshore wind. We already have more offshore wind than anywhere else in the world. We see it as an important part of our low-carbon targets going forward.

It is about finding the right balance between community interests, the wider concerns about those developments and also being very clear about where we are trying to get to on this. In order to get to our 2020 targets of producing 30% of our electricity from renewables—within that there is some biomass, some offshore wind and some onshore wind—by about 2020 we are looking at 7% to 9% of our electricity coming from onshore wind. This is not an ambition without end. We are looking at something that is reasonable and achievable. It is an important part of our energy security because it comes back to the point I was making earlier; we have a natural resource and we should be taking advantage of it where we can.

Q163 Sarah Newton: I have one final question, about when you are expecting those two reports on the potential health risks. When do you think those studies will be complete and the reports published?

Charles Hendry: The Institute of Acoustics is reporting back to us in the course of the second half of this year, I think. I do not have the date on the flicker one to mind, so perhaps I can write to you, Chairman, with that information.

Q164 Chair: On a final point on wind—so as not to worry too many members of the public as a result of your answers—and achieving your 30% target, one of the figures that we were astonished by in Germany was the fact that there are 25,000 onshore turbines. We have something over 3,000 in total, the majority of which, I suspect, are offshore. Do you have any idea about the scale of onshore that you would envisage making up the mix?

Charles Hendry: In order to get to that 7% to 9% figure that I mentioned, the farms that are built, consented to and under construction or are in the planning process take us to beyond where we would need to be to deliver that. We can start to see that we have identified many of the strong resource areas already. The large-scale farms—or almost certainly the areas which could accommodate those, where they have a good strong resource—have been identified and are well into the process already. The number of wind farms that are built, under construction, consented or in the planning process takes us beyond the level where we need to get to.

Q165 Chair: That would take us to a number that is substantially lower or closer—

Charles Hendry: Very much so. Also bear in mind that the sort of wind farms we are seeing now are more efficient. They have a greater output capacity, so you need fewer turbines to deliver the same amount of output that is currently being generated.

Chair: Minister, I am extremely grateful for your attendance this afternoon. Professor MacKay and Mr Hays, thank you very much as well. It has been a very informative session.

Written evidence

Written evidence submitted by the Department of Energy and Climate Change (Risk 00)

This submission has been prepared for the Committee's inquiry into risk assessment, communication, perception and tolerability in relation to energy infrastructure, focusing on nuclear power by the Department of Energy and Climate Change.

INTRODUCTION

1. The Government has committed to delivering a low carbon and affordable energy mix of renewables, new nuclear and clean gas and coal which will provide continuous low carbon generation and reduce the UK's dependence on fossil fuel imports. In common with other countries, the UK faces two great risks: the prospect of dangerous climate change which will have unprecedented impacts on global security and prosperity, and challenges to energy security as our current generation of power stations closes and ensuring supplies of energy which are resilient to volatile fossil fuel prices.

2. DECC's ultimate goal is to deliver clean energy for the future and tackle dangerous climate change. In line with the priorities set out in the National Security Strategy we identify and assess risks to energy assets and networks including from terrorism, cyber attack, international military crises, and natural hazards and major accidents. Working in partnership with industry and regulators we take action to reduce vulnerabilities, and put in place plans and arrangements to respond and recover in the event of infrastructure failure.

3. We believe that nuclear power stations have a vital part in our energy strategy to help ensure a diverse mix of technology and fuel sources, increasing the resilience of the UK's energy system. Nuclear power is a proven technology able to provide continuous low carbon generation and is forecast to be the lowest cost form of low carbon generation. These potential benefits mean that new nuclear power stations have an important role to play in the UK's energy future.

4. The Department of Energy and Climate Change (DECC) has a key role to play in several aspects of the UK's civil nuclear activities. Through the establishment of nuclear regulatory bodies covering safety, security, transport and environmental protection, the Government has set in place the organisations essential to ensure the nuclear industry in the UK is appropriately regulated in compliance with European and international requirements. The regulatory regime applies to current nuclear installations and will apply to any future installations.

5. To further enhance this regime the Government has created the Office for Nuclear Regulation, which will combine the safety, security and transport aspects of regulation for the nuclear industry. DECC, through the Nuclear Decommissioning Authority, is responsible for the decommissioning, clean-up, waste management and eventual disposal of the civil nuclear liabilities created during the public ownership of the nuclear industry. To facilitate new nuclear build in the UK the Government has taken a number of actions: developing the National Policy Statement on sites for new nuclear power stations; Regulatory Justification; Waste and Decommissioning finance arrangements; and Generic Design Assessment of proposed reactor systems.

6. The unprecedented events at Fukushima Dai-ichi in Japan focussed global attention on nuclear power, specifically in relation to its safety and security. Safety is and will continue to be our number one priority, both in relation to existing facilities and potential future plants. Some countries such as Germany, Italy and Switzerland have decided to phase out nuclear power. Alongside other countries such as France, Finland, China and the US, the UK Government has decided to continue with our policy that nuclear has a role in the energy mix now and will continue to do so in the future.

7. Recent polls, including a populus survey conducted in August this year show that support for nuclear power in Britain has risen over the past year, despite the events at Fukushima. A recent Nuclear Industry Association (NIA) YouGov poll (November 2011) has also shown that 77% (risen from 68% in the summer) of those polled agree that "Britain needs a mix of energy sources to ensure a reliable supply of electricity, including nuclear power and renewable".¹

8. Our response to the Committee focuses on DECC's role in communicating nuclear policy, which includes new nuclear, safety and security, non-proliferation, emergency planning, managing radioactive waste and touches on the themes of the inquiry rather than addressing the specific questions point by point.

GOVERNMENT'S ROLE IN COMMUNICATING NUCLEAR POLICY

9. The role for Government is to communicate the role of nuclear in the UK as an essential part of the energy mix, and the benefits that it brings. In particular: that it is a safe and reliable low carbon technology which will help to mitigate the impacts of climate change, help to meet our ambition to be less dependent on imported fossil fuels, and help in providing UK consumers with cost-effective electricity.

¹ NIA press release: <http://www.niauk.org/NIA-Press-Releases/Industry-poll-shows-continuing-support-for-nuclear.html>

10. DECC primarily communicates this through its policy statements and consultations, whether that is on the energy mix and nuclear's role, or specific nuclear policy such as the Nuclear National Policy Statement or policies on waste and decommissioning. More on this is in the section below.

11. It would be unrealistic to aim for consensus, but we believe it is important that our policy towards nuclear should win widespread understanding, confidence and respect. We aim to do this by:

- (a) Communicating regularly and effectively with all our audiences through a variety of channels to reinforce messages on the role of nuclear in the energy mix, Government's commitment to new nuclear, and safety of nuclear power stations. These communications are based on factual and scientific evidence, accessible and understandable to the public and communicated by Ministers and officials.
- (b) Ensuring that information on the work of the Office for Nuclear Development is accessible and transparent on the DECC website to help encourage understanding and trust in the Government's policy on nuclear.
- (c) Ensuring we understand and address the needs and concerns of our stakeholders and target audiences through clear fact based messages.

12. There is an onus on the nuclear industry to build a reputation that instils trust and confidence and provides reassurance on the safety of the nuclear industry, particularly post-Fukushima. However there is a clear role for Government to ensure that the regulatory regime is fit for purpose and to engage with local communities and the public to communicate that nuclear is a reliable and safe form of energy.

13. In the case of Fukushima, it was important that we established the facts before making any decisions on policy. In this regard, the Secretary of State asked that the Chief Nuclear Inspector Dr Mike Weightman report on the lessons learned from Fukushima and the implications for the nuclear industry and new nuclear. This was an independent report.

14. In light of this, we have re-emphasised the importance of the safety of nuclear power and the ongoing need for nuclear as part of the energy mix. Separately, Dr Mike Weightman has presented his reports to media, key stakeholders and the public and the Secretary of State has placed these reports with Parliament.

SPECIFIC NUCLEAR POLICY

15. The Government has conducted a number of public consultations which have provided clear facts and evidence-based information on nuclear power to raise awareness of nuclear, both the benefits and the risks. In particular the last administration conducted an extensive consultation in 2007 which led to the Government's decision in the 2008 Nuclear Power White Paper that nuclear should be part of the energy mix. Government is taking facilitative actions to enable the marketplace to come forward with nuclear energy that will help provide long-term energy security.

16. The policy of these facilitative actions and nuclear policy is communicated through a variety of mechanisms as set out below.

REGULATORY JUSTIFICATION

17. The EU Basic Safety Standards Directive requires member states to justify new radioactive practices, that is, to assess whether their benefits outweigh the health detriment they may cause. Justifying two reactor designs, the AP1000 and EPR, was one of the facilitative actions necessary to allow new nuclear power stations to be built in the UK. The Government held three public consultations which respectively covered: the process; the application for each of these designs, submitted by industry; and the Secretary of State's proposed decisions. The application and the decision documents addressed in detail the issues around the impact of radiation on health, the operation of the regulatory regime intended to keep radiation doses received by people below certain levels, and the Secretary of State's reasons for concluding that the regulatory regime did this effectively. The Government's Responses to these consultations made clear concerns raised by the public and stakeholders on health issues related to nuclear and the Secretary of State considered these concerns at length in his decision documents.

18. The decisions were approved by the House of Commons by a majority of 520–27 for the EPR and 517–26 for the AP1000.

THE NATIONAL POLICY STATEMENTS

19. The Nuclear National Policy Statement provides the primary basis for making decisions on applications to build nuclear power stations, and sets out a list of sites potentially suitable for the building of new nuclear power stations up to the end of 2025. The NPS was subject to an Appraisal of Sustainability, which analyses the environmental, social and economic impacts of its implementation. The NPS was also subject to a Habitats Regulations Assessment, which assesses the impact of the NPS on the integrity of European natural habitat sites. The NPS sets out the potential impacts of building new nuclear power stations, and the Government's assessment of the potential for mitigating these at the sites in question. The NPS and its associated documents were the subject of a series of public consultations, which included public meetings and exhibitions at all the

proposed sites, and public meetings in regional centres. These meetings gave people the opportunity to raise concerns about the impact of nuclear power stations and for officials and regulators to respond. The Government also published detailed responses to the consultations, covering all the points raised. The Nuclear NPS was approved by the House of Commons by a majority of 267–14.

20. The Nuclear NPS also gives planning guidance on health impacts and assesses individual sites and in doing so documents the concerns that residents raised at each site and the Government's response. This included concerns raised about risk, such as risks of flooding, or risks of health impacts. This gives clarity on how perception of risk has affected the assessment of whether individual sites are potentially suitable or not.

MANAGING RADIOACTIVE WASTE

21. DECC is committed to delivering a solution for safe and secure disposal of higher activity radioactive waste, both for legacy and future nuclear wastes. Without credible mechanisms for long-term management of nuclear wastes, the new-build programme will be jeopardised. Government must be satisfied that effective arrangements will exist to dispose of waste from new nuclear reactors.

22. The Government's policy for dealing with higher activity waste is through geological disposal, coupled with safe and secure interim storage until a Geological Disposal Facility (GDF) is operational. DECC and the NDA's Radioactive Waste Management Directorate (RWMD) are driving forward the Managing Radioactive Waste Safely (MRWS) programme to implement this policy.

23. The principles of voluntarism and partnership are key in this, working with willing communities to find a suitable site for a GDF. The voluntarism approach involves working closely with local communities to explain the realities of geological disposal, answer questions, address concerns and tackle issues openly in order to deliver stakeholder confidence that decisions are taken for the right reasons and developments will be safe and beneficial to the local community. In particular we have been working closely with the west Cumbrian MRWS Partnership, led by local authorities who have already expressed an interest in the programme, to develop and deliver several rounds of extensive local stakeholder engagement activities, including DECC and NDA officials participation in regular open meetings and community events to explain government policy and answer stakeholder questions and concerns.

NUCLEAR SAFETY

24. DECC is accountable to Parliament for safety at nuclear power stations and other licensed civil nuclear sites in the UK. The Secretary of State receives advice on nuclear safety issues from the Office of Nuclear Regulation, currently an agency of the HSE pending legislation to create a separate statutory body.

25. The operation of the UK's nuclear safety regime is delivered through the ONR who undertake licensing and the day-to-day regulation of nuclear sites throughout the UK. In its 2009 report on the UK system the IAEA IRRS report noted that "the UK has a mature and transparent regulatory system and advanced review process, which is backed up by highly trained, expert and experienced nuclear inspectors". The report also noted the UK's ability to effectively manage safety in the nuclear industry now and in the future, through the proposed establishment of the Office of the Nuclear Regulator, as it stated that "once again the UK are showing world leadership—an encouraging example to all in the world preparing for the challenges of the future".

26. With the move in October 2011 of the transport regulator for radioactive material from DfT to ONR, DECC has also become accountable to Parliament for the transport of radioactive material by road rail or inland waterway.

27. Through ONR's reporting and international safety standards, DECC is able to reassure the public and parliament of the UK's safe and secure nuclear industry. However, it is within ONR's remit and that of nuclear operators to ensure they are transparent and open in their policy and communicating this to the public. This is a specific recommendation in Dr Weightman's report of the lessons learned from Fukushima.

NUCLEAR SECURITY

28. DECC is responsible for the overall effectiveness of the security regime for the UK's civil nuclear sites. It is crucial that all nuclear facilities and nuclear material are protected against "extreme hazards" including criminal or malevolent acts because of the potential risk to public health and safety, and the environment. Security arrangements are kept under constant review as part of a continuous process to ensure existing arrangements are robust and effective and flexible to respond to any indication of a terrorist threat on a UK nuclear installation or nuclear material in transit. Security arrangements comply with international standards—the Convention on the Physical Protection of Nuclear Material and the recommendations in International Atomic Energy Agency's regularly updated guidelines, especially the information circular INFCIRC225.

29. DECC works closely with the Office for Nuclear Security (part of the ONR), the independent security regulator, as well as the Civil Nuclear Police Authority and the Civil Nuclear Constabulary (a specialised armed police force), to ensure that security measures at UK civil nuclear sites and for nuclear material in transit are effective. The Nuclear Industries Security Regulations 2003 makes provision for the protection of

nuclear material, both on sites and in transit, against the risks of theft and sabotage, and for the protection of sensitive nuclear information.

30. All civil nuclear operators are required to have site security plans setting out the security arrangements for the protection of nuclear sites and nuclear material on such sites. The arrangements cover, for example, physical protection features such as fencing and turnstile access, the roles of security guards and the Civil Nuclear Constabulary, the protection of proliferation-sensitive data and technologies and the trustworthiness of the individuals with access to sensitive nuclear information and material. These arrangements will apply to new nuclear build operators.

31. The UK is committed to nuclear security and to learning from others. In October, an IAEA International Physical Protection Advisory Service (IPPAS) Mission visited the UK to assess our compliance with the International Convention on the Physical Protection of Nuclear Materials and the IAEA's guidelines on nuclear security. The IAEA concluded that the state of civil nuclear security arrangements was sufficiently robust; both in the context of the legal and regulatory framework and how it is implemented at the Sellafield nuclear site and the port of Barrow used for nuclear shipments. The IPPAS Mission team identified many examples of good practice and a number of valuable recommendations and suggestions. DECC is working with the nuclear regulator, Sellafield Ltd and NDA to use this "CONFIDENTIAL" report to ensure that we continue to develop and improve our civil nuclear security regime.

NUCLEAR NON-PROLIFERATION

32. DECC leads on a number of individual non-proliferation policy areas to support international measures to reduce the threat of proliferation of weapons of mass destruction, largely through its commitments as a signatory to the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and those arising under the G8 Global Partnership. DECC is also the lead Department for the nuclear and radiological elements of the Global Threat Reduction Programme (GTRP), the UK's principal programmes of co-operative overseas assistance on nuclear security and wider non-proliferation.

33. It is inevitable that any international developments regarding activities associated with actual or potential weapons of mass destruction will capture, and hold, media attention. DECC works hard with its international partners and agencies to help ensure that press releases and other information on the global efforts to promote safe and secure nuclear operations and materials, and the commitments to which states must adhere, is made fully available, and is accurate. In this regard the website of the IAEA is a major tool. Moreover both DECC's own website and that of the FCO, and the website of the Export Control Organisation (ECO) in BIS provide respectively, clear information about the UK's non-proliferation activities and guidance to firms about nuclear sensitive exports.

34. The UK's GTRP programme publishes an annual report on its activities (online at www.decc.gov.uk/gtrp). DECC's Press Office also handle one-off matters, such as the UK's ad-hoc contributions to the IAEA's Nuclear Security Fund or the signing of bilateral Nuclear Cooperation Agreements.

EMERGENCY PLANNING AND RADIATION MONITORING

35. DECC is the lead Government Department in the response to an emergency with off-site effects from a licensed civil nuclear site in England and Wales. As such, one of its responsibilities is to ensure that information is available to the public and media regarding the implications of a nuclear emergency. DECC also contributes to the wider National Risk Assessment (NRA) process led by the Cabinet Office.

36. Under REPPiR (Radiation (Emergency Preparedness and Public Information) 2001) Regulations, nuclear site operators and carriers must share their assessments of reasonably foreseeable hazardous events relating to their work with the nuclear regulator (the Office for Nuclear Regulation). They must also provide people living or working near to nuclear sites with certain prescribed information regarding the potential risks posed by ionising radiation.

37. DECC publishes information on its website regarding the risks posed by ionising radiation. The website (www.decc.gov.uk) contains facts sheets with information on the characteristics of ionising radiation and the effects of exposure to it on human health and dose comparison data. The Health Protection Agency's website provides further, more detailed, information on the potential health implications, including cancer risks from exposure to radiation. In addition, DECC's Radiation Incident Monitoring Network (RIMNET) provides gamma monitoring data for inclusion on the publicly accessible EURODep European Union database. DECC also plans to publish regular monitoring updates on its own website shortly.

38. Site operators provide such information in a variety of forms at regular intervals not exceeding three years, often in the form of a calendar. Site operators also make the information available to the wider public by placing copies in libraries, civil centres and other public buildings.

39. In addition, there is information with local communities through Emergency Planning Consultative Committees. These Committees provide a forum for organisations with responsibilities for preparing emergency

arrangements in response to events at local licensed nuclear sites to consult, co-operate and co-ordinate these arrangements.

December 2011

Written evidence submitted by the British Geological Survey (Natural Environment Research Council) (Risk 05)

Submission regarding the following matters as specified in the Terms of Reference:

- What are the key factors influencing public risk perception and tolerability of energy infrastructure facilities and projects?
- To what extent can public perceptions be changed by improving risk communication?
- How do risk perceptions and communication issues in the UK compare to those of other countries?

KEY FACTORS

1. The UK, together with many countries around the world, continues to face difficulties with all things nuclear—from building new reactors for energy generation to the geological disposal of radioactive waste. Technically speaking, both reactor construction and geological disposal are well understood and have a firm scientific basis enabling informed judgements to be made. However, particularly for the construction of repositories and disposing of waste, national programmes continually stall because of concerns and fears of the various stakeholders; indeed a significant proportion of the public still asks whether a repository or a nuclear power plant is safe.

2. Most people remain unconvinced that living next to a nuclear power station or a deep repository for radioactive waste (especially for high-level waste) is safe. Anything “nuclear” is seen as dangerous, polluting and unpredictable. Much of this anxiety is the result of decades of concerns about nuclear weapons, radioactive fallout from atmospheric bomb testing and long-term effects of exposure to radiation. Such worries are confirmed and reinforced by “incidents” (used as a neutral term in this document) at, for example, Windscale (1957), Three Mile Island (1979), Chernobyl (1986) and, of course, at Fukushima in 2011.

3. Compounding the problem of confidence in the nuclear industry is secrecy—or at least the failure to openly provide relevant and sufficient information—which has too often resulted in a feeling that “they” (the authorities and the experts) are not telling the whole truth. It could be argued that this is the current situation in the UK. Additionally, many scientists lack the necessary communication skills and are poorly equipped to present their work clearly to non-specialists—particularly when attempting to provide clear and unambiguous answers to difficult questions conveying, for example, the idea of risk. There is also the argument from anti-nuclear groups in many countries that “solving” the waste disposal problem only encourages the nuclear industry to continue its “dangerous” activities—indeed many opposition groups now use this link to block any new nuclear power stations until the waste “problem” is solved.

4. Building the confidence of non-experts in the nuclear industry is thus a crucial, but extremely difficult task that must be undertaken if both nuclear new-build and the disposal of radioactive wastes are to be achieved. Only by achieving this confidence, based on sound science and a recognition and acknowledgment of anxieties, can the nuclear industry progress. The communication of risk forms part of this building of confidence. The trick is finding effective communicators, who are also excellent scientists, who can inspire trust and confidence in all groupings.

RISK PERCEPTIONS AND EXPERIENCE IN OTHER COUNTRIES

5. Lessons can be learnt from the communication experiences in other countries, particularly with regard to the geological disposal of radioactive waste (West and McKinley, 2007). For example, comparisons between the communication styles in Finland, France, Sweden and the UK reveal two patterns. The “Decide-Announce-Defend” (DAD) approach to site selection has been used extensively in the past in France and the UK. Unfortunately, this has not been particularly successful in its goals and has generated considerable suspicion of the nuclear industry and manifestly not improved the confidence of non-technical groups, in particular with regard to the “riskiness” of a repository. This approach is now often called DADA (“Decide-Announce-Defend-Abandon”) because it is ineffectual. By contrast, the “Review-Decide” pattern currently followed in Finland and Sweden (and now used in the UK by the Nuclear Decommissioning Authority NDA and in France) is open, with plans for the disposal of waste in the public arena for scrutiny and comments.

6. Although the “Review-Decide” pattern is not without its own problems (timescales can be very long and it can be an expensive process), it is much more successful in building confidence. However, it must have a sound scientific basis. For example, the use of natural (“nature’s laboratories”) and archaeological analogies (so called “natural analogues”) to illustrate difficult scientific concepts to non-technical parties is now widely used by many organisations and training courses (eg www.naturalanalogues.com ; http://www.nagra.ch/g3.cms/s_page/83290/s_name/naturalanalogues ;

<http://www.itc-school.org/index.php/Present-Courses/Utilisation-of-Natural-and-Archaeological-Analogues-in-waste-disposal-2012.html> ; Miller *et al*, 2000) although these must be used with care (see paragraph 9 below).

7. Examples of communication styles in other countries are also useful, particularly in Japan, which has over 50 nuclear power reactors, providing one-third of its total energy requirements. The legacy of the Hiroshima and Nagasaki bombs plus a series of nuclear incidents in Japan in the 1990s and 2000s, which were not always handled in the best and most open way by the nuclear industry, has meant that, even before the Fukushima Dai-ichi incident in March 2011, there was a serious mistrust and lack of confidence in all things nuclear in the Japanese population.

8. The releases of radioactivity from the Fukushima Dai-ichi power plant and ensuing contamination of the surrounding area, resulted in accusations that the risk associated with the site had been underestimated by the nuclear industry and by the Japanese government; and that the robustness of the older reactors at the site had been over-estimated. This criticism is certainly well founded and the fundamental problem of low-probability, high-consequence events and the experience of Fukushima had led to proposals for improvements in many national programmes. However, the attribution of blame is continuing in Japan but what is happening, following Fukushima, painfully illustrates how societal “nuclear” memories coupled with poor communication have led to the extremely difficult position in which the Japanese nuclear industry finds itself today.

9. Additionally, Chernobyl was linked to the Fukushima incident, even in its earliest stages and generated a lot of fear in Japan. This was not a correct analogy, which technical experts understood but were unable to communicate effectively, and, as a result, the link is still powerful. This linkage illustrates the importance of using the correct analogy when attempting to explain complex issues to non-experts and having a well established, proactive and interactive communication strategy in order to rectify such errors. Indeed much can also be learnt from examining the global history of incidents at nuclear reactors to both allow Fukushima to put into context and to provide better sources of experience to help remediation efforts in Japan (McKinley *et al*, 2011). Such comparisons will also help the UK and other countries when addressing nuclear infrastructure projects.

LESSONS FOR OTHER ENERGY INFRASTRUCTURE PROJECTS

10. The capture and geological storage of carbon dioxide (CO₂) from power stations (carbon capture and storage (CCS)) is a developing technology which will help mitigate greenhouse gas emissions. The UK government is very supportive of the technology and it is likely that a major demonstration site will be built in the near future. Although it is extremely likely that UK emissions will be stored in off-shore geological formations, it is important to recognise that the “riskiness” of injection of CO₂ into on-shore storage sites is now stopping the technology in many countries eg Netherlands

http://www.dutchnews.nl/news/archives/2010/11/barendrecht_co2_storage_plan_h.php
and Germany

<http://www.nytimes.com/gwire/2010/04/07/07greenwire-frightened-furious-neighbors-undermine-german-35436.html?pagewanted=all>.

Again, the “DAD” pattern of communication seems to have been adopted which has stalled some projects. It is important to recognise that the communication errors made by the nuclear industry seem to be being repeated in the search for CO₂ injection sites, albeit in European on-shore sites. It is essential that the other errors in communication made by the nuclear industry are not repeated in the drive to store CO₂. There is much that can be learnt by the nuclear and CCS industries having an exchange of experiences (see article by Chapman *et al*, 2011 also available at <http://www.geolsoc.org.uk/page10374.html>).

DECLARATION OF INTERESTS

Julia West, JP, PhD, CBiol, FSB is a Principal Scientist at the British Geological Survey (Natural Environment Research Council). Dr West has over 25 years’ experience working on the geological disposal of radioactive waste in UK and overseas programmes including those in Europe (France, Sweden, Switzerland), Canada and Japan. She is not only recognised for her scientific expertise in this area but also for her advice to implementing organisations when developing communication strategies relating to nuclear issues.

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Dr Julia West

British Geological Survey (Natural Environment Research Council)

12 December 2011

Written evidence submitted by the Royal Statistical Society (Risk 09)

1. The Royal Statistical Society (RSS) is the UK's only professional and learned society devoted to the interests of statistics and statisticians. Founded in 1834 it is also one of the most influential and prestigious statistical societies in the world. The Society has members in over 50 countries worldwide and is active in a wide range of areas both directly and indirectly pertaining to the study and application of statistics. It aims to promote public understanding of statistics and provide professional support to users of statistics and to statisticians.

SUMMARY

2. The main points we would like to submit are as follows:

- (a) The public is currently desperately ill-served by the lack of ready access to up-to-date balanced and trustworthy information on the possible risks associated with different energy sources. Those that exist appear to be either reassuring propaganda or are limited to a particular hazard.
- (b) We suggest some general principles for numerical communications of risks associated with energy sources:
 - (i) Separate different types of hazards experienced: eg acute short-term from chronic long-term.
 - (ii) Separate impact on individuals, society and the environment.
 - (iii) Include both quantifiable risks and those that are important but are difficult to put numbers on.
 - (iv) For quantifiable risks, to use clear metrics, using whole numbers preferably in comprehensible units.
 - (v) Be clear about the uncertainty attached to numbers, which should only be given to the precision justified by the evidence.
 - (vi) Comparisons may be made with both other sources of risks, but voluntary and involuntary risks should be clearly separated.
 - (vii) Give multiple formats and ways of expressing risks, eg in terms of both rate and impact on a population.
 - (viii) Provide a clear warning that the past does not necessarily predict the future, and that we should be wary of being either reassured or scared by historical events.
 - (ix) Be clear about the extent to which risk estimates are based on scientific models, and emphasise their assumptions.
 - (x) Acknowledge uncertainty and limitations of data and knowledge.
 - (xi) Acknowledge any disputed science.
 - (xii) Attempt to give a balanced view that does not seek, or appear to seek, to persuade.
- (c) We recommend that public communication acknowledges that there are many relevant issues of concern and does not solely focus on those most easily put into numbers.
- (d) We recommend that a suitable trusted provider for this comparative information be identified.

INTRODUCTION

3. As statisticians, our expertise is in designing studies, evaluating quantitative evidence, and assessing and communicating uncertainty. We shall therefore focus on issue 3) in the call for submissions—*How effectively does local and central Government communicate risk and could it be improved?*

4. It is well-known that nuclear energy ticks most of the boxes for “fright factors” that influence risk perception: for example, radiation is feared and unknown, appears out of personal control, affects the vulnerable and unborn, is complex and the information sources may be untrustworthy. These important issues of risk perception are not our main area of expertise, but will influence our comments on numerical summaries, comparison and presentation.

5. We shall concentrate on nuclear energy but emphasise that comparisons should be made with other energy sources and hazards. This is not the place to review evidence for the magnitude of the risks, so we will just use illustrative examples from the literature.

What is currently communicated to the 'public' by government?

6. A web search using popular terms does not reveal any communication from the government, or indeed anyone else, which readily permits a comparative assessment of the magnitudes of the various risks associated with different energy sources. In particular the Department of Energy and Climate Change (DECC) website does not appear to contain any readily accessible information.

7. Those communications that exist are aimed at a professional audience, and we shall focus on their use of numerical information. We note that there is not just one "public", and a range of different stakeholders have different levels of expertise.

8. The information provided by the Health and Safety Executive (HSE) Office for Nuclear Regulation¹ is aimed at an informed audience and, as befits a regulator, is primarily concerned with explaining its framework for assessing and monitoring nuclear facilities. The HSE's *Tolerability of risks from nuclear power stations* is a classic document that, although dating from 1988–92, provides a good explanation of the HSE's general approach. Individual and societal risk is distinguished, but no attempt is made to quantify societal total "detriment" of multiple deaths, disaster management, public shame and outrage, land rendered unproductive and so on. Tables of typical doses of ionising radiation are given, and safety standards are expressed in terms of risks per annum: for example, "we require that a modern plant be so designed as to be able to withstand safely all earthquakes except those of a severity whose chance of occurrence is judged to be less than 1 in 10,000 per annum". Tables of everyday risks are provided as odds, for example a 1 in 200 chance of death per million km driven. The safety criteria are further explained *Safety Assessment Principles for Nuclear Facilities*.

9. HSE's risk communication has been recently reviewed by Boudier and Lofstedt,² who supported the HSE's "consensual" approach to risk communication, but suggested that in highly contested areas it could improve by being more proactive and engaging with people's concerns, exploiting wider expertise, and focusing on becoming a trusted source which is seen as understanding the social context. The HSE's documents, although a clear exposition of their regulatory approach, do not provide the public with a basis for judging the risks.

10. The Health Protection Agency (HPA) provides popular, reassuring information on "Nuclear Emergencies"³ with a good animation, but focuses on explaining the doses and risks from low-dose ionising radiation,⁴ providing a comparative table of exposures from different sources, for example a 135g bag of Brazil nuts corresponds to 0.01 mSv (milliSieverts).

What is currently communicated to the "public" by other sources?

11. The World Nuclear Association is a producers' lobby group whose site on nuclear safety⁵ discusses safety (accidents), security (terrorism) and safeguards (proliferation), and a reassuring table of accident fatality rates from different energy sources is given.

12. The International Atomic Energy Agency (IAEA) is concerned with nuclear safety and security but information about relative risks is singularly absent. FAQs from 2006⁶ include the following:

Q: Some nuclear power plants are built on sites subject to natural phenomena such as earthquakes or tornados, which can pose a risk for any installation. What has been done to ensure the safety of these plants?

A: Extensive experience has shown that this philosophy of conservative design has been sufficient to cope with all of these types of natural phenomena at all nuclear power plants, which perhaps should be revised after Fukushima.

13. A recent document from the Intergovernmental Panel for Climate Change (IPCC)⁷ (pp 745–747) provides the most comprehensive and comprehensible comparison of the risks from serious accidents from different energy sources, derived from the ENSAD database at the Paul Scherrer Institut.⁸ Both fatalities per Gigawatt-year as well as maximum fatalities are given—some of their data are revisited below.

14. The best exposition is given by David Mackay,⁹ currently Chief Scientific Advisor to DECC, who provides an accessible comparative assessment of different energy sources, including both short-term and long-term impacts. Risks are communicated as fatalities per Gigawatt-year.

15. There are a vast range of other sources of information from academic sources, individuals and pressure groups, including a website of wind turbine deaths¹⁰ (32 up to end of 2010), communicated as fatalities per Terawatt-hour. There are endless conflicts about the impact of Chernobyl, which is of doubtful relevance to any UK nuclear programme.

16. The public is currently desperately ill-served by the lack of ready access to up-to-date balanced and trustworthy information on the possible risks associated with different energy sources. Those that exist appear to be either reassuring propaganda or are limited to a particular hazard.

How could communication be improved?

17. We suggest some general principles for numerical communications of risks associated with energy sources:

- (a) Separate different types of hazards experienced: eg acute short-term from chronic long-term.
- (b) Separate impact on individuals, society and the environment.
- (c) Include both quantifiable risks, and those that are important but where difficult to put numbers on.
- (d) For quantifiable risks, to use clear metrics, using whole numbers preferably in comprehensible units.
- (e) Be clear about the uncertainty attached to numbers, which should only be given to the precision justified by the evidence.
- (f) Comparisons may be made with both other sources of risks, but voluntary and involuntary risks should be clearly separated.
- (g) Give multiple formats and ways of expressing risks, eg in terms of both rate and impact on a population.
- (h) Provide a clear warning that the past does not necessarily predict the future, and that we should be wary of being either reassured or scared by historical events.
- (i) Be clear about the extent to which risk estimates are based on scientific models, and emphasise their assumptions.
- (j) Acknowledge uncertainty and limitations of data and knowledge.
- (k) Acknowledge any disputed science.
- (l) Attempt to give a balanced view that does not seek, or appear to seek, to persuade.

The systematic inadequacies in past data as a basis for future predictions means that formal statistical “error bars” have less relevance than an open assessment of deeper uncertainties, so that identifying orders of magnitude may generally be adequate.

18. A wide range of potential hazards related to energy production can be identified that impact on individual people, society and the environment, associated, for example, with routine activities, severe accidents, disposal of waste, climate change, terrorism, proliferation and energy security. All of these enter into the public debate when discussing nuclear energy and making comparisons with other sources. Some may be quantified with greater or lesser confidence—but others are more difficult to model. We recommend that public communication acknowledges that there are many relevant issues of concern and does not solely focus on those most easily put into numbers.

19. In principle a matrix could be formed for each energy source, related to each potential hazard. It is crucial that a full picture is portrayed—in many cases a quantitative assessment would not be possible but a qualitative level of severity might be assigned. Some examples are given below.

20. *Routine activities and minor accidents.* These need to be expressed in the same units as severe accidents, separating workers from the general population exposed, for example, to pollution and radiation from traditional power plants. These risks should also be expressed in terms of the total burden on the population—fossil fuels were estimated in a National Science report to lead to 20,000 deaths in the USA each year,¹¹ and the House of Commons Environmental Audit Committee reported that particulate matter reduced life expectancy by seven to eight months,¹² which ignores the effect of low-dose ionising radiation from fossil-fuel power stations. The environmental damage from routine coal and oil extraction also needs to be considered.

21. *Severe accidents.* The IPCC report⁷ estimates for EU countries the following future risks (these have been translated into fatalities per TWy in order that whole numbers are appropriate): coal (135), oil (99), hydro (85), natural gas (68), biomass (15), offshore wind (6), inshore wind (2), geothermal (2), nuclear (0.4 early deaths, 0.7 later deaths) and photo-voltaic (0.2). This does not include the possibility of ship collisions with offshore wind facilities. These “average” figures do not address the perceived catastrophic potential of nuclear power. This scenario should be explicitly addressed and justification for the quoted risks needs to be provided. Trusted sources of information, and a continuing period of safe operation, will help this be convincing. The recent Deepwater Horizon accident suggests the vital importance of environmental damage as well as direct harm to health.

22. *Waste disposal.* For nuclear waste, quantitative risk models can be provided, emphasising their sensitivity to any discount rates given to events far in the future. Carbon capture and storage also needs to be addressed, although may be more difficult to quantify.

23. *Climate change.* The impact of alternative technologies on CO₂ production can be well-quantified, and possibly a more cautious assessment made on future climate.

24. *Terrorism, proliferation, energy security.* These are vital issues that need to be specifically addressed, and assessments of the vulnerability of say nuclear installations and oil-pipelines can be provided. Exposure to

geo-political forces that deny supplies can be made explicit. However, probabilities of these occurring cannot be given with any precision.

25. To reiterate our recommendations in paragraph 12, it should be made clear when there is disputed science, and numbers should only be given to the precision justifiable by the analysis. The overall confidence in the conclusions could be scored using a qualitative scale such as the GRADE score used in medical evidence reviews,¹³ or the IPCC's methodology for qualifying its conclusions.¹⁴

26. This is an area of disputed science, in which trust is vital. We recommend that a suitable trusted provider for this comparative information be identified.

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12 December 2011

Written evidence submitted by the EDF Energy (Risk 12)

ABOUT EDF ENERGY

1. EDF Energy is one of the UK's largest energy companies with activities throughout the energy chain. We provide 50% of the UK's low carbon generation. Our interests include nuclear, coal and gas-fired electricity generation, renewables, combined heat and power plants, and energy supply to end users. We have over five million electricity and gas customer accounts in the UK, including both residential and business users.

2. Following the events in Japan in March this year, EDF Energy understands the attention that is being given to the risks surrounding energy infrastructure, in particular nuclear power. We fully support the conclusions and recommendations of the Weightman Report, which reaffirmed that UK nuclear facilities have no fundamental

safety weaknesses and praised the openness and transparency of the industry. We are committed to ensuring that this continues in the future, and will implement the report's recommendations in full.

3. EDF Energy has further enhanced this approach under a four-pillared programme to inspire our company's leaders: to engage on nuclear; involve the people at our power stations who best embody our safety culture in building public trust; impact by listening to stakeholders' and customers' concerns; and integrate others who can contribute to a better understanding of the achievements and challenges of our industry.

EDF ENERGY'S RESPONSE TO YOUR QUESTIONS

Q1. What are the key factors influencing public risk perception and tolerability of energy infrastructure facilities and projects?

4. Given the events in Japan in March this year, it is understandable why the committee has chosen to focus on nuclear power. In October 2011, the HM Chief Inspector of Nuclear Installations, Dr Mike Weightman, published his Final Report on "Japanese earthquake and tsunami: Implications for the UK nuclear industry".² This examined the lessons to be learnt for the UK nuclear industry from the events and found no fundamental safety weaknesses at UK nuclear facilities. The report did make a number of recommendations for Government, regulators and industry. EDF Energy is committed to addressing these, and in doing so will continue to work with the Office for Nuclear Regulation (ONR).

5. It is important to remember, however, that all forms of energy infrastructure have some element of risk (or perceived risk), whether related to safety, security of supply, affordability, sustainability, visual impact or environmental impacts arising from emissions to air, land or sea. The UK will need to use diverse technologies to meet its energy policy objectives, namely decarbonisation of electricity generation, security of supply and affordability. Technologies will need to include nuclear, renewables and fossil fuels (with carbon capture and storage if it can be proven) as well as improving energy efficiency. This serves to highlight the need for all of these forms of low carbon energy. It also provides both Government and the energy industry with a fundamental challenge: how to communicate this difficult balance between differing energy sources and different risks to the public.

6. It is important to distinguish objective scientific risk assessment methodologies from risk perception, based on an individual's subjective assessment of the probability of an event, and the perceived consequences of a negative outcome. It is therefore possible for the same risk to be interpreted differently by different groups.

7. Although the energy industry has a strong track record in terms of safety, the risk is that assessments may be based on emotion rather than hard evidence, which may then in turn derail legitimate energy projects. EDF Energy believes that it is imperative that the concerns of the public are adequately addressed through open and transparent communication between policy makers, operators and the general public. This is necessary as part of the ongoing initiatives to inform the public of the need for new safe, secure and affordable low-carbon energy infrastructure, and will help promote greater transparency and build trust between the different stakeholders involved.

8. Although the public's interest and understanding of energy issues is growing, it is still relatively low and so any initiatives that improve this should be encouraged. We believe that it is important to highlight to the public the connection between power station operation, transmission lines, and the universal availability of electricity in the home, which over time has simply been taken for granted. This is one of the main reasons that EDF Energy launched its Energy Future website³ in order to engage the public in discussion around where we get energy from and what the UK's future energy mix should be.

9. We believe that there are a number of factors that can influence public risk perception of energy infrastructure projects. These include where people live, educational background, personal experiences and values or prejudices, as well as an incomplete understanding of the nature of the risk. In some instances there is likely to be an element of distrust/scepticism of the institutions involved in the process, including the infrastructure operators and the Government and regulators, which can only be eliminated by all parties continuing to act in an open and transparent manner. Risk perception is likely to differ between the national and local level, with the latter forming views based on local knowledge—which may be either positive or negative.

10. Another key factor is the role of the media (in all its forms) and the attention it gives to an event. While media reporting can be objective, coverage tends to focus on events rather than analysis which can make it more difficult to have a genuine and productive debate of issues. Recent events (eg Deepwater Horizon, Fukushima) have demonstrated that concerns over events in other parts of the world can have an impact on public opinion of the energy industry in the UK.

Q2. How are public risk perceptions taken into account in the planning process for energy infrastructure?

11. Public perception of risk from any potential development is shaped through consultation, both formal and informal, between the developer and consultees. These consultees will vary from statutory consultees as laid down by legislation to any individual or group with an interest in the development.

² <http://www.hse.gov.uk/nuclear/fukushima/final-report.htm>

³ <http://www.edfenergy.com/energyfuture/key-info/the-energy-gap>

12. The new planning regime, brought about by the Planning Act 2008, has placed a duty on developers to consult ahead of submitting a planning application. However, in reality good developers would always aim to build a constructive relationship with consultees, particularly the most immediate community around the development, ahead of a planning application being submitted. Engaging communities during the development of proposals helps to improve people's understanding of the infrastructure, its impacts and any mitigation measures required, as well as fostering a sense of trust. Building constructive relationships with neighbours/ key stakeholders throughout the planning process also helps to ensure constructive relationships later during operation and beyond.

13. As an example, prior to submitting its application for development consent for Hinkley Point C new nuclear development project, EDF Energy undertook four formal stages of consultation over a three year period. This involved engagement with some 6,500 consultees resulting in around 2,000 responses. Beyond this, we also had many informal meetings with representative groups, statutory bodies and others. All of this enabled us to identify specific issues, and develop our plans in order to mitigate, or compensate for, those issues. Much of this mitigation and compensation will be reflected in the planning conditions and obligations which will be agreed should we get development consent to construct Hinkley Point C.

14. It is important to note that the majority of issues raised during these four stages of consultation were not specific to the risk from an operating nuclear power station but were related to the impacts during construction, particularly from transport, visual impacts, and the migration of temporary workers into the area and the pressure this could bring upon housing and accommodation.

Q3. How effectively does local and central Government communicate risk and could it be improved?

15. We believe that both local and central Government have a number of responsibilities in relation to the public understanding of risk:

- consulting on and defining national policy;
- ensuring that the public has access to clear and reliable information;
- providing resources for world class research and for authoritative independent agencies; and
- ensuring that the school curriculum equips young people with the mathematics and science skills to help them make informed choices.

Q4. To what extent can public perceptions be changed by improving risk communication? (please provide examples)

16. Locally, all of EDF Energy's power stations (both nuclear and non-nuclear) are in regular contact with key stakeholders in the community, including councillors, media and the local population. We believe that it is important we maintain the trust of local communities. We operate openly and transparently, informing the local population of our operational issues through regular Site Stakeholder Group meetings, and receive feedback on what we can do better. We produce newsletters, host visits, engage in community-based activities and give talks in schools.

17. However, we recognise that after the events in Fukushima we must go further. One of the key recommendations of the Weightman report was that the industry should be more open and transparent, particularly with those further from our sites.

18. We are doing more:

- We now have an open reporting website, updated daily, giving information on the operational status of our nuclear plants.⁴
- We have hosted focus groups to ensure we are well positioned to respond to public concerns about our industry, and have worked with an independent panel of experts to advise us on our approach to transparency.
- We are working to reopen Visitor Centres to allow people to see what we do, and we have incorporated the design of new visitor centres into our new nuclear build plans.
- As stated above, our Energy Future website helps explain to people what choices we need to make about how we generate our energy and does so with information on the benefits and disadvantages of each technology choice.

19. Polling has shown that despite Fukushima, 61% of the public⁵ believe nuclear should be part of the energy mix. In fact, the results show that support for nuclear new build has broadly held up, with 47% supporting new nuclear power stations to replace ones that are being retired (and 28% against). This compares with 52% a year ago, and 46% in March this year. We believe that such consistency of support can be attributed in part to better risk communication and an appreciation by the public of the benefits of nuclear power as part of a diverse, low carbon energy mix.

⁴ www.edfenergy.com/about-us/energy-generation/nuclear-plant-status.shtml

⁵ YouGov poll conducted for EDF Energy in June 2011, from a sample of 4,029 adults

Q5. *How does and should the Government work with the private sector to understand public perceptions of risk and address them?*

20. The role of the Government's regulatory bodies and other agencies, including the Health and Safety Executive, Health Protection Agency and the Environment Agency is particularly important. The public expects such bodies to undertake independent and robust scrutiny of operators of energy infrastructure on its behalf, and to provide accurate scientific information. In order to reassure the public that they are fulfilling this duty, regulators need to provide clear advice and information on operators' ability to mitigate and deal with risks, and so it is important that they communicate the reasoning and the evidence behind any action they may take.

Q6. *How do risk perceptions and communication issues in the UK compare to those of other countries?*

21. The fundamentals of risk perception and communication are not likely to change significantly from country to country. However, differences do occur in terms of risk perception according to differences in the political, geographical and cultural make up of different regions, and the historical background. As a result, we have seen very different responses to the events at Fukushima, in terms of nuclear power policy, in different countries of the European Union, and worldwide.

22. It should be noted that in the European Union there are more Member States either maintaining or increasing their nuclear capacity than those that are not. We suggest that this demonstrates that the need for low carbon energy sources to help achieve climate change targets is considered to outweigh the risks from using nuclear power.

14 December 2011

Written evidence submitted by the Applied Policy Sciences Unit, University of Central Lancashire (Risk 14)

EXECUTIVE SUMMARY OF THE MAIN POINTS MADE IN APSU'S SUBMISSION

1. What may be described as a "context effect" explains why publics in the vicinity of some nuclear facilities like Sellafield can, overall, have a favourable public opinion towards the nuclear industry—even though they are concerned about the risks associated with that facility. This context effect may create a new political geography of risk.

2. The characteristics of perceived risks associated with nuclear facilities make them particularly influential in a negative way in the formation of public opinion relating to the nuclear industry.

3. Perceived salience and proximity to the nuclear facility appear to be two key factors which significantly influence an individual's perceptions of nuclear facilities.

4. At the level of the wider, general public, and among individuals who are remote from nuclear facilities, popular culture and the mass media, influence awareness of these issues and *amplify* the impact of nuclear risk perceptions upon opinion.

5. At the local level, in the vicinity of long-term extant nuclear facilities, the nuclear issue may be seen as both salient and proximate by local publics and communities. Thus, in areas like West Cumbria, the local community context and "Sense of place" can work to *moderate* and limit the effect of perceived risk associated with that industry in the local community and raise the apparent threshold 'tolerability' of risks associated with those facilities.

6. The planning process for energy infrastructure appears to lack a systematic understanding of the development of risk perceptions in their psychological and sociological contexts. The nuclear industry, for good scientific and technical reasons, emphasises quantitative risk assessments. However, this fails to appreciate or accommodate the constructed and contextual nature of perceived risk.

7. Evidence suggests that neither local nor central government systematically communicate risk, especially in the nuclear sphere, in the sense of synthesising scientific and technical assessments of risk with the qualitative factors associated with perceived risk embedded in cultural context and the rhythm of daily lives in communities.

8. In nuclear risk communication, science often fails to understand the public, in all its diversity and complexity and, as a consequence, the public are not given accessible means to understand science.

A BRIEF INTRODUCTION TO APSU AND THE CONTEXT OF ITS WORK

9. The Applied Policy Sciences Unit (APSU) is an independent political science research unit aligned with the Lancashire Law School at the University of Central Lancashire (UCLan) and based at the Westlakes Science and Technology Park, near Whitehaven in West Cumbria.

10. The APSU's mission is to make an original and independent contribution to policy and its implementation. This unit draws upon academic research, consultancy and dissemination in the field of applied policy and political science and applies them to current policy problems. In addition to UCLan staff involved

in academic research and dissemination, the APSU also involves, as advisors, individuals who are professionally involved in politics, policy and government.

11. This submission draws upon work undertaken in applied policy sciences since the late 1980s in West Cumbria and further afield, relating to public opinion, perceived risk and the governance of the civil nuclear industry. This submission is, therefore, grounded in partnership working in the context of the earliest community partnership in Britain. This experience, which was centred on the nuclear sector at Sellafield, makes this work especially relevant to the work of this committee.

12. In West Cumbria the nuclear sector comprises nuclear power generation, decommissioning and reprocessing at the Sellafield nuclear complex, and radioactive waste management nearby. This industry has dominated the economy and communities of this area since the early 1950s. This complex nuclear cluster and the associated “Britain’s Energy Coast” policy initiative are fundamentally based upon favourable public opinion towards the nuclear industry in this community and this favourable opinion is founded upon a particular configuration of risk perceptions in the locality. These opinions and perceptions have given and continue to give the nuclear industry a special “licence to operate” in West Cumbria. They are especially revealing about risk assessment and communication relating to energy infrastructure. They have also set the scene for expansion of new nuclear power, fuel cycle activities and discussions about the possibility of a geological disposal facility for radioactive waste in this area. However, new political geographies of risk may emerge within existing areas as new infrastructure projects develop.

13. In the vicinity of the Sellafield complex, public opinion towards the nuclear industry is positive overall even though there have been a number of significant accidents involving a release of radioactivity into the environment in this area over the years. These incidents have included the Windscale fire in 1957 and the beach incident in 1983 and in 1986 fallout from the Chernobyl accident which has resulted in still-detectable contamination of parts of the Cumbrian fells.

14. Research reveals that public opinion towards the nuclear industry in West Cumbria close to the Sellafield complex is positive overall, in contrast to public opinion at the national level. This local favourability exists notwithstanding a widespread awareness and concern about risks associated with that nuclear facility. Thus, in West Cumbria there is a widespread awareness of risk associated with the nuclear industry among members of the, generally supportive, local community. However, the relationship between the site and the community within which the local public live moderates the severity and impact of those risk perceptions, as individuals balance risks against the wider and often extrinsic benefits associated with the nuclear facility.

THE SUBMISSION

What are the key factors influencing public risk perception and tolerability of energy infrastructure facilities and projects?

15. Our studies of perceived risk and the civil nuclear industry, which stretch back over almost two decades, reveal the vital importance of context in understanding public risk perceptions. What may be described as a “context effect” explains why publics in the vicinity of some nuclear facilities like Sellafield can, overall, have a favourable public opinion towards the nuclear industry—even though they are concerned about the risks associated with that facility. In the West Cumbria area research reveals that the community are more risk aware yet apparently less averse, to perceived risks associated with the civil nuclear industry, than compared with the national public—even in the light of widely known accidental discharges of radioactivity into the local environment.

16. The characteristics of perceived risks associated with nuclear facilities make them particularly influential in a negative way in the formation of public opinion relating to the nuclear industry. That said, public opinion towards the nuclear industry is based upon a package of beliefs held by individuals, which may be strongly influenced by context, culture and social norms. Public opinion and risk perceptions may be only marginally influenced by official or technical reassurances or representations of risk.

17. Perceived salience and proximity to the nuclear facility appear to be two key factors which significantly influence an individual’s perceptions of nuclear facilities. Generally speaking, nuclear risks have certain qualities and characteristics which give them significant weight in influencing perceptions. These include their potential scope and scale—both in terms of space and time; the invisibility of man-made radiation; the perceived lack of control over nuclear issues; and their irreversible nature. These negative qualities associated with nuclear risks are exacerbated by *perceptions* that science and technology may not be fully in control of nuclear technology and that legislation and regulation may not provide an ultimately robust defence against the risks. We would stress, though that we are talking about perceptions among the lay public in this respect.

18. The perceived risks associated with the nuclear industry are further complicated by the invisibility and contested impact of man-made nuclear radiation. These qualities open the issue of the impact of man-made radiation up to multiple and sometimes competing interpretations, which bear upon the safety and security of nuclear installations in the public domain. Moreover, for most people, the nuclear issue is neither particularly salient nor proximate to their lives. For most individuals the print and broadcast media, who are prone to sensationalise nuclear stories, are the principal source of information about nuclear matters. Nuclear issues—especially given the severe characteristics of nuclear risks—closely relate to the factors making for sensational

storylines which resonate with the public—and sell media copy and airtime. At the level of the general public, and among individuals who are remote from nuclear facilities, popular culture and the mass media, influence awareness of these issues and *amplify* the impact of nuclear risk perceptions upon opinion.

19. In recent years, however, the risks perceived as being associated with climate change, which have been widely disseminated in the media and which have been compared with risks perceived as being associated with the nuclear industry, have undoubtedly influenced public opinion at the national level.

20. In contrast to the above, at the local level, in the vicinity of extant nuclear facilities, the nuclear issue may be seen as both salient and proximate by local publics and communities. Thus, in localities like West Cumbria, the local community context and “Sense of place” can work to *moderate* and limit the effect of perceived risk associated with that industry in the local community and raise the apparent threshold “tolerability” of risks associated with those facilities. It must be recognised, though, that support for the Sellafield nuclear complex in this area is mainly for extrinsic reasons associated with its perceived role in the local community and economy.

21. In the vicinity of the Sellafield nuclear complex, the nuclear industry is embedded in the locality and is connected with most of the elements of the local community. The nuclear industry at the Sellafield nuclear complex is, and has been for decades, acknowledged as part of the local reality. It is part of the heritage of the area, part of the local sense of identity and “place” and the facility underpins most aspects of the local economy. It is also seen as providing a future for the area and opportunities for future generations of local children. This package of beliefs associated with the nuclear industry in West Cumbria, where the nuclear industry is a proximate and salient issue for most individuals sharply contrast the majority of members of the UK public who have a more detached relationship with the industry.

22. We recommend that greater attention be paid to understanding perceived risk associated with energy infrastructure developments in their local, community context.

How are public risk perceptions taken into account in the planning process for energy infrastructure?

23. The planning process for energy infrastructure appears to lack a systematic understanding of the development of risk perceptions in their psychological and sociological contexts. The nuclear industry, for good scientific and technical reasons emphasises quantitative risk assessments. However, this fails to appreciate or accommodate the constructed and contextual nature of perceived risk.

24. An example of this lack of accommodation is the presentation of nuclear projects in isolation from one another, and from the comprehensive backstory of engagement in the area. In West Cumbria, for example, the current public consultation document relating to the geological disposal of radioactive waste in West Cumbria does not locate a proposed waste facility in the local community, nor does it position such a facility within the local nuclear context.

25. Risk, in this context is often addressed within the confines of a safety case, which may include deterministic analysis, fault analysis, engineering substantiation, probabilistic safety analysis and consequence assessments. However, though robust in its treatment from a technical standpoint, such a process fails to address perceived risk in its cognitive, community and contextual settings.

How effectively does local and central Government communicate risk and could it be improved?

26. Evidence suggests that neither local nor central government systematically communicate risk, especially in the nuclear sphere, in the sense of synthesising scientific and technical assessments of risk with the qualitative factors associated with perceived risk embedded in cultural context and the rhythm of daily lives in communities.

27. In West Cumbria nuclear risk perceptions and related attitudes have developed out of long term experience with a facility by the community in its area. This has been buttressed by a sense of isolation felt in many these communities which, like Sellafield and Dounreay, are otherwise remote and isolated. As a result, these communities have a unique risk awareness relating to these sites. This risk awareness is probably difficult to achieve *de novo* and this local ability to handle perceived risks should be seen as one of the principal assets of a locality.

28. A most significant issue in risk communication in the planning process is, however, communication between different levels of Government. Government is not a monolithic structure and Local Government operates through different Government departments than does other areas of policy. This may mean that voices articulating local risk perspectives may be difficult to hear as they are insulated by different levels of Government and isolated from different policy networks.

29. We recommend that greater attention be paid to communities within which existing nuclear facilities are located, like West Cumbria, in the policy process and that greater emphasis be placed on local government articulating risk perceptions to all levels of government involved in nuclear infrastructure policy and projects.

To what extent can public perceptions be changed by improving risk communication?

30. We do not believe that, in respect of nuclear energy infrastructure projects, public perceptions of risk can be easily achieved by improving communications about the risks associated with those facilities. Clearly, the reassurance of regulatory control is of fundamental importance in the operation of these facilities, but it does not appear to account for the increased support in the vicinity of facilities like Sellafield. We would stress that this additional support is due to the embedding of the facility within the local community identity and within the rhythms and activities of daily life—the local “zeitgeist”.

31. At the national level, we have seen in recent years some emphasis on the risks associated with climate change and, in the context of an increasing awareness of those risks, an improvement in the level of public support for nuclear energy. At the national level, it is the ranging of one risk against another that may have resulted in this change as individuals see the nuclear issue as a lesser and therefore more “acceptable” risk than climate change.

32. Perhaps the most problematic public will be those within whom a facility may be sited *de novo*. Perceptions among this group will be entirely dependent upon technical risk perceptions and the history of nuclear facility siting and associated scientific and regulatory reassurance at sites like Druridge Bay in Northumberland in 1979 and more recently Kirksanton and Braystones in Cumbria, suggests that without this embedding of a facility into the local community which is only achieved over time, new project implementation in a greenfield site may be very difficult, and costly, to achieve. These emerging political geographies of risk may have significant implications for local government as affected communities emerge within wider political units over time.

33. The above observation again emphasises the special nature of communities like West Cumbria in which there is a high level of local community support based on a long standing relationship with the nuclear industry and a wider social and political context within which to locate the risks they perceive as being associated with it.

34. Risk perceptions may also be addressed by the more careful use of language. In communities like West Cumbria, for example, risk perceptions use a lexicon of terminologies many of which are embedded in lay local discourses and culture. Beyond such localities nuclear risk communication is often much less successful as technical terms and terminologies are used in attempts to convey complex scientific terms and concepts. In short, in nuclear risk communication, science often fails to understand the public, in all its diversity and complexity and, as a consequence, the public are not given accessible means to understand science.

How does and should the Government work with the private sector to understand public perceptions of risk and address them?

35. Given the increasing globalisation of the nuclear sector, and the involvement of the private sector in the design, operation and siting of energy infrastructure facilities it is essential that Government work with industry to understand and address risk perceptions in localities. Of special importance will be the localisation of risk in the context of multinational consortia and the preservation of the special relationship with communities in the vicinity of existing nuclear facilities.

36. One of the problems at the national level may be traditionally lower levels of trust accorded to industry, especially non-local companies, in risk communications.

37. The nature of public sector policy is changing. Government is less dominant in policy design and implementation and is more involved with multinational companies. In policy partnerships in future infrastructure developments, Government are increasingly involved with private sector organisations and the financial sector. In these complex policy networks there will be a key role for Government to represent and articulate lay and locality risk perceptions especially in wider, global policy settings which may be detached from their local implementation.

How do risk perceptions and communication issues in the UK compare to those of other countries?

38. We believe that the same problems apply in other countries than those mentioned above. The issues are common across countries, though in many newly industrialising countries there is little experience with nuclear facilities, or technologies in the public domain—especially long-term relationships with nuclear facilities such as in West Cumbria.

39. With many new countries seeking to adopt nuclear energy without much public experience with nuclear issues, there is clearly scope for sharing of insights from more established countries like to UK—especially in the field of risk perceptions and its relationship with public opinion.

MEMBERS OF APSU AND THEIR INTERESTS

UCLan staff

Dr Graham Baldwin (ex officio Chairman of the APSU), Deputy Vice Chancellor (Academic) and Vice President of the University of Central Lancashire.

Professor Keith Faulks (ex officio Deputy Director of the APSU), Dean of the School of Education and Social Science at the University of Central Lancashire.

Lynne Livesey (ex officio Deputy Director of the APSU), Dean of the Lancashire Law School at the University of Central Lancashire.

Dr Rick Wylie (ex officio Executive Director of the APSU), Samuel Lindow Academic Director at the University of Central Lancashire's Westlakes Campus.

External Advisors of APSU

Professor John Fyfe, International Strategic Development Specialist.

Lord Roger Liddle, public policy specialist and Chair of Policy Network, the international progressive think tank.

Councillor Michael Heaslip, representing Workington St Johns Ward in Allerdale Borough Council.

Jamie Reed MP, Member of Parliament for the Copeland constituency.

Tony Cunningham MP, Member of Parliament for the Workington constituency.

John Thurso MP, Member of Parliament for the Caithness, Sutherland and Easter Ross constituency.

14 December 2011

Written evidence submitted by Sedgemoor District Council (Risk 15)

EXECUTIVE SUMMARY

1. The key points influencing risk perceptions are seen to be national media reporting and the influence of NGO's and pressure groups that take a specific position with regard to nuclear power.

2. In our experience local communities are more objective in their perception of risk. They perceive that there is a potentially high impact yet low likelihood of a catastrophic event at the power station. Whilst the issue of likelihood is acknowledged and understood by local communities to be low they are nonetheless aware of the unique and significantly high harmful impact if a catastrophic event were in fact to occur. Those implications are potentially significantly more harmful and different from the potential impacts of a catastrophic event in other forms of energy production.

3. The planning process for nuclear power infrastructure projects has no reasonable mechanism to deal with risk and the perception of risk for the communities affected. The issues of risk perception and tolerability have no outlet within this framework. Communities and those that represent them have no means of articulating or redressing these issues within the planning process. There is no arena for an objective and considered discussion of these issues or potential solutions.

4. The planning process as a regulatory function is the most easily engaged with and understood process for individuals and communities. The other technical regulatory processes for nuclear energy are less understood and more "expert" driven in a technical way. Communities are used to engaging through the planning process which touches in one way or another many people's lives. The failure of the planning process to allow for the objective consideration of the assessment of risk, its perception and tolerability, is a significant gap that undermines the creditability and "fitness for purpose" of the process.

5. The failure of current promoters of new nuclear development to agree a community benefit regime similar to that already in assistance for the renewable energy sector, undermines the confidence of the communities in relation to the risks associated with nuclear power stations. The availability of a negotiated community benefit fund for those local communities would increase the potential engagement of those communities in the wider consideration of risk and toleration of risks associated with nuclear power.

6. Risk to human health and wider environmental risk from a catastrophic event is not dealt with in the environmental impact assessment element of a planning application. The risk however low of adverse affects resulting from the exposure of radiation to the public or the environment is not considered.

7. The failure of the national policy statement on nuclear energy to address risk and perception of risk from the exposure to radiation is also a significant oversight that must be remedied before the new generation of nuclear power is developed. It is insufficient for this significant issue to be dealt with through the other more technical and less accessible regulatory regimes.

8. Both Local and Central Government fail to communicate adequately in regard to risk, perception of risk and tolerability. To undertake an objective consideration of such issues requires technical and expert support. Local Government is in a weak position with limited resources to support communities compared with well resourced Project Promoters such as EDF. Central Government has failed to support Local Government in their work to consider and support communities through a complex and technical process.

9. Communication from Government on the issue of risk has been weak or non-existent and the void is filled by NGO's and pressure groups who potentially have a single position of being against nuclear power per se. There are therefore inadequate resources for the communities to engage adequately in an objective and open minded manner.

10. Local authorities should act as a community resource for objective consideration of risk and tolerability of risk. Local authorities should be adequately resourced to even out the current inequalities of resources between those who promote new nuclear projects and the communities affected.

INTRODUCTION

1.1 Sedgemoor District Council is pleased to have the opportunity to submit written evidence to the Committee's inquiry on Risk Perception and Energy Infrastructure and welcomes the Committee's examination of this important issue. We would welcome an opportunity to give oral evidence to the Committee and are happy to provide additional information.

1.2 Sedgemoor District council is situated in the County of Somerset. The authority has a significant coastline along the Severn Estuary and is predominantly rural with its main town being Bridgwater. The District has good communication links along the M5.

1.3 It is proposed that Hinkley Point C (HPC) will be the first new generation nuclear power station built in Britain. The promoters EDF Energy have now submitted an application for a development consent order for a new nuclear power station which is currently before the Infrastructure Planning Commission.

1.4 West Somerset Council is the relevant local planning authority for HPC. The nature of the geography however means that the proposed new nuclear power station lies adjacent to a number of communities in Sedgemoor District Council, namely the village of Cannington and Bridgwater Town itself. The impact of the development and construction will be felt in the Sedgemoor District particularly as all communication routes will have to go through Sedgemoor and Bridgwater in order for construction to take place.

1.5 In order to progress the HPC development, West Somerset Council and Sedgemoor District Council with Somerset County Council have collaborated to set up a single team for the purposes of considering planning and other regulatory processes and impacts on the community. The Councils affected requested support from the Government in order to support local communities through the process and to provide an objective and reasoned set of representations to the IPC. This request was refused. The Councils have however been supported through the process by a planning performance agreement funded by the promoters of the project EDF Energy. This has permitted the authorities to commission support from appropriate technical experts to assist them in representing their communities.

EVIDENCE ON RISK ASSESSMENTS, COMMUNICATION PERCEPTION AND TOLERABILITY IN REGARD TO NEW NUCLEAR DEVELOPMENT

2.1 Communities adjacent to HPC have lived with the presence of nuclear energy production since 1957 when construction began. On site there is currently Hinkley Point A, which is being decommissioned and Hinkley Point B which is still producing energy. The communities are therefore accustomed to the presence of nuclear infrastructure, which has provided jobs for those living in the adjacent communities. The current nuclear power stations have had no serious or significant events that would exacerbate the issue of risk for local communities. In fact the continued safe operation of the current sites has done much to reassure local communities about the realistic levels of risk in living adjacent or close to a nuclear power station.

2.2 The perception of risk however remains for those communities as they are aware of the implications of a catastrophic event would potentially be more significant and detrimental than a similar event at a coal fired power station, for example. The distribution of iodine tablets to local communities for use in the event of a release of radioactive material acts as a constant reminder of the additional risks that exist for a nuclear power station. The events at Fukushima (and the ongoing repercussions) in addition to other historic problems at nuclear power stations have also impacted on the perception of risk.

2.3 It is also recognised through the local authorities emergency disaster processes, that the manner in which a catastrophic event at Hinkley Point would impact on communities and individuals is more significant and greater than those for other energy facilities. Whilst communities take comfort from the long period over which the current facilities have operated without incident, it merely has the effect of emphasising the low likelihood of the risk rather than minimising the impact of the seriousness should an event take place.

CURRENT PLANNING PROCESS

3.1 New nuclear infrastructure projects are required to be dealt with by the Infrastructure Planning Commission. An application for a DCO is currently before the IPC for HPC.

3.2 The planning process is one which is commonly understood and actively engaged in by individuals and communities. Of all the regulatory processes it is less technical than most and the one with which communities and individuals are most accustomed to engaging. It is important from a credibility point of view that the process is seen to be open and transparent and to take into consideration all relevant matters. In the normal

course of a planning application, PPS 23 “Planning and Pollution Control”, would ensure that considerations of impact, risk assessment, perception and tolerability were taken into account. PPS 23 Annex A sets out the matters for consideration when deciding individual planning applications. At the penultimate bullet point it cites the following as a relevant consideration in the planning process:

“the objective perception of unacceptable risk to health or safety of the public arising from the development”.

In these circumstances issues of risk and tolerability would potentially be a material consideration for the planning process.

3.3 The DCO process that has been instituted by the Planning Act 2008 requires the IPC to consider large infrastructure projects against the national planning statement issued by the Government. The recently issued national policy statement (NPS) on nuclear energy exhorts the IPC to consider applications based on the guidance contained therein. In dealing with risks to health, particularly in regard to releases of radioactive material, the NPS states the following at 3.12.11:

“The IPC should act on the basis that the risk of adverse effects resulting from exposure to radiation for workers, the public and the environment, will be adequately mitigated because of the need to satisfy the requirements of the UK’s strict legislative and regulatory regime as well as the ONR’s implementation of the government’s policy on demographics.”

3.4 Curiously this policy guidance suggests that the issues of risk and perception of risk in regard to exposure to radiation is one that is not appropriate for consideration within the planning process. Instead it is already one that has been resolved through other regulatory processes. This contrasts with the requirement in other areas, through PPS 23.

3.5 It is also evident that the issues of risk and perception of risk and their tolerability by local communities is not catered for within the environmental impact assessment regulations. In their scope they do not require the consideration of risk and perception of risk but are more concerned to deal with potential harm to people and the environment and how that should be mitigated or removed. This is dealt with in an extremely technical way, which has the effect of excluding the public and communities who do not have the resources or technical ability to challenge or engage in these areas. Whilst there is the requirement to produce a non-technical summary, the ability to challenge or make representations in regard to issues of risk require technical capacity if it is to be done in a reasoned, objective and relevant way.

3.6 This leads to support for communities being offered by NGO’s or pressure groups (many not themselves local) often with a single objective. In the case of those groups that are anti-nuclear, then the support and technical advice given to communities or individuals who may want to consider the issues of risk come in the main from that perspective. In terms of generating an objective and considered discussion, this does not assist and as the process does not address legitimate concerns on risk, then communities and individuals feel excluded and thus the process and final decision has diminished credibility. It is the view of Sedgemoor District Council that the consideration of risk and tolerability is best placed within the planning process as it is the process that is best understood and actively engaged in by communities and individuals. The placing of the consideration of risk and tolerability in the more technical and less familiar scientific processes of other regulatory considerations, does not adequately deal with legitimate community concerns.

3.7 This is exacerbated by the inadequate funding for local authorities to support communities and individuals in their consideration of technical matters. The key to objective consideration of risk and its ultimate tolerability lies in good communication and adequate engagement with communities and individuals in a technically complex area. The need for support for local authorities to ensure adequate technical resources are provided is key. Small Rural District Councils do not carry expertise in these areas and such expertise is both scarce and expensive.

3.8 The resources of all the Councils involved in Somerset have been dedicated to meeting the requirements of the processes set out by the Planning Act 2008 and the National Policy Statement which have by their effect excluded the issues of risk and tolerability. The limited funding provided by the developers through the PPA has meant that the authorities have had to choose to restrict their communications, considerations and engagement with communities to those issues that are directly relevant to the planning process. It has not allowed for a wider engagement and discussion or significant communication on the issues of risk, perception of risk and tolerability. This on the face of it is a significant gap in the process.

COMMUNICATION WITH COMMUNITIES AND INDIVIDUALS AND COMMUNITY BENEFIT

4.1 As with the issue of risk and tolerability of risk, the provision of community benefit is a matter that currently sits outside the planning process. Community benefit is the internationally accepted form of compensation paid to communities hosting large impactful infrastructure projects, particularly nuclear power stations. Payments are made from the developer’s and Energy providers into a fund that communities can access as they consider most beneficial to make the hosting of a new nuclear power station more tolerable. There are many examples of this approach internationally. Community benefit is paid in such diverse countries and USA, Japan, France, Italy, Spain as well as being in place for renewable and low carbon energy projects in the UK.

4.2 Currently community benefit, despite having been referred to once in the NPS has not been accepted by promoters of new nuclear infrastructure. There is an assertion that it may be perceived as “buying” planning consent. It seems to those authorities and communities affected by this, that there is no grounds for such a perception to arise. The decision as to whether infrastructure projects should be granted consent lies with an independent objective body the IPC and on to the Secretary of State.

4.3 Sedgemoor District Council’s view is that there would be an opportunity for a more rounded discussion about risk and tolerability of risk within the context of the provision of a community benefit fund. Whilst the planning process may provide for compensation through Section 106 Agreements for direct and indirect impacts arising from the construction and operation of the new nuclear facility, there are wider issues of impact and risk that do not fall within the planning process. In particular the perception of risk from a significant catastrophic event at a nuclear power station is one that is not covered by the planning process. Nor is the greater perception of risk created by the issue of iodine tablets to the local communities. It would not be dealt with by the Section 106 Agreement as the NPS has stated that the issue of human health and risk are matters for consideration in other regulatory formats where compensation and Section 106 Agreements have no place.

4.4 The acceptance by the Government and developers of the appropriateness of community benefit for communities hosting renewable energy projects has national acceptance. The potential impact on communities of new nuclear is both greater and more significant. The provision of community benefit would seem in these circumstances more appropriate and necessary. It could also be used appropriately as a catalyst for consideration of the wider issue of risk, perception of risk and tolerability for communities. In the absence of this there is no reasonable context in which such considerations can take place alongside wider issues of risk and impact of hosting a large infrastructure project that will benefit the nation.

4.5 The Councils in Somerset have accepted that the pursuit of community benefits lies outside of the planning process and have put in place lines of responsibility which respect this issue. However, it would seem completely appropriate to run a community benefit discussion parallel with the planning process so that risk and toleration of risk can be properly considered (along with other relevant issues). A swift move to a comprehensive agreement in this regard between government, local authorities and potential developers would have the benefit of settling this matter at an early stage.

4.6 In preference, however, it would be more appropriate to ensure that both the issues of risk, perception of risk and tolerability and payment of community benefit to communities affected by new nuclear power stations should be included within the planning process. Both these issues lie outside the consideration of the planning process currently. There is failure to communicate these issues with communities and no resources for local authorities to step in and take up these issues with those communities.

4.7 There is no reason why the Government through an amendment the NPS or through separate policy or advice could not ensure that the planning processes adequately deal with and considered risk, perception of risk and tolerability as well as appropriate direct funding to support communities affected. This could also be coupled with a proper consideration of community benefit for each project promoted through the planning process. Specifically permitting these areas to be included in the planning process would remove the alleged perception of “buying” planning permission.

4.8 This could be delivered by ensuring that community benefit is a matter for local negotiation and settlement *within* the planning process and a matter the IPC should ensure is adequately dealt with and provided for before considering any application before it. In any event as the IPC would not be a direct beneficiary of any community benefit they cannot be tainted in reaching their own independent and objective conclusion. This would ensure the transparency and openness in such a process if adopted.

14 December 2011

Written evidence submitted by Sense About Science (Risk 17)

1. INTRODUCTION

1.1 Sense About Science is a UK-registered charity (No 1101114) to equip people to make sense of science and evidence. We work with thousands of scientists and hundreds of groups across civil society to respond to questions and challenge misleading claims about evidence.

1.2 We are unable to address all of the questions posed by the committee. We particularly address questions 3, 4 and 6 put forward by the committee in their call for submissions.

2. Question 3. *How effectively does local and central Government communicate risk and could it be improved?*

2.1 The House of Commons Science and Technology committee report on “Scientific Advice, Risk and Evidence Based Policy Making”⁶ specifically provided recommendations on Risk Communication, the

⁶ House of Commons Science and Technology Select Committee, Seventh Report 2005–06, *Scientific Advice, Risk and Evidence Based Policy Making*, HC 900.

Precautionary Principle and a Common Language of Risk that could be useful across Government. We have found these recommendations to be of enduring relevance.

2.2 The recommendations included a pro-active approach to working with the media in this area and said that government guidance should encourage a more aggressive approach to correcting inaccuracies or misinterpretations in media coverage of risk. The way that risk is communicated can be compromised by government reactions to reports of events, both by adopting or changing policies as a knee-jerk response and in the way that the communication of risk is done.

2.3 We also need to consider what is happening at the European level, since EU decisions regarding risk management and the way that risks are communicated affect national perceptions. For example, the EU Physical Agents (EMF) Directive 2004/40/EC, which seeks to define safe levels for equipment operators' exposure to electromagnetic fields (EMF), puts limits on exposure for operating staff. In the Directive, European legislators adopted overly-cautious restrictions which would have had consequences for clinical magnetic resonance imaging (MRI). These might have been unintended, but threatened potentially disastrous limitations on the use of the technology despite there being no known harmful effects on staff exposed to low frequency EMF, such as is used in MRI systems. It was argued that adoption of precautionary, even unfounded, regulatory limits provides reassurance. In our experience, with radiation in particular, it is as likely to cause politicians, the media, campaign groups and thereby the public to conclude that this is evidence of danger. We can provide further information about the unintended consequences of precautionary measures on risk perception; some academic work in the UK, Germany and elsewhere has begun to look at this problem over the past four years.

3. Question 4. *To what extent can public perceptions be changed by improving risk communication? (please provide examples)*

3.1 At Sense About Science we monitor public debates, enquiries, science stories in the news, new science legislation and consultations. If we see an issue regularly occurring and find ourselves constantly fire-fighting, or if there are underlying assumptions that would be useful to the discussion, we address these through collaborative projects which respond to specific misconceptions. If there are areas in which public perception seems to be based on misinformation or misconceptions, we find it is helpful to start by addressing these directly instead of just setting out everything that we might know about the area.

3.2 In doing this and to be able to communicate about risk effectively we need to address uncertainty. Over the last two years, Sense About Science has seen an increase in questions from members of the public about the meaning of uncertainty and worries among scientists about its misinterpretation.

3.3 We have established a working group and will produce a guide early in 2012 to include the following points: Uncertainty is typically taken to mean "we don't know", when rather it is a statement of how confident we are. Uncertainty doesn't mean that anything goes, or that it is impossible to be certain of anything surrounding the issue under discussion. Rather, uncertainty shows that an investigation of the subject has been taken seriously.

3.4 Scientists should be able to talk about uncertainty without it being interpreted that every topic in a whole discipline is open to interpretation or that there is no consensus view.

4. Question 6. *How do risk perceptions and communication issues in the UK compare to those of other countries?*

4.1 This memo is concerned with the media reporting of the Tohoku Great Earthquake in Japan in March 2011 and reporting of the subsequent events at the Fukushima Daiichi nuclear plant.⁷ The earthquake and ensuing tsunami led to nearly 16,000 dead and over 3,000 people missing now presumed dead. Towns were sluiced away and there was extensive damage to food and water supplies, medical services, power and communications, affecting hundreds of thousands of inhabitants.

4.2 Following the Tohoku earthquake politicians focused on the events at the Fukushima Daiichi nuclear power plant and the prospect of losing control over the nuclear reactors there. On Tuesday 15 March, the EU Commissioner for Energy Günther Oettinger said: "There is talk of an apocalypse and I think the word is particularly well chosen. Practically everything is out of control. I cannot exclude the worst in the hours and days to come."

4.3 Whilst there clearly was a serious issue that needed addressing in Japan, it is doubtful that public clarity would be achieved by referring to the situation at the Fukushima plant as the "apocalypse". It seems unlikely to help people understand the situation in order to tackle and weigh-up the specific problems in a considered and measured way, which must be a priority when policy-makers and Governments communicate risk, rather than political point-scoring.

4.4 It is likely that the way the events at Fukushima were communicated in different countries and the reaction of policy makers in different countries also affected risk perceptions.

⁷ The media's coverage of the Tohoku earthquake and tsunami and the events at the Fukushima Daiichi nuclear plant will be the topic of a discussion session we have organised at the AAAS conference in February 2012.

4.5 According to the findings of the Global @dvisor Wave 20 (G@20), an Ipsos survey on *Global Citizen Reaction to the Fukushima Nuclear Plant Disaster* shows that three in five global citizens (62%) oppose the use of nuclear energy and that a quarter (26%) of those have been influenced by the recent nuclear disaster in Fukushima, Japan.

4.6 However the UK does not appear to reflect this. In his recent column “Learning the lessons of Fukushima”,⁸ Professor Nick Pidgeon refers to these results as well as tracking data from the Public Perceptions of Climate Change and Energy in Britain by Cardiff University. He argues that these results seem to indicate that “Fukushima has had little impact on overall UK public concern about nuclear power”, in contrast to the picture globally.

4.7 In Germany, Chancellor Angela Merkel announced on 15 March an immediate three-month closure of seven of the older nuclear power reactors in the country. This was just a few days after the tsunami affected the Fukushima Daiichi plant and appears to have been a knee-jerk reaction to the media coverage rather than any reassessment of the risk that these plants posed. In May, Merkel went on to announce that all nuclear power plants would close down by the end of 2022 based on the reporting of an “ethics committee” and following many public demonstrations against nuclear power. Germany also plans to significantly decrease carbon dioxide emissions but it has been estimated that these will increase—with an extra 300 million tonnes of carbon dioxide until 2020.⁹

5. DECLARATION OF INTERESTS

5.1 We have no competing interests to declare.

12 December 2011

Written evidence submitted by Professor Nick Pidgeon (Risk 21)

BACKGROUND

1. The Understanding Risk research group at the School of Psychology Cardiff University¹⁰ is a centre of expertise for the study of public risk perception, risk communication, and public engagement with science and technology. The work of our group is independent of stakeholders, and has been funded over the years through grants from academic sources including the Leverhulme Trust and the Research Councils (ESRC, EPSRC, NERC, USNSF).

2. We are currently conducting a major project (2011–12) under the UK Energy Research Centre (UKERC) programme, investigating public acceptability of whole energy system change to 2050—including all major elements of energy supply infrastructure (renewables, carbon capture and storage, and nuclear).

3. We have particular expertise in attitudes to nuclear power, having built up unique empirical data sets through studies of British public responses to nuclear energy, summarised as follows:

- Major nationally representative surveys conducted for us by Ipsos-Mori in 2002, 2005 and most recently 2010.
- Parallel qualitative studies (the earliest in 2002) of how the public talk about nuclear power in relation to climate change and energy security concerns.
- A major study from 2003–08 on “Living with Nuclear Risk” with residents living close to the Bradwell, Oldbury, and Hinkley Point power stations.

We are the only social sciences centre in the UK to have systematically studied British public attitudes to nuclear power, both empirically and theoretically, over the past 10 years.

KEY FACTORS INFLUENCING PUBLIC RISK PERCEPTION AND TOLERABILITY OF ENERGY INFRASTRUCTURE FACILITIES AND PROJECTS

4. Risk perception and risk communication research¹¹ is a well-established field of inquiry, dating back to work in the mid 1970’s.

5. A first general finding of this work is that it is a misnomer to talk of the public as a single undifferentiated entity. In reality many different “publics” exist in Britain as elsewhere—comprising a myriad of attitudinal positions, cultural diversity, interests and concerns regarding risks.

⁸ Pidgeon N, December 2011, *Learning the lessons of Fukushima*, People and Science, pg 20. <http://www.britishtscienceassociation.org/NR/rdonlyres/9223A350-74E4-4D11-B7C2-5DEA7D5548C6/0/peoplesciencedec11.pdf> [accessed 13 Dec 2011]

⁹ Deutsche Bank, 27 May 2011, *German Power: Getting Down to the Nuclear Core*, <http://www.endseurope.com/docs/110530c.pdf> [accessed 14 Dec 2011].

¹⁰ Details of the *Understanding Risk* research programme and a number of its key policy and survey reports may be found at www.understanding-risk.org

¹¹ See Royal Society (1992). Risk perception. Ch 5 of *Risk Analysis, Perception and Management: Report of a Royal Society Study Group*, London, The Royal Society.

6. A second clear finding is that—despite what is often assumed—concerns about risk do not stem from any simple deficit of knowledge about the science or an “ignorance” of what uncertainty and probability might mean (the so-called deficit model of science communication). There is now ample evidence to show, and the House of Lords “Science and Society” report of 2000¹² makes clear, that simply providing more knowledge does not automatically bring greater acceptability of a technology or risk issue. Rather, the relationship between greater knowledge and attitudes is complex: typically quality of argument improves as people gain more information, while views also become more polarized with stronger opinions voiced on all sides to a debate.

7. Research has shown that public concerns about technological and environmental risks are based upon a set of factors not ordinarily incorporated into traditional risk assessments. In particular:

- (a) *Qualitative characteristics* of the hazard: eg whether a risk is seen as uncontrollable and involuntarily imposed, the perceived catastrophic nature of “worse case” accidents, and perceived lack of knowledge about future impacts.
- (b) *Trust and concerns about risk governance*: in particular whether the responsible decision maker and/or regulation is competent, fair and caring; whether unintended consequences of complex and rapidly moving scientific enterprises will be controlled; and worries about the social commitments that a technology entails (eg the form of society and organisation required to keep a technology safe).
- (c) The *historical context* within which a hazard arises; eg links between civilian nuclear technology and its military uses, and the culture of secrecy.
- (d) *Media reporting*, often difficult to anticipate, which can at times attenuate, and at others amplify, a range of these “non-risk” aspects.¹³
- (e) The affective properties of a hazard—that is, whether it promotes a general feeling of insecurity or fear. It is now recognised that good decisions and reasoning processes require both “analytic” (appraisal of risks, benefits etc.) and “affective” components.¹⁴

8. *Recognition of the above cautions against relying solely upon communicating engineering concepts of risk (probabilities, damage estimates, expected fatalities etc.) when engaging people and communities, as these are unlikely to meet their actual concerns.*

9. What is also clear from four decades of research is that a technology with potential risk but also a *very clear and visible personal benefit* (eg personal benefits of energy use) will be more acceptable to people compared to one which does not have such a visible benefit. Equally, a risk is sometimes less acceptable where risks and benefits are inequitably distributed—eg benefits believed to go to others but the risks to ourselves.

PUBLIC PERCEPTIONS AND NUCLEAR ENERGY

10. Historically, many of the above factors have come into play in shaping perceptions of nuclear power. Concerns about catastrophic accidents (and associations with atomic weapons), the invisible and long-term nature of radiation, involuntariness of exposure, and strong negative affective associations. Regulation and management of nuclear power is also distrusted by many people, in part because of visible failures (TMI, Chernobyl) in the face of past reassurances of safety, but also because of secrecy and lack of accountability. Openness and transparency are now watchwords for regaining confidence.

11. In more recent times, but pre-Fukushima, opinion polling had indicated a significant reduction in opposition amongst the public in Britain,¹⁵ as compared to the very high levels of opposition (up to 80%) reached after the Chernobyl disaster. This in part reflected the arguments being advanced regarding nuclear power’s possible contribution to combating climate change and to delivery of future energy security, but also the fading collective memory of Chernobyl.

12. A closer look at the national data shows a more complex picture, however, with a large proportion of recent support remaining conditional—a “reluctant acceptance” at best.¹⁶ While many more in Britain have indeed come to support nuclear power over the past decade they do so while viewing it only as a “devil’s bargain”, a choice of last resort in the face of the threat of climate change.¹⁷ Given the choice individuals still show very clear preferences for renewable electricity generation.

13. Views become more complex at existing nuclear locations, many of which are being asked to host nuclear new-build. What we know here is that the response of people in such communities does not always

¹² House of Lords Committee on Science and Technology (2000) Report on *Science and Society*. HL Paper 38, February: Westminster.

¹³ Pidgeon, N F, Kasperson, R K and Slovic, P (2003). *The Social Amplification of Risk*. Cambridge, Cambridge University Press.

¹⁴ Loewenstein, G F, Weber, E U, Hsee, C K & Welch, N (2001). Risk as feelings. *Psychological Bulletin*, 127(2), 267–286.

¹⁵ Knight, R (2009). *Public Attitudes to the Nuclear Industry*. London: Ipsos MORI; see also Grove-White, R, Kearnes, M, Macnaughten, P, & Wynne, B (2006). Nuclear Futures: Assessing public attitudes to new nuclear power. *The Political Quarterly* 77 (2) 238–246.

¹⁶ Bickerstaff, K, Lorenzoni, I, Pidgeon, N F, Poortinga, W and Simmons, P (2008). Re-framing nuclear power in the UK energy debate: nuclear power, climate change mitigation and radioactive waste. *Public Understanding of Science*, 17, 145–169.

¹⁷ Pidgeon, N F, Lorenzoni, I and Poortinga, W (2008). Climate change or nuclear power—no thanks! A quantitative study of public perceptions and risk framing in Britain. *Global Environmental Change*, 18, 69–85; also Corner, A, Venables, D, Spence, A, Poortinga, W, Demski, C and Pidgeon, N F (2011). Nuclear power, climate change and energy security: exploring British public attitudes, *Energy Policy*, 39, 4823–4833.

mirror that obtained from national samples. A common assumption is that people in these locations will be overwhelmingly positive about nuclear power, because of long-standing experience with the local station and local economic benefits. While it is true that surveys conducted at such locations tend to be somewhat more positive about nuclear power in aggregate compared with samples living elsewhere, detailed research again suggests a more complex picture and the need to look beyond the headline statistics.

14. Geography certainly matters, as when a station contributes economically or in other ways to nearby communities, but not to others slightly further away who might also nevertheless perceive themselves to be at risk. The detailed history (for example of organised protest over the years) and socio-economic location (degree of dependence upon the station for local jobs) is also important in understanding local views. In this respect the existing UK nuclear sites vary enormously in social, economic and historical circumstance.

15. In our own interview research in 2004–07 at Oldbury and Bradwell, we found that many nearby local residents did express confidence in site activities. For most of the time people saw their existing local station as both a familiar and unremarkable feature of the locality, and confidence in plant activities had also built up over time. However, almost everybody we interviewed could also recount instances (news of the Chernobyl disaster, the London terrorist bombings, a friend being diagnosed with cancer) where the “extraordinary” risks of nuclear power, and with this very real personal anxieties, had been brought home to them in a powerful way.¹⁸ People at such locations also deploy various forms of humour and irony in their talk about nuclear power and its potential risks, in order to express uncertainties and anxieties which might otherwise be difficult to voice.¹⁹

16. Whatever their position on nuclear power, the vast majority of residents (84%) we surveyed in 2008 at Oldbury and Hinkley Point agreed that the industry and government should fully involve them in plans for siting new nuclear power stations locally.²⁰ Many also had concerns about radioactive waste (77%).

17. It is too early to reliably judge the full impacts of the Fukushima Disaster on public perceptions in the UK or internationally. Polling internationally has shown large declines in support in many countries (eg Germany, France, Japan). It is genuinely puzzling that in the UK (and the USA) there remain as many people in favour as are opposed to nuclear power in such polls.²¹ This may be due to Fukushima’s spatial distance, and/or because people here attribute the primary cause to an overwhelming natural disaster, or because climate change and energy security discourses remain important for British people. We do know, however, that accident risk is more salient now for people, and that there is also some evidence of a widening gender gap (women are more concerned) in attitudes to nuclear power. Detailed empirical work with identical survey items and methodologies replicating previous studies is now needed to provide robust answers to this important question.

18. The impacts of Fukushima on existing UK nuclear communities are likely to be even more complex. As argued above, anxieties always exist below the surface at such sites and external events such as Fukushima have the capability to bring them to the surface, and powerfully so, for many people. Communication, dialogue and engagement with such communities are all likely to become much more difficult—both practically and ethically—as a result.

19. While the current UK policy focus is on the existing nuclear sites, the upper end of potential expansion of UK nuclear power—to 40GW or more—would almost certainly require development at sites without any history of nuclear operations. It is my personal opinion that the Fukushima disaster has made such development almost impossible in the short-term. The social and governance implications of attempting to site in locations with no history of nuclear operations have received no attention to date, and yet some of the more ambitious nuclear scenarios appear to depend upon this.

20. It is worth noting here that there is now an extensive literature on local acceptability and siting of new energy facilities—some in relation to nuclear, but more recently drawing on detailed empirical studies of renewable energy siting.²² A clear conclusion is that the term NIMBY (Not In My Backyard) is an inaccurate description of the ways that such communities are responding when they raise questions about new developments that might affect them. It both marginalises and denigrates many legitimate local concerns, including: threats to local identity and community fabric; distrust of the motives of powerful outside organisations; concern about the degree local involvement and control; worries about disruption during construction activities, or despoliation of valued landscapes; alongside any potential risks and long-term uncertainties. Again, this work cautions against relying solely upon communicating (engineering) concepts of risk when engaging such communities.

¹⁸ Parkhill, K A, Pidgeon, N F, Henwood, K L, Simmons, P and Venables, D (2010). From the familiar to the extraordinary: local residents’ perceptions of risk when living with nuclear power in the UK. *Transactions of the Institute of British Geographers*, NS 35, 39–58.

¹⁹ Parkhill, K A Henwood, K L Pidgeon, N F Simmons, P (2011). Laughing it off? Humour, affect and emotion work in communities living with nuclear risk. *British Journal of Sociology*, 62(2), 324–346.

²⁰ Pidgeon, N F, Henwood, K L, Parkhill, K, Venables, D and Simmons, P (2008). Living with nuclear power in Britain: A mixed-methods study. Final Report. Cardiff University and University of East Anglia.

²¹ Butler, C, Parkhill, K A and Pidgeon, N F (2011). Nuclear power after Japan: the social dimensions. *Environment: Science and Policy for Sustainable Development*, 53(6), 3–14.

²² See eg Devine-Wright, P *Renewable Energy and the Public. From NIMBY to Participation*. London: Earthscan.

How are public risk perceptions taken into account in the planning process for energy infrastructure?

21. At the moment there is no legal obligation to take such perceptions into account in the planning process. However, in practice they can and do impact the outcomes of planning inquiries through the legitimate activities and representations made by interest groups. In extreme cases they can disrupt the planning process entirely, when developers are persuaded to withdraw plans in the face of what they believe to be concerted local opposition. Perceptions can be very real in their consequences!

22. The Health and Safety Executive has introduced the notion of “societal risk” to risk policy vocabulary²³—indicating risks which can lead to high numbers of fatalities in any one incident. They argue that there may be a case for stricter safety limits/investments applied at planning and elsewhere if the public are averse to such “scale” events (as compared to the equivalent number of fatalities occurring in individual accidents). However the evidence for such “scale-aversion” as defined by HSE is mixed.²⁴

23. One of the paradoxes of contemporary planning inquiry processes is that they exclude many of the legitimate issues that local people often want discussed. Can we trust the developers and regulators in what they are saying? Will local people have a degree of control over outcomes? Will this development lead on to further (possibly worse) developments in the future? What about any uncertainties that probabilistic risk assessments cannot estimate? For this reason, risk and safety can become vigorously contested domains, as the only potential vehicle to raise such issues.

How effectively does local and central Government communicate risk and could it be improved?

24. Currently there is no unified approach to risk communication either within central or local government in the UK. Efforts have tended to remain fragmented and tailored to the needs of individual Departments. For example, the Department of Health published useful guidelines on risk communication in 1997, including a “risk comparison” scale for placing risks in context.²⁵ The Health and Safety Executive have sponsored research on risk communication in the workplace,²⁶ and with respect to major accident hazards,²⁷ while in 2002 the Cabinet Office published general guidance for Departments on handling risk, including advice on communication.²⁸ The Treasury has also issued guidance on managing risks, including a “concern assessment framework” for gauging perceptions.²⁹ The Food Standards Agency—set up in the wake of the BSE debacle—were also proactive under their first Chairman Lord Krebs, especially in relation to risks where evidence was sparse or highly uncertain (their philosophy, generally regarded as successful, was to be as transparent and open as possible about uncertainties). I make suggestions to overcome this fragmentation at national level in Paras. 29–31 below.

25. An important issue here is to define what we mean by risk communication. Current thinking is that it should be oriented towards dialogue with people. The US National Research Council has defined risk communication as:

“an interactive process of exchange of information and opinion among individuals, groups and institutions. It involves multiple messages about the nature of risk and other messages, not strictly about risk, that express concerns, opinions, or reactions to risk messages or to legal and institutional arrangements for risk management” (National Research Council, 1989, p21).³⁰

26. Risk communication is now a very mature field of research, with the UK at the forefront of international activity in this field. The core lessons of this research are that:

- (a) To succeed such *communication should encompass a dialogue* rather than progress in a one-way (“expert” to “public”) fashion;
- (b) Given the right support and risk representations *people can grasp and deal with complex probability information*. Here, aids such as visual frequency displays or comparisons with other (qualitatively similar) risks can help, but all techniques have to be used with care and with reference to the evidence on their effectiveness;
- (c) While it is important to “get the numbers right”³¹ communicating risk is about far more than this—enabling trust, exploring divergent values of varied people, meeting concerns about uncertainty or governance arrangements etc. As such, the public should not be characterised as “irrational” in their responses to risk estimates when they are concerned about these other matters.

²³ Health and Safety Executive (2001). *Reducing Risks Protecting People*. HSE, London.

²⁴ Environmental Resources Management (2009). *Evidence or Otherwise of Scale Aversion; Public Reactions to Major Disasters*. ERM/HSE, London.

²⁵ Department of Health (1997) *Communicating Risks to the Public: Pointers to Good Practice*. London.

²⁶ Cox, P, Niewöhner, J, Pidgeon, N, Gerrard, S, Fischhoff, B and Riley, D (2003). The use of mental models in chemical risk protection: developing a generic workplace methodology. *Risk Analysis*, 23, 311–324.

²⁷ Irwin, A, Simmons, P, Walker, G (1999). Faulty environments and risk reasoning: the local understanding of industrial hazards. *Environment and Planning A* 31, 1311–26.

²⁸ Cabinet Office (2002). *Risk: Improving Government’s Capability to Handle Risk and Uncertainty*. Strategy Unit Report.

²⁹ H M Treasury (2005). *Managing Risks to the Public: Appraisal Guidance*. London.

³⁰ National Research Council (1989). *Improving Risk Communication*. Washington DC. Also Royal Society (1992) at footnote (2) above.

³¹ Fischhoff, B (1975). Risk perception and communication unplugged: 20 years of process. *Risk Analysis*, 15,137–145.

- (d) Above all there is a need to continually evaluate the impacts of communications as related to the original purpose of a communication programme. Such evaluation can range from simple measures of information transmission, to satisfaction with deliberative or participatory processes, to increased trust in decision makers.

27. Risk communication becomes particularly difficult when there is sparse or uncertain evidence (the “unknown-unknowns”). Under such circumstances the best advice is to be as open and transparent as possible about what is and what is not understood, how uncertainties might be resolved, and what precautionary measures might be adopted in the meantime.

28. Strategic capacity in risk communication is sorely lacking in the UK as elsewhere. Individual proposals for a risk information centre have been raised in the past (eg by the Hazards Forum) but there is no one entity in the UK dedicated to research, communication and policy support for risk.

29. In a paper this year in *Nature Climate Change* with Baruch Fischhoff of Carnegie Mellon University, completed before the events in Japan, we argued for a strategic approach to risk communications³² as applied to climate change. As this argument is a generic one, applicable to many complex, uncertain, and socially divisive risk issues, it applies equally to energy risk communications. *We argue that the proper goal of risk communication is in supporting decisions*—whether this be a government decision to proceed with a piece of infrastructure, or a local community debating the implications of this for them. What is communicated is then dictated by the requirements of the decision problem at hand.

30. A strategic approach to risk communication comprises two elements: (1) strategic listening—an approach which treats communication as a genuine dialogue, and seeks to thoroughly understand intended audiences and their decision needs prior to communication design; and (2) strategic organisation.

31. The range of skills needed for such an effort would include natural scientists, decision scientists, social scientists and communications specialists, through to programme designers and evaluators. It should aim to meet basic research needs in risk and uncertainly analysis, risk perception, and risk communication as well as immediate policy goals—in effect operating as a “boundary organisation” between academia and public policy.³³ It should be resourced so as to provide continuity of career progression for its scientists, alongside responsiveness to emerging risk communication needs. We suggest that good models for such an interdisciplinary boundary organisation might be the RAND Corporation (US), IIASA (Austria) or the Tyndall Centre (UK). If this seems challenging then we should not forget that risk communication has become central to a number of critical public policy issues, not just energy or climate change.

To what extent can public perceptions be changed by improving risk communication? (please provide examples)

32. In some more straightforward circumstances (such as health protection) we know that risk communication can work well if it focuses upon first understanding where a group holds key misunderstandings, or has gaps in knowledge, and targeting those with appropriate risk representations and messages.³⁴ If behaviour change is also the goal, such communications also need to be supplemented by information on what practically one can do to avoid the risk.

33. Where legitimate value conflicts exist (as with many questions of energy infrastructure) the issue of “changing” perceptions becomes more problematic. Here one can easily cross into areas that look (to the recipients of any communication) like propaganda. Under such circumstances people may reject a message and/or question the motives of the communicator. Again, this is why it is better to think of risk communication as a process of participation, dialogue and decision support rather than a simple one-way transfer of information to persuade.

How do risk perception and communication issues in the UK compare to those of other countries?

34. We know that the very *broad principles* of risk perception, communication, and the development of risk controversies are likely to operate in similar ways across different nations—at least in Europe and North America where much of the key research has been conducted. However, as has been stressed throughout, context does matter. Therefore *the details* of the ways different issues manifest can differ significantly by country. For example, high societal trust in technical expertise has been one reason why in France nuclear power has historically enjoyed greater levels of acceptance compared to in the UK (a situation which may now be changing). Remaining sensitive to such nuances of context is one of the key aims of “strategic listening” noted in Para. 30 above.

³² Pidgeon, N F and Fischhoff, B (2011). The role of social and decision sciences in communicating uncertain climate risks. *Nature Climate Change*, 1, 35–41.

³³ Guston, D H (2001). Boundary organizations in environmental policy and science: an introduction. *Sci. Tec. Hum. Values*, 26, 399–408.

³⁴ Fischhoff, B, Brewer, N T and Downs, J S (2011). *Communicating Risks and Benefits: An Evidence-Based Users Guide*. Food and Drug Administration of the US Department of Health and Human Services.

Interest Statement: I currently serve as a member of the Chief Scientist's Science Advisory Group (SAG) at the Department of Energy and Climate Change. The opinions here are, however, offered solely in relation to my professional academic position.

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