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Nuclear Futures: Assessing Public Attitudes to New Nuclear Power

A paper prepared for *Political Quarterly* by:

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Abstract

The nuclear debate has become once again a 'live' policy issue in UK national politics, with far-reaching implications for a diverse range of stakeholders. There is now a new policy rationale for the consideration of new-build nuclear power in the context of climate change and a low carbon economy.

In a rapidly evolving public policy context there is a strategic need for a clearer picture of public and community perceptions of nuclear power and wider community issues, and for examining whether such insight can be integrated into policy and decision-making processes.

The paper explores the state of public and community perceptions of nuclear power in Britain, at several levels, assessing potential factors likely to govern future responses to nuclear power.

Current 'Public Perceptions' of Nuclear Energy

Over the past year or so, a number of quantitative opinion surveys have sought to assess current UK public attitudes towards nuclear power.

Research by MORI on behalf of BNFL, British Energy and Nirex has suggested that public support for nuclear power is relatively low in comparison to that for other (renewable) energy technologies. Thus in December 2004, a MORI/BNFL poll found that just 28% of those surveyed responded positively to the question 'How favourable or unfavourable are your overall opinions or impressions of the nuclear industry/nuclear energy?'

Despite this low figure, successive recent MORI polls indicate public perceptions of nuclear power may be improvingⁱ. In July 2001, when asked the question 'How favourable or unfavourable are your overall opinions or impressions of the nuclear industry/nuclear energy?' 49% expressed 'unfavourable' impressions, compared with 19% recording 'favourable' impressions. By contrast, in December 2004, 26% expressed 'unfavourable' impressions, compared to 28% 'favourable' impressions. In addition, the percentage of people expressing opposition to 'the building of new nuclear power stations in Britain to replace those being phased out over the next few years' was noted as having fallen from 60% in July 2001, to 30% in December 2004. Knight suggests such results indicate that 'public support for nuclear now outweighs opposition in the UK for the first time in over five years'. Similar recent research published by Mori for EDF suggests that 'the public accepts, albeit reluctantly, that nuclear energy has a place in the overall energy balance (54% agree)', specifically in the context of the increasing emphasis on global warming and security of supply.ⁱⁱ

However, according to a May 2005 ICM poll for BBC, a rather lower percentage (21%) of respondents supported the proposition that nuclear represented 'the most feasible way of meeting the UK's future energy needs while reducing carbon dioxide'. This survey found that 52% of respondents considered it wrong for 'the government to consider nuclear power as an energy source for the future', compared to 39% who considered it right.

Similarly, a poll undertaken in July 2005 by Populus, for The Times newspaper, found that only 18% of respondents expressed a preference for building new nuclear power stations as a desirable means of meeting a projected shortfall in Britain's energy needs following the phasing-out of existing nuclear power stations, compared to 79% who favoured 'investing in (other) energy generating plants, particularly renewables'. The same poll reported that a majority (59%) of respondents felt closest to the statement 'nuclear waste problems remain and it would be irresponsible to build new nuclear power stations'.

A report by Wouter Poortinga and Nick Pidgeon for the Leverhulme Trust, reported on the results of a quantitative survey (carried out by MORI) covering perceptions of five key risk issues: climate change, radiation from mobile phones, radioactive waste, genetically modified food and genetic testing. The authors concluded that of the five risk issues, 'Radioactive waste is the most contentious risk case. ... About half of the respondents felt that Radioactive Waste was a "very bad thing"'. The authors also reported that in relation to questions of risk, 'the least trusted information sources were national government and the European Union' (p. 55).ⁱⁱⁱ

A report, carried out in September 2004, by the Laboratory for Energy and the Environment at MIT reported on a survey of attitudes towards energy and environmental issues. The survey suggested that 'nuclear energy continues to be confused as a greenhouse emitter and the technology attracts both strong support and opposition'.^{iv}

More generally, findings from a number of current quantitative opinion research surveys on UK energy options have been collated in a desk study carried out by the EPSRC on behalf of RCUK. This study reviewed over 30 recent surveys and opinion polls on public attitudes towards different energy generation options. Key findings included that:

Attitudes to future energy generation technologies are strongly in favour of renewable energy technologies. Around two thirds of the UK public is in favour of further investments in renewable energies (or wind energy in particular) as compared to one third or less for nuclear power. This relation is more or less stable over the last five years.^v

The same study reported that, although nuclear energy might contribute to a broad policy of reducing CO₂, 'for a majority in the UK negative aspects of nuclear such as waste disposal seem to outweigh this advantage'.^{vi}

Overall therefore, the message from recent public opinion research appears to be that public attitudes and opinion toward nuclear energy – as the primary way of meeting future energy needs – are currently broadly unfavourable. In raw terms, recent data suggest that only between 21-28% of respondents favour nuclear power.

It needs to be borne in mind that, as reported in a recent analysis, *What the Polls Tell Us*, during the period over which most of these polls were conducted, nuclear power as an issue has lacked 'saliency' for the public at large, in that people have been responding in a context where there has been little meaningful public or political focus on the issue.^{vii} Recent government statements about climate change and the associated need for fresh energy investments may be changing this – which could explain the signals that a minority of perceptions of nuclear power may have been moving in a somewhat more positive direction.

Assessing Pre-Existing Concerns

So far, this discussion of recent poll findings has focused principally on simple Yes/No responses towards nuclear power.

However, implicit in much of the same research has been an observable persistence of specific and long-standing public concerns *vis a vis* such issues as radioactive waste management, trustworthiness of government, industrial secrecy, and nuclear proliferation. Whilst some of the quantitative research suggests that 'new' factors – such as climate change, security of supply, and decommissioning – may play an important role in framing future responses, current perceptions appear to be influenced by pre-existing and latent understandings of both nuclear energy and the nuclear industry.

Thus both polls and quantitative research point to the continuing importance for many members of the public of long-standing concerns arising from previous historical experience:

1. Many people assess the merits of possible new nuclear station construction in the light of the unresolved issues of safe disposal of radioactive waste and secure decommissioning of existing facilities. Recurrently, satisfactory solutions to these issues emerge as preconditions for looking more favourably on any new nuclear proposals. Moreover, existing research has demonstrated a widespread perception that there may be 'no solution' to the radioactive waste issue;^{viii}
2. Public perceptions of new nuclear energy investment appear to be influenced strongly by widespread lack of trust in national and European governments and industry either to tell the truth or to take adequate responsibility, should something go wrong. ^{ix}

Alongside such ongoing concerns there is also some evidence of public appreciation of potential benefits of nuclear energy, including security of supply, cleaner air and reducing the emission of greenhouse gases. More favourable perceptions of nuclear energy appear to be contingent on there being a projected future *mix* of energy generation sources. Thus there appears to be some support for a continued role for nuclear energy in the context of a diverse mix of energy technologies, a finding which is not obvious in polls structured around a simple choice between nuclear *or* renewables *or* maintenance of status quo

Nevertheless, there is also *qualitative* research which tends to confirm the significance of longer-standing concerns for public attitudes. As part of the Government's *Energy Review* in 2002, the DTI commissioned a wide-ranging public and stakeholder consultation exercise. This included focus groups run by UK CEED, a set of community workshops run by the New Economics Foundation, and a web-based consultation process administered by Dialogue by Design.^x

This research found that members of the public consulted 'held wide-ranging views on nuclear power – from those who were completely opposed to its use, to those who supported it'^{xi}. It suggested that a portion of the opposition to nuclear power was based on principle, and was therefore unlikely to change. However, there appeared also to be a large body of opinion which was both concerned and yet undecided. There was some consensus that for this group certain key factors influenced judgements about the nuclear industry. Amongst these, the waste issue was seen as of critical importance, including a widely-held perception that there was currently no acceptable solution to its long-term secure management. On-going perceptions of the industry as inherently secretive also contributed to negative perceptions. Moreover, over and above such specific factors, a key finding of the deliberative research was the *highly conditional* nature of any possible shift in attitudes towards new nuclear investments. Thus:

The most controversial and complex element of the debates on energy mix concerned nuclear power: in all the processes there were strong views *for* (e.g. it is a low-carbon option) and *against* (e.g. safety concerns), and a large body of concerned but undecided opinion. Waste management was a dominant issue for all shades of opinion on nuclear power, with many people unable to envisage acceptable solutions to the problem of waste disposal. In the focus groups and workshops a *highly conditional view began to emerge*, with acknowledgement that nuclear power won't go away, alongside a reluctance to accept it except under very stringent conditions – for

example, rejecting new building until waste storage issues are dealt with more effectively. (emphasis added)^{xii}

In an important sense therefore, the quantitative and qualitative research findings considered above point strongly to an in-built *provisionality* in current UK public orientations towards nuclear power.

This framework, we suggest, can be expected to play an important role in shaping future public responses, as it has done in the past. Earlier experience of nuclear controversy suggests that such matters will help determine the all-important *social relations* associated with the technology, and hence the ways in which public attitudes towards it may evolve. How things develop from this point will depend on what happens next, in relation not only to the radioactive waste issue, but also to the development of *the particular political, institutional and industrial framework which UK nuclear power might be expected to develop*.

Before expanding on this point, comment must be made on the ways in which the very notion of ‘public perceptions’ tends to be conceptualised and represented within the UK policy community.

Conceptualising ‘Public Perceptions’

Official representations of public views and concerns about a particular technology as ‘perceptions’ convey the impression that they are somehow ‘soft’ and insubstantial, by comparison with more ‘real’ material dimensions such as safety, performance, economic viability, and environmental effects – all of which are held to be measurable in supposedly robust objective terms.

Such a tendency is misleading in at least two respects.

Firstly, it fosters the impression that public reactions are only coincidentally related to ‘the facts’ about the technology in question (facts which are supposedly represented definitively through the officially recognised, more material analytical categories). By contrast, the record suggests that on nuclear-related issues such as economic viability, the challenges of secure waste management, radiation uncertainties, and the commercial implications of prospective regulatory pressures, wider public understandings have in the past proved more realistic than many of those of the industry or government.

Secondly, it obscures the extent to which reactions by citizens may rest on a body of understanding of a technology *as experienced in the real world* on lines unrecognised by – and hence unrepresented in – supposedly objective official assessment processes.

There are echoes here of recent UK experience with GM crops: Throughout the early- and mid-1990s, the formalised scientific Risk Assessment procedures of the Advisory Committee on Releases to the Environment (ACRE) and other official bodies were asserted by government to be capturing all relevant – and hence legitimate – issues and concerns about GM crops. (Questions posed in quantitative opinion polls about GM issues over the same period tended to reflect similar categories of understanding.)

But in the event, these methods proved inadequate and misleading. Following political controversy in the late 1990s, a series of inquiries and reports by the Agriculture and Environment Biotechnology Commission (2001, 2003), the *GM Nation?* Steering Board (2003), the Prime Minister’s Strategy Unit

(2003) and the GM Science Panel (2003) revealed the central importance of a range of substantive social, economic and scientific disagreements and uncertainties associated with the technology lying beyond the purview of the official evaluation methods. Such disagreements and uncertainties had earlier been pictured officially as merely insubstantial ‘public perceptions’. They have since been incorporated as central to UK public policy on GM.^{xiii}

Wynne (2001) and others have argued that such processes of continuing official marginalisation of what proved subsequently to be valid and legitimate dimensions of concern have actively fed the public *mistrust* of government which constituted such an important element of the UK’s GM-related crisis of legitimacy in the late 1990s.^{xiv}

In the present context, this suggests that, in considering ‘public perceptions’ of nuclear power – and in particular, how these might be expected to develop - it is important to go behind official categories and understandings, to see what kinds of dynamics could be set in motion should a programme of new power stations become a serious likelihood.

Earlier Controversies and the ‘Social Constitution’ of Technologies

In the 1970s and 1980s, there was continuing public controversy surrounding civil nuclear power, in Britain and elsewhere.

On the one hand, these controversies focused on issues of safety, waste management, and economic viability. At a succession of public inquiries (Torness, Windscale/ Sellafield, Sizewell, Hinkley etc), there was protracted argument by NGOs and others about such matters.^{xv}

But beyond this, a range of further concerns in society at large were reflected in and through the civil nuclear issue, in a way that lifted it above other, more ‘conventional’ environmental disputes, crystallising in what some sociologists have termed a *social movement*. We have argued elsewhere that the particular social intensity of the arguments around nuclear power over the period 1973-1989 ‘reflected not simply ‘technical’ issues held to be legitimate by governments and scientists, but also *wider social relations in which the particular technology was embedded (indeed of which it was judged to be a reflection) at [its] particular historical moment*’ (emphases added).^{xvi}

What were these ‘social relations’, and in what ways could they be said to be distinctively ‘nuclear’ in character?

In the report, *Wising Up*, we coined the concept ‘*social constitutions*’ of new technologies to help explain this kind of issue.^{xvii} Different technologies bring with them distinctive patterns of relationship with society – through the demands of their particular industrial structures, their regulatory requirements, and their perceived social ‘externalities’. In short, they cement and reproduce their own distinctive patterns of *social relations*.

The human experience of these relations may lead technologies to be experienced quite differently, one from another, in the wider social world. To explore this, *Wising Up* contrasted *information technology (IT)* and *GM crops*, pointing to the inherently different ‘social constitutions’ of the two technological fields, to

throw light on the contrasting social receptions experienced by each - positive and relatively frictionless in the case of IT; sceptical and negative in the case of GM.

In assessing and comparing the different public responses, the study explored how people's views and concerns were influenced – beneath the radar, as it were – by routine experience and shared interpretations of a number of intersecting technical, social and institutional dynamics associated respectively with IT and GM. Key parameters of comparison included:

- openness and diversity of industry structure;
- social distribution of associated patterns of expertise;
- forms of consumer benefit and hazard potential;
- perceived retrievability in the event of crisis;
- degree of regulatory independence from the state; and
- extent of acknowledged uncertainties and ignorance.

In all of these instances, IT emerged as more flexible, unthreatening and diverse than GM.

Thus the suggestion is that public attitudes to the introduction of a new technology may be shaped importantly by people's experience and expectations of the social relations following from that technology's development and actualisation in the every-day world. Attitudes are influenced not only by evaluations of the technological option viewed as 'hardware', or by judgements about the technical properties, impacts or 'risks' of that option. They also embody responses to the ways in which the innovation is sensed to mesh with wider patterns of human interaction, value, agency, and even overall power distributions within society as a whole.

These social dimensions of technology are assuming ever-greater significance, as sustainable development priorities become increasingly important, and the economic and social costs of public backlashes (as in the GM case) become more evident.

Recent examinations of the contemporary 'science in society' nexus^{xviii} point to the political importance of such dynamics, as the potential scope and social purchase of new technologies – for example in the spheres of genomics or nanotechnology – becomes increasingly far-reaching. What is more, there is now a growing body of social experience of unanticipated consequences from technological innovation, feeding the public's capacity to engage in informed argument about such matters.

The 'Social Constitution' of Civil Nuclear Power

In the earlier developmental stages of civil nuclear power in Britain – extending from the 1950s to the late 1980s - it appeared to be in the nature of the technology that its effective implementation rested on a distinctive set of institutional and industrial arrangements. Four illustrations make the point:

1. the complex and extended nature of the nuclear fuel cycle required (and continues to require) exceptionally sustained commitment to costly and integrated national fuel fabrication and waste management infrastructures, in parallel with power station development;

2. its worst-case accident potentials led government to accept unique (and, for a commercial industry, privileged) liability burdens;
3. the distinctively toxic properties of its fuel components, and their sensitive relationship to nuclear proliferation, brought with them a need for unusually robust security arrangements – now updated in the Anti-Terrorism, Crime and Security Act: Part 8, ‘Security of Nuclear Industry’^{xix}; and
4. the particular capital intensity of its economic profile as an energy producer encouraged reliance on the concept of ‘series ordering’ of power stations – carrying the implication of reduced future opportunities for public objection at particular proposed power station sites – in the pursuit of necessary (but so far unachieved) economies of scale.

Features of these kinds led nuclear power to be understood by many in the 1970s and 1980s as an unusually *centralising, inflexible* and *security-sensitive* energy technology, over and above any more conventional environmental and economic concerns. Such issues lay behind much of the wider social resonance of the ‘anti-nuclear’ movement of that era at both national and local community levels. In other words, the ‘social constitution’ of civil nuclear power, quite as much as its more readily quantifiable dimensions and impacts, helped feed the troubled public attitudes surrounding it.^{xx}

This history has implications for an understanding of possible movements of public opinion in the circumstances of 2005, where, as suggested by the poll and survey findings cited above, such opinion appears to be at best ‘conditional’, from a predominantly negative starting point.

The question thus becomes: How might the social relations of civil nuclear power – its ‘social constitution’ – come to develop, as the issue takes on greater public ‘salience’ in the period immediately ahead?

Future Social Relations of Nuclear Power

On the face of it, much has changed in the nuclear industry since the 1980s. Privatisation, the liberalisation of energy markets world-wide, manifest economic weaknesses (with government economic bail-outs of Sellafield and British Energy), new reactor designs, and the emergence of climate change as a central issue for public policy world-wide – all of these have produced a radically changed context for new nuclear investment from that which prevailed in the previous era. The centralisation and inflexibility inherent in the industry of that period, which we suggest was formative in the development of public scepticism towards the technology, might be thought now to be a thing of the past.

But it is too early to say whether this will in fact prove the case.

In recent months, there have been significant signals. The Chief Executive of the Nuclear Industry Association (the industry’s spokesman), Keith Parker, has called on government to introduce substantial changes to the licensing and regulatory framework for nuclear power in the UK, if the energy policy potential of the technology is to be realised: ‘If measures were taken “to streamline some of the procedures at the beginning around licensing, regulation and the planning system”, then 10 new stations could be up and running in 10 years time’, Mr Parker is reported as having claimed in May 2005.^{xxi}

More recently, the same spokesman has called for four specific changes.^{xxii} On each of which we comment:

1. Changes to the UK's land use planning system, to 'reduce delays' arising from the public inquiry system.

Our Comment:

In 2002, the Government withdrew proposals for precisely such changes in its Green Paper, 'Major Infrastructure Projects: Delivering a Fundamental Change' (HMSO 2001b), following strong Parliamentary, NGO and other expert criticism concerning the restrictions on public rights of participation and objection at both parliamentary and local inquiry levels which such measures would have entailed .

2. Streamlining of generic licensing procedures for new reactor designs.

Our Comment:

Similar standardising proposals were advanced by the industry in the late 1970s, but rejected because of the importance of site-specific factors in licensing decisions for new reactor types in the UK.

3. Guarantees for a minimum price for nuclear electricity, to prevent it being rendered unprofitable should other means of generating power (arising, for example, from later technological innovation) turn out to be cheaper.

Our Comment:

Proposals for advance Treasury commitments of this kind to protect private investors over the 40-year lifetimes of specific plants would appear likely to attract major controversy.

4. Guaranteed series-ordering of nuclear stations to ensure economies of scale.

Our Comment:

Previous industry aspirations to series-ordering of nuclear stations, in 1973 and 1979, proved nugatory, because of the industry's own inability to meet its commitments. Implicit in such cumulative ordering patterns would be major constraints on established public inquiry procedures and on the potential for subsequent re-evaluations of the resulting policy commitments.

Taken collectively, such requests appear to represent an attempt to press government to create the conditions currently thought necessary by the industry, if effective new nuclear power programmes are to be possible in the UK.

However, what is striking is that, if achieved, the resulting measures would re-create very much the *centralised* and *inflexible* framework – and hence, we suggest, much the same 'social constitution' – which proved so publicly provocative in the very different political and economic circumstances of the 1970s and 1980s.

What is more, it seems reasonable to suppose that, even before such a stage were reached, attempts to put in place any one of the measures in question would give the nuclear issue major 'salience' for a variety of influential public and expert constituencies, presenting platforms for accumulating public controversy.

In considering the possible development of 'public perceptions' of nuclear power in the period ahead, there are thus reasons for believing the technology continues to be capable of igniting substantial opposition at both national and local levels, on issues to which wider opinion would be sensitive.

Whether or not this turns out to be the case seems likely to depend on the extent to which *other* factors could emerge to alter the social relations of the technology in more positive directions. Greatly increased openness and transparency about the economics of the industry, a convincing long-term solution to the nuclear waste issue, and the adoption of manifestly 'fail-safe' new reactor types without the associations of past ventures (if such can be demonstrated to exist), could conceivably alter the picture to bring about shifts in public responsiveness, particularly if coupled to conclusive demonstrations of cumulative CO₂-saving benefits.

A Coda on Sustainable Energy Policy

Given the present state of public opinion, as discussed above, the burden of proof now on the nuclear industry and its wider policy community appears to be high one.

Viewed from a sustainable development perspective, it seems important that the potentials for renewed public turbulence around the nuclear option – involving informed bodies of opinion with little interest in the technical merits of the nuclear energy option as much as those more directly engaged – should be given weight as a substantive factor for evaluation in the policy decision equation.

As suggested earlier in this paper, recent experience – in the GM case for instance – points to the danger of treating public attitudes and the factors shaping them as of secondary significance. Truly sustainable energy policies seem likely to benefit from going with the grain of wider public concerns, rather than from rubbing up against them.

Acknowledgements

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ⁱ Knight, R., 2005: What do the polls tell us. *Nuclear Engineering International*, April 2005, 24-25.

ⁱⁱ See: MORI, 2005: Energy Issues Research, 7 November 2005. <http://www.mori.com/polls/2005/edfenergy.shtml>; and Murray-Watson, A., 2005: Britons back new nuclear plants. *The Telegraph*, 6 November, 2005. <http://www.telegraph.co.uk/money/main.jhtml?xml=/money/2005/11/06/cnucl06.xml>.

ⁱⁱⁱ Poortinga, W. & Pidgeon, N., 2003: *Public Perceptions of Risk, Science and Governance: Main Findings of a British Survey of Five Risk Cases*. Centre for Environmental Risk, University of East Anglia, p.54-55.

^{iv} Curry, T., Reiner, D., de Figueiredo, M & Herzog, H. 2005: *A Survey of Public Attitudes towards Energy & Environment in Great Britain*. Laboratory For Energy and the Environment, MIT, Cambridge MA. <http://lfee.mit.edu/publications>. p. 18.

^v McGowan, F. & Sauter, R., 2005: *Public Opinion on Energy Research: A Desk Study for the Research Councils*. <http://www.epsrc.ac.uk/CMSWeb/Downloads/Other/EnergyAttitudesDeskStudySussex.pdf>, p.27.

^{vi} IBID, p.27.

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- vii Wiley, R. & Hague, R, 2003: 'What the Polls Tell Us' – paper to Nuclear Industry Association (NIA)/British Nuclear Energy Society Conference on 'Energy Choices 2003', London, NIA.
- viii See: DTI, 2002a: *Integrated Public and Stakeholder Consultation to inform the Energy White Paper*, http://www.dti.gov.uk/energy/developpep/int_public_and_stake_con_rep.pdf; DTI, 2002b: *Our Energy Future: Creating a Low Carbon Economy*. London, HMSO; and Stagl, S, forthcoming: Multicriteria evaluation and public participation: the case of UK energy policy. *Land Use Policy*.
- ix Poortinga & Pidgeon, IBID.
- x See DTI, 2002a; and 2002b; IBID
- xi DTI, 2002a, p.10.
- xii IBID, p. 22.
- xiii See: Defra, 2004: *Secretary of State Margaret Beckett's Statement on GM Policy*. www.defra.gov.uk/corporate/ministers/statements/m60940309.htm
- xiv Wynne, B., 2001: Creating public alienation: expert cultures of risk and ethics on GMOs. *Science as Culture*, 10(4), 445-481.
- xv See Wynne, B. 1982: *Rationality or Ritual*. Chalfont St Giles, Bucks, British Society for the History of Science; and O'Riordan, T, Kemp, R, & Purdue, M. 1988: *Sizewell B: an Anatomy of the Inquiry* London, Macmillan.
- xvi Grove-White, R, Kearnes, M, Miller, P, Macnaghten, P, Wilsdon J & Wynne B, 2004: *From Bio to Nano: Learning the Lessons, Interrogating the Comparison*. Working Paper. Lancaster, IEPPP.
- xvii Grove-White, R, Macnaghten, P & Wynne B, 2000: *Wising Up: The Public and New Technologies*. Lancaster, IEPPP.
- xviii See for example: HMSO, 2000: *Science and Society*. Report of the House of Lords Science and Technology Committee, London, HMSO; and Porritt, J. 2000: *Playing Safe: Science and the Environment*. London, Thames and Hudson.
- xix HMSO, 2001a: Anti-Terrorism, Crime and Security Act. London, HMSO.
- xx See: Hall, A. 1986: *Nuclear Politics: The History of Nuclear Power in Britain*. Harmondsworth, Penguin; and Wynne, B., Waterton, C., and Grove-White, R. 1993. *Public Perceptions and the Nuclear Industry in West Cumbria*. Lancaster: CSEC, Lancaster University
- xxi BBC, 2005: *Is Britain's Future Really Nuclear*. BBC News, May 16, 2005. <http://news.bbc.co.uk/1/hi/uk/4549313.stm>
- xxii In: Meek, J., 2005: Back to the future. *The Guardian*, 4 October 2005, G2, p. 8.