

## The PIA review 2001

The submission by academics associated with the Universities Nuclear Technology Forum

### Preamble

The Universities Nuclear Technology Forum (UNTF) is a voluntary group of which membership is open. It exists to provide an opportunity for discussion of developments in nuclear technology and research, with particular reference to research education, and has met annually for over 35 years with presentations by graduate students undergoing research training. This paper has been prepared by academic staff from a number of university engineering and science departments who have experience of nuclear technology stretching back over the whole period of commercial nuclear power in the United Kingdom. The group also includes the Nuclear Department of HMS Sultan, MoD. It includes university academics whose research is at the forefront of knowledge and whose work helps to underpin the current safe operation of nuclear power plant in the United Kingdom.

## **Introduction**

1. The Project Scoping note for the Energy Policy Review has set out the rationale:
  - the potential for increased conflict with environmental objectives
  - questions about the security and diversity of energy suppliers.

It further identifies the scope:

- to look at energy policy for Great Britain 2050
- to set out the objectives of energy policy
- to develop a strategy that ensures current policy commitments are consistent with longer-term goals.

We will comment briefly on matters relating to the Rationale and the Scope using as our point of reference the joint Royal Society and Royal Academy of Engineering study, 'Nuclear Energy, the future climate' which was published in 1999. However, academic activity is concerned with education and training, together with basic research aimed at underpinning the safe operation of nuclear plant in Britain. Issues concerning the viability and future development of these activities will therefore form the second part of the submission.

## **General Issues**

2. We recognise that nuclear power has made, and will make in the immediate future, substantial contributions to Britain meeting its targets for the control of greenhouse gas emissions. We concur with the joint Royal Society and Royal Academy of Engineering study (hereafter called the Joint Study) that neither the various renewable energy fuels, nor carbon sequestration, nor nuclear energy can individually be regarded as the answer to global environmental issues (that is replacement of fossil fuels and reduction of greenhouse warming). At the same time, it would be wrong to rule out any one of them as components of a strategy. This argument is reinforced by the risk of major fluctuations in oil prices and the expectation of future rises.
3. We consider that it is vital to keep the nuclear option open. Like the Joint Study, we have no reservations on the grounds of safety, given the present regulatory framework, and recognise no rational reason for seeking a retreat from its usage on these grounds. We do, however, recognise the problems associated with public acceptance of nuclear energy. While the public concern may not be well founded, the concern needs to be answered. It cannot be ignored.
4. We agree with the Joint Study that it would be a serious error to base taxation aimed at improving efficiency and removing the unfair disadvantage under which non-fossil fuel systems operate on energy rather than on carbon. Nuclear generation in Britain, as noted above, has already demonstrated the substantial role that it plays in reducing greenhouse gas emissions. The fact that nuclear generation has been subsidised the past initially to help ensure security and diversity of energy supply is not relevant when considering future actions.
5. We recognise that BNFL and British Energy are now international companies with significant capacity to export British knowledge and experience.

6. Maintaining a nuclear option will involve joining in international efforts to develop power systems, which combine, in better ways, economy in construction and operation with improved inherent safety. We consider that, along with appropriate research into all means of energy production, Britain should participate in these research programmes.
7. Disposal of radioactive waste remains, in the public mind, a significant difficulty. We support the House of Lords conclusion that there should ultimately be a Geological Repository in Britain capable of accommodating both intermediate level and high level radioactive wastes. The failure to win support for the proposed Rock Characterisation Laboratory was a substantial setback to the effort to provide conditioning, storage and disposal routes for the various categories of waste. Research and international collaboration directed towards geological disposal of intermediate level waste should continue. There should be proper exploration of what are felt to be good sites, and this will require government involvement.
8. Delayed geological disposal of intermediate level waste implies a longer period of storage prior to disposal, but we are of the opinion it is technically feasible to package and store this waste safely. The public needs to be aware that a safe process exists now.
9. While the present policy of incorporating reprocessed high-level waste into glass blocks (vitrification) allows safe storage and the return of waste to owner countries, it does not necessarily represent a complete solution<sup>2</sup> and we would support further research and international collaboration into the disposal of un-reprocessed fuel materials. In addition, we are aware of active research programmes in other European countries into novel means of destruction of high-level waste and surplus plutonium, and consider that Britain should make links with these programmes.
10. We agree with the Joint Study that developing and maintaining public confidence is central to maintaining a nuclear option within Britain's energy policy. We regard maintaining this option, bearing in mind the great importance of the issues and the uncertainty in and their resolution, as sufficiently important for the government to take a lead. This leadership should take a form of emphasising the excellent safety record of nuclear power and its potential role in a broad and robust solution to the energy supply in a proper environmental context.
11. Effective education and training needs to be maintained so that properly qualified staff are available. The universities have a role to play and the second section of this report deals with this role. We welcome the close interest being taken by HSEIDTI in this issue.
12. We concur with the Joint Study in recommending a formal presumption that a new nuclear plant may be required in the course of the next two decades, and that the timetable be aimed at avoiding an irreversible decline in the role of nuclear in electricity generation.

### **The role of the universities**

13. In a partially privatised industrial environment, the universities have demonstrated their ability to provide research services which, in earlier times, would have provided within industrial and government organisations. These services are often provided in association with specialist

consulting firms. This is in addition to fundamental research, which will allow Britain to take advantage of future developments in safety and efficiency. In addition, universities provide

independent members for expert committees, which help to ensure public confidence in key matters of public concern.

14. Examples of technical areas where universities provide research services and advice include: radiation protection and radioecology; nuclear design, operational efficiency and safety; quality assurance of equipment through reactor testing; nuclear criticality safety; structural mechanics and the behaviour of pressure envelopes and of graphite; fluid flow; computer control and software reliability; human reliability/psychology and risk assessment.
15. Universities will continue to have a leading role in pre-competitive research, not funded directly by the industry due to its fundamental, speculative long-term nature. Examples include software reliability, novel materials and electronics and innovative solutions to waste processing and remediation.
16. The provision of trained manpower for the industry has recently become a matter of concern both for the Regulator (the Health and Safety Executive) and for DTI and the industry itself. This need will exist irrespective of the degree of 'new build' in that extensive involvement of industry will still be needed in, for example, dealing with the waste legacy from earlier operations.
17. Industry has not, in the past, looked favourably on undergraduate courses in nuclear technology (apart from specific modules), preferring to take, say, good electrical, mechanical or chemical engineering graduates and give them appropriate specialist experience. Industry and the Regulator have recently supported one-year Masters courses. Such courses are appropriate for in-service training or for the intensive orientation of new graduates. Examples are the course at Birmingham in Reactor Technology and that in Radiation and Environmental Protection at the University of Surrey. However, the pool of academics pursuing nuclear power research and teaching is reducing, and this trend is set to continue while nuclear power remains an unfavoured option. Our current judgement is that universities could make a significant contribution to the provision of the specialist staff needed for a renewed nuclear power programme, if the financial incentives to graduates are sufficient, and the costs of universities in providing training are met fully.
18. The complementary role in training of the MoD should be recognised. The Nuclear Department, HMS Sultan, (which combines the previous department from the Royal Naval College, Greenwich, with the Nuclear Systems Group), provides some 50 courses to engineers and scientists etc associated with the Naval Nuclear Propulsion Programme. These cover the range of necessary disciplines -with the result that the pool of trained staff in Britain, including technical staff such as reactor operators, is enhanced.
19. Imperial College has maintained in operation the low power, research and training reactor 'CONSORT', which is used by several sets of Masters course students from other universities in experiments to familiarise them with the physics and engineering of reactor operation. As the only research and training reactor in Britain, this reactor could form a crucial national facility for future training programmes.

## References

Nuclear Energy, the future climate, Royal Society and the Royal Academy of Engineering, 1999

Management of Nuclear Waste, Select Committee of Science and Technology, House of Lords, 1999

## Academic Staff associated with this submission

Dr B. Axcell	University of Manchester
Dr H. Banford	Scottish Universities Research & Reactor Centre
Prof. P. Beeley	Nuclear Department, HMS Sultan, Gosport
Prof. D. Beynon	University of Birmingham
Dr C. Blyth	University of Birmingham
Dr L. Earwaker	University of Birmingham
S. Franklin	Imperial College Reactor Centre
Prof. A. Goddard*	Imperial College
Dr J. Hemingway	University of Liverpool
Prof D. Jackson	University of Manchester
Dr M. Joyce	University of Lancaster,
Prof I. P. Jones	University of Birmingham
Dr B. McEnaney	University of Bath
Dr B. More	University of Birmingham
Dr E. Morton	University of Surrey
Dr G. Neighbour	University of Hull
Prof J. Nelson	University of Birmingham
Dr C. de Oliveira	Imperial College
Dr D. Parker	University of Birmingham
Dr G. Parks	University of Cambridge
Dr K. Randle	University of Birmingham
Prof K. Ross	University of Salford
Dr M. Scott	University of Binnuigham
Prof. N. Spyrou;	University of Surrey
Prof. P. Thomas	City University
Dr D. Walton	University of Manchester! INucE
Dr D. Weaver	University of Birmingham
Dr R. Winterton	University of Birmingham

\* correspondent for this submission