

Research and Development within the Nuclear Industry

LEAD OFFICER: Steve Smith
REPORT AUTHOR: Denice Gallen

Summary and Recommendation:

The focus of this report is on whether the Government is doing enough to maintain and develop UK nuclear research and development (R&D) capabilities and the associated expertise to ensure that nuclear energy is a viable option for the future.

Recommendation:

That the contents of the report are noted and members consider what actions are needed to take this issue further.

1. Introduction

The House Of Lords Science and Technology Committee, under the Chairmanship of Lord Krebs, launched a short inquiry to investigate whether the UK's nuclear research and development (R&D) capabilities are sufficient to meet its future nuclear energy requirements to 2050.

The Committee invited evidence on a range of topics covering:

- *The implications of future scenarios*
- *The research base*
- *Competing in the global market*
- *Strategic oversight and co-ordination*
- *International and European research activities and comparisons*
- *Roles and responsibilities*

The Committee were also interested to hear about any other issues not already covered by the call for evidence that are relevant to the scope of the inquiry. A comprehensive overview of the scope of the inquiry is included as Appendix B – Research and Design Inquiry Questionnaire.

The consultation response on the inquiry closed in April of this year. The House of Lords Science and Technology Committee published its conclusions as a result of this inquiry earlier this month. (Appendix A – Nuclear Research and Development Capabilities, 3rd report on session 2010-2012)

2. Findings of the inquiry:

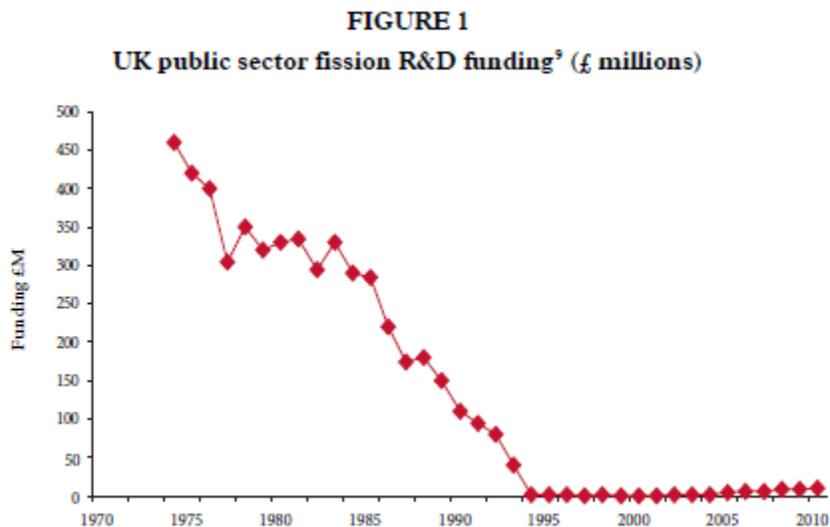
The focus of the inquiry was not on the arguments for or against nuclear energy; but on whether or not the Government is doing enough to maintain and develop UK nuclear research and development (R&D) capabilities, and the associated expertise to ensure that nuclear energy is a viable option for the future.

The report concluded that they are not.

They also found that the absence of leadership and strategic thinking in Government in this area has resulted in a lack of co-ordination of nuclear R&D activities and a perception amongst international partners that the UK is no longer a serious player in the field.

There is also a failure to recognise that although, at present, the UK has a number of strengths in nuclear R&D and expertise, those strengths are built on past investments and will soon be depleted as many experts near the end of their careers.

As figure 1 below illustrates there has been a rapid and severe decline in the research and development sector, especially since the privatisation of the industry.



Source: Nuclear research and Development Capabilities – 3rd Report on Session 2010 -12 Pg. 13

3. Recommendations as a result of the Findings:

The report found that there was an extraordinary discrepancy between the views of the Secretary of State and those of independent experts from academia, industry, nuclear agencies, the regulator and the Government's own advisers.

The Lords advised that *"a fundamental change in the Government's approach to nuclear R&D is needed now to address the complacency which permeates their vision of how the UK's energy needs will be met in the future."*

They made a number of recommendations for the Government to take action to ensure that this change takes place:

- The development of a **long-term strategy for nuclear energy**;
- The development, as part of that strategy, of a **nuclear R&D roadmap**;
- The establishment of **an independent Nuclear R&D Board**, made up of representatives from the Government, industry and academia, chaired by an independent, expert, authoritative Chairman.

These recommendations are intended to bring about high-level changes in the Government's approach to policy development for nuclear

Long-term strategy for nuclear energy

They recommended that the Government should set out a long-term strategy for nuclear energy, outlining:

- How they intend to keep the options open to ensure that, if required, nuclear can contribute more to the energy portfolio beyond the current plans for new build up to 2025; and
- How R&D capabilities and the associated expertise will be maintained to keep the different nuclear energy options open;
- How they intend to support the exploitation of the UK's strengths in the research base for the commercial benefit of the UK; and
- The role they envisage the UK playing in the global nuclear market over the period to 2050 and beyond. This should cover both the development of the supply chain for Generation III technologies and the UK's involvement in the development of new nuclear technologies in the future.

Road Map:

The roadmap will:

- Improve co-ordination of R&D and associated expertise and ensure that research on strategically important and vulnerable areas, such as Generation IV technologies and advanced fuel recycling and reprocessing, is covered within a national R&D nuclear programme;

- Ensure that the UK maintains a healthy research base to attract people into the field to maintain capabilities for the future;
- Provide clarity and attract potential international collaborators and
- Provide industry with sufficient clarity to encourage them to invest in R&D and associated expertise in the UK.

Research and Development Board:

A recommendation was made that the Government should establish a body with both advisory and executive functions.

The purpose of the Board would be to:

- Advise DECC on the development and implementation of the nuclear R&D roadmap and the Government's nuclear energy strategy;
- Monitor, and report on, progress by DECC with regard to the development and implementation of the roadmap and the strategy;
- Advise the Government, industry and academia on involving UK researchers in national and international collaborations and, where appropriate, facilitating such involvement;
- examine what mechanisms are needed to signal to the international research community that the UK is a credible and willing partner for international collaborations;
- Maintain a strategic overview of nuclear R&D (including research facilities) and related training, and where appropriate, facilitate the co-ordination of activities within the research community;
- Establish a clear link between fundamental and applied research through to commercial exploitation for the benefit of the UK;
- Identify R&D areas of strategic importance that are either missing or vulnerable and, where necessary, commission research to complement the current R&D activities; and
- Facilitate public engagement activities on the use of nuclear technologies

Impacts for Copeland

Within Copeland there is currently a pool of skilled and experienced people within the nuclear sector particularly decommissioning and reprocessing. However as this report has highlighted there has been a severe drop in funding in research and development since the privatisation of the industry, this is something that needs to be addressed urgently to sustain and grow our existing expertise in this sector.

The knowledge gap is ever widening as many experts near the end of their careers and further investment in the education and training of future generations is required.

The current expertise within the sector has been built on past experiences and if Cumbria and the UK are to remain market leaders in this sector we need to invest in research and

development facilities to ensure that we are at the cutting edge of technology and internationally competitive.

The development of West Cumbria as an area of excellence in education and training is in line with the vision outlined in the socio-economic blueprint for the area developed by Britain's Energy Coast (BEC).

The NDAs recent published strategy on the management of Oxide Fuels (see report elsewhere on agenda ref Oxide Fuels Strategy Development) looked at the future closure of THORP and investigated alternatives.

In that report they recognised the existing experienced and skilled people held within the area and the potential that these highly skilled people may be displaced if THORP closed as planned in 2018. In their report they state that keeping THORP open to retain the existing skilled workforce until future facilities are developed is not a credible option. NDA recommend that in order to ensure there is not a leakage of skills and a brain drain in the area that there is substantial investment in the research and development sector to ensure retention and future development in this and related nuclear sectors.

Copeland is ideally positioned to make the most of this potential new investment opportunity. With the existing and proposed nuclear industries in the area it is a strong candidate for hosting world class research and development facilities, if the government decide to invest in this sector.

4. Way Forward

There has been no direction given yet as to whether the government intends to implement any of the proposed recommendations put forward by the Lords, as a result of this inquiry, and if so how this will be delivered.

The findings from the call to evidence and the report published by the House of Lords has been critical of the governments investment in the research and development sector. Clear direction and actions have been given for the way forward.

Members are asked to consider what actions they wish to pursue in response to the House of Lords report.

5. List of Appendices –

Appendix A – Nuclear research and development Capacities

Appendix B – Research & design inquiry questionnaire

6.Consultees

Appendix A – Nuclear Research and Development Capabilities – 3rd Report on Session 2010 - 12

For full report click on link below:

<http://www.parliament.uk/business/committees/committees-a-z/lords-select/science-and-technology-committee/news/nuclear-report-press-notice/>

Government too complacent about Nuclear Energy Future, say Lords



22 November 2011

The Government is too complacent about the UK's nuclear research and development (R&D) capabilities, and associated expertise, which will be lost unless there is a fundamental change in the Government's approach. This is just one of the conclusions of the House of Lords Science and Technology Committee, which publishes its report today.

The Committee's key recommendations include:

- the development of a long-term strategy for nuclear energy looking beyond 2025, outlining support for R&D through an R&D Roadmap and for the commercial exploitation of the UK's current strengths in nuclear research. This is vital to ensure that the UK keeps the nuclear energy options open
- the establishment of an Nuclear R&D Board, made up of industry, academic and government partners, to develop and implement the R&D roadmap and help to improve the co-ordination of R&D activities to protect vulnerable areas of research and close gaps in capabilities

Committee Chairman, Lord Krebs, said:

"Many of the UK's experts in R&D on nuclear energy are nearing retirement age. The UK's expertise was built on past investments in research and a lack of investment over the last two decades means that the UK is now in danger of losing this expertise. As a result we are in danger of placing ourselves in a position where we will be unable to ensure a safe and secure supply of nuclear energy up to 2050.

Government have stated that nuclear energy will play an important role in the electricity supply in the future. If the Government are serious about this commitment, they must take steps now to ensure that there is a new generation of experts, together with R&D, on which the nuclear industry, Government and the regulator rely. Without action now, in our view, the Government's nuclear energy policy simply lacks credibility."

Appendix B – Research and Design Inquiry Questionnaire

SELECT COMMITTEE ON SCIENCE AND TECHNOLOGY Call for Evidence

Nuclear Research and Development Capabilities

Deadline for submissions: Thursday 28 April 2011

The Science and Technology Committee, under the Chairmanship of Lord Krebs, has launched a short inquiry to investigate whether the UK's nuclear research and development (R&D) capabilities are sufficient to meet its future nuclear energy requirements to 2050.

Background

The Government's finalised Energy National Policy Statements will be presented to Parliament for ratification in the spring and regulatory approval of nuclear reactor designs for new build plants is expected to be given later this year.

In recent months, a number of reports, including a report on nuclear fission by the Energy Research Partnership in September 2010, have highlighted the need for Government to look beyond current plans for nuclear new build and, looking ahead to 2050, to consider whether the UK satisfies the R&D requirements necessary to meet the country's demand for nuclear energy in the future.

A range of scenarios and roadmaps estimate that between 12 to 38 GW of nuclear capacity will be required if a secure, reliable and low carbon energy system is to be in place in the UK by 2050. Attempts have been made to assess the R&D capabilities that will be needed, now and in the future, to meet these future scenarios. Conclusions from this work indicate that, within the 2050 timeframe, deployment of a new generation of nuclear technology (Generation IV) is likely. If this is the case, a significant global R&D programme will be needed over the next few years to ensure successful delivery of Generation IV. Added to this, increasing demand for uranium, coupled with concerns about nuclear proliferation, will require consideration of the development of technologies associated with recycling of fuel and reprocessing plutonium. Assessment of the adequacy of the UK's nuclear R&D capabilities will need also therefore to include our being able to ensure a safe and secure supply of fuel and, when the time comes, its safe and secure disposal.

In these circumstances, the Committee has decided that it is timely to consider what role the UK should be playing in the coming years to develop these future technologies and what domestic R&D capabilities are needed to contribute to, and benefit from, international research programmes in order to meet our future nuclear energy needs.

The Committee decided to undertake this inquiry before the recent events in Japan concerning the Fukushima Daiichi nuclear plant. Consideration of health and safety R&D capabilities is inherent within the scope of this inquiry. These events confirm the importance of ensuring that

the UK has adequate R&D capabilities to meet current and potential future needs for nuclear energy safely and securely.

The Committee is aware that the UK's nuclear interests extend beyond the UK's borders to international non-proliferation and security policies. The Committee fully acknowledges the critical importance of these policy areas. However, for the purposes of this present inquiry, our intention is to focus principally on UK nuclear R&D and our ability to meet future nuclear energy requirements, touching on other related policy areas only where they have implications relevant to this inquiry topic.

Questions

The Committee invites evidence on the following questions. Submissions are not required to cover all questions. **The deadline for written evidence submissions is Thursday 28 April 2011.**

The implications of future scenarios

What are the research and capability requirements of nuclear energy policy options, roadmaps and scenarios up to 2050?

What consideration is the Government giving to the UK's R&D requirements to meet the policy objectives for nuclear energy both in the near term and longer term (to 2050)? Does more need to be done?

What research capabilities and commitments are required now to meet these future nuclear energy policies?

The research base

Does the UK have adequate R&D capabilities, including infrastructure, to meet its current and future needs for a safe and secure supply of nuclear energy?

Are there sufficient opportunities and avenues to conduct translational nuclear research in the UK to develop future technologies? Which bodies should be funding this work?

Competing in the global market

What are the research areas in which the UK is recognised internationally as having strengths?

What are the costs and benefits to the UK of a more or less active R&D capability within the country?

Strategic oversight and co-ordination

Is there sufficient co-ordination between the bodies involved in nuclear research and, if not, how should it be improved? Who has oversight of the whole nuclear R&D landscape, including international activities?

What role should the Government play in identifying gaps in research, providing oversight of the whole landscape and encouraging co-ordination between funders and deliverers? Are they fulfilling that role? Should more be done?

International and European research activities and comparisons

Should the UK be involved in international and European research activities on nuclear? If so, how and what are the benefits and costs of doing so?

What can the UK learn from how other countries presently organise and deliver R&D provision for nuclear? To what extent are other countries increasing or decreasing their research capacity in order to deliver future nuclear policies?

Roles and responsibilities

Are the bodies involved in funding research and setting research agendas adequately fulfilling their roles and responsibilities? Should anything change?

In particular:

what is the role of the Research Council's cross-council Energy Programme? Is it giving sufficient attention to the UK's current and future nuclear energy research requirements? Is the National Nuclear Laboratory fulfilling its R&D remit appropriately? Can it deliver the required research to support the UK's future nuclear energy policies? How does it compare to NNL's in other countries?

Is the Nuclear Decommissioning Authority's R&D remit still appropriate, given the UK's current and potential future nuclear policies?

The Committee would also be interested to hear about any other issues not already covered by this call for evidence that are relevant to the scope of the inquiry.

The Committee will hold public meetings from May 2011 and the Committee's report will be published later in 2011.

Submission instructions

Evidence should be submitted in an editable electronic form as a Microsoft Word document by email to: hlscience@parliament.uk. Please do not submit PDFs. If you do not have access to Microsoft Word or to the internet you may submit a paper copy to: Christine Salmon Percival, Clerk to the Science and Technology Committee, House of Lords, London SW1A 0PW, Fax: 0207 219 4931. The deadline for written evidence is Thursday 28 April 2011.

Please ensure that you include relevant contact details. Evidence should be attributed and dated, with a note of your name and position, and should state whether it is submitted on an individual or corporate basis.

Short submissions are preferred. Longer submissions (more than 6 pages) should include a one-page summary. Hard copy should be clearly printed or typed on single sides of A4 paper, unstapled. Paragraphs should be numbered.

Evidence should be prepared specifically for this inquiry. Witnesses are encouraged to focus on those issues of which they have particular knowledge or experience—submissions are not required to cover all questions.

Evidence becomes the property of the Committee, and may be printed, published electronically or circulated by the Committee at any stage. Written evidence will normally be published online and deposited in the Parliamentary Archives.

Once you have received acknowledgement that the evidence has been received, you may publicise or publish your evidence yourself, but in doing so you should indicate that it was prepared for the Committee. Parliamentary privilege will not apply to your own publication. If a submission is substantially the same as work that has already been published or disseminated for some other purpose, or is deemed not to be relevant to the inquiry, it will not be treated as formal evidence.

Personal contact details supplied to the Committee will be removed from evidence before publication and from the copy deposited in the Archives. However, personal contact details will be retained by the Committee Office and used for specific purposes relating to the Committee's work, for instance to seek additional information or to send copies of the Committee's report.

The Committee will invite some of those who submit written evidence to give oral evidence at Westminster. Transcripts of such evidence will be published.

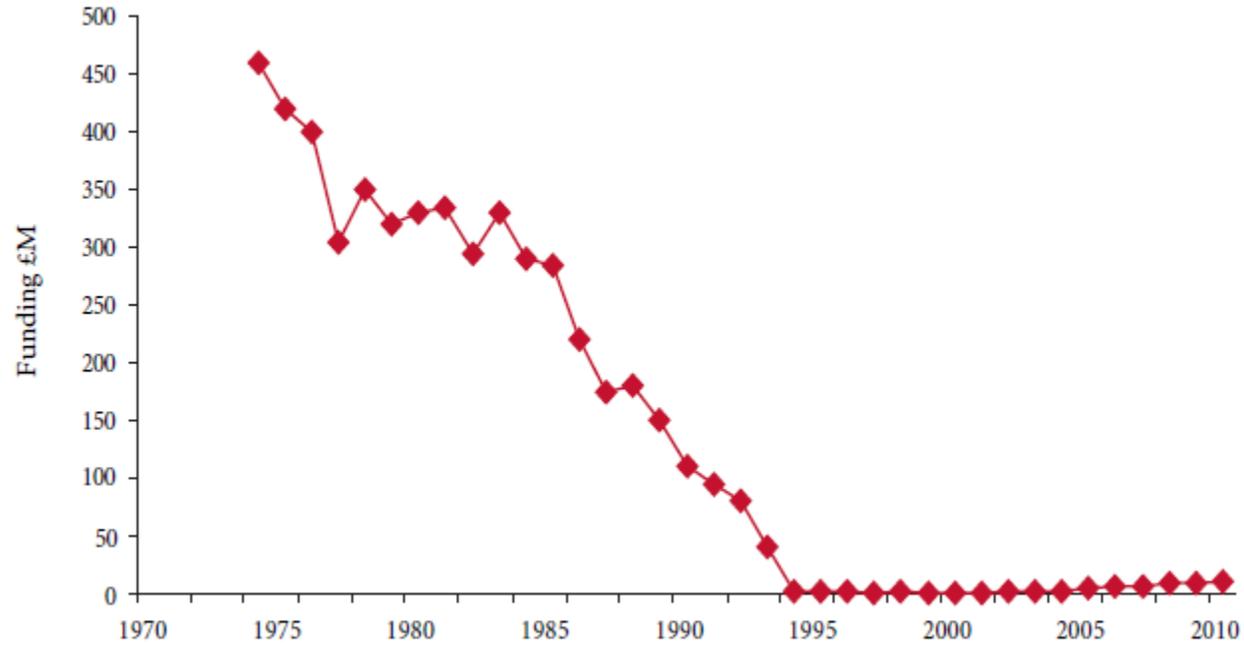
Substantive communications to the Committee about the inquiry should be addressed through the Clerk or the Chairman of the Committee, whether or not they are intended to constitute formal evidence to the Committee.

You can follow the progress of the inquiry via the Science and Technology Committee web pages, accessed from <http://www.parliament.uk/hlscience>.

Appendix B – Graph demonstrating the spend on R&D since 1970's

FIGURE 1

UK public sector fission R&D funding⁹ (£ millions)



Source: Nuclear Research and Development Capabilities 3rd Report on Session 2010 -12 pg. 13

Appendix C – Table Comparing the amount Other Countries invest in R & D

TABLE 1

Comparisons of government-funded research on energy and nuclear fission (figures for the latest available year²⁶⁾²⁷

| Country | Fission R&D (€M) | Total energy R&D (€M) | Fission R&D as proportion of total energy (%) | Date |
|----------------|------------------|-----------------------|---|------|
| Australia | 8.214 | 184.524 | 4.5 | 2007 |
| Belgium | 39.442 | 97.184 | 40.6 | 2007 |
| Canada | 140.444 | 531.408 | 26.4 | 2009 |
| Czech Republic | 12.779 | 36.556 | 35.0 | 2009 |
| Finland | 9.452 | 170.606 | 5.5 | 2008 |

Source: Nuclear Research and Development Capabilities 3rd Report on Session 2010 -12 Pg. 16

Appendix D

Annual Research Council spend on nuclear fission (£)⁴²

| 2000-01 | 2001-02 | 2002-03 | 2003-4 | 2004-5 | 2005-6 | 2006-7 | 2007-8 | 2008-9 | 2009-10 |
|---------|---------|---------|---------|---------|---------|-----------|-----------|-----------|-----------|
| 127,562 | 324,879 | 307,195 | 212,239 | 111,947 | 951,643 | 2,812,548 | 2,962,960 | 4,254,066 | 6,449,604 |

Source: Nuclear Research and Development Capabilities 3rd Report on Session 2010 -12 Pg. 21