

# Ad Hoc Nuclear Research and Development Advisory Board

Summary of the Recommendations and Work of the Board



# Introduction

In November 2011, the House of Lords Select Committee on Science and Technology published the report of their Inquiry into Nuclear Research and Development Capabilities in the UK<sup>1</sup>. The report recommended that Government produce a new long-term strategy for nuclear<sup>2</sup> energy in the UK and a nuclear R&D roadmap to underpin such a strategy. The report also recommended a new independent Nuclear R&D Board in the UK.

In February 2012, the Government's response to the Select Committee's report<sup>3</sup> accepted the need for a long-term strategy for nuclear energy and for an underpinning nuclear R&D roadmap. The Government also announced its decision to establish immediately an ad hoc Nuclear Research and Development Advisory Board (the Board) to assist with the production of these documents.

The Board was established in March 2012<sup>4</sup> under the Chairmanship of the Government's Chief Scientific Adviser, Sir John Beddington<sup>5</sup> and met seven times between March and December 2012<sup>6</sup>. The Board also created a number of Sub-Groups to look at individual issues in more detail<sup>7</sup>. This document summarises the work of the Board and, in particular, highlights its recommendations for the future.

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<sup>1</sup> <http://www.publications.parliament.uk/pa/ld201012/ldselect/ldsctech/221/221.pdf>

<sup>2</sup> For clarity, throughout this document, 'fission' and 'fusion' are used in specific reference to one or other technology only, while 'nuclear' is used in reference to both fission and fusion.

<sup>3</sup> <http://www.parliament.uk/documents/lords-committees/science-technology/NRDC/GovtResponseNuclear.pdf>

<sup>4</sup> Terms of Reference of the Advisory Board to be found at Annex A

<sup>5</sup> Membership of the Advisory Board to be found at Annex B

<sup>6</sup> List of meetings of the Advisory Board to be found at Annex C

<sup>7</sup> Five Sub-Groups were established: (i) academic and other R&D organisations; (ii) industrial; (iii) international; (iv) skills and (v) geological disposal.

# A long-term strategy for nuclear energy in the UK

The Board provided advice to the Department of Energy and Climate Change and the Department for Business, Innovation and Skills as the new long-term Government strategy for nuclear energy in the UK was developed.

The new strategy<sup>8</sup> makes clear Government's intent that nuclear power will continue to play an important role in the provision of base-load, low-carbon energy in the UK to 2050 and beyond. The strategy notes that, in the majority of future scenarios to 2050 envisaged in the Government's Carbon Plan<sup>9</sup>, nuclear fission will be called upon to play a greater role in the energy mix than it does today.

The Strategy is explicit in its expectation that a wide range of nuclear technologies may be required to meet the challenges of an expanded demand for nuclear power and that consequently the option to deploy these technologies in the UK must be kept open. The strategy recognises the crucial role of R&D in keeping these technological options open and the potential for the market to fail in this respect if public funds are not invested in a timely way.

## RECOMMENDATION 1

**The Board welcomes the clarity provided in the new “Government Strategy for Nuclear Power” and endorses the central conclusion of the Strategy with respect to R&D: that the potential to deploy a wide range of future nuclear energy technologies must be kept open.**

**The Board recommends that this central conclusion guides future decisions related to public support for nuclear R&D in the UK.**

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<sup>8</sup> Long-term Nuclear Energy Strategy - URN BIS/13/630  
<https://www.gov.uk/government/publications/long-term-nuclear-energy-strategy>

<sup>9</sup> <http://www.decc.gov.uk/assets/decc/11/tackling-climate-change/carbon-plan/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf>

# A long-term industrial vision for nuclear energy in the UK

The Industrial Sub-Group of the Board has worked with the Department for Business, Innovation and Skills to produce an “Industrial Vision Statement”<sup>10</sup> for the nuclear sector in the UK.

The Statement sets out a compelling vision for the nuclear sector. A vision in which the UK can regain international leadership in this area and where nuclear power contributes to long-term economic growth whilst providing a safe, reliable and affordable form of low-carbon electricity.

The vision highlights four areas of opportunity for future domestic and international success:

- **new nuclear build** – where excellence in the delivery of the UK’s new nuclear power stations could help secure a significant share of a very large international market for new build in the decades to come;
- **operations and maintenance** – where, in addition to providing service capability for domestic reactors, there is strong potential for UK industry to provide packaged life-cycle management solutions for future generations of reactors in the UK and overseas;
- **waste management and decommissioning** – where UK industry is becoming a global leader and could secure a significant share of high-value waste management and decommissioning contracts at home and overseas;
- **nuclear fuel cycle services** – where the UK could expand its international market share in current fuel supply and spent fuel management, and position its industry to exploit future opportunities in advanced fuel cycle technologies.

The Statement identifies the role that Government, working together with industry, needs to play if the vision is to be realised. That role is fourfold:

- to commit to the nuclear research, development and innovation programmes that will provide a strong commercial footing for the UK nuclear industry in the medium and long-term in both the domestic and global market place;

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<sup>10</sup> Nuclear Industrial Vision Statement - URN BIS/13/629 –  
<https://www.gov.uk/government/publications/nuclear-industrial-vision-statement>

- to establish a policy environment that ensures a strong, accessible domestic market for the UK nuclear industry;
- to promote the UK nuclear industry to overseas customers and to help that industry grow its share of the global marketplace;
- to work with industry to provide the required UK infrastructure solutions.

## **RECOMMENDATION 2**

**The Board recognises the importance of the nuclear industry to the UK's future economic well-being and the contribution it makes to high-value jobs. The Board supports the vision for both domestic and international commercial success set out in the Industrial Vision Statement and commends the four areas of opportunity highlighted for the future.**

**The Board recommends that Government invests further in research, development and innovation to facilitate commercial success in the specialist areas identified, that it establishes the required framework to work with industry on infrastructure issues, and that the strengths of UK commercial diplomacy are deployed fully in support of this sector.**

# A review of the UK's nuclear R&D capability

The Board has overseen a review of the UK's current nuclear R&D capability which provides a baseline against which decisions about the future scope and scale of support to this sector can be taken.

The Review<sup>11</sup> provides a detailed snap-shot of current policy, existing R&D strategies, the R&D funding system, capability in terms of both personnel and facilities and finally coordination and collaboration within the R&D system.

The Review concludes that the institutional landscape for nuclear R&D and associated funding programmes underpin an historic policy framework (pre-dating the 2008 White Paper) in which decommissioning, waste-management, existing reactor operations and fusion predominate. Funding for the nuclear R&D sector is much lower than many international competitors and negligible for research into future generations of fission reactors.

## RECOMMENDATION 3

**The Board recommends that, in recognition of the now clear UK policy in support of nuclear power as part of the low-carbon energy mix, the Government puts in place a new R&D programme which explicitly supports the potential deployment of future nuclear energy solutions in the UK through the creation of the necessary technology, facilities and skills.**

The Review concludes that coordination mechanisms, across the breadth of the nuclear R&D landscape, are limited in their scope, including at the level of Government and between different research funders. Coordination is important in this area given the wide range of policy drivers related to nuclear R&D (including energy policy, economic policy, foreign policy, trade policy, national security policy). The Review recognises the value of an integrated approach to R&D undertaken by

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<sup>11</sup> A Review of the Civil Nuclear R&D Landscape in the UK – URN BIS/13/631 – <https://www.gov.uk/government/publications/civil-nuclear-research-and-development-landscape-in-the-uk-a-review>

academia and the national laboratories, and its subsequent implementation by industry.

#### **RECOMMENDATION 4**

**The Board recommends that a coordinating group is established within Government, bringing together energy and other policy objectives (including economic) to maximise the potential benefits of nuclear R&D to the UK.**

**The Board recommends that a permanent nuclear research and development advisory board is created with a long-term mission, clear objectives and a dedicated, expert secretariat based outside of Government. The advisory board and its secretariat should monitor and report on implementation of the new R&D roadmap.**

The Review concludes that the future growth and international standing of the nuclear R&D sector in the UK could be jeopardised by the scarcity of irradiation sources and radioactive material handling facilities.

#### **RECOMMENDATION 5**

**The Board recommends that the Government negotiates on behalf of the research community in the UK to secure access to appropriate research facilities overseas.**

**The Board recommends that a national nuclear users' facility is established to facilitate wider (especially academic) access to existing material handling facilities and to provide appropriate samples to a wider range of R&D laboratories including UK universities.**

The Review concludes that nuclear fission R&D in the UK's national laboratory is concentrated on current reactor operations, waste management and decommissioning. These areas are crucial to the achievement of existing policy objectives and should not be reduced. Less emphasis is currently attached to forward-looking areas such as advanced reactor systems and associated fuel cycles and to developing essential capability for the future. Likewise, the academic sector, which has a considerable potential to undertake long-term R&D of strategic importance, is also focussed on legacy and current operations. In contrast, nuclear

fusion R&D is clearly focussed on the longer-term and is therefore able to manage future capability in a strategic way.

#### **RECOMMENDATION 6**

**The Board recommends that a balanced short-, medium- and longer-term mission for the National Nuclear Laboratory is developed, coupled with an enhanced remit to ensure both its responsiveness to the Government's nuclear policy aims and a greater collaborative effort with the academic and industrial sectors.**

The Review concludes that, although the benefits of international engagement are recognised in the UK, and a number of strong ad-hoc relationships exist between UK organisations and foreign counterparts, at present, there is no coordinated strategy for engagement with international nuclear R&D.

#### **RECOMMENDATION 7**

**The Board recommends that the advisory body referred to in Recommendation 4 should develop an international strategy for nuclear R&D with clear objectives for multilateral and bilateral relationships.**

**This strategy should include: a plan for optimal influence over/participation in the Euratom R&D programme; re-engagement with the Generation IV International Forum, exploring the potential for collaboration on small modular reactor development; and clear priorities at the country level (for example with the US, France, India, China and Japan).**

## A roadmap for nuclear R&D in the UK

The Board guided the development of a nuclear R&D roadmap for the UK, which aims to fill the gap between the current nuclear R&D landscape in the UK (from the Review) and the level of ambition for the future of nuclear power (from the long-term Strategy).

The Roadmap<sup>12</sup> recognises that the potential growth of the nuclear sector in the UK will not be driven by technology alone. A complex mix of Government policy, relative cost of nuclear power, market decisions and public opinion will influence the rate and direction of growth in the decades to come. As the long-term strategy points out, it is this level of unpredictability that obliges Government to keep a wide range of technological options open for the future and therefore to maintain an agile and flexible R&D capability.

The Roadmap uses a limited range of scenarios to 2050, with an upper expectation for the role of nuclear that is consistent with the high-nuclear scenario in the Carbon Plan<sup>13</sup>. It identifies key future decision points for these different scenarios and what data will be required to inform those decision points. Crucially, it also highlights a number of areas where action is required now to keep open specific nuclear options which might be required in one or more of the scenarios chosen.

The Roadmap does not advocate UK leadership in all technological areas. It does however argue that the minimum requirement is for the UK to be an intelligent customer and to provide effective regulation for all technologies that might be potentially deployed in the UK. It also highlights the potential economic advantages of moving beyond this minimum requirement and into commercially successful exploitation of UK expertise.

The Roadmap notes that advanced reactor systems (for example Generation IV reactors or small modular reactors) represent one set of technologies for the future, which many major nuclear nations expect to be important from the next to the middle decades of this century. The Roadmap identifies the immediate risks posed by a dwindling UK capability in this area and the potential for this route to be closed if mitigating steps are not taken.

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<sup>12</sup> Nuclear Energy Research and Development Roadmap: Future Pathways - URN BIS/13/632 - <https://www.gov.uk/government/publications/nuclear-energy-research-and-development-roadmap-future-pathways>

<sup>13</sup> <http://www.decc.gov.uk/assets/decc/11/tackling-climate-change/carbon-plan/3702-the-carbon-plan-delivering-our-low-carbon-future.pdf>

### **RECOMMENDATION 8**

**In the context of the new Nuclear Industry Skills Strategy and linked to Recommendation 3 above, the Board recommends that Government, with the help of industry and academia, puts in place a new R&D and skills programme which explicitly supports the deployment of future nuclear energy systems and associated fuel cycles in the UK.**

The Roadmap notes that UK scenarios which include ambitious demands for nuclear power, coupled with global growth of the sector, will put a strain on existing uranium supplies and increase the volumes of radioactive wastes that must be safely disposed of. Reprocessing of nuclear fuels may assume greater importance in such scenarios. The Roadmap highlights the ongoing need for skills and capability in this area.

### **RECOMMENDATION 9**

**The Board recommends that Government, with the help of industry and academia, puts in place a clear plan to retain, develop and attract the skills and capability necessary to keep open the option for future reprocessing of spent nuclear fuels. The Board notes the importance of the new Nuclear Industry Skills Strategy in this context.**

The Roadmap notes that UK scenarios that include ambitious demands for nuclear power, coupled with likely future decisions on the use of the UK's plutonium stockpile as a fuel, will create a potential demand for a wider range and a greater quantity of nuclear fuels in the future. The Roadmap highlights the ongoing need for skills and capability in this area.

### **RECOMMENDATION 10**

**The Board recommends that Government, with the help of industry and academia, puts in place a clear plan to retain, develop and attract the skills and capability necessary to keep open a range of options for future nuclear fuel production in the UK. The Board notes the importance of the new Nuclear Industry Skills Strategy in this context.**

The Roadmap notes that a credible programme to manage radioactive wastes, including geological disposal of higher-activity radioactive wastes, is a prerequisite for all future nuclear energy scenarios (including a scenario without nuclear power). The Roadmap also notes the importance of radioactive waste management and geological disposal to the public acceptability of ambitious future nuclear energy scenarios.

#### **RECOMMENDATION 11**

**The Board recommends that Government ensures that the development and regulatory scrutiny of the safety cases and the development of technologies supporting geological disposal are thoroughly underpinned by transparent, robust R&D which develops confidence among all stakeholders including the public.**

The Roadmap notes the potential for nuclear fusion power to be produced at scale in the second half of this century and the world-leading role that the UK is playing in the global development of nuclear fusion technologies and capability. The Roadmap highlights the potentially significant impact of these technologies and the economic benefits already flowing to the UK as result of its world-leading status. The Roadmap also points to potential areas of synergy in future fission and fusion programmes, both public and private.

#### **RECOMMENDATION 12**

**The Board recommends that the UK's world-leading position for nuclear fusion R&D is maintained with the support of Government.**

**The Board also recommends that Government acts to ensure that synergies between fusion and fission R&D are fully exploited for the benefit of both communities.**

# Annex A

## Nuclear Research and Development Advisory Board

### Terms of Reference

The Nuclear Research and Development Advisory Board is being established as part of the Government's response to the House of Lords Select Committee report on nuclear research and development capabilities. The Board is an ad hoc advisory body, created for a specific set of tasks and for a finite period of time.

#### **The Terms of Reference are as follows:**

1. To advise the Secretary of State for Energy and Climate Change and the Secretary of State for Business, Innovation and Skills on issues related to civil nuclear research and development in the UK.
2. To provide advice on, and peer-review of, research and development aspects of a new long-term nuclear energy strategy for the UK. The Government intends to publish this strategy in the summer of 2012.
3. To oversee a review of the civil nuclear R&D landscape in the UK, to be completed by the summer of 2012.
4. To guide the development of a UK civil nuclear R&D roadmap to underpin the implementation of a new long-term nuclear energy strategy. The Government intends to publish this roadmap before the end of 2012.
5. To provide input into the production of an industrial vision statement, setting out the potential role industry might play in the global civil nuclear market and how the UK research base can support that role.
6. To improve the strategic coordination of civil nuclear R&D in the UK.
7. To consider the opportunities to strengthen civil nuclear R&D for the UK through international engagement, both bilateral and multilateral.
8. The Board will also be given the opportunity to input to the overall long-term nuclear energy strategy, in particular to make recommendations for an optimal long-term advisory structure for nuclear R&D in the UK.

# Annex B

## Nuclear Research and Development Advisory Board

### Membership

**Sir John Beddington (Chairman)**  
Government Chief Scientific Adviser

Mr George Beveridge  
Deputy Managing Director, Sellafield Ltd

Professor Richard Clegg  
Global Nuclear Director, Lloyds Register

Professor Steve Cowley  
Chief Executive Officer, UK Atomic Energy Authority

Mr Stuart Crooks  
Chief Technology Officer, Nuclear Generation, EDF

Professor Robin Grimes  
Director, Imperial College Centre for Nuclear Engineering

Mr Norman Harrison  
Director, Strategic Development, Babcock International

Professor Paul Howarth  
Managing Director, National Nuclear Laboratory

Dame Sue Ion  
Fellow of the Royal Academy of Engineering

Professor Francis Livens  
Radiochemistry, University of Manchester

Mrs Jean Llewellyn OBE  
Chief Executive, National Skills Academy Nuclear

Professor Rebecca Lunn  
Engineering Geosciences, University of Strathclyde

Professor David MacKay  
Chief Scientific Adviser, DECC

Dr Graeme Nicholson  
Director, Science and Technology, AWE

**Mr Keith Parker**  
Chief Executive, Nuclear Industry Association

**Professor Richard Parker**  
Director of Research and Technology, Rolls-Royce

**Professor John Perkins**  
Chief Scientific Adviser, BIS

**Professor Nawal Prinja**  
Technical Director, AMEC Nuclear

**Professor Andrew Sherry**  
Director, Dalton Nuclear Institute, University of Manchester

**Dr Adrian Simper**  
Strategy Director, Nuclear Decommissioning Agency

**Dr Mike Weightman**  
HM Chief Inspector of Nuclear Installations

# Annex C

## Nuclear Research and Development Advisory Board

### Meetings

27 March 2012

24 April 2012

31 May 2012

17 July 2012

20 September 2012

7 November 2012

11 December 2012

All meetings were held in the Conference Centre at the Department for Business, Innovation and Skills, 1 Victoria Street, London, SW1.

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