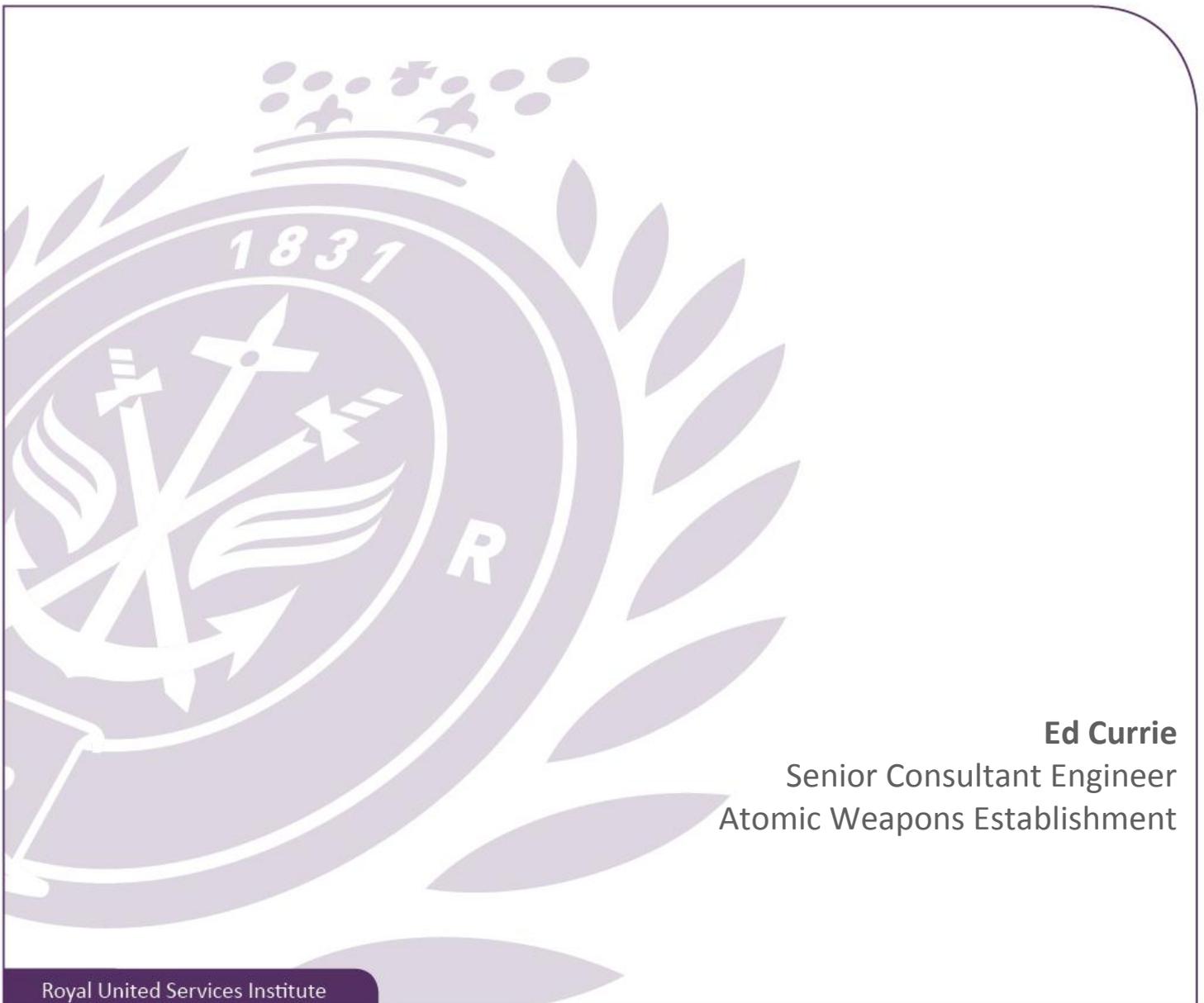


# Prospects for the UK Nuclear Enterprise

Presented to the 2013 UK PONI Annual Conference



**Ed Currie**  
Senior Consultant Engineer  
Atomic Weapons Establishment

## **Introduction**

The UK's nuclear industry has an unprecedented opportunity ahead. To grasp it, the UK needs strong national leadership, sector collaboration and alignment between programmes. Success will create a thriving national industry, valued in the UK and globally exportable. Failure could bring an energy crisis, failed national programmes and the collapse of an industry. Positive steps must therefore be taken now to ensure we realise the opportunity and maximise the benefit to the UK as a whole. This will only happen if through collaboration. This paper will, very briefly, touch on some aspects that influence the nuclear programmes of the UK, USA and France. It includes topics such as the emergence of shale gas, nuclear research and development funding, fundamental approaches to industrial strategies, support for nuclear education and international relationships.

## **The UK Nuclear Enterprise**

The UK's nuclear industry is unique, both in its national capabilities and its maturity. Until fairly recently the UK's nuclear industry was static – with the focus on the management of current assets, programmes and waste. During this period of stability the need to change the way in which we operate was limited. But as investment comes on stream and programmes mature, the UK need to revisit the way in which it works. Since 2000 the industry has changed - in both the defence and more recently the civil industry, significant investment is on the horizon and with it comes challenges but also great opportunities.

The UK Government has declared that it will modernise its nuclear deterrent. The 2006 White Paper and the 2010 Strategic Defence and Security Review are clear policy statements for its retention. Investment is supporting both the new naval reactor programme and the warhead programme. The successor submarine continues through the procurement process with significant investment in Rolls-Royce's Raynesway plant in Derby to design and manufacture the PWR3 reactor. Further investment in AWE continues under the Capability Sustainment Programme and the facility rebuild programme which has already delivered successful capabilities such as the Orion laser. Progress is also continuing on the replacement warhead assembly facility, Mensa, and on others agreed in the Teutates treaty between the UK and France, including the joint hydrodynamic research facility and the technology development centre. However, these programmes are in addition to the day-to-day operations of the Royal Navy, wider MoD, BAE Systems and Babcock, all of which will still require investment for many years. Moreover, transition between platform programmes will see a peak in demand for skills; for example when the Royal Navy crews two classes of ballistic submarine. Therefore, when the current investment projects come to an end, there will still be an enduring need for long-term investment to support skills and innovation.

In the civil nuclear industry, the UK has gone significantly further than stating national policy. The Departments of Energy and Climate Change, and Business, Innovation and Skills, jointly published a nuclear strategy in March this year. The comprehensive supporting documentation covered not only the industrial strategy, but also the long-term nuclear energy strategy, including an industrial vision statement, a research and development roadmap, and an economic benefit statement.

There is a contrast between the civil and defence sectors' approach to their strategies; while both have clearly policies, the government has gone further to define a strategy for delivery. Should there be greater collaboration between our two sectors, and how can the UK maximise benefit from the unprecedented opportunity presented by current and planned investment in the nuclear industry?

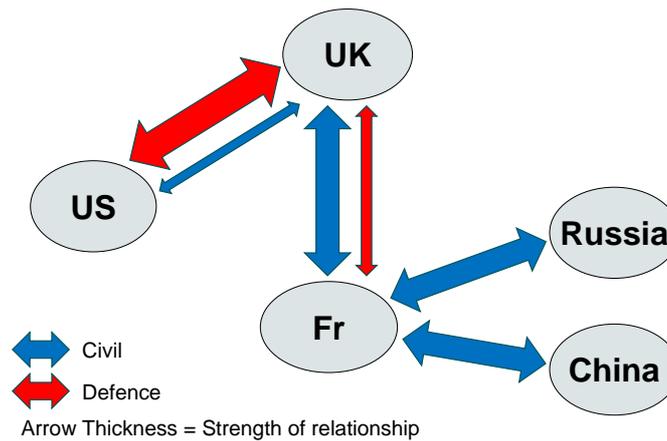
## **Nuclear Industrial Characteristics of the US and France**

There is a balance to be struck between investment by government and free-market economics, between the defence and civil sectors, and between R&D and programme delivery. These interfaces need to be managed. In France, the National Centre for Scientific Research (CNRS) is a public organisation in the 'Higher Education and Research Ministry'. The CNRS controls research institutes such as the National Institute of Nuclear and Particle Physics, - which works in partnership with the CEA - and its Military Applications Division (DAM). Within the CEA, the balance between civil and military is split 50/50 with a workforce of 4,500 in each.[1] The CEA has a long established approach to exploiting defence research for the civil programme and vice-versa. As long ago as 1973, for example, the CEA annual report discussed the need to 'adapt to taking advantage of the civilian programme to limit cost'. France seemingly has never divorced the civil and military nuclear programmes and their national labs are at the centre of the industry. Should the UK aspire to such a visible return on investment from our defence nuclear industry?

In the US, the picture is similar, with the Department of Energy (DOE) and the Battelle Institute both conducting publicly funded research. The DOE has funded university nuclear science, engineering and research education programmes which have bolstered the industry's workforce and mitigated workforce demographic problems. The number of undergraduates enrolling in nuclear-based courses has closely tracked the investment from the DOE.[2] The UK, at £66M, significantly lags behind civil R&D spending in the US, at £1bn, and France, at £700m, and our investment is far from its 1980's peak of £800M.[3] The intellectual property generated from government investment, be it civil or defence, must be exploited for the benefit of the country. France recognised this. The UK has established civil and defence nuclear R&D with the government changing its approach to managing the civil R&D organisations of the National Nuclear Laboratory and Nuclear Physics Laboratory.

The US and France have different approaches to sustaining their nuclear industries. France has continually invested in its civil and defence programmes – regularly bringing new defence systems or civil reactors into service; whereas the US has opted for life-extension programmes and stewardship of stockpiles. The long-term affordability of new nuclear energy in the US is dependent on gas prices and the success of shale gas extraction. The long term sustainability of these approaches will become apparent, through the skills base, future programmes, future investment requirements, et cetera. There is a warning, however. The French civil power generation programme has oversold itself and has struggled to keep pace with global demand for its expertise. The UK's approach is akin to the US; opting to life-extend major elements of its defence programme, and skipping a generation of civil power.

The UK has excellent nuclear relationships with both the US and France; we have a special relationship with the US on defence while our relationship with France is in research into civil power, and more recently, defence research. The UK involvement in the US and French programmes is very valuable but it also means we accept the features borne by their approaches.

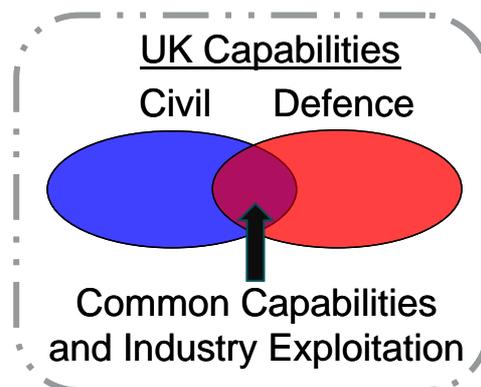


**Figure 1: International nuclear relationships.**

The basis of the UK nuclear relationships differ between the US (primarily defence) and France (primarily civil power generation). The French industry has sought to globally export its civil nuclear business

**Conclusion & Summary**

The UK is unique. It has been in the nuclear industry from the beginning and has the facilities and capabilities associated with all aspects of nuclear engineering. But it also has a mix of issues that affect the French and US programmes. This paper does not advocate copying the organisational structures of our close partners just for the sake of it. Organisations currently exist in the UK nuclear industry which can respond to the needs of the community. New models and new ways of working that might benefit the industry should be investigated. When looking at the lessons the UK, and others, have learnt, it is vital be open to looking at new models and ways of working, and be responsive and flexible enough to react. The nuclear community in the UK is fragmented and although it is unlikely, or undesirable, to create a completely integrated enterprise, the UK must do more to remove the barriers for internal collaboration and exploitation of investment, as our international partners have done.



**Figure 2: Common Nuclear Capabilities**

There are common capabilities that are replicated in both the civil and defence sectors. Collaboration in these areas will deliver enhanced value for money while allowing the effective delivery of challenging government policies.

Problems created by inaction can be avoided only if government, industry and academia work together. Investment will be required from all to support growth in education, skills and R&D. The problem cannot be looked at from individual vantage points: the issues the industry face cannot be solved locally– it can only be done as an enterprise. Take for example the nuclear regulatory community which is vital to the success of the industry as a whole; experienced and qualified people must be available as needed - requiring centrally-driven investments of time and resources.

The opportunity for the UK nuclear industry has been well recognised – especially in the civil sector. So, too, have the challenges. This is not a nuclear power generation problem, or a civil R&D problem, or a defence waste problem, or a personnel problem, or a facility new-build problem, or a nuclear security problem, or an organisational structure problem, or an investment problem – it’s all of these. To realise the full opportunity, and to succeed with our nuclear programmes, it will take strong central leadership, with all parts of the enterprise adopting a role and collaborating. Only then will the nuclear dream become a reality.

## References

- [1] Mycle Schneider, *Nuclear France Abroad: History, Status and Prospects of French Nuclear Activities in Foreign Countries*, May 2009. <http://www.nirs.org/nukerelapse/background/090502mschneidernukefrance.pdf> Accessed: 28/05/13
- [2] American Physical Society, ‘Readiness of the U/S Nuclear Workforce for 21<sup>st</sup> Century Challenges’, *Physics & Society*, January 2009. <http://www.aps.org/units/fps/newsletters/200901/mtingwa.cfm> Accessed: 28/06/13
- [3] Department of Business, Innovation and Skills, *A Review of the Civil Nuclear R&D Landscape in the UK*, BIS/13/631, 2013. [https://www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/168039/13-631-a-review-of-the-civil-nuclear-r-and-d-landscape-review.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/168039/13-631-a-review-of-the-civil-nuclear-r-and-d-landscape-review.pdf) Accessed: 28/06/13

**Disclaimer:** This paper is the work of the author, and all opinions expressed are his own and do not necessarily represent those of RUSI, UK PONI or any associated organisation or its stakeholder.

## About the Royal United Services Institute

The Royal United Services Institute is an independent think tank engaged in cutting edge defence and security research. A unique institution, founded in 1831 by the Duke of Wellington, RUSI embodies nearly two centuries of forward thinking, free discussion and careful reflection on defence and security matters.

RUSI provides corporate and individual membership packages offering exclusive access to the UK's premier forum on defence and security. Through our publications and events, RUSI members benefit from authoritative analysis, insight and networks. RUSI is renowned for its specialist coverage of defence and security issues in the broadest sense. Our expertise has been utilised by governments, parliament and other key stakeholders.

RUSI is a British institution, but operates with an international perspective. Satellite offices in Doha and Washington, DC reinforce our global reach. We have amassed over the years an outstanding reputation for quality and objectivity. Our heritage, and location at the heart of Whitehall, together with our range of contact both inside and outside government, give RUSI a unique insight and authority.

## About the UK Project on Nuclear Issues (UK PONI)

UK PONI was established in 2010 as a cross-generational forum dedicated to fostering dialogue and building expertise amongst emerging nuclear scholars.

The issues surrounding nuclear weapons and nuclear energy are complex and multifaceted, requiring a broad understanding of everything from technical intricacies to developments in International security. Changes to the shape, size and function of the world's nuclear arsenals, have the potential to profoundly affect global dynamics. Developments in civilian nuclear energy will similarly influence the form and direction of international non-proliferation efforts. These trends will ensure that nuclear issues continue to be at the top of the defence and security policy agenda. Yet despite the continuing importance of nuclear issues, there is little evidence that sufficient expertise is being grown to sustain those with expertise in the field.

Aiming to redress this, UK PONI was established as a cross-generational forum allowing young nuclear scholars to engage with established experts on a wide variety of contemporary issues. As part of the US PONI network founded by the Center for Strategic and International Studies (CSIS) nine years ago, UK PONI aims to promote the study of nuclear issues with a European focus. Accordingly, UK PONI holds an annual conference, as well as small events throughout the year. It also sponsors young delegates to attend conferences elsewhere, and aims to facilitate a global network of emerging nuclear specialists.

### Key contacts for the UK Project on Nuclear Issues (UK PONI):

**David Jarvis CBE**, Director of UK PONI

E: [davidj@rusi.org](mailto:davidj@rusi.org)

**Andrea Berger**, Deputy Director of UK PONI

E: [andreab@rusi.org](mailto:andreab@rusi.org) T: +44 (0)20 7747 2630

**Hugh Chalmers**, Programme Coordinator for UK PONI

E: [HughC@rusi.org](mailto:HughC@rusi.org) T: +44 (0)20 7747 4966