



BEIS Industrial Strategy - Nuclear Institute Response

Our priorities are UK nuclear energy, technology development, use of digital, waste management and UK skills.

The Nuclear Institute

The Nuclear Institute (NI) welcomes this opportunity to respond to BEIS Industrial Strategy. This submission is supported by our professional members through the work of their Special Interest Groups.

The NI is a charity registered in England. Its objectives relate to:

- a. the advancement of education relating to nuclear energy;
- b. the advancement of nuclear science, engineering and technology;
- c. in the interests of public safety, the promotion of high standards of education and professional performance amongst those engineers, scientists and others working within the nuclear industry;
- d. the promotion of the public understanding of nuclear sciences and the impact on society and the environment.

It is also a professional and learned body with over 2000 individual members, made up of engineers, scientists, other professionals and a number of individuals who have an interest in the NI's objectives. The NI is licensed by the Engineering and Science Councils to register qualified members as Chartered Engineers and Chartered Scientists.

The NI is not a trade association and does not directly take account of "corporate member" views, instead relying on individual members' views and organised group discussions to come to an independent position on each of the themes presented.

How we have presented our response

Where appropriate we have used the government's consultation questions as a guide to our answers. However as a number of the topics have specific issues around them we were keen to reflect these issues in more detailed responses that did not always fall clearly within one or more questions. For this reason parts of our response are more narrative in format.

In order to collate this information we have drawn on a number of sources including previous responses on the topic of small modular reactors, our Education and Training Committee views and our Special Interest Groups on the topics of Radioactive Waste¹ and BIM-Digital.

¹ The Radioactive Waste Management (RadWaste) Special Interest Group (SIG) is a committee led under the governance of the Nuclear Institute (NI). The principal purpose of the RadWaste SIG is to highlight the importance of radioactive waste management to the UK, so to encourage improvements in performance and resilience, and to maximise opportunities for growth. The outputs of this group will encourage collaboration and sharing between industry sectors of good practice in radioactive waste management, promote a better understanding of the capabilities that exist in the UK and help ensure that the industry remains able to attract and retain a skilled workforce as well as making best use of opportunities for growth both domestically and internationally.

1. NUCLEAR SECTOR THEME - SMALL MODULAR REACTORS

1.1 SMRs - Position Summary

Within the nuclear power production sector, we currently have no indigenous UK nuclear power plant owner/operators, we no longer have a UK reactor design authority and we no longer have a manufacturing capability for high value reactor components. What we do have is a strong legacy position in regulatory and licensing areas, safety case, environmental permitting and liabilities management, all of which are knowledge based and many transferable for export.

As UK nuclear services have evolved towards lifetime asset care and decommissioning programmes our industry has become less structured on manufactured products and progressively more service centred. In this regard it has also become technology-lite. Paradoxically UK energy capacity needs and supporting technology requirements are high; and meeting these needs has created a renaissance in the sector. This is at a time when nuclear internationally is relatively passive outside of Asia. To take advantage of this opportunity is the nub of an industrial strategy proposal for a new reactor design – a UK designed and built small modular reactor (SMR).

The NI believes that the UK needs SMRs as part of creating a decentralised energy market and driving energy efficiency. SMRs will directly contribute to Pillar 7 “Delivering affordable energy and clean growth as we the transition to a low-carbon economy”. SMRs have the potential to provide safe and secure power to cities and remote communities alike. This is based upon technology already demonstrated by UK and international organisations. The immediate market opportunity is however UK led and the government strategy for nuclear energy must embrace this unique opportunity to seek to go beyond passive 60% deals on UK content for large civil New Nuclear Build and move into a UK led, value added sustainable SMR market place. Opportunities for export and global marketplaces will follow but should not distract from the immediate and long term current UK energy need and UK nuclear sector supply chain and skills issues. Based on a 10GW UK SMR market need and production of two 100MW(e) reactors per year creates an ‘export ready’ but sustainable 50-year business in the UK alone.

1.2 Possible ‘sector deal’ for the nuclear sector

We believe that there is a significant opportunity for the UK industry to collaboratively develop a potential ‘sector deal’ to help commercialise UK SMR nuclear expertise and help get this product to market. Using national infrastructure such as the>NNL, Nuclear Industry Council and NIRAB will establish a platform for decision making and ensure that there is adequate representation from all interested parties in developing a nuclear sector deal and appropriate R&D programmes. Specific to the SMR opportunity any deal must focus on three things:

- Creating UK IP for reactor design and associated manufacturing technologies
- Create a UK licensed operator
- Make the UK attractive to international investors such that we can secure funding for a UK long term build programme; else government must directly fund the first phase of any SMR deployment.

Government investment is required now to get SMR technologies (and supporting energy market instruments) to the stage where the commercial case is clear. The government’s commitment to spend £250m over the next 5 years on nuclear R&D is welcome but we would recommend that a significant element of this budget (and possibly more) should be prioritised on SMRs.

1.3 Deployment of SMRs in the UK

This should be a priority area for the UK Industrial Strategy energy and nuclear sectors. The development of a UK design and the associated accumulation of Intellectual Property generated through the deployment of a SMR could:

- Significantly enhance the UK nuclear capability and re-establish our international credibility as a market leader
- Improve UK security of supply of electricity
- Improve the economics of financing nuclear power in the UK.

The UK's current advanced manufacturing capability means it is well placed to support the development of SMR technology led by British based business with military and civil reactor experience. The SMR opportunity window is immediate and this current window offers the ideal time for the UK to develop its reactor core (power unit) module products and supporting services in advance of AGR nuclear site closures.

A single core design and UK manufactured modules would provide a flexible array for multiple configurations and uses. Benefits are maximised when the individual reactor power units are sized to be between 50 and 300MW(e).

An additional challenge for the industry is to ensure that there is sufficient capability and pipeline skills and knowledge to successfully deliver current and future nuclear programmes. We believe it is essential and critical to success that there is continued investment in the nuclear skills, training and leadership arena through the appropriate recognised bodies and training providers. This should be managed as a partnership with the new UK licensed operator(s) and focussed around a sustainable UK business model for design, manufacturing, installation, operations and decommissioning.

1.4 Export Potential

Assuming international design and manufacturing standards are adopted the UK will be able to tap into an expanding international export market for SMRs. Whilst the business case should not be predicated on this it is a natural by-product of a sound industrial strategy and commensurate SMR manufacturing investment plan.

2. NUCLEAR SECTOR THEME – RADIOACTIVE WASTE

The RadWaste Special Interest Group, sponsored by the Nuclear Institute (NI), welcomes this opportunity to comment on the Government’s draft Industrial Strategy. The Strategy is described as being intended to move the UK “beyond short-term thinking to focus on the big decisions that will deliver long-term, sustainable success”. The success of many UK industries, including the nuclear sector but also manufacturing, oil & gas, defence and life sciences, depend on having access to a robust and sustainable radioactive waste management infrastructure. This includes access to the specialist skills, research, treatment and disposal facilities, as well as wider public understanding and confidence in the safety of radioactive waste management arrangements. Currently the draft Industrial Strategy makes no mention of the importance of waste infrastructure to the UK. We consider this to be a significant omission.

Current radioactive waste management infrastructure within the UK is fragile and significant opportunities exist for improvement. Greater leadership from government is needed to help ensure that UK industries, including nuclear, have access to a robust and sustainable infrastructure for the long-term management of radioactive wastes in the UK, driving better performance, better value and enhanced growth. In order to achieve these ambitions we propose that:

- UK should have a visible national body responsible for providing oversight of UK radioactive waste infrastructure and supporting the development and delivery of radioactive waste solutions across all relevant sectors through a single UK radioactive waste management strategy
- The national radioactive waste management strategy should set out clear outcomes for radioactive waste management and approaches which enable:
 - o national decisions on radioactive waste solutions (making best use of economies of scale etc from across sectors),
 - o better value for waste producers,
 - o greater consistency in application of relevant limits and regulatory expectations,
 - o an emphasis on safe, final disposal sooner rather than later (eg by clarifying expectations for disposability),
 - o investment in UK solutions and access to global markets for radioactive waste management.
- The national strategy should be supported implemented through a single UK national radioactive waste management programme to include:
 - o delivering and maintaining a comprehensive radioactive waste inventory,
 - o securing better radioactive waste solutions through a competitive framework operating for all sectors
 - o ensuring better clarity on ownership of Intellectual Property (IP) that helps new technology to be made available
 - o facilitating collaborations across governments, industry, regulators, supply chain and academia, in particular to understand and address the particular challenges of retaining a skilled workforce for radioactive waste management in the UK,
 - o helping support better public awareness and understanding of radioactive waste management issues.

Key these recommendations are perhaps the missing ‘bedrock’ of the Industrial Strategy upon which its pillars stand: ensuring that sectors retain the confidence of the general public and other stakeholders. We are very aware of the considerable sensitivities relating to issues of radioactivity and the implications of public confidence and awareness on our ability to have access to radioactive waste management solutions and of course there are similar sensitivities in other sectors, especially high hazard. We suggest that some further consideration should be given to this in the implementation of the strategy, perhaps considering ways in which sectors seek to engage with both local and national stakeholders, and strengthen commitments to safety and environmental protection including the consideration of intergenerational equity.

We also suggest that a further pillar to the Industrial strategy is the need for modern regulation, for example, ensuring regulatory approaches enable optimisation of radioactive waste management decisions in the final stages of nuclear site decommissioning and clean-up.

Further detail is provided in our response to specific questions posed within the consultation document.

Responses to Specific BEIS-IS Questions:

1. Does this document identify the right areas of focus: extending our strengths; closing the gaps; and making the UK one of the most competitive places to start or grow a business?

There is no mention of the importance of sustainable development to the Industrial Strategy. We suggest that this should be included as a key area of focus, ensuring that the strategy strives to ensure proper protection of people and the environment including the protection of future generations, whilst enabling business to thrive.

2. Are the ten pillars suggested the right ones to tackle low productivity and unbalanced growth? If not, which areas are missing?

The need for modern regulation is missing. Eg ensuring regulatory approaches enable optimisation of radioactive waste management decisions in the final stages of nuclear site decommissioning and clean-up.

We also suggest that various pillars rest firmly upon a bedrock of ‘Public Confidence’. Overall success of the strategy will rely on all sectors retaining the confidence of the general public and other stakeholders (a particular issue for us in the context of concerns relating to radioactivity). Some further consideration should be given to this in the implementation of the strategy more generally, perhaps considering ways in which sectors seek to engage with both local and national stakeholders, commit to safety and environmental protection including the consideration of intergenerational equity, and are transparent in their performance.

3. Are the right central government and local institutions in place to deliver an effective industrial strategy? If not, how should they be reformed? Are the types of measures to strengthen local institutions set out here and below the right ones?

No. There is a lack of recognition of the importance of radioactive waste management infrastructure to the UK industrial strategy. We recommend a national body be established to provide oversight of UK radioactive waste infrastructure, develop and implement a national

radioactive waste management strategy and programme – working collaboratively across relevant national and local organisations.

5. What should be the priority areas for science, research and innovation investment?

A focus on developing existing technologies that exist elsewhere (within the global Nuclear industry, or within other industries) – to help bridge the gap between invention/early stage development to application. The key challenge area to drive maximum economic impact and to support commercialisation is the ability to form joint ventures / collaborative procurement – which needs better clarity on the ownership of Intellectual Property.

7. What else can the UK do to create an environment that supports the commercialisation of ideas?

The industry must consider how they specify their needs - as long as the industry specifies the solution rather than the outcome required, innovation and commercialisation will be stifled.

8. How can we best support the next generation of research leaders and entrepreneurs?

Better articulate the importance and benefits of radioactive waste management – for the full range of outcomes that it supports, not only to the UK but globally – recognising the opportunities available to promote growth, better performance and support to emerging economies around the world. Similarly ensuring access to a comprehensive UK radioactive waste inventory.

9. How can we best support research and innovation strengths in local areas?

For example, through innovation days, to enable partnering in local areas.

10. What more can we do to improve basic skills? How can we make a success of the next two to three years? Should we change the way we study for certain engineering or technical education pathways? Are there further lessons from other countries' systems?

One challenge for developing skills in radioactive waste management is that only one certification scheme exists – seen to be all or nothing. To gain certification, as a Radioactive Waste Advisor, it is necessary to demonstrate competence against a broad set of core skills, requiring considerable relevant qualifications and demonstration of experience. Such a level of certification may not be appropriate for all practitioners working in the field of radioactive waste management – but alternatives don't exist. Development of basic skills might be better enabled using a modular approach and we encourage the vision for the new technical education system to consider how a more modular approach might be encouraged.

Radioactive waste management skills / capabilities are in short supply and receiving limited attention. For example, they are recognised 'generally' within the existing nuclear skills strategy but the efforts to address this area do not consider the specific skills and capabilities that are needed, nor the wider needs of the supply chain and other sectors. These skills are important, not only for the nuclear industry, but also others. Examples include the skills and capabilities needed to model the behaviour of radionuclides in the environment, the development and assessment of environmental safety cases, and the assessments of risk for development proposals relating to land contaminated with radioactivity. Better clarification of the particular needs would better help the development of relevant courses, the extent of demand and so to sustain the infrastructure we all need. It would also help develop and position the UK as a global centre of excellence for the provision of such training and capabilities in these areas which are equally in demand elsewhere.

Within the legacy nuclear industry, radioactive waste management is a growth area. We need to be in a position to a) make that growth area attractive to the workforce and b) facilitate retraining and upskilling. The perception is that the majority of training, education etc. is focused at new entrants to the industry (e.g. apprentices, higher education) and retraining and upskilling will require a different focus. We recommend not only that the importance of waste management be better recognised in the context of the Industrial Strategy but that opportunities sought to better attract, develop and retain the workforce required.

11. Do you agree with the different elements of the vision for the new technical education system set out here? Are there further lessons from other countries' systems?

See response to 10.

13. What skills shortages do we have or expect to have, in particular sectors or local areas, and how can we link the skills needs of industry to skills provision by educational sectors in local areas?

See response to 10.

14. How can we enable and encourage people to retrain and upskill throughout their working lives, particularly in places where industries are changing or declining? Are there particular sectors where this could be appropriate?

See response to 10.

15. Are there further actions we could take to support private investment in infrastructure?

Investment in radioactive waste management infrastructure is hampered by lack of clarity of a comprehensive waste inventory, and a reliance on wastes arising from activities limited by annualised funding. Hence framework contracts exist but with little or no guarantee of revenue, inconsistent data and information on requirements. Access to longer term strategies for market sectors (possible by way of the sector deals) should consider ways to remove annualised funding. Delivery of waste through a national programme approach could secure commercial investment in large waste infrastructure projects.

16. How can local infrastructure needs be incorporated within national UK Infrastructure policy most effectively?

Given the significance of radioactive waste management and the volume likely to be generated, a single integrated UK radioactive waste policy is needed which should support the development of regional and / or national infrastructure facilities (eg interim waste stores, permitted disposal sites), and establish such facilities as nationally significant infrastructure projects. This should be developed in collaboration with planning representatives (eg NuLEAF) to recognise and support local needs where possible – avoiding unnecessary burden on local infrastructure for such key facilities. Such a policy would facilitate commercial investment in developing, operating and decommissioning such facilities.

17. What further actions can we take to improve the performance of infrastructure towards international benchmarks? How can government work with industry to ensure we have the skills and supply chain needed to deliver strategic infrastructure in the UK?

Through development of a visible, credible and coherent integrated strategy for radioactive waste management, implemented through a national programme of work offering clarity and confidence in foreseeable waste arisings and how revenues would facilitate investment in necessary infrastructure for the treatment and disposal of radioactive waste.

Partnerships between Government, producers of the waste and commercial available services and facilities in the supply chain would help – providing greater leadership and confidence. Encouraging true partnership between such clear players is a vitally important element of delivering growth and innovation in the UK economy.

Providing a national focus on developing an understanding of the key radioactive waste management skills and capabilities that we need, to understand what exists and so to ensure we sustain our own needs as well as supporting growth through export of our experience and expertise. In particular to consider relevant CPD and available training, modularisation of such training to allow mid-career development, facilitate those returning to work after a career break or the utilisation of retired service personnel workforce.

18. What are the most important causes of lower rates of fixed capital investment in the UK compared to other countries, and how can they be addressed?

The biggest cause is uncertainty, whether relating to regulatory changes, funding concerns, political uncertainty such as Brexit and Scottish Independence. Such factors all influence the ability to provide suitable insight and forecast on the levels of return on investments required to make longer term investment decisions. Investors require consistent messages, clear energy policy, and for government to provide longer term commitment in the areas of radioactive waste strategy – including cross-party agreement to key strategies such as industrial strategy and the pending nuclear sector deal – and the importance of a robust radioactive waste management infrastructure.

19. What are the most important factors which constrain quoted companies and fund managers from making longer term investment decisions, and how can we best address these factors?

See response to 15. and 17.

22. What are the barriers faced by those businesses that have the potential to scale-up and achieve greater growth, and how can we address these barriers? Where are the outstanding examples of business networks for fast growing firms which we could learn from or spread?

Short-term decision making to maximise immediate returns is the greatest barrier – missing the potential to scale up and achieve greater growth and better results in the medium-term. This can be addressed through having a clear national radioactive waste strategy delivered through a single comprehensive radioactive waste programme, removing annualised funding and unnecessary waste transfer limits (eg within non-nuclear permits), and by improving the quality of waste inventory across the sectors. For example, the change to the transfer limits for radioactive wastes between consignors / consignees (recognising the limits still apply at point of receipt) helped to facilitate greater use of new waste routes.

23. Are there further steps that the Government can take to support innovation through public procurement?

Lessons should be learned from other countries and across sectors eg to consider the US model known as the Small Business Set Aside contracts which actively encourage SME companies to take the lead on significant projects in the delivery of radioactive waste management. These contracts not only encourage SME to bring innovation to the contract but also actively encourage diversity in the companies to which the awards are made.

25. What can the Government do to improve our support for firms wanting to start exporting?
What can the Government do to improve support for firms in increasing their exports?

Improve clarity of radioactive waste policy for import / export. Promote UK capability to nuclear and non-nuclear markets overseas.

29. How can the Government, business and researchers work together to develop the competitive opportunities from innovation in energy and our existing industrial strengths?

A clear energy structure which defines the role that the UK wishes to take is required – eg whether the UK wants to be a leading nuclear nation or one which accepts the nuclear technology of others as it is implemented on its shores. The nuclear sector deal will be key to setting out the longer term strategy and ambition of government and how industry will engage to deliver such ambitions.

Practical examples that might be considered include looking at the US MIT model for bringing innovation to commercial scale, ensuring that innovation was not limited to SMEs. Also importantly the legal framework was highlighted and the need to remove IPR constraints within flow down conditions from Government agencies and organisations to facilitate and encourage innovation in government contracts.

30. How can the Government and industry help sectors come together to identify the opportunities for a 'sector deal' to address – especially where industries are fragmented or not well defined?

Opportunities to improve radioactive waste management will be relevant to all parts of the nuclear sector – from potential new build actors to managers of existing legacy sites. In addition they will be important in other potential sectors that may wish to consider 'deals'. The nuclear sector deal could lead the way in presenting opportunities and seeking wider involvement and support from other emerging sectors who similarly would benefit from the recommendations we have made for a national integrated strategy and programme for radioactive waste management.

32. How can the Government ensure that 'sector deals' promote competition and incorporate the interests of new entrants?

Clarity on the governance and review mechanism should be established for each 'sector deal' as they are developed – to ensure that they are visible and available to all, and that stakeholders have the opportunity to provide comment to any co-ordinating body.

33. How can the Government and industry collaborate to enable growth in new sectors of the future that emerge around new technologies and new business models?

Current understanding of radioactive waste management is fragmented across industrial sectors. All too often it is perceived as simply an issue for the nuclear sector rather than recognised as a fundamental enabler to the UK achieving its ambitions for energy, climate change, security and growth. The UK first needs to be able to articulate the challenge for radioactive waste management for all sectors and to establish the links with relevant parts of academia that can support this.

The UK would benefit from having a clearer, shared picture of the current landscape – what exists where and how well it is working. This will help clarify the gaps and issues. The UK is recognised globally for having established strategic approaches to the management of radioactive wastes that optimise its management across a range of waste treatment and disposal routes. However, the UK still lacks a comprehensive radioactive waste inventory and a nationally integrated radioactive waste management programme. For example, the UK has established a nuclear LLW strategy and working arrangements that bring together the nuclear

producers and some of the permitted supply chain – but this omits non-nuclear waste producers, and currently does not address the skills needs of the industry or to build links to relevant sector skills councils or academia. Whilst the nuclear industry has established world-leading research and development to address the particular shortfalls in nuclear skills this does not address the wider and specific capabilities for radioactive waste management upon which it and other sectors will rely (eg skills needed to assess the fate of radionuclides in the environment). This lack of attention and investment has led to a depletion in the number of relevant courses being available within the UK and consequently a limited supply chain able to offer the niche services that the nuclear and other sectors require.

A range of opportunities could be considered and the RadWaste SIG will be exploring the ways in which it can support these. They include:

- Development of professional standards of certification for practitioners in radioactive waste management (eg equivalent to current WAMITAB arrangements)
- Establishing a network of pan-sector industry mentors / mentees
- Building links across professional institutes eg between Nuclear Institute and the Chartered Institute of Waste Management, and into a range of sector groups eg DecomNorth Sea
- Improving our communications about radioactive waste management across sectors through professional journals, conferences and other fora.

Fundamentally a ‘big decision’ is needed to deliver long-term success in this area. The UK lacks any one organisation responsible nationally for oversight and co-ordination of an integrated programme of radioactive waste management that considers all relevant sectors, including nuclear, and which would provide a focus for collaboration with academia and supply chain, as well as a visible national centre which could support wider public awareness and understanding of the issues of radioactive waste management.

Consideration should be given to limiting the need for knowledge transfer unnecessarily, and instead ensuring that responsibilities for managing radioactive wastes reside with the right organisation at the right time. For example, transferring the responsibility for interim storage of fuels and wastes from the waste producer to the relevant waste disposal organisation sooner rather than later – ensuring that, at the earliest opportunity, the responsibility lies with the organisation which has a vested and enduring interest in ensuring the safe, secure management and disposal of the wastes, including management of their records.



3. NUCLEAR SECTOR THEME – BUILDING INFORMATION MANAGEMENT & DIGITAL

Purpose

The Nuclear Institute Digital Special Interest Group, (NI-DigitalSiG), is supported by National Nuclear Laboratory, Innovate UK and the supply chain on behalf of the nuclear industry, to help develop a best practice Digital community within the industry. The vision is to continually evolve best practice within nuclear related organisations through knowledge sharing within the sector and knowledge transfer from other sectors. This group will embrace the wider Digital skills and knowledge challenge rather than focus on any one specific area of competency. The group will drive the dissemination and on-going development of the nuclear strategy document: *Building Information Modelling & Data Management – Nuclear Strategy – v10* (Isgar, Elsdon & Bew) and to embrace going forward the requirements toward a 'Digital Built Britain'.

Partners

Nuclear Institute – to ensure industry representation from the professional nuclear community and enhanced coordination via the NW and Cumbria Branches of the NI.

The National Nuclear Laboratory (NNL) has agreed to be the principal partner member company due to its location.

Sunbeam Management Solutions Ltd – Executive Consultant with NNL and, as lead and co-author of the nuclear strategy document, to provide transition of strategy

KTN Ltd – to facilitate best practice and knowledge transfer across the industry and other sectors and to connect with KTN communities and Catapults.

Waldeck Consulting – providing technical/digital BIM oversight and advice to the group as a pro-active Tier 2 Supplier to the Decommissioning, Defence and New Build sectors along with the SMR requirements.

1.1 BIM-DIGITAL Position Summary

Specific to the pillars of:

- Developing infrastructure
- Developing skills

the NI believes that the UK needs to invest in UK PLC capability for the nuclear sector that could enhance or upgrade planned nuclear infrastructure covering New Nuclear Build and also decommissioning related construction.

What is clear is that technology led advances in industrial efficiency are going to come from more interconnected infrastructure, items such as 5G, Industrial Internet of Things etc. The benefits will arise from smart equipment and connected sensors & devices whilst often difficult to measure must be factored in to every part of the UK energy sector infrastructure programme. Investments in older UK nuclear power plants such as AGRs have been focussed on like for like (analogue technology) replacement and not progressive technology upgrades. Conversely, UK industry must prepare to collaborate and adapt to the technology revolution for New Nuclear Build - we must be ready not only to engage but also to be planning how best to leverage digital technology and knowledge. Assets with inbuilt intelligence will be hugely important for the NNB and also for site decommissioning.

Skills needs in terms of delivery of digital strategies are not totally defined at present. This cannot continue or digital strategies will be underdeveloped and NNB plants will be unable to achieve their maximum output and reliability potential. The importance of investment in digital infrastructure implementation and establishment, and the creation of the technology itself are key. However, the utilisation of data outputs and trained people who operate in this environment are equally crucial to



the success of business and will become reliant on digital technologies. The core theme behind the Digital Community is part of a holistic approach from Initiation and Business Case through to successful Operations and eventual Decommissioning and Disposal.

1.2 Possible 'sector deal' for the nuclear sector

We believe that there is a significant opportunity for the UK industry to develop a potential 'sector deal' to help support the 'Nuclear Digital Community (Engineering-Construction-Operations)' as part of a wider industrial/energy sector investment or even as a specific element of a UK Nuclear Sector Deal. Specifically, this would support the specific Pillars of:

- Investing in science, research and innovation
- Cultivating world leading sectors

In simple terms the government BIM mandate (in 2011) and associated BIM Level 2 requirements provide the structure for application. At a recent interview with the 'Digital Built Britain' Project Team we shared our aspirations to develop from BIM Level 2 & 3 to Digital Level 3 within the framework established by Cabinet Office and Innovate UK. It is vital that the nuclear industry construction industry evolves and seeks to progressively collaborate to meet this objective.

To do this 'thought leadership' must be maintained and strengthened through existing government led Working Groups such as the UK BIM Alliance and Digital Built Britain. These groups would benefit by seeking more industry input and involving organisations that are ready and able to help. There is a tremendous amount of good work going on in the BIM environment in the UK by many organisations, this needs to be taken on board. By way of example, the current BS and PAS documents have gone under public consultation recently but do not seem as yet to have taken on board the comments from industry and those who are actually undertaking work and attempting to align it with these documents. This is where there is an incredible amount of industry push, but with minimal success in terms of impacting the way the standards and guides are set out.

1.3 Academia and Industry collaboration

Specific to the pillar of

- Creating the right institutions

a critical issue remains how best to share and optimise use of the digital intellectual property.

Collaboration is critical to BIM-Digital and a connected future, however those that develop IP do need to have their payback for their investment. It is unclear how that will be addressed, however at a contractual level there should be a mechanism in place to facilitate the wider benefits of collaborative work rather than pockets of excellence within UK PLC. Academia needs to rely on industry experts to guide and inform priorities and seek to move both forward in a joined-up manner. The digital industry is moving at rapid pace, as too should academic curriculums to ensure they reflect the latest industry requirements. Organisations like the Construction Industry Council (CIC) and Building Research Establishment (BRE), which now include Constructing Excellence (CE), are well placed to help standardise and educate the industry in current and new offerings. These should be harmonised further still through a more integrated approach to the curriculum of academic establishments. Making this so should be a priority area for the government industrial strategy across the wider energy sector.

Responses to Specific BEIS-IS Questions: *(these answers are as reported by members of Dig-Sig)*

1. Does this document identify the right areas of focus: extending our strengths; closing the gaps; and making the UK one of the most competitive places to start or grow a business?

Yes, the proposed issues here are all important factors for success. We would benefit from a greater sharing of technology and LFE between different sectors. Some sectors are consistently successful. We should take these lessons and apply them across sectors. The 'Digital Community' can be used to help facilitate this through shared outcomes and collaboration.

2. Are the ten pillars suggested the right ones to tackle low productivity and unbalanced growth? If not, which areas are missing?

The ten pillars are a great overall approach to improvement. However, the success of this thinking will only be delivered by the detail of how these topics will be actioned. It's not clear how this is proposed. Digital (including BIM) is a relatively new technology and the benefits must be emphasised. Some organisations feel that the Digital process is a Government imposed system that does not benefit individual delivery organisations. This should be addressed and the message made clear that businesses will benefit greatly from the intelligent and considered use of Digital technologies.

4. Are there important lessons we can learn from the industrial policies of other countries which are not reflected in these ten pillars?

Organisations within the Dig-SIG have worked closely in Europe (with German and Italian companies specifically). German companies appear to be less flexible than UK ones but the benefit is that they can often deliver a less compromised product. Italian and German manufacturing businesses are generally led by appropriate engineers and not just managers. This seems to work well.

5. What should be the priority areas for science, research and innovation investment?

It is believed that we should tailor our education system to meet the UK commercial / industrial needs. Applied qualifications should be made more readily available at apprentice levels and employers must be encouraged to support this approach, perhaps through better incentives. Digital can enable some of these areas of development. Interestingly, training is often provided by software providers which is probably not always the best way to move forward as messages will be passed on that suit specific manufacturers' products.

7. What else can the UK do to create an environment that supports the commercialisation of BIM business ideas?

BIM may be seen as unwieldy and a costly approach by many at a senior level in business. The message must be sent forward that the principles are simple and that proper execution will provide commercial benefit. Demonstrate the similarities of BIM with methodologies in other industries (e.g. PLM and PDM in Aerospace and Vehicle Manufacturing). In these industries the benefits of these methods have been demonstrated and this knowledge needs to be transferred to convince other industries it is worth investing and developing.

8. How can we best support the next generation of research leaders and entrepreneurs?

Ensure that the correct personnel are available and properly used as in 4 and 5 above. Governmental involvement can drive better outputs. A free market approach, where things find their own level, will not be successful while other governments are actively assisting their national industries and developments. A case in point, the French, Italian and Spanish

governments have placed high tariffs on imported steel from China. This unilateral action on the part of these governments breached EU legislation. However, they did it and were not reproached by the EU. These countries retain relatively healthy steel industries while the UK does not.

10. What more can we do to improve basic skills? How can we make a success of the next two to three years? Should we change the way we study for certain engineering or technical education pathways? Are there further lessons from other countries' systems?

There is little doubt that there is a vast group of people who would be extremely enthusiastic about taking any opportunity to improve their career prospects. We feel that we do not offer enough opportunity to qualifications below degree / HNC / HND level. There is little doubt that streamlined, targeted, modern qualifications would greatly enhance the available workforce and, hence, improve the potential of UK businesses.

The principles of BIM can be readily, and simply, instructed to people of low (or no) knowledge on the topic.

Apprentices and Graduates joining organisations having limited knowledge of BIM and the tools that make it possible. These topics need to be enhanced in curriculums so that the next generation are pushing the use of the tools and methods.

13. What skills shortages do we have or expect to have, in particular sectors or local areas, and how can we link the skills needs of industry to skills provision by educational institutions in local areas?

Existing educational institutions in local areas should be asked to form close links and liaison with local industry / employers to provide locally targeted requirements. Availability of individuals trained to lead the BIM process is limited: The supply of people who can work on individual modelling tools is quite good, however individuals who understand how to federate models and the associated information and then work with a design team to co-ordinate the design and achieve 'concurrent engineering' is more limited. We miss the full benefit of BIM because of this lack of skills.

14. How can we enable and encourage people to retrain and upskill throughout their working lives, particularly in places where industries are changing or declining? Are there particular sectors where this could be appropriate?

This can be achieved where individuals can see a clear correlation between further study / training and achievement. This is currently not the case. BIM technology should be marketed as the great opportunity it is.

15. Are there further actions we could take to support private investment in infrastructure?

This will only happen if the private sector can see a potential return. However, that return may be seen as an unfair burden on taxpayers who expect services to be provided in return for what is contributed. More convincingly ways to demonstrate the business case for converting to a BIM methods of working through actual ROI data from a range of businesses and suppliers.

19. What are the most important factors which constrain companies from making longer term BIM investment decisions, and how can we best address these factors?

As stated in 2 and 7 above.

The message is not being delivered effectively that BIM can benefit businesses and that it is not just a system being driven by the Government. There is too much misunderstanding whereby businesses only see BIM as a potentially costly and difficult procedure. The benefits should be publicised more concisely.

Concern over being uncompetitive if the client and competitors are not at the same level of understanding in BIM. The headline data tends to show overall project cost savings and in earlier phases costs are perceived to increase because of the additional design co-ordination, which benefits the later stages. If your business only works in the early phases of projects and not all suppliers and the client have full understanding of BIM the perception is you will automatically submit a higher price.

22. What are the barriers faced by those businesses that have the potential to scale-up and achieve greater growth, and how can we address these barriers? Where are the outstanding examples of business networks for fast growing firms which we could learn from or spread?

Fast growing businesses are flexible and open to change / innovation. Those who have worked in other sectors such as retail have a view that constant success is only achievable by continual evolving response to demands. This is a good mantra for other industrial sectors.

23. Are there further steps that the Government can take to support innovation through public procurement?

Government procedures for procurement can stifle or omit the opportunity for the full engagement of a proven supply chain. Much expertise is available among the better elements of the supply chain. If this expertise can be more readily captured and included in design proposals at an early stage, the outcomes will be more predictable and (most likely) more economical. Better procurement procedures can enable this advantage to be realised.

29. How can the Government, business and researchers work together to develop the competitive opportunities from innovation in energy and our existing industrial strengths?

As stated in 2, 4, 5, 14, 22 and 29

The message must be clearly stated that the success of business and Government aspirations are one and the same thing. Government should be more open in its communication with business and should provide support where appropriate to achieve goals that will benefit everyone.

31. How can the Government and industry help sectors come together to identify the opportunities for a 'sector deal' to address – especially where industries are fragmented or not well defined?

It seems simple; make a clear, honest and compelling argument that business will benefit and business will do what is to their benefit.

32. How can the Government ensure that 'sector deals' promote competition and incorporate the interests of new entrants?

It can only be made to seem attractive if business can see a direct benefit. The Government can help by providing clear guidance and, if necessary, facilitating networking and collaboration. BIM could help here.

33. How can the Government and industry collaborate to enable growth in new sectors of the future that emerge around new technologies and new business models?

Investment must be made to provide training for new technologies. It is felt that the current education system is not aligned with commercial / industrial.
The collaboration must be where industry provide the details of what is required. Government can then provide the education.

35. What are the most important new approaches to raising skill levels in areas where they are lower? Where could investments in connectivity or innovation do most to help encourage growth across the country?

It is essential to convince employers that the opportunities will exist to reward their efforts in innovation. Government funded organisations (client bodies) often do not offer clear incentives (in terms of improved business opportunities) where businesses invest time and effort in offering innovation.

37. What are the most important institutions which we need to upgrade or support to back growth in particular areas?

Education, . . . Major organisations that receive Government funding need to do more with it for the future.

The approach to BIM for Nuclear has to be truly multi-disciplinary and this creates a detailed interaction between the main disciplines of Process, Mechanical, Electrical, Civil and Structural. This interaction needs further development to accommodate the different working methods in each discipline, whilst not constraining one discipline to fit into another working method. Could work by academia and the institutions support this development?