



## CROSS-INDUSTRY ENGAGEMENTS - TECHNICAL INNOVATION WORKSHOP Oil & Gas Technology Centre, Aberdeen, 13<sup>th</sup> February, 2019



### The Preface

On 13<sup>th</sup> February 2019, the Oil & Gas Technology Centre (OGTC) hosted a cross-industry engagement between nuclear decommissioning and oil & gas sectors, focussing on Technical Innovation, one of the thematic areas of common interest previously agreed between the Nuclear Decommissioning Authority (NDA) and Oil & Gas Authority (OGA). This workshop forms part of a series of similar engagements between these sectors.

Technical Innovation is one of ~15 themes of common interest, but a particularly important one, which can be readily understood as a driver of value, job creation, and exportable UK expertise. Technical Innovation is seen by both the Nuclear Decommissioning and Oil & Gas sectors to be a key enabler of step changes in cost and schedule reduction, a wider subject on which a further engagement is planned mid-2019.

The landscape of Research and Development (R&D), with links to academia, project funding, and commercial entities developing solutions, tends to have sectoral specific challenges. Whereas there may be confidentiality considerations, it is recognised that there are benefits from sharing learnings; to avoid duplication of effort; speed up development; and potential for joint working on initiatives.



Inevitably when discussing the general topic of innovation, the workshop also touched on wider (non-technological) aspects, such as cultural practices and leadership in the two sectors, both of which share a relatively conservative approach to innovation due to the risks involved with working with hazardous materials, the high complexity of engineering challenges, and a high degree of regulation in a very safety conscious environment.

The workshop was preceded on 12<sup>th</sup> Feb. by a site visit to the newly inaugurated National Decommissioning Centre at Newburgh.

### **The Participants**

To ensure that each attendee could play an active part in the discussion, and to remain focussed on agreeing actions at the conclusion of the workshop, the workshop comprised a small, manageable, and vertical representation of organisations from both sectors. 26 participants were present, from the following organisations:

Oil & Gas Authority (OGA)	Nuclear Decommissioning Authority (NDA)
Oil & Gas UK (O&GUK)	National Nuclear Laboratory (NNL)
Oil & Gas Technology Centre (OGTC)	Sellafield (SL)
National Decommissioning Centre (NDC)	Dounreay
Taqva	Shell
Repsol Sinopec	DECOM North Sea
Innovate UK	WYG
Wood plc	University of Aberdeen

An organisational glossary is provided in Appendix A.



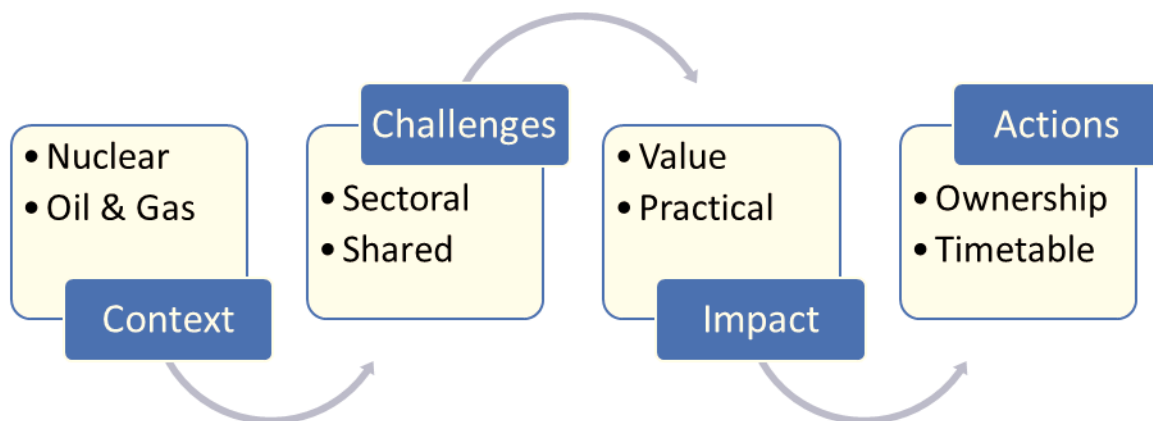
## The Approach

Workshop objectives included; identify a small number of high impact actions that involve joint working between the industries; full and open debate to share process and learnings on Technical Innovation.

As with previous knowledge-sharing meetings, and in accordance with the Principles of Engagement pre-agreed between the NDA and OGA, the workshop and its outputs were conducted under the Chatham House rule, of non-attributable comments.

OGTC facilitated the workshop, and the deliberations were captured using the interactive media tool Bluescape which, along with all presentations and workshop material, included a touch-screen accessible repository of reference information that had been collated prior to the event.

This workshop comprised four sequential elements as depicted by the graphic below. The sessions were interactive and prompted discussion around the challenges faced by both industries, the impact of what 'good' could look like if they were addressed and reached some agreement on a series of possible actions involving joint work.



## Context

The early morning plenary session provided context to the day and comprised presentations from key organisations from both sectors. Questions were encouraged throughout the presentations which included:

- **OGTC** – it's purpose, mission and current work including decommissioning theme
- **OGA** – Decommissioning UKCS scope & strategy
- **OGA** – Supply Chain Action Plans and Pathfinder Portal
- **OGTC** – Technology Horizon Scanning, Radar, Network, Reuse & Energy Transition
- **OGTC** – National Decommissioning Centre, Aspiration and Programme
- **Repsol Sinopec** – An operator's perspective
- **NDA** – Who we are, How we work, The Challenge, Costs, Forward Look
- **NDA** – Innovation, R&D, Approach and Progress
- **Sellafield** – Key Challenges, Innovation Funnel, Examples
- **NNL** – R&D Landscape broader than decom, AMRC, NPL, CINDe & Funding
- **NDA** – Measuring performance of an innovation programme, Common Blocks

## The Workshop

### Session 1 - Challenges

Delegates split into 4 groups to discuss what they believed were the challenges that are faced both in sectoral isolation and in common. They were encouraged to think about:

- What are the contractual issues being faced / worked on?
- What enabling technologies are being faced / worked on?

### Common Challenges were noted as:

- Project Management and cost estimation
- Lack of uniformity of design
- How far do we go post production, investing now to save future care and maintenance costs isn't as simple as a NPV calculation? Can we model and simulate using LFE and AI in a manner which will get Boardroom buy-in.
- How do we make decommissioning attractive to a future workforce (cf. new-build)?
- Internal stakeholder alignment and performance drivers not aligned with cost reduction strategy
- Risk aversion to innovation and new technology deployment
- Appropriate risk transfer to supply chain
- Environmental concerns, hazardous wastes, and project risks associated
- The decommissioning mind-set (cf. new-build)
- Planning for decommissioning to involve minimal staffing (cold-stacking – being much cheaper than warm-stacking)
- Underwater cutting – lasers
- Remotely operated robotics and vehicles
- Socio-economics, regeneration and future jobs in communities built around single industry
- When is the best time to commit to deploying new technology?
- Legal & commercial risk concerns stifling innovation, as well as lowest initial cost solution 'trumps' all during procurement
- Reaching through supply chain for innovative products, services and solutions
- How do both sectors continue to learn and share from each other – what platforms could we use?



## Session 2 – Impact and Value

In this session, participants considered which of the challenges from Session 1 could be most beneficial / impactful in terms of value, plotted on a 2x2 against the practicality/relative ease of implementation. Participants were asked to consider:

- How can the sectors work together?
- Which of the challenges should we be focussing on collaboratively?

The objective was to tease out which of the challenges could be the most beneficial when plotted on the 2x2 matrix. The results showed in the top right-hand quarter (high impact, relatively low ease of implementation) the following:

- Digital simulation – virtual and artificial reality
- Project management and cost estimation
- Knowledge transfer over time
- Decision making tools that have multiple and balanced attributes
- Data characterisation – what happens when you don't have historic data
- In what order do we do things – how AI can help simulate environments
- Innovation and regulation – early engagement with regulators to help shape and enable technology and deployment
- Proven or developing technology knowledge transfer across sectors
- Contracting strategies – how to get past traditional ('lowest cost') to 'best value'
- Waste management characterisation, reduction and dealing with non-compliant waste streams
- Connecting the innovators and supply chain to the operators and owners
- Underwater laser cutting, use of drones for monitoring
- Addressing supply chain issues of competitive tendering, undefined scope, behaviours on both sides and availability of data

## Session 3 – Action Planning

The first 2 sessions revealed that, whereas the participants had been invited to discuss technical innovation, the innovation challenges revealed during discussion were much wider than technical challenges alone. With such a vast and wide range of challenges and possible solutions being discussed, it was decided to refocus session 3 on the particular area of innovation for which this workshop was initially conceived – Technical Innovation.

The organisers grouped technical innovation topics into four thematic areas for further discussion:

- Digital, data and simulation (and decision support)
- Supply chain (technical) – developing and deploying new technology
- Supply chain (contractual) how we get past tradition
- Specific technologies (cutting tools, explosives, impermeable barriers) how knowledge is exchanged

A workshop table was dedicated to each of the four themes and participants were invited to visit each theme in turn to discuss possible actions and in particular to think about:





- What needs to be done to move forward?
- Who needs to be involved?
- Which external organisations need to be brought on board?
- Is this a piece of work for OGTC or NDC?

### Headline notes for each Topic

#### 1. Digital, data and simulation (and decision support)

- How do we manage all the data in a way that is open, geographically based, easy to access and transfer yet is secure? Common standards and shared platform
- Can we have a simulation plan for optimising decommissioning
- Technology is available to help support (robotics, sensors, drones etc) but how do we bring them together and adopt new technologies?
- Both sectors to engage jointly with the Digital Catapult

#### 2. Supply chain (technical) – developing and deploying new technology

- What is our combined knowledge of existing technologies that can be diversified – share common challenges in a more transparent way
- Link incubators, demonstrators, catapult centres etc. The whole innovation landscape should be engaged
- Cross sector forum needed, or decom online knowledge sharing platform
- Incentivise supply chain to develop, trial and deploy new tech. Link facilities such as>NNL / NDC

#### 3. Supply chain (contractual) how we get past tradition

- Can academia or business schools share models and investigate best practice
- Can we better define scope in tendering process to reduce uncertainty and risk
- Tenders need to be designed for allowing innovation from the supply chain (e.g. be less prescriptive)
- Better visibility of positive contracting models needed and how to become the client of choice for supply chain

#### 4. Specific technologies (cutting tools, explosives, impermeable barriers) how knowledge is exchanged

- Development ideas for digital twins
- Could we share lessons from Tech20, TechX and LINC
- We need to have a platform e.g. Community of Practice
- Laser cutting underwater is common to both, as are drones & ROVs. Sludge and waste management, corrosion and AI – needs technology focussed workshops



Approximately 70 ideas for were collated across the four themes, so for the wrap-up, participants reconvened in plenary to choose the primary actions and next steps from each of the four thematic areas.

## The Next Steps & Actions

### General

- Joint technology working with NDA / NNL / NDC based on a known and discussed issue of laser cutting underwater – reducing or harnessing the bubble effects. In a nuclear pond this potentially results in a release of radioactive material. Can nuclear make joint use of the NDC ponds and laser?

**ACTION:** NDA / NNL / SL / OGTC / NDC to share existing projects on laser cutting and arrange follow-up discussion – March 2019

- Strengthen engagement with public funding bodies collaboratively. Joint funding calls for common challenges – ROV, UAV, Asset integrity etc. Do this in conjunction with other funders e.g. UKRI.

**ACTION:** NDA / OGTC to develop scope(s) for joint funding call(s) – May 2019

- Establish platforms / networks or ‘communities of practice’. This could include online groups, bi-annual meetings and specific theme events. Constituents need to involve both sectors and be appropriate to the topic e.g. NDA / NNL – OGA / OGTC. Groups could be themed against:
  - Contracting models (e.g. accelerator, incubators)
  - Technologies (e.g. laser cutting)
  - Research/academia (e.g. CINDe / NDC)

**ACTION:** NDA to demonstrate capabilities of HUB to OGTC for online collaboration platform – May 2019

**ACTION:** NDA/OGA to continue working on establishing platforms for mutual knowledge sharing, periodic feedback, communities of collaboration.

### Digital, data and simulation (and decision support)

- Knowledge Management – conduct a review of what is out there

**ACTION:** OGA / NDA to share existing KM programmes – May 2019

- Decision making – share NDA value framework

**ACTION:** NDA to share value framework with OGA / OGTC – March 2019

### Supply chain (technical) – developing and deploying new technology



- Could NDA/SL/NNL/OGTC/DNS have a joint call for Nuclear and Oil & Gas decommissioning technology developments. A joint challenge – perhaps through UKRI?

**ACTION:** NDA/OGTC to discuss possible approaches and engage UKRI – June 2019

- Develop supply chain capability in line with decommissioning cycle and technology – build on NDC matrix.

**ACTION:** OGTC to connect NDA with Decom North Sea to discuss their “Decommissioning Supply Chain Matrix”, developed in conjunction with Scottish Enterprise. April 2019

### ***Supply chain (contractual) how we get past tradition***

- Institute of procurement to gather and share insights into new models
- Could academic research or a business school help to suggest alternative contracting models

**ACTION:** NDA/OGA to coordinate follow-up discussion on contracting models.

Post meeting note: Engage with ECITB regarding the University of Texas project on Creating New Business Models for Capital Projects – Operating System 2.0. ECITB supporting with the European Construction Institute (ECI)

### ***Specific technologies (cutting tools, explosives, impermeable barriers); how knowledge is exchanged***

- We need to define ways to access complimentary specialist facilities (not necessarily institutions), bringing together critical applications e.g. simulators, modelling tools, material verification rigs, etc for condition analysis
- Organise The Hub awareness sessions including sharing of roadmaps

**ACTION:** NDA/OGTC to share relevant roadmaps – June 2019

**ACTION:** After reviewing our respective roadmaps, develop a common statement of intent to collaborate on specific areas, and identifying lead researchers/tech developers in this area

- Arrange meeting between primary academic institutions and actors and scope avenues for technology specific collaboration – Aberdeen, Manchester, NNL, NDC

**ACTION:** NDA/NNL/OGTC to share academic contacts – April 2019.

**ACTION:** NDC to host a HEIs/RTO forum, with the view of forging research partnerships in areas of commonality – September 2019





- Meeting to discuss the potential for a joint call exploring funding and common challenge – NDA / OGTC /NNL / NDC / UKRI

**ACTION:** NDA/OGTC/Other funders to meet to discuss future call – June 2019

### The Action Table

#	What	Who	When
<b>1.0</b>	<b>General</b>		
1.1	Share existing projects on laser cutting and arrange follow-up discussion – March 2019	NDA /SL /OGTC /NNL	April 19
1.2	Develop scope(s) for joint funding call(s)	NDA/OGTC	May 19
1.3	NDA to demonstrate capabilities of HUB to OGTC for online collaboration platform	NDA / GTC	May 19
1.4	Continue working on establishing platforms for mutual knowledge sharing, periodic feedback, communities of collaboration.	NDA / OGA	Ongoing
	<b>Digital, data and simulation (and decision support)</b>		
2.1	Share existing KM programmes – May 2019	OGA / NDA	May 19
2.2	NDA to share value framework with OGA / OGTC – March 2019	NDA	April 19
3.0	<b>Supply chain (technical) – developing and deploying new technology</b>		
3.1	NDA/OGTC to discuss possible approaches and engage UKRI	NDA / OGTC	June 19
3.2	Connect with Decom North Sea (DNS) to discuss their “Decommissioning Supply Chain Matrix”, developed in conjunction with Scottish Enterprise.	OGTC / NDA / DNS	April 19
4.0	<b>Supply chain (contractual) how we get past tradition</b>		
4.1	Coordinate follow-up discussion on contracting models.	NDA / OGA	April 19
5.0	<b>Specific technologies (cutting tools, explosives, impermeable barriers); how knowledge is exchanged</b>		
5.1	Share relevant roadmaps – June 2019	NDA / OGTC	June 19
5.2	After reviewing our respective roadmaps, develop a common statement of intent to collaborate on specific areas, and identifying lead researchers/tech developers in this area	NDA / OGTC	July 19
5.3	Share academic contacts – April 2019.	NDA / NNL / OGTC	April 19
5.4	NDC to host a HEIs/RTO forum, with the view of forging research partnerships in areas of commonality	NDC	Sept 19
5.5	NDA/OGTC/Other funders to meet to discuss future call	NDA / OGTC / Other	July 19



## **APPENDIX: An Organisational Glossary**

### **Nuclear Decommissioning Authority**

The Nuclear Decommissioning Authority (NDA) is a non-departmental public body created through the Energy Act 2004. We employ just over 200 staff. Our headquarters are based in west Cumbria. We own 17 sites across England, Wales and Scotland, some dating back to the 1940s, plus the associated liabilities and assets.

We report to the Department for Business, Energy and Industrial Strategy (BEIS); for some aspects of our work in Scotland, we are responsible to Scottish ministers. Our role is strategic: we establish the overall approach, allocate budgets, set targets and monitor progress. We do not have a hands-on role in cleaning up our facilities. Instead, we deliver our mission through others, primarily 12 businesses.

We are responsible for decommissioning and cleaning up these nuclear facilities ensuring that all waste products, both radioactive and non-radioactive, are safely managed:

- implementing policy on the long-term management of nuclear waste
- developing UK-wide strategy and plans for nuclear Low Level Waste (LLW)
- scrutinising the decommissioning plans of EDF Energy, who own the operating fleet of Advanced Gas Cooled Reactor (AGR) nuclear power stations

We aim to deliver safe, sustainable and publicly acceptable solutions to the challenge of nuclear clean-up and waste management. This means:

- never compromising on safety or security
- taking full account of our social and environmental responsibilities
- always seeking value for money for the taxpayer
- actively engaging with stakeholders

Our work, cleaning up the UK's nuclear legacy, is the largest, most important environmental restoration programme in Europe. We implement policies set by government. The devolved administrations for Scotland, Wales and Northern Ireland are responsible for developing their own policies in this area.

How we implement these policies is set out in our Strategy, which develops over time to reflect any policy changes introduced by government. UK government and the Scottish ministers approve our Strategy and business plans.

### **Oil & Gas Authority**

The Oil and Gas Authority's role is to regulate, influence and promote the UK oil and gas industry in order to maximise the economic recovery of the UK's oil and gas resources.

We seek to be a progressive and highly effective authority, doing all we can to attract investment and with that jobs, helping to anchor valuable skills and expertise in this country

Created as one of the key recommendations of Sir Ian Wood's 2014 Review of the UKCS, the OGA became an Executive Agency on 1 April 2015, which created operational independence from DECC (now the Department for Business, Energy and Industrial Strategy) to the fullest extent possible within the established boundaries and gave us direct accountability for exploration and development decisions and approvals.



Oil & Gas  
Authority



On 1 October 2016 we became a government company, limited by shares under the Companies Act 2006, with the Secretary of State for Business, Energy and Industrial Strategy the sole shareholder.

The OGA is largely funded by an industry levy introduced on 1 October 2015. We are headquartered in Aberdeen with another office in London

### **Oil & Gas Technology Centre**

The OGTC in Aberdeen is an industry-led research and knowledge organisation, backed by both the UK and Scottish governments to fund and direct projects that help to unlock the full potential of the UK North Sea. Its aim is to be the go-to technology centre for the oil and gas industry in the UK and internationally. To do this, it provides an industry-led, focused and flexible approach to deliver, accelerate, stimulate and inspire innovation between industry, academia and government to help maximise economic recovery from the UK sector of the North Sea.

### **National Decommissioning Centre**

Officially launched in January 2018, the National Decommissioning Centre (NDC) is a £38m partnership between the Oil & Gas Technology Centre and the University of Aberdeen, part of the Aberdeen City Region Deal funding.

Combining industry expertise with academic excellence, the Centre aims to work in partnership with companies to become the global leader in R&D focused on reducing costs, extending field and asset life, and transforming the conventional approach to decommissioning.

100 offshore platforms and 5,700km of pipeline are forecast to be decommissioned or reused over the next decade on the UK Continental Shelf. With the Oil and Gas Authority estimating the total cost of oil and gas decommissioning to be £58bn, the NDC will help industry deliver the >35% cost reduction target set by the regulator in 2016.

The NDC builds on the world-leading R&D capability at the University of Aberdeen in areas such as decommissioning technologies, predictive modelling, environmental assessment and the economics of decommissioning. Linking industry demand and expertise with academic capability and skills will help create competitive advantage, not only for the oil and gas industry, but for decommissioning challenges in the wider energy sector, for example, in offshore renewables.

The NDC will also collaborate with R&D institutions and innovation centres across the country active in late life asset management and decommissioning, and partner with digital, fishing, marine, safety, legal and environment organisations in the UK and internationally. Its overarching goal is to help maximise economic recovery from the UK continental shelf, anchor the supply chain in the North-East of Scotland, train the next generation decommissioning experts and create a culture of innovation through cross-sector knowledge transfer.

### **National Nuclear Laboratory**

We play a key role in the UK and global nuclear industry. That means reducing the cost of clean-up and decommissioning, maintaining critical skills and attracting talented new people to the industry. We're the only UK organisation with the skills, facilities and expertise to provide technical support to all aspects of the nuclear industry. What's more, we pride ourselves on offering quality, value and service to every one of our customers.

We want to be known for world-leading science and innovation; moving from the UK stage to a global one, working with partners and stakeholders, combining commercial delivery with leading edge science to deliver innovation and economic impact across the world.

We have everything in place to help shape the UK's nuclear future, including some truly world-class facilities. Our all-round capability means we provide technology services across the entire nuclear fuel cycle. Meaning our facilities can deliver everything from fuel manufacturing and power generation, to treatment of used fuel and decommissioning.

Quite simply, our range of facilities and laboratories is second to none. You'll find us at various different locations around the UK. Where we also provide nuclear science and engineering education, act as advisor to Government and collaborate on an international scale with a wide range of leading universities. NNL is perfectly placed to provide you with the all-round technical capacity and flexibility you need. Now and into the future.

The Central Laboratory is at the core of NNL. When fully commissioned, the Laboratory has world-class potential to make a very significant contribution to global nuclear research and development.

### **Glossary of Terms:**

AI	Artificial Intelligence
ECITB	Engineering Construction Industry Training Board
HMG	UK Her Majesty's Government
LFE	Learning From Experience
NDA	UK Nuclear Decommissioning Authority
NDC	National Decommissioning Centre
NDPB	Non Departmental Public Body
NNL	National Nuclear Laboratory
OGA	UK Oil & Gas Authority
PBO	Parent Body Organisation
PM	Project Management
SME	Small and Medium-sized Enterprise
SL	Sellafield Limited
SLC	Site License Company