CROSS INDUSTRY CONVERSATIONS – DECOMMISSIONING ROUND TABLE

Energus, Lillyhall, Workington. 30th October 2018

On 30 October 2018, the Nuclear Decommissioning Authority (NDA) and Oil & Gas Authority (OGA) hosted, in conjunction with Sellafield Ltd., a workshop of qualified managers from the oil & gas and civil nuclear sectors. This meeting was part of a series of discussions that will share learnings in areas of common interest between the decommissioning aspects of the sectors, which includes 14 topical themes.

The agenda was a full-day discussion on 3 of the 14 themes; **Project Management**, **Commercial Models** and **Supply Chain**. Challenges in these areas are common to both industries, and each have experienced successful, and less than successful outcomes in decommissioning to date. The workshop's aim was to share key lessons learned with a view to reducing future costs, and support delivery of the decommissioning mission. A 31 October site visit to Sellafield's facilities helped demonstrate some of the issues involved in decommissioning the world's most complex nuclear site, and helped oil & gas participants visualize common challenges.

This document presents the key points emerging from this sharing of mutual learnings, structured by the topics discussed.

The civil nuclear and oil & gas decommissioning programmes share the following characteristics; complex engineering challenges; heavily regulated environments; large scale in terms of timescales and cost; early days in the learning curve. In the UK, one key difference exists between the sectors; oil & gas has commercially owned operating assets funding their own decommissioning liability; legacy nuclear assets are a public liability, and the private liability is capped for nuclear assets still operating (the remainder being a public liability).

The workshop was conducted under the Chatham House Rule, with comments and discussion unattributed. It was agreed that the output from the roundtable in the form of these notes be captured and made available to workshop participants are colleagues in the organizations with which they are affiliated.

Contextual Opening Remarks

Welcome

The UK nuclear industry is experiencing a period of significant strategic transformation and HM Government has recently set out its policy for the future in the form of the Nuclear Sector Deal and the Industrial Strategy making resources available through the Challenge Fund.

The nuclear industry has been engaged in a number of cross-sector initiatives such as 'Big Tech', considering opportunities for collaboration and innovation across a number of key areas including

project management, technologies, commercial models, supply chain, leadership & culture, and regulatory environments.

Both the nuclear and oil & gas industries are facing huge decommissioning challenges and this round table presents an opportunity to share knowledge and learning as well as explore potential areas of collaboration.

Workshop Context and Background – NDA Perspective

A recent NDA strategic review led to significant organisational change and the realization that the organisation could benefit from being more outward looking and more overtly externally focused. It was recognised that there would be benefits to establishing closer engagement with other industrial sectors. Areas of common interest were most obvious with Oil & Gas in particular, due to engineering and regulatory similarities, and also due to being in similarly early stages of large decommissioning programmes. For an engagement approach between the industries, the idea of a single large conference was rejected in favour of multiple parallel conversations (small scale events focused on specific topic areas). There are also opportunities to "piggy back" on existing intra-industry work-streams by introducing a stronger inter-industry dimension.

A joint nuclear – oil & gas workshop in February 2018 outlined an approach to the cross-industry collaboration (Principles for Engagement – shared in this meeting) and agreed number of common topics of mutual interest which were later grouped into 14 "themes". This 30 October 2018 workshop focussed on 3 of the 6 high priority themes, and later workshops will cover the remaining themes.

This workshop's agenda explored learning from both sectors through a number of brief presentations followed by a time for discussion. Authorities, operators and Tier 1 and 2 suppliers were represented in the audience and presenters.

Workshop Context and Background – OGA Perspective

The oil & gas industry has a number of forums already established for exchanging learning within the sector but could do more. Cross-industry workshops would benefit from focusing on areas which have already experienced success and sharing the learning rather than speculating where improvements might be made.

Three things to focus on to achieve our objectives of decommissioning cost reduction; SCOPE - be tangible and ruthless in reviewing and determining what needs to be done to see if it can be done better or approach should change – be clear if it delivers tangible results or need to do things differently; GET BETTER - improve the overall effectiveness and efficiency of what is already being done; FRAMEWORK - enhance the organisational and commercial frameworks to provide greater incentivisation.

Workshop Context and Background – NNL Perspective

Sharing knowledge and collaboration already plays a significant part in the nuclear sector achieving the goals set out in the Clean Energy Strategy and Nuclear Sector Deal both with respect to reducing the cost and schedule of new builds and decommissioning existing sites.

NNL approach is similar. Through Big Tech and the Clean Energy roundtables NNL is bringing together key influencers from within the nuclear sector as well as introducing "disrupters" from other sectors and the UK Catapult networks to challenge and shake up thinking.

NNL recognises through this approach that innovation is not just a question of introducing technologies, but is also about how we organise ourselves in project management, supply chains, commercial models as well as softer skills - leadership and culture.

Technology collaboration is focused on bringing together key stakeholders (Sellafield, NDA and SMEs) within the sector to clarify the challenges and issues they are facing, the outcomes being sought and the potential partners from outside the sector (including Innovate UK, Catapults, BAE Systems, Schlumberger, Cross Rail, ESA) with experience in the successful application in key technology areas (such as electro-chemistry, Artificial Intelligence, Virtual and Augmented Reality, Autonomous Systems, Robotics, Digital technologies and Project Management tools, etc). These must be focused to address the Clean Energy Strategy and Nuclear Sector Deal in terms of cost reduction challenge and goals for improvement in economic impact, eg through exports.

Project Management (PM)

Oil & Gas Sector Insights

- Oil & gas has not been that good at PM, identifying a gap in this area in 2013 which led to establishing a steering group of representatives from the bigger players to bring the industry together, harness the existing initiatives and set a clear programme of improvement.
- The Engineering Construction Industry Training Board (ECITB) have developed a collaborative PM 'toolkit' which is not just about technical skills and performance, but also behaviours and competencies with KPIs around softer issues of trust, communications & team working (the Collaboration Toolkit can be found from the ECITB web site: www.ecitb.org.uk).
- Intra-industry mentoring (between organizations) has been introduced to "future proof" the PM community with a focus on softer leadership skills, client relationship building, influencing; almost 50 candidates gone through this process, benefitting both mentees and mentors.
- Successful project delivery is heavily dependent on the softer skills as well as hard systems and processes; the important differentiators are leadership, the right behaviours, and an ability to effectively communicate key messages across the many interfaces.
- The industry has undertaken a benchmarking study of Oil & Gas Projects 2011-2016 and produced a lessons-learned report available on the ecitb website highlighted above; key finding is that there is no correlation between the size and complexity of projects and the delays and cost overruns which they encounter – much more about HOW it was executed than WHAT was delivered.

- Decommissioning is very different to the exploration, select, design and build and operational phases of the lifecycle; often only get one chance to do it well so must be right first time every time.

"… often encounter anomalies, for example in relation to a temporary structure required for a duration of only 6 weeks during decommissioning, we were required by standards to paint the structure with a coating specified for a 25 year life – need to think differently"

A Large Oil & Gas Operator's Perspective

- Approach to PM identified as being very inconsistent across the company and industry. As projects failed and were reviewed, projects standards were incremented such that they eventually became unwieldy, inefficient and expensive. The operator became increasingly uncompetitive; needed to radically change to have a future.
- Now this operator no longer has inflexible standards, but has adopted a "risk based" approach which has adaptable methodologies and standards to the situation.
- Operator has established a PM Academy; a combination of mentoring, learning and education; 70% on the job; 20% networking / peer learning; 10% classroom based courses. This is resulting in successful outcomes with much greater consistency in programme delivery, contributing to 50-70% cost reductions in some specific elements, and with learning systematically ploughed back into future projects.
- The learning curve on decommissioning has been steep, but it is coming down. Some projects being unique with no opportunities to benchmark in order to more accurately estimate costs and timescales. Clear identification of the challenges, and breaking down the project elements is essential for such unique projects.

Both sectors have in common the challenge of decommissioning structures that were never designed to be taken apart, in a heavily regulated industry with significant environmental and safety case risks attached. Therefore, the ultra-conservative culture has an inbuilt tendency to over-specify solutions and over-apply regulatory requirements – need to define appropriate risk-based environment for decommissioning.

Nuclear Sector Insights

- Sellafield (SL) has had 40 years of focus on project delivery but has, several times, ended up delivering the wrong projects well. Some of this is down to human factors; SL had lots of experienced people with strong operational backgrounds, and project managers experienced in getting things done, but a lack competent programme managers for complex portfolios of projects. Consequently, SL identified a need to focus on programme management.
- SL Identified the need to shift the focus to concentrate on how to deal with uncertainty, how to characterise complexity, and how to manage and transfer risk appropriately.

- SL needed to define "competence" in the project arena – the required scope of experience, knowledge, behaviours and leadership. Also to differentiate more clearly between training versus education, to provide a "blueprint" for the PM academy.
- Through the SL PM Academy, a holistic approach has been adopted, with 18 organisations involved; including higher education (Universities of Manchester and Cumbria) local colleges, charities and employers in the local area. Career pathways have been developed to support individual PM professionals, help them deal with uncertainty and operate as part of integrated project teams, as well as providing education, vocational training and enhanced technical knowledge.

Now entering a post operational period, SL has focussed on building Programme and Project Management capability, collaborating across the local and regional economy to build a PM Academy, open to all.

Commercial Models

Commercial Models commentary reflects where the responsibility for decommissioning lies across each sector; with nuclear being driven by the NDA - a non-departmental public body; and within oil & gas - the private sector operator having liability in perpetuity.

Oil & Gas Operator / Contractor Insights into Commercial Models

- Specific example of off-shore decommissioning discussed. Various options considered, from modular removal of the top-side, to single lift. Considered a range of off-the-shelf and bespoke / designed-for-purpose technologies, including robotics and AI solutions. Learning points:
    - Consider all the possible options
    - Breakout and package into manageable work scopes
    - Appreciation of timescales v cost; may not need to do it immediately - could save cost by waiting
    - Constructively challenge the apparent regulatory requirements - offer alternatives
    - Identification of areas of less knowledge and experience
    - Work on issues together with supply chain - not remotely
    - Engage with supply chain early - be open about challenges
- Jointly negotiated insurance covering the work scope for everyone in the programme, utilisation of each other's resources on site to minimise costs, working concurrently on some tasks agreed with regulator
- Aware of new technologies but significantly more benefit derived from better understanding and planning and the use of existing technologies in better ways

- Contract steering group to create flexibility – right work right scope right plans – allow supply chain to advise on schedules to better suit cost time and schedule constraints
- Challenge corporate processes and cultures to remove barriers, redefine ways of doing things and enhance learning
- An inherent risk in driving fixed price contracts is that health and safety suffers in pursuit of margin as all the risk is pushed down onto the contractor
- Risks need to be better understood and should sit where they are most appropriate - "open book" is an option but requires trust on both sides – keep it simple – don't over specify or over complicate the solution
- Decommissioning at sites that are still operational adds cost, as operational, regulatory and safety constraints are placed on the contractor restricting their scope of operations.

> Competition between the Operators (i.e. the clients) does not deliver value in decommissioning. The Operator doesn't want or need a competitive edge in decommissioning. Cross-operator collaboration is essential in order to solve the common challenges we face. We can secure economies of scale across multiple units / projects.

Nuclear Sector Insights into Commercial Models

The nuclear industry operates under a very distinct organisational structure and commercial operating model when it comes to decommissioning: the nature of the uncertainties associated with nuclear decommissioning means that private entities are unable / unwilling to accommodate the risks. UK's HM Government will always underwrite the liabilities, and this is devolved to the NDA.

NDA is a wholly owned HM Government Non-Departmental Public Body (NDPB) mandated to conduct competitions in order to reduce costs – NDA provides a "thin" management layer to allocate budget to key contracts and report performance.

Nuclear sites are managed by a number of Site Licence Companies (SLCs; e.g. Magnox, Dounreay, Sellafield). SLCs are enduring legal entities, providing confidence to the regulator and HM Government that their expertise and capabilities will remain available to the UK as long as they are required to deliver the clean-up programme. As the SLCs are not competitors there is an opportunity for significant exchange of ideas and shared learning.

There is proud history of commercial operations and a wide range of commercial models (short term tactical through to long term partnering) in operation across the nuclear sector, mostly concerned with how public money is flowed down through the NDA and SLCs into the supply chain; possibly the only model not in use is Public Private Partnerships.

Parent Body Organisations (PBOs) are strategic commercial partnerships designed to enhance the performance of the SLCs. PBOs bid to temporarily operate the SLCs and provide external management expertise to manage the supply chain and deliver the programmes in the most efficient and cost effective way.

The PBOs are incentivised to reduce costs through shared benefits (gain share / pain share) but the value they bring is significantly more than cost reductions, providing "reach back" into their own organisations and across industry sectors in terms of their depth of management expertise, skills and availability of resources.

Key learnings:

- In an environment of high complexity, uncertainty, risk and regulation, and with a supply chain held harmless of commercial risks and benchmarking data, it is difficult to arrive at an effective and sustainable PBO commercial model that will go a long way to satisfying all or most of these competing interests and demands. Whilst the PBO model remains effective in some cases, the NDA commercial model with SLCs therefore continues to evolve towards a "direct subsidiary" approach. Sellafield no longer operates under a contract to NDA but an MOU providing greater autonomy of decision making, simplification of reporting and avoiding the need for complex contract management and change control; changes to the Magnox SLC are likely in 2019.
- NDA funding of SLCs is on an annual basis, which forces severe constraints on projects and operations that span decades. Yet a stop-start approach around the end of each fiscal year, to match activity exactly to budget, costs the taxpayer more in the long run: for every £1 of activity paused, an additional £3 is incurred to restart later.
- Challenges are too large and too complex for most of the supply chain to undertake – supply chain has consequently become "trained" into being transactional in their response.

Long term frameworks have been put in place to counter the transactional response of the supply chain. Such frameworks provide market stability enabling investment by suppliers in local capability and capacity. Examples include:

- **Design Services Alliance (DSA)**; engineering design and associated project management and project control support and safety case assessment service. Approximately £1.6bn over 15 years; now 7 years into the programme.
- **Decommissioning Delivery Partnership (DDP)**; high hazard retrievals and risk reduction to provide capability and capacity to deliver decommissioning tasks and projects. £1.5bn over 10 years; now 3 years into projects. Piloted fixed price approach based on defining the requirements and setting out the risks; experimented with fencing off physical areas and handed over to the contractor until clearance completed.
- **Infrastructure Strategic Alliance (ISA)** – delivering basic infrastructure on site; electrical distribution services, utilities, roads, bridges etc. £1.1bn over 5 years with 15 year option. Cost reduction good but schedule adherence poor due to constraints of working on licenced site.

These previous approaches tended to specify requirements and outcomes from pre-determined design solutions and not go out to the market until the specification stage was complete, i.e. the

operator was prescriptive in its requirements. A new approach currently in procurement builds on current best UK practice:

- **Project and Programme Partners (PPP)** is the new approach currently awaiting award. Enabling a partnership approach, success driven single integrated team from the outset; single project delivery team, single outcome, single agreed target price with a focus on delivery rather than on all the effort going into defining specifications, contract wrangling and claims management. £7bn in projects over 10 years, profits linked incentivised approach, with common success driven goals.
- PPP is aligned with Project 13 approach, the industry-led response to traditional infrastructure delivery models that fail not just clients and their suppliers, but also the operators and users of our infrastructure systems and networks.
- Moves away from traditional approach to risk by removing Liquidated Damages, and increasing the degree of trust between operator and supplier.
- Fixed and capped profits, with profit release linked to milestone achievements and performance across the portfolio. As profits are linked to outcomes, including post-construction plant performance, there is no point in "burning hours" and no incentive in re-work; everyone's profitability is linked with how the whole team works together.

Supply Chain

Oil & Gas Large Operator Insights

An example of supply chain learnings was discussed in the context of decommissioning an off-shore platform:

- The available technology changed rapidly during the planning phase for deconstruction of the top sides. Multiple lifts of modular sections of the topsides were planned, but the availability of a marine vessel with very heavy lift capacity changed the whole approach to a single-lift of the top-sides in one go, and the operator regretted the wasted effort on the alternative.
- Need to develop a strategy for decommissioning during greenfield development, and consider how we design facilities to ultimately be decommissioned at lower cost.
- In decommissioning projects, we do have the luxury of having time to consider the best approach from among the alternatives, gain understanding, and find opportunities for cost reduction.
- Everyone is attempting to establish an 'A team' to undertake the task of decommissioning; by definition we can't all have the best team; need to build a new model for decommissioning rather than repeating the past approaches to new-build.
- Better approach:

- scope requirements; understand the problem and be clear at the outset what you are trying to achieve;
- create intelligent client who understands the challenges and will work with you to overcome them;
- engage early with all stakeholders including the supply chain and don't overburden them with pre-defined over specified unachievable solutions;
- evaluate risks; what is a true hazard rather than what does the operational safety case and culture want you to do to be compliant;
- not just about being efficient but also effective; what needs to be done now versus what can be left to be done later, but with what cost implication?
- set up a team for the long haul committed to successful delivery right attitude and behaviours more about collaboration than directive; right people right focus right mindset

Nuclear Sector Insights, an SME Supplier Perspective

- Critical that the NDA and SLCs are increasingly open to becoming intelligent customers to the supply chain, drawing on SME expertise, and understanding the know-how they bring to site. SMEs bring considerable experience in high hazard, high complexity, cost effective demolition gained from a wide spectrum of projects.
- The Supply Chain operates across industries, and therefore automatically brings cross-industry learnings that might be absent from operators with a narrower perspective.
- SMEs are typically rooted in local communities, directly engaged in training and education, addressing socio-economic issues providing jobs and direct support to local economy.
- Challenging environment for new start-ups; need a better strategy for SMEs to incubate and grow, but some who are scaling up through aggregation of demand and co-operation with larger organisations.
- SMEs rarely able or allowed to access the right people in the operator / authority in order to understand the real issues and challenges; typically having to go through other organisations or commercial department as an intermediary to the real client. SMEs need an access mechanism to be able to address value propositions directly to those who own the problems.
- Onerous requirements on new entrant companies trying to access nuclear sector are causing many to give up long before they get a contract. Some are under a false perception that nuclear has, or demands, a much higher standard of engineering which they consider unachievable. SMEs feel that they are not able to compete with existing companies on skills or pay, so need to differentiate themselves in other ways, but find it difficult to know what and how. Consequently, good SMEs with knowledge and skills in other sectors are not even applying for nuclear work.

"… the Nuclear industry has little entrepreneurial spirit, very settled and well paid so no incentive or drive for new ideas and to access opportunities from within the supply chain. Hard to resist culture clashes forcing SMEs to adopt and work their bad habits; eventually undermines your USP"

- Significant overheads encountered working in nuclear; transferring people and skills between sectors a big challenge and cost for SMEs. The sector needs to consider ways of reducing over specification (gold-plating), simplifying processes and procedures, especially reduce commercial barriers, and standardise practices in order to reduce costs and increase flexibility.
- Facilitating SME access to the decommissioning market and enabling these organisations to deliver in innovative, agile and responsive ways requires procurement strategies and mechanisms which;
    - Recognise the overall value add and benefits being of the service being offered and strike an appropriate balance between time, cost and quality across the programme of work, rather than simply focussing on lowest tendered price.
    - Specify the problem in terms of the desired outcomes and hard constraints rather than in terms of the solution. This enables suppliers to respond with innovative approaches which facilities capability development, the creation or development of new IP and stimulates growth.

Nuclear Sector Insights, a Large Supplier Perspective

- Difficult message to communicate when it comes to defining value; decommissioning is cost, there is no value to it, the quicker you do it the more costs you avoid.
- Nuclear operating assets enjoyed a high degree of autonomy prior to decommissioning. A fleet (batch) approach to decommissioning nuclear power plants means difficult decisions (e.g. take 1,000 heads out over 15 months) in order to get costs down quickly. Has a huge impact to the local economy and presents a significant leadership and culture change challenge at the site.
- Bradwell was the first UK site to be taken all way into care and maintenance whereby site will lie dormant for 70 years until waste reduction starts with end waste solution defined. A programme approach to multiple sites drives the strategy up the supply chain: learnings from early sites rolled on to the next site.
- Long-lived operating nuclear assets leave a strong localised community and site identity, not just individuals but families and generations of workers, who are very well paid relative to local economy. A lack of alternative employment, and strong resistance to relocating, conjoins with general resistance to change. Very strong reaction to taking the site out of an operating condition and transforming it to a dormant state ready for decommissioning.

Some decommissioning decisions can have local, regional and national political implications

- Waste categorisation and characterisation is a big issue. We don't want the expense and difficulty of transporting spent fuel and waste across the UK (to Sellafield) - need to define better options
- Once out of operations, switching off lights and heating means that infrastructure deteriorates rapidly and in unexpected and unplanned ways, for example; rapidly drying out asbestos flaking off walls, deteriorating buildings cladding incurred significant unexpected costs to resolve. Better decision making process needs to consider full life time costs and take into account action now v potential future costs.
- Just as new-build projects have a tension between CAPEX and OPEX spend (cut corners on the project, but risk spending more ultimately during operations), decommissioning projects have a tension with late-life operations (save money during operations, but risk spending more ultimately during decommissioning).

> Real challenge for the NDA is how much to continue to invest in assets and spend on maintenance during late life ahead of decommissioning especially when there is no obvious political capital in doing this.

Roundtable Feedback

Feedback was solicited from the participants as to the workshop. These learnings will be incorporated into future cross-industry engagements.

Positives (repeat next time …)

- All benefitted from the exchange; not just from the cross-industry component – O&G even learned something new from O&G
- The cross-industry nature of the participation added a dimension to the usual intra-sector workshops; different questions were asked; greater openness was encouraged
- Good education on the similarities and opportunities for shared learning between the two industry sectors
- Participation was with an open mind and willingness to contribute and listen
- Delegates were appropriate; right vertical mix of authorities / operators / supply chain and right level of experience / seniority

Negatives (even better if next time …)

- Insufficient time to discuss all the topics; 3 of the 6 high-priority 'Areas of Common Interest' were covered – would have benefited from covering a maximum of 2
- Could have been more specific about what we were looking to achieve from each topic

- Not fully explored these 3 topics of Project Management, Commercial Models, Supply Chain; need a more detailed follow up session
- Table-chair layout should have been cabaret-style (small circular tables) to encourage discussion

Other thoughts for future workshops

- Consider continuity of some of the participants between workshops to minimise the re-education component and inherent over-head
- Topics covered in this workshop could do with more future discussion – consider similar group reconvening
- Consider covering fewer themes in future workshops, allowing time for more depth
- Consider tighter control of the agenda, with specific topics and outcomes
- Consider structuring future agenda by challenges, presentation / discussion responding with solutions
- Include Oil & Gas SME representative organisation
- Future topics to include
    - Late Life Asset Management
    - Collaborative project examples
    - Campaign / fleet approach
    - Detailed Supply Chain
    - Waste Management and Removal
    - Detailed Programme / Project Management
    - Regulator and Supply Chain relationships

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Glossary:

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