Openness and insularity in the NDA group's organizational learning

Findings and recommendations

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SUMMARY

- Four types of organizational complexity were evident within and across the NDA group that impacted its organizational learning, related to – structures and processes; stakeholder relationships; the workforce; and modes of thinking and learning.

- Together, these indicate tensions related to organizational learning between openness and insularity, at three levels: within the NDA group organizations, between NDA group organizations, and at the sectoral level.

- To build further on the forms of mission-driven and collaborative learning in and across the NDA group it is recommended that it:
  - ☐ Review its mission statement and its associated indicators and measures of mission progress.
  - ☐ Review the NDA group's current stakeholder strategies and mechanisms.
  - ☐ Integrate systems and processes across the NDA group as much as is practicable.
  - ☐ Further develop a culture of collaborative control and challenge.

1. INTRODUCTION

1.1. Introduction to the Nuclear Decommissioning Authority (NDA) and NDA Group

The Nuclear Decommissioning Authority (NDA) is a non-departmental public body, sponsored and funded by the Department for Energy, Security and Net Zero (DESNZ). The NDA has responsibility for cleaning-up the UK's earliest nuclear sites safely, securely and cost effectively, and is set to take on responsibility for decommissioning Britain's seven advanced gas-cooled reactors (AGRs).

Since its formation in 2005 the NDA has re-organized its relationship with its subsidiary operating companies (OpCos) and merged some of them. The NDA group is now made up of the NDA and its four key component parts: Sellafield, Nuclear Restoration Services (NRS), Nuclear Waste Services (NWS), Nuclear Transport Solutions (NTS), and several other subsidiaries.

1.2 Sustainable organizational learning

Sustainable organizational learning is not only a necessary component but also a key enabler of continuous improvement across the NDA group to fulfil its mission to deliver "safe, secure, sustainable, and publicly acceptable solutions to the challenge of nuclear clean-up and waste management" [1].

To help the NDA group achieve its mission by developing a deeper understanding of how more sustainable organizational learning would enable more effective delivery, this research examines the strengths and weaknesses of organizational learning [2,3] within and across the NDA group, identifying broader features that influence these patterns. By identifying and analysing enablers and barriers to sustainable organizational learning this research aims to inform interventions that can minimise weaknesses to organizational learning and exploit opportunities for improved learning practices.

2. RESEARCH DESIGN

The study employed an exploratory, mixed-methods approach designed to capture an in-depth understanding of organizational learning practices within the NDA group from late 2023 to Dec 2024. This design allowed themes to emerge from the data through reflexive thematic analysis [4,5] rather than imposing prior frameworks, enabling comparison between multiple data sources. The methods and data involved:

An interim report summarising the key findings from the research was developed and an overview of this was presented to a selection of NDA group employees in October 2024. The presentation was followed by small group discussions in which the main findings were confirmed as being representative of the employees' experiences, with additional comments and insights provided which further developed the findings.

The findings should be interpreted as representing, the thoughts, feelings, and practices of a selection of variously located people within the NDA group, as well as a selection of external stakeholders, about the significant strengths and weaknesses of organizational learning in the group, and their reflections about why this is the case.

Methods	Data Collected	
Document Analysis	Redacted NDA board meeting minutes (2022-2023), NDA and Operational Company (OpCo) business plans, strategies, annual reports, progress reports, National Audit Office (NAO) documents, Office for Nuclear Regulation (ONR) reports, BEIS departmental review, Organizational Health Index (OHI) surveys, Baxter-Neuman Leadership Survey, Holliday Inquiry, Chair's review	
Non-participant Observation	Four OpCo offices/sites, cross-industry conference, NDA-partner forum, four NDA working group meetings (including stakeholder involvement), operational site activities	
Interviews	69 interviews	NDA: 7
		OpCo A[1]: 26
		OpCo B: 26
		OpCo C: 1
		OpCo D: 1
		External: 8
Focus Groups	Three focus groups across two sites	
Surveys	55 participants across six surveys	Internal: 43

1 The OpCos were anonymised to encourage frank and open conversation.

Table 1. Data Summary

3. FINDINGS

The findings are organized into four themes around organizational complexity which are inter-related and affect each other.

3.1. Complexity in Structures and Processes

The NDA Group demonstrates multifaceted organizational complexity stemming from its considerable size, geographical dispersion, and extended project timescales. This complexity is manifested through legacy effects of previous organizational models, fragmented information systems across sites, professional divides between teams, and some potentially disproportionate rule-focused processes in safety and training.

3.1.1. Organizational Structure

The considerable scale of the organization creates inherent challenges for organizational learning and knowledge management. As one OpCo manager explains: "Part of it is just the size, the scale of the organization (…) it's impossible to fully understand all the intricacies of the business". This complexity manifests in communication barriers, knowledge silos, and coordination challenges across different organizational units.

The Parent Body Organization (PBO) model (when SLCs were owned by private-sector organizations with the aim of fostering competition and innovation) [6] has left a lasting imprint on organizational structure and behaviour, particularly in relation to knowledge management and organizational learning. A critical issue emerged in the substantial loss of expertise following privatisation, with many experienced staff departing and some later being contracted back to maintain essential operations. The PBO era's impact continues to manifest in persistent resistance to knowledge sharing, with staff noting a lingering "muscle memory" that treats knowledge as proprietary rather than a shared resource.

3.1.2. Geographical Dispersion

The organization's geographical dispersion presents significant operational challenges, with sites reported as operating in relative isolation despite facing similar issues. Over time, each site has developed unique operational contexts and local stakeholder relationships, which is sometimes seen to lead to fragmentation and inefficiencies. Communication barriers are a common concern, as highlighted by one OpCo manager: "You've got people 170 miles down south telling you how to fix something. I don't know whether that can sometimes come across. I don't know if there's a bit of that friction involved due to that".

3.1.3. Project Timescales

Nuclear decommissioning operates on extended timelines, presenting unique challenges for maintaining organizational focus and orientation. As one OpCo executive observed: "You'll see there's a high tolerance of amber and red in the operating plan (…) because people are very comfortable with the very long timescales". These prolonged project durations necessitate sophisticated strategies for preserving institutional memory across multiple generations of workers.

3.1.4. Governance

Analysis of NDA board documentation revealed a predominantly inward-focused orientation in decision-making and oversight processes. NDA board meeting minutes from 2022 to 2023 showed three key patterns. First, external engagement was notably limited, with only one external organization (EDF) appearing in the top 50 most frequently referenced entities. Second, the language was heavily centred on internal NDA organizations and regulatory bodies. Third, the language used was predominantly administrative and managerial in nature, with three main themes emerging: 'governance and oversight', 'strategic management', and 'performance and compliance'. This predominantly inward-focused board governance operates within a challenging context of restricted regulatory attention and leadership practices that, whilst reportedly strong on strategy, was seen to face ongoing challenges in organizational engagement and change management.

The research indicated both positive developments and ongoing challenges in leadership within the NDA. Senior leadership was widely praised for providing clear strategic direction, e.g. an NDA manager noted: "Overall business goals and strategies set by senior leadership are taking NDA in the right direction". However, concerns were raised about leadership communication practices. An OpCo manager highlighted a recurring issue where leadership culture prioritises one-way communication over meaningful engagement, failing to explain rationales or maintain visibility during periods of changes.

3.1.5. Information Sharing

Information is seen to reside in disconnected pockets throughout the organization, with different sites maintaining separate systems for similar functions like Learning from Experience (LfE). This fragmentation manifests particularly strongly in the IT infrastructure, where multiple parallel condition report systems – ATLAS (Sellafield), Q-Pulse (Magnox), UNER (Dounreay) – operate with limited integration, creating significant barriers to cross-organizational collaboration.

This structural isolation is further exacerbated by information-hoarding behaviours. An OpCo manager explains: "We're quite siloed. We like to keep our information. And some people see information as power". This mindset reflects a deeper cultural challenge where control over information is equated with influence, creating barriers to open collaboration.

3.1.6. Professional Divides

The research identified significant divides among various organizational groups, creating persistent barriers to learning and collaboration. As an NDA manager succinctly put it: "[NDA is] silos within silos". A notable disconnect exists between operational and office staff, highlighted by their differing approaches to safety practices and organizational priorities. Limited interaction between specialised teams fosters knowledge silos, while varying professional languages and priorities further complicate cross-functional collaboration.

3.1.7. Perceived Disproportionate Rule-focus in Safety and Training

Perceptions of potential overreach are evident in training and safety procedures. For example, while always holding handrails on stairs is sensible in high-risk operational environments, applying this requirement in site offices illustrates how rule-focused processes can extend beyond nuclear-specific safety concerns into general workplace behaviours. While well-intentioned and relevant, such over-prescription risks diluting the focus on more critical safety protocols. This tendency towards excessive rule-focused standardisation through training and procedures

suggests a broader organizational pattern that may undermine staff judgment and initiative.

The research also indicated a potential misalignment between mandatory compliance training and professional development needs. One OpCo manager remarked: "There's a lot of time spent doing learning and training, and it's mandatory training (...) But we sometimes don't spend the amount of time on doing a course that's going to make you a better engineer".

3.2. Complexity in Stakeholder Relationships

The NDA group demonstrates significant challenges in engaging with external perspectives and learning opportunities, though there are some notable areas of success. Its stakeholders include high-engagement entities (regulators, government departments, and supply chains) requiring regular interaction; moderate-engagement partners (local councils, industry partners, and academic partners) collaborating periodically; and low-engagement stakeholders (Non-Governmental Organizations (NGOs), advocacy groups, international regulatory bodies, and international partners) who remain distant but influential on specific issues. Figure 1 represents their relative levels of engagement.

3.2.1. Government and Regulators

The NDA's relationship with government bodies and regulators operates across multiple levels, from central government oversight to local authority engagement. At the national level, the organization maintains intensive relationships with key regulators including the Office for Nuclear Regulation (ONR) and environmental agencies, as well as government departments. These relationships involve
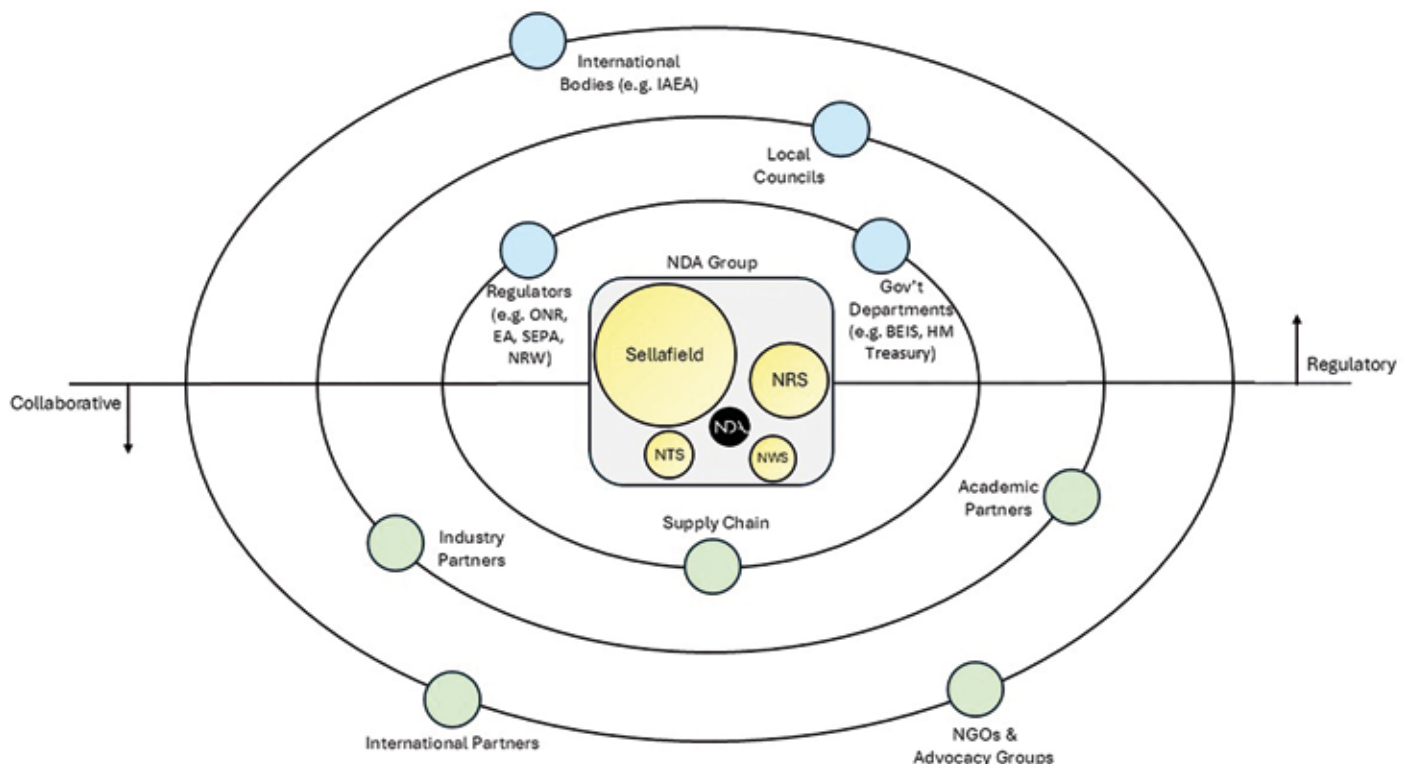

Figure 1. NDA Stakeholder Map

regular interaction related to compliance, funding, and maintaining operational effectiveness. At the local government level, engagement typically centres on economic development, planning permissions, and community impact.

Although regulatory relationships are generally well-established and effective, they were seen to sometimes create barriers to innovation and efficiency. This tension between stringent regulatory compliance and the need for operational flexibility remains a key challenge in the organization's stakeholder management approach.

3.2.2. Supply Chain Relationships

Within the sector, the research identified a relatively strong collaborative culture between supply chain members and OpCo staff. One OpCo-embedded external partner highlighted this dynamic: "There is very much a culture that's being set out of, there's no distinction between supply chain members embedded in projects and [OpCo] staff. So it's a very collaborative work environment". However, security requirements frequently position the supply chain as a potential vulnerability, creating tensions between stringent safety protocols and practical working arrangements.

3.2.3. Industry, Academic, and International Partnerships

The NDA Group shows a mixed record in external engagement with research and development. In 2022 - 23, the organization allocated £99.8 million to research and development, including £3.0 million for university interactions. Despite these efforts, gaps in knowledge dissemination hinder the full potential of these partnerships. For example, during an NDA forum, a senior engineer noted that some PhD presentations addressed problems already resolved internally within the NDA group but not shared externally. Such instances highlight missed opportunities for knowledge exchange and collaborative learning.

3.2.4. Community and NGO Engagement

The NDA's Strategy 4 and the development of Strategy 5 demonstrate an increasing recognition of the importance of engaging with broader stakeholders, including younger people, NGOs, and diverse perspectives. These strategies emphasise transparency through regular updates and feedback mechanisms while aiming to foster inclusivity through multiple engagement channels. Each OpCo and the NDA has its own forms of community and/or NGO relationships and engagements. The OpCos appeared to favour place-based forms of community engagement, while the NDA found that there was sometimes a lack of local capacity for engagement in social or economic partnerships.

However, the research uncovered significant challenges in effectively engaging with local communities and NGOs. Despite strategic intentions, practical implementation is sometimes seen to fall short. This disconnect was starkly illustrated by one NGO member's strongly critical metaphor, describing the NDA group as: "A swarm of flies around a dead body." This metaphor reflects deep-seated tensions and dissatisfaction among certain stakeholder groups, highlighting the strong opinions around the nuclear sector.

3.3. Workforce Complexity

The NDA Group's workforce shows relative demographic homogeneity with an aging population. Strong local community ties and predictable career trajectories foster organizational memory but impede change, while weak reward satisfaction and staff departures indicate retention challenges.

3.3.1. Demographics

The NDA Group faces challenges related to workforce composition and development, particularly evident in its demographic profile. Survey and interview data indicate that the workforce at the OpCos is predominantly male, white, and composed of engineering professionals, with operational sites largely recruiting from local communities. This homogeneity was perceived to limit the diversity of perspectives available for problem-solving and innovation.

The homogeneity of the workforce cultivates strong community bonds. As one OpCo manager described: "[OpCo] is still a community (...) There is still a lot of generational family input (...) The community spirit is profound". This sense of community fosters deep organizational memory and strong cultural continuity, which can support stability and efficiency. However, it also creates resistance to new approaches and external perspectives, posing challenges for adaptability and change.

The organization displays a distinctive pattern in career development, characterised by long-term employee tenure and a predictable career trajectory. As an NDA manager noted: "The industry finds it very hard to learn to listen to anybody, especially because it's such a static organization". While this stability fosters deep institutional knowledge (considered particularly important in nuclear decommissioning [7,8], it also reinforces entrenched attitudes about expertise and authority. Such attitudes were seen to contribute to an insular organizational culture resistant to change: "We've got quite a lot of old school attitudes to overcome (...) You have to have done this job for ten years to have a valid opinion."

The aging workforce is seen as another critical challenge for the organization, with much of its expertise concentrated in staff close to retirement age. Many key individuals possess extensive knowledge and experience that remain largely undocumented in formal systems. An OpCo manager observed: "We've got people in the business who've been here 30 to 40 years and have learned a huge amount, but we haven't had the right support and push to make sure we capture that knowledge before they leave".

3.3.2. Perception of Rewards

In the context of a relatively homogeneous, aging workforce with a relatively predictable career pattern, the perception of rewards and recognition is potentially significant. Staff satisfaction with overall reward systems is relatively weak, as evidenced by interviews and survey scores. Several OpCo staff members reported a significant increase in staff departures to other industries due to less attractive financial compensation, a trend that represents a notable change from historical retention patterns and is seen to be negatively impacting workforce morale.

3.4. Complexity in Thinking and Learning

Four particular forms of thinking and learning orientation were indicated in the research: mental barriers to external learning; intentional learning, which involved different formal and cultural aspects; different forms of hierarchical thinking and tensions between them; and morale.

3.4.1. Mental Barriers to External Learning

The sector's self-perception as unique appeared to limit engagement with external learning. An OpCo manager reflected: "I think it's (…) that mentality of nuclear. The mentality in nuclear is different. And I think, therefore, we think that our solutions are extremely complex. (…) But I'm fairly certain there are other really complicated issues in oil and gas plants and stuff that we might be able to take learning from". This mentality was seen to extend to defensiveness regarding external input and learning opportunities, as an OpCo executive observed: "What you see happen at [OpCo] traditionally is that they'll resist it if it's not invented here (…) so you end up with this inherent resistance".

3.4.2 Intentional Learning

There are several formal learning practices implemented within the NDA group, as well as some formally ingrained habits. The key formal learning practices included training and embedded processes such as 'Learning from Experience' and various documentation practices. The key formally ingrained habit was the conscious encouragement of a habit of challenging assumptions, practices and ideas to avoid mistakes and to improve, and in some areas strong collaborative processes of learning were seen to be in play.

Training programmes demonstrate strong institutional commitment and positive employee engagement. As one OpCo senior manager explained: "We've done quite a lot of work on learning to ensure that things get embedded and actually stay (…) We have a learning strategy (…) lead and learn forum where people come back and share all their experiences". Employee engagement with learning is weakly positive, with the statement "everyone expects regularly to update their skills and knowledge" scoring 3.95 out of 7. However, challenges emerge in the reliance on informal networks for learning. An OpCo embedded partner stated: "You can't really use useful learning from other areas of the business unless you know where to go to get it or the right people to speak to".

The Learning from Experience (LfE) scheme is seen as a cornerstone of knowledge acquisition and sharing. Survey participants gave a weakly positive score (3.84 out of 7) to the statement "Learning new things is a way of life here". LfE is particularly effective in operational and tactical learning contexts. However, the system shows limitations in capturing broader, strategic learning opportunities. As one OpCo senior manager explained: "When we fill in a condition report (…) the investigation isn't to identify what learning there could be. The investigation is to identify what happened".

Documentation practices serve as critical mechanisms for preserving organizational knowledge. Comprehensive documentation contributes to a robust safety culture ensuring compliance with key regulations. Some inconsistencies of perception across the OpCos were observed with one OpCo experiencing over-documentation whilst another faced gaps in formal documentation.

The research also indicated a complex picture regarding the habit of challenging practices and ideas. The NDA group demonstrates a weakly positive challenge culture, with the statement "Departments or units both challenge and help each other" scoring 3.91 out of 7. However, external stakeholders often experience this challenge culture differently, with one NGO member describing how raising a question about contamination caused "a huge upset", suggesting the NDA may be uncomfortable with external challenge.

Another aspect of intentional learning were some strong collaborative relationships involving NDA group organizations, the supply chain, and industry partners that had been intentionally developed over several years. Respondents reporting these positive collaborative relationships highlighted the contribution of such collaboration to progress against the NDA group mission, for example, in terms of speeding aspects of the work programme and/or reducing monetary costs.

3.4.3. Hierarchical Thinking

A key instance of hierarchical thinking within the NDA group is the focus on the NDA mission, with a strong commitment to safety and security deeply embedded in its culture and practices. This prioritisation is consistently reinforced across all levels, as highlighted by one OpCo staff member: "You'll never be told to prioritise production over safety, and it's always very explicit that if it's a safety concern, that will come first and will stop it".

Despite the consensus on the validity and importance of safety and security concerns, there were diverging perspectives on whether they were always appropriately applied. While office staff typically view safety protocols as fundamental principles, operational staff report often experiencing a disconnect between high-level safety rhetoric and ground-level practices. Such a dynamic can create tension when safety considerations are invoked in situations where their relevance or proportionality might be questioned. In these cases, several respondents commented that safety can be used as a 'trump card,' effectively halting discussions of alternative approaches or broader organizational improvements.

Another feature of hierarchical thinking in the research is its association with the hierarchical structure of the NDA group and the OpCos. This is indicated in the survey data which showed particularly low satisfaction with communication flows in policy and strategy formation, highlighting a disconnect between decision-makers and operational staff: "all members of the organization take part in policy and strategy formation" scored 2.43/7 and "policy-making is seen as a way of helping people to stay really involved with the organization" scored 2.55/7.

A key tension evident in some of the findings related to learning is that between a focus on thinking about operations and a focus on thinking about strategic aims. There is a perceived strength in tactical and operational learning, particularly in safety and compliance domains. However, the strong focus on immediate operational concerns is sometimes seen to overshadow efforts to identify systemic patterns or generate broader insights.

3.4.4. Morale

Morale issues within the NDA group appear to be significantly influenced by the sector-specific dynamics of decommissioning work, which often lacks immediate and visible results. Respondents that reported a positive sense of satisfaction in their work described being able to feel, or point to, their contribution towards positive impact within their part of the group's operations. The absence of tangible progress, however, appears

to make it difficult for some employees to maintain a sense of accomplishment and purpose.

The gradual decline of the sites has further exacerbated morale challenges. Reflecting on this shift, an OpCo engineer used a poignant metaphor, comparing the organization to a butterfly reverting to a chrysalis: "It's going from a butterfly into chrysalis. That's what it's done. It has, it's gone in reverse. (...) The nuclear industry in the 50s and 60s was the front end of Britain's technology. It's not anymore. And particularly for decommissioning, it's the ugly end of it".

3.5. Openness/Insularity — Multidimensional Facets

Each of the types of complexity highlighted above indicates different types and degrees of organizational openness and insularity within and across the NDA group.

Within the NDA group organizations there were forms of openness in relation to learning from experience, to embedding training, and in supporting a culture of challenge. There were forms of insularity between teams, between functions, between operational and office staff, and between hierarchical levels. These tensions were evident in some of the weaknesses around collaboration and co-ordination systems, because of specialisation, size, complexity and inertia, and in the relative homogeneity of the workforce and the focus on safety and security.

Between NDA group organizations there were forms of openness in terms of developing long-term collaborative relationships between each other and developing forms of integrated information systems. There were forms of insularity in terms of a degree of organizational narrowness in approach, limits to information-sharing, in organizational defensiveness, and the perception of there being some tensions between the NDA and the Operational Companies.

Finally, at the sectoral level, there were forms of openness in relation to strong regulatory relationships and significant development of supply chain and industry relationships, as well as investment in research and development, including with academia. There were forms of insularity in terms of the inward governance focus, the safety and security focus, and some weaknesses in stakeholder engagement.

It is important to note, however, that organizational openness and insularity can both be organizational strengths or weaknesses depending on the context and the issue. The value of either characteristic depends on what it enables or restricts as well as on how it is strategically used rather than any universal value.

The benefits of these findings and analyses are that they help clarify and articulate some of the enablers and barriers to organizational learning within and across the NDA group, and can thus inform how the NDA group might make its organizational learning more sustainable going forward, for example, considering how to improve communication flows in policy and strategy formation.

4. KEY RECOMMENDATIONS

To build further on the forms of mission-driven and collaborative learning in and across the NDA group it is recommended that it:

- **Review its mission statement and its associated indicators and measures of mission progress**
  The research revealed challenges in workforce morale and engagement linked to difficulty in seeing tangible progress. The current mission emphasis on cleaning-up, safety, security, and cost-effectiveness, while crucial, may not fully capture the broader societal value of the NDA's work. A reimagined mission emphasising environmental renewal and community regeneration might motivate staff and communicate value to stakeholders better by.

- **Review the NDA group's current stakeholder strategies and mechanisms**
  Our findings indicate notable insularity in organizational practices and limitations in external learning. While the NDA group maintains strong relationships with regulatory stakeholders, engagement with other stakeholders, such as environmental or community groups, shows room for improvement. Structured review against stakeholder standards may help identify gaps and opportunities for enhanced engagement.

- **Integrate systems and processes across the NDA group as much as is practicable**
  The research identified persistent challenges from fragmented systems and processes across sites. While some fragmentation may be inevitable due to security requirements, there may be opportunities to streamline and integrate systems where possible, reducing duplication and improving knowledge sharing.

- **Further develop a culture of collaborative control and challenge**
  Our analysis revealed tensions between hierarchical control structures and the need for innovation and learning. A collaborative approach to control, combined with respectful challenge practices, may help balance these competing demands while fostering trust and engagement.

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ACRONYMS

AGR	Advanced Gas-cooled Reactors
DESNZ	Department for Energy, Security and Net Zero
LfE	Learning from Experience
ONR	Office for Nuclear Regulation
OpCo	Operational Company
NDA	Nuclear Decommissioning Authority
NGO	Non-Governmental Organization
NRS	Nuclear Restoration Services
NTS	Nuclear Transport Services
NWS	Nuclear Waste Services
PBO	Parent Body Organization

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