# Good Practices for Independent Strategic Reviews in Nuclear Decommissioning

## Workshop Report

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## Contents

# Foreword

Independent reviews are an essential part of maintaining high quality and confidence, by the public, government and oversight organisations, in the development, execution and management of major projects and programmes. This is especially important for decommissioning of nuclear facilities established for defence and energy production, where complexity, long time frames, high hazards and a history of mistrust engender the need for on-going constructive scrutiny. Important experience and lessons learned have been gained in the formulation and carrying out of independent reviews in the nuclear and other sectors in many countries. The workshop reported here brought together highly experienced individuals from government agencies, advocacy organisations and academia to share lessons learned and good practices based on their experience.

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# Executive summary

This report summarises an on-line workshop that was held during two, one-half day sessions to identify good practices for developing and carrying out independent strategic reviews for defence and civilian nuclear decommissioning programmes. In the context of this report, nuclear decommissioning programmes include activities necessary for final disposition of materials and facilities and environmental clean-up from production of nuclear power and production of defence nuclear materials. Strategic reviews are undertaken in support of government decisions and oversight for major capital programmes that are complex and long-term. They are crucial to ensuring these programmes deliver public value. Public value includes contributing to sustainability, (social, economic, and environmental aspects) and ensuring protection of people and environment both now and into the future. The workshop brought together senior representatives from organisations tasked with carrying out independent reviews from the United Kingdom, the United States, France, Canada, Sweden and the International Atomic Energy Agency to identify and discuss good practices for independent strategic reviews and lessons learned from their experiences.

# Introduction

In England a range of major defence and civilian nuclear decommissioning programmes are underway or proposed that are both complex and long term. In the context of this report, nuclear decommissioning programmes include activities necessary for final disposition of materials and facilities and environmental clean-up from production of nuclear power and production of defence nuclear materials. Strategic reviews are undertaken in support of government decisions and oversight for major capital programmes that are complex and long-term. They are crucial to ensuring these programmes deliver public value. Public value includes contributing to sustainability (social, economic, and environmental aspects) and ensuring protection of people and environment both now and into the future. Major defence and civilian nuclear decommissioning programmes also are an international issue, with similar challenges being faced in the United States, and multiple countries in Europe and Asia.

Strategic reviews support future government decisions that impact major programme direction, organisation or alternatives selection with potential impacts to the regional economy, infrastructure or environment. Independent strategic reviews also can supplement programme governance and assurance and provide additional challenge and scrutiny to check whether programme aims are being met. The workshop explored approaches, lessons learned and good practices for independent strategic reviews carried out for the UK and foreign government agencies facing similar challenges. Nuclear decommissioning brings its own challenges, and it is important to learn from what is working well and gain insights by bringing together relevant experience. To be clear, the workshop was not about learning lessons on how to deliver major capital programmes. The focus of the workshop was on the practice of independent reviews and how to ensure they deliver best value.

The workshop was held in two three-hour sessions on 1 and 10 June 2022 using an on-line format. The workshop agenda, a list of workshop participants, biographies of workshop presenters, and individual presentations are provided in Appendices 1 through 4, respectively.

# When are independent strategic reviews needed?

Decommissioning liabilities are a significant component of national liabilities (HM Treasury, 2022) and understanding these liabilities and the associated uncertainties has been the subject of parliamentary hearings in the UK, and similarly congressional hearings in the US. Indeed, hearings by national legislative bodies have played an important part in communicating the importance of decommissioning for further scrutiny. There is added value that is gained from identifying broad, overarching issues that arise repeatedly in decommissioning projects and options and strategies for addressing decommissioning challenges. Given the magnitude and complexity of the scope of decommissioning challenges in the US, the Government Accountability Office (GAO) has developed and uses a decision tree to help understand scope, risks and prioritization of individual decommissioning projects.

Independent strategic reviews are needed at major decision points that impact programme scope and direction. Carrying out strategic reviews early in the decommissioning project lifecycle is critical, since many problems and challenges can be identified early and be addressed most efficiently (foresight). However, significant benefit can be derived from reviews that are retrospective (e.g., lessons learned) and while programmes are in-progress (insights). For example, National Audit Office (NAO) reviews have been triggered by:

- Early stage investment appraisals or the development of new delivery model to provide an assessment of the critical early development stages and risks ahead (Hinkley Point C; NAO, 2017a);
- Completion of major phase of programme and examinations of preparations for next stage including risks (Decommissioning of the AGR nuclear power stations; NAO, 2022);
- A major failing in a programme with a clear impact on value for money (Magnox contract reviews; NAO, 2017b, 2020);
- Part of a regular programme of follow-up reviews on progress and responses to previous recommendations (Sellafield progress monitoring; NAO, 2015, 2018).

Independent strategic reviews present an opportunity to consult with a broad range of stakeholders and synthesize diverse information and perspectives. In addition, reviews play an important role in understanding and communicating programme objectives, direction, risks and uncertainties with stakeholders. Thus, early identification of key stakeholders – those responsible for execution and oversight of decommissioning projects,

### Stakeholders

As used in this report, **stakeholders** refers to the full range of people and organizations that may have legally defined roles (e.g., government agencies), be affected by (e.g., local communities, workforce, contractors), or have an advocacy role (e.g., non-governmental organizations) with respect to the subject matter of the independent strategic review.

those potentially impacted, and those who are the targeted audience for the strategic review and recommendations – is essential. Also, it should be recognized that interests of some stakeholder groups may go beyond technical, legal and economic considerations including risk perception[1], employment, community investment/amenities and communication. Targeted participation and exchange with each of the identified groups of stakeholders is important during the review charter development, execution and reporting.

Independent strategic reviews have been carried out by government audit agencies, and independent organizations that assemble recognized and renowned experts. The National Audit Office (NAO) supporting Parliament and the GAO supporting Congress are responsible government audit agencies for the UK and US, respectively. The International Atomic Energy Agency (IAEA), The National Academies of Sciences, Engineering and Medicine (NASEM); and the Consortium for Risk Evaluation with Stakeholder Participation (CRESP) are examples of independent organizations that carry out independent reviews based on assembled teams of national and international experts. In addition, government agencies may have branches independent from the agency's mission execution, such as the Department of Energy's Office of Enterprise Assessment (DOE-EA) that carry out strategic reviews. Independent regulators can also play an important role with supporting reviews.

Independent strategic reviews may be initiated based on direction from legislative bodies, senior leadership of government agencies charged with direction or oversight of decommissioning programmes (e.g., Nuclear Decommissioning Authority (UK), DOE (US)), or self-initiated by the responsible government audit agency.

# Defining the scope and framing an independent strategic review

The review charter, which defines the review scope, framing and timing, should be developed in consultation with the initiating agency or group, as well as in consultation with key stakeholder groups, including with the senior leadership of the organizations initiating the review and being reviewed, and the parties that may be impacted by the outcome of the review. It is important that the organization being reviewed recognizes the review as a beneficial opportunity rather than as an adversarial investigation, which would limit frank and open discussion and information exchange. Good rapport with the organization to be reviewed can be developed through informal discussions to build relationships before the formal review begins. The evidence basis (e.g., previous reports, supporting data, other evidence) available to inform the review should be evaluated during

[1] GAO has developed risk-informed decision making guide (GAO, 2019) that helps GAO analysts account for risks that span outside of technical bounds and need to be communicated to respective parties.

scope formulation. Additional considerations are the external pressures that impact both the development and contents of the scope (timing, scheduling, cost, etc.), as well as potential information asymmetry and how this can affect the power dynamic with scope definition. This approach provides insights into the information that will be available for the review, the maturity of the problem definition and potential challenges that may arise during the review.

Detailed planning is considered essential, iterative, and can take several months depending on the complexity and stakeholder interests. Typically, terms of reference and lines of inquiry will capture the objectives, scope schedule, co-ordination/communication requirements, available resources and informing standards/guidance. The identified objectives need to be understandable, comprehensive, reasonable, actionable, realistic and timely. Specific questions to be answered and lines of inquiry should be defined, but the scope should not be too narrowly defined to avoid limiting the review committee from pursuing relevant related information or previously unexplored approaches and potential solutions. However, the scope of the review should be monitored while on-going to ensure that scope creep does not occur ("care should be taken to make sure that the "threads" analysts tug on during a review are relevant to the scope of the review in question."). Good practices include having a review of the draft scope either by a peer-review or by an internal oversight group followed by a brief public comment period (e.g., 20 days) prior to finalization.

The information and methods to be used during the review should be specified during scope development. Several of the workshop participants noted the usefulness of a review matrix as a basis for developing, executing and communicating the outcomes of a strategic review. An example review matrix is provided as Figure 1. Specific review methods used are provided in Table 1, with the citation providing a detailed discussion for the applicability and use of each method.

**FIGURE 14: AUDIT MATRIX FOR THE SAI OF THE UNITED STATES' "ENERGY-WATER NEXUS: A BETTER AND COORDINATED UNDERSTANDING OF WATER RESOURCES COULD HELP MITIGATE THE IMPACTS OF POTENTIAL OIL SHALE DEVELOPMENT" REPORT[a]**

| Objectives / Researchable Question(s) | Audit Criteria, Key Information Required, Source(s) of Information | Scope and Methodology | Challenges Encountered in Conducting the Audit | Audit Results and Key Findings |
|---|---|---|---|---|
| To perform this audit, the Government Accountability Office (GAO) examined:<br><br>1) what was known about the potential impacts of oil shale development on surface water and groundwater;<br><br>2) what was known about the amount of water that may be needed for commercial oil shale development;<br><br>3) the extent to which water will likely be available for commercial oil shale development and its source; and<br><br>4) federal research efforts to address impacts to water resources from commercial oil shale development. | **Criteria**<br><br>• Law – *Energy Policy Act of 2005*<br><br>• Regulations proposed by the Department of the Interior on oil shale development<br><br>• Departmental mission statements<br><br>**Required Information and Its Sources**<br><br>• Information on potential water-related impacts of oil shale development, obtained from:<br><br>- studies published by public and private research entities;<br><br>- agency documents; and<br><br>- interviews with federal and state officials, as well as representatives of the oil industry and environmental groups.<br><br>• Information on the amount of water needed for oil shale development and the likely availability of water for this purpose, obtained from:<br><br>- Studies on oil shale development and interviews with the authors; and<br><br>- Water estimates and projections produced by federal and state agencies.<br><br>• Information on federal research efforts, obtained from a review of documentation and interviews with officials from federal and state agencies, universities, the oil industry, and water experts. | This audit examined the state of knowledge and activities related to potential oil shale development in the states of Colorado and Utah, as these are the areas in which the oil industry is most interested in developing oil shale deposits. To perform this evaluation, GAO:<br><br>• ***Analyzed studies*** on the water requirements of oil shale development. This analysis was limited to studies published in 1980 or later, and included studies prepared by federal agencies, academics, and private research entities.<br><br>• ***Reviewed agency documentation,*** such as the environmental impact statement on oil shale development prepared by the Bureau of Land Management.<br><br>• ***Interviewed*** a variety of stakeholders involved in oil shale development or research, including officials from federal and state agencies, industry representatives, environmental group representatives, authors of the studies identified in the literature review, and academics. In addition, the audit team interviewed water experts and other specialists (e.g., geologists) ***to obtain their expert opinions*** and to validate the accuracy of the different studies and data GAO was analyzing.<br><br>• ***Conducted site visits*** to oil shale demonstration projects. | A senior member of the audit team reported that it was challenging for GAO to develop estimates of the amount of water required for commercial oil shale production due to:<br><br>• resistance from oil industry members to sharing proprietary data on oil shale technologies; and<br>• general uncertainty about the unproven technologies themselves.<br><br>As a result of these limitations, the audit's data on the water needs of oil shale development were presented as a range of potential values rather than a specific numerical estimate. | Although oil shale development could have significant impacts on the quality and quantity of water resources, this audit was unable to determine the magnitude of these impacts due to the unproven nature of oil shale technologies and the lack of reliable information on the status of water resources in the region.<br><br>Nevertheless, GAO attempted to quantify the expected total water needs for oil shale production by providing a range of potential estimates based on its analysis of research studies and limited assistance provided by external experts. Using this data and information obtained from interviews with government officials and other stakeholders, the audit team found that the size of the oil shale industry in Colorado and Utah could eventually be limited by water availability issues.<br><br>In addition, GAO reported that its interviews with officials and water experts revealed there were insufficient data to understand the baseline conditions for water resources in the oil shale regions of Colorado and Utah. Furthermore, this problem is exacerbated by the lack of coordination between the federal and state agencies that conduct water-related oil shale research and those that regulate water. |

**Figure 1. Example review matrix (INTOSAI, 2013).**

**Table 1. Auditors toolbox (INTOSAI, 2013).**

| Basic Audit Tools | More Specialized Audit Tools |
|---|---|
| Interviews | Expert panels (including workshops) |
| Document reviews | Focus groups |
| Site visits | Database analyses |
| Questionnaires and surveys | Economic analyses |
| Case studies | Scientific analyses |
| Obtaining expert opinions | International benchmarking |

The different organizations involved in the workshop had differing approaches for defining and framing a specific strategic review. NAO takes a “value for money” approach with their auditing that evaluates the effectiveness, efficiency and economy of government spending and tend to include a conclusion on value for money and recommendations. They report independently to the UK parliament. The NAO define good value for money as the optimal use of resources (economy, efficiency and effectiveness) to achieve the intended outcomes. GAO focuses on whether or not there is a clear understanding of (i) the scope of the problem (e.g., is the scope of contamination known or reasonable estimated?), (i) the risks to human health and the environment (e.g., are these risks known and have they been adequately communicated to potentially affected parties?), and (iii) the basis for prioritization and decision-making to selecting cleanup activities (e.g., is prioritization aligned primarily on the basis of risk to human health and the environment? How long will it take under historic funding levels?). Furthermore, US federal agencies have obligations or commitments to (1) protect the public from existing environmental and health hazards and (2) avoid creating new hazards. Included are environmental justice considerations which are obligations and commitments and mitigate disproportionate environmental impacts on minority and low-income communities.

The Organisation for Economic Cooperation and Development (OECD)-Nuclear Energy Agency (NEA) focuses on reviews as a Design Authority and Technical Authority (TA). The Design Authority assures that the selected solution conforms with applicable requirements, laws and regulations (safety, nuclear security, performance specifications). The Technical Authority ensures effective implementation of the selected solution. At the end of project phases (basic design, detailed design) and if difficult challenges are encountered during project execution, the TAuses a projects maturity approach. TA reports and conclusions are not public documents but may be disclosed to regulators.

The DOE-EA functions under DOE Order 227.1A which states (DOE, 2015):

> "Independent Oversight appraisals must be prioritized on areas of greatest potential risks…Higher priority and greater emphasis is placed on conducting Independent Oversight appraisals of high consequence activities, such as nuclear project design, construction and commissioning; high hazard nuclear operations…Other areas of consideration for Independent Oversight appraisals are organizations whose performance may present significant risk (e.g., less than expected safety or security performance records and/or serious or recurring incidents or violations of requirements)."

Current focus areas are:

- Oversight of Nuclear Facility Construction Projects
- Nuclear Safety Oversight of Operations Supporting Increased Pit Production
- Issues Management and Findings Follow-up
- Analysis of Site Safety Culture Surveys
- Work Planning and Control - Electrical Safety Focus
- Construction Worker Safety and Health
- Emergency Management Program Effectiveness

# Transparency and communications

Transparency and communications for all stakeholders are key components of an independent strategic review and necessary to provide credibility and public trust in the review process and outcomes. Good practices for transparency and communications is summarized as follows:

**Communications Plan.** A review communications plan should be developed that includes specification of which individuals and organizations (e.g., review sponsor, review organization, review committee) will be responsible for communications and engagement with each stakeholder, when, what aspects of the review will be discussed at identified communications and engagement point, and the mode of communications and engagement**. Information should be provided at multiple levels and in forms that are readily understandable by various stakeholders with different backgrounds and levels of technical expertise**. A relatively recent format for communication that has been used is to follow the structure of "we asked, you said, we did" to help the public understand the subject and outcomes of the review.

Careful listening is important when communicating with review entities and stakeholders. When CRESP has done majors reviews, the reviews start with communicating to all stakeholders what is being done and how it will be accomplished. This includes **listening to the terms that the community is using and the manner in which they are being used**. People with different backgrounds/life experiences all come to the table during stakeholder discussions to provide input and all of them have

important messages. In addition, **there are two types of cultural issues to be aware of and sensitive to — i) individual's background, and ii) organizational cultures of the group being reviewed and the review customer (e.g., congress, site contractors)**. If you enter into reviews without an understanding of the differences you might encounter, you are going to run into issues. For example, Native American tribes should provide input as independent nations, and not grouped generally as stakeholders —using the wrong terminology to describe a group or interest can immediately shut them down.

**Stakeholder Identification.** Early during review scope development, the different stakeholders, or groups thereof, should be identified along with each stakeholder's interests, roles, and authorities or special needs (if any). Identification should include (i) local, regional or state, and national regulators, (ii) local and potentially impacted communities and the respective community representatives, representative bodies (e.g., community advisory boards) and elected officials, (iii) historic indigenous people (Tribes in the US), (iv) project contractors, (v) labor organizations and representatives, (v) local, regional and national advocacy groups. If the review has potential to impact specific local communities, the potentially impacted communities need to be informed, and the more informed they are, the more they can provide input and consent. Furthermore, when local community interests and values are represented and they consent, they may become project champions. **Early in the process, it is important to communicate with and define the role of local elected officials**. Multiple opportunities for communication (in-person, zoom, citizens panels, etc.) should be provided to ensure the review committee is hearing the diversity of voices within a community. Knowledge of the demographics of the local and potentially impacted communities is useful to ensure that the communications and engagement mechanisms reach broadly into the communities and do not disenfranchise community subgroups. Special needs of specific stakeholder groups may include funding to recruit their own "experts" that can be representatives during technical exchange can help overcome information and knowledge asymmetries, thus supporting diverse input and building trust within what otherwise is a relatively closed knowledge domain.

**Scope Development.** **Transparency and communications should be initiated with the range of stakeholders during review scope development, allowing opportunity for review and input before the review scope is finalized**. The Committee on Radioactive Waste Management (CoRWM, UK) states "…we have combined a technical assessment of options with ethical considerations, examination of overseas experience and a wide-ranging programme of engagement with the public and with interested parties (stakeholders)" (CoRWM, 2006). NASEM requires posting of the draft review scope and committee membership for 20 days of public comment prior to finalization.

**Review Committee Selection.** Proposed membership of the review committee should include a member from the potentially impacted communities. This person is not a community representative charged with providing the community view, but rather to provide a local perspective and make sure that diverse local views are considered

during review committee deliberations. See Sections 6 and 7 of this report for further information review committee selection.

**Review Process.** Information gathering sessions of review committees are generally should be open, except when specific information is restricted for safety, security restrictions (e.g., classified) or confidential business reasons. However, review committee deliberations and draft documents should be confidential.

If the review has potential to impact specific local communities, the potentially impacted communities need to be informed, and the more informed they are, the more they can provide input and consent. Furthermore, when local community interests and values are represented and they consent, they may become project champions. **Early in the process, it is important to communicate with and define the role of local elected officials**. Multiple opportunities for communication (in-person, zoom, citizens panels, etc.) should be provided to ensure the review committee is hearing the diversity of voices within a community. There should be multiple opportunities for stakeholders to provide input to the review committee**. The review process should be communicated, with clarity about when and how stakeholders can learn about and provide input to the review.** This is especially important for programmes or projects that may involve short-term increases in local health, safety and environmental risks to achieve long-term risk reductions.

**Review Results.** Constructive engagement with stakeholders allows for input during a review, and after a review, provides an opportunity to explain and discuss the review committee's conclusions and recommendations. In addition to briefing the review sponsor and review customer, review results should be briefed to local elected officials, the organizations being reviewed or providing input to the review, to the local and potentially impacted communities, and other stakeholders previously identified.

**Media Engagement.** **Proactive media engagement seems to work best at the beginning of a review to communicate the review scope, and at the end of a review to communicate review conclusions and recommendations**. However, **media engagement should not be a substitute for person to person communications and relationship building**, which advances trust between stakeholders, reviewers and implementing organizations.

# Responding to accidents and unplanned events

In the nuclear industry, there are different levels of accidents and unplanned events that need to be responded to. As a nuclear power plant reactor enters the deactivation and decommissioning stage, the scale of potential accidents/events may significantly reduce, particularly when the reactor is defueled. For example, the possibility of a meltdown is eliminated once the reactor is defueled. However, significant risks may remain associated with used fuel pool inventories. Similarly, the levels of accidents and unplanned events

that can occur during decommissioning a defence nuclear processing or waste management facility decreases as the inventory of radioactive or special nuclear materials is decreased but may increase during the retrieval of materials or while this material is moved.

The response plans for accidents/events need to be developed based on the risk of the remaining materials onsite, and should be modified when risk associated with the material inventory or risk of failure of defence in depth containment changes significantly, as well as at regular intervals.

Independent strategic reviews can help with preplanning and understanding the implications of mitigation options during the intermediate phase of decommissioning (where some work is being done that could release material if an accident or unplanned event were to occur), which is particularly important. **A good practice is to have active stakeholder engagement as part of work planning to identify prevention and mitigation measures** for such events and at each stage as progress is made from deactivation and radioactive materials inventory retrieval to dismantling to demolition and through site remediation. Demolition is much more visible and dynamic compared to dismantling reactor operations. For example, debris dust and particles from nuclear facility demolition can be contaminated with radioactivity and the potential for spreading is much greater.

It's important to spend time during preplanning to find ways to prevent/mitigate debris dust/particle related unintended events. Thinking about such accidents during the planning stage can increase the amount of time spent in planning, but is valuable. Decommissioning emergency response planning considers different emergency response actions that can be performed during demolition because personnel can get closer in a demolition accident than in a reactor accident.

There is a different mindset for accident response during demolition than during reactor operation. Demolition accidents can happen quicker, the magnitude can be lesser, and the response actions are less standard (i.e., they are unique to the facility in question). It is also important to keep the local community in the loop as decommissioning progresses. There may be a higher likelihood for accidents during demolition of the building itself. The visual nature of accidents is important- e.g., removal of radioactive material from a facility undergoing deactivation (dismantling and decontamination) is not very visible, whereas demolition is visible and the debris fields from events that may occur during demolition are also visible. If the material released during a demolition accident has off-site consequences, the local community needs to be engaged. Thus, the local community is an important partner to consider during planning because local emergency services (fire department, hospitals, etc.) will be responding, unlike with reactor accidents.

After an emergency, a good practice is to staff the emergency operating centers 24-7. While expensive, availability of staff to respond to calls from the community and information requests fosters continued trust with the community. However, the process of open communication and trust building needs to start before an event. Understanding the local radiological profile using sampling before initiating deactivation and demolitions is

also a good practice, so that after an event, the changes (if any) can be understood relative to a baseline and communicated to the local community.

All DOE sites are reviewed every two years at minimum for their emergency response action capabilities. Routine engagement with workers in the field during decommissioning projects is important to make sure that they are performing work processes and response procedures in the manner expected of them. Best practice is to do as much work on material removal using the original reactor's or facility's controls. Although these may be "excessive" for a decommissioning operation, their benefits and mechanisms of action are understood by local communities, which can help build trust with community groups during the decommissioning processes.

Independent reviews are important after an unplanned event to understand root causes, to build community and stakeholder confidence that the event is being responded to appropriately, and to ensure that appropriate actions are being taken. Typically, post-event reviews happen after the recovery point to avoid impeding emergency action and recovery at early stages. Independent review after an event also factors into future pre-planning. If there are enough similarities between different events, then **an extent-of-condition review is used to determine where a similar or related event could occur elsewhere**. In some cases, multiple sites may have similar vulnerabilities and a series of oversight activities may be needed with multiple site reports and then a final roll up. Furthermore, other organizations are invited to evaluate roll-ups to provide independent expertise and perspective.

**Routine consideration of events in other countries and related processes and evaluations used by other organizations, such as the Nuclear Regulatory Commission (in the US, the regulator for non-defense nuclear facilities) and the IAEA, is important to maintain awareness of unforeseen occurrences and good practices**. **A lessons learned database among contractors with an annual a lessons learned report from the events that have happened throughout the year maintains awareness and reduces the likelihood of similar recurrences**.

# Elements of Effective Reviews

Independent strategic review processes from multiple organizations[2] were compared and good practices highlighted for the key review elements of context, reviewing organization, scope development, the review committee and review participants; review process and

[2] IAEA – ARTEMIS, NASA, GAO, DOE-EA, DOE-EM, and CRESP

tools; and review products and outcomes. Good practices for each of these elements is summarized as follows:

**Review Context.** *Strategic reviews support future government decisions that impact major program direction, organization or alternatives selection with potential impacts to the regional economy, infrastructure or environment*. "Addressing these issues is often a difficult and complex endeavour, particularly in instances where governments must balance competing demands and interests while attempting to develop effective responses" (INTOSAI, 2013). To understand the review context, questions to be clearly answered are:

- Who is the review customer?
- What is motivating the review?
- What decisions and actions may be impacted?
- Who are the stakeholders?

**Reviewing Organization.** The reviewing organization should be independent organizationally (without lines of authority to the reviewee) and with respect to resources from the organization or entity(s) being reviewed. Documented review processes and procedures should be in place. There should be routine independent review of review scopes, products and processes, such as through standing review boards (for process and scope reviews) and project specific review panels (for independent peer-review of the final draft report). Constructive relationships and dialogue should be between the review organization, customer, reviewers and reviewees.

**Review Scope Development.** The review scope should be through iterative development in collaboration with the customer, and include input from the reviewed entity and stakeholders. It is important to take the necessary time to get the scope right to protect the value and credibility of the review and review/reviewed organizations. It is not unusual for it to take six months for scope development.

**The Review Committee and Review Participants.** **The selection of the review committee should be independent of (free of influence from) the organization commissioning the review and the review customer.** There should be transparency with respect to expertise, composition and bias, and absence of conflicts of interest. Multiple experts with similar or overlapping expertise should be included in review committee membership to insure diversity in viewpoints and consideration of constructive contrarian perspectives. Engagement of the academic community should be considered because of independence and long-term engagement builds institutional knowledge that helps to respond to complex problems and train a new workforce, recognizing decommissioning represents multigenerational challenges. There also should be efforts to ensure diversity with review groups covering cultural, gender, cognitive and age diversity. The review committee also should include members from the local and affected community(s) of the programme being reviewed. Review committee membership for separate reviews should be rotated to avoid perception of potential conflicts of interest or confirmation bias.

**The Review Process and Tools.** An audit matrix has been found to be effective for defining, communicating and keeping the review scope on track (Figure 1). Review process tools have been presented in Table 1, and in the INTOSAI guide (INTOSAI, 2013). A stakeholder engagement plan and a media engagement plan should be developed in concert with the review scope development.

**Review Products and Outcomes.** A good practice has been to have multiple tiers of review outputs: (i) at the higher level, are what are often called "findings", these are situations which the review team considers to be substantially inconsistent with a recognized, pertinent requirement or standard, (ii) a lower-tier, often called "observations" which are believed to be valid feedback to the reviewed entity, but not meeting the definition established for findings, and (iii) recommendations which should be limited in number to focus attention and future execution. For findings and observations, it is important to include a clarifying statement as to each one's importance (or, "so what"). Prior to finalization and public release, the review report should be subject to (i) independent review for adherence to scope and adequate foundations for conclusions and recommendations, absence of bias, (ii) factual accuracy review by the reviewed entity(s), and (iii) a reviewed entity response to the report conclusions and recommendations. Briefings of the review report should be made to (i) the reviewed entity, (ii) the review customer, and (iii) the full range of stakeholders. **Outcomes from the review report should be tracked with respect to follow up to recommendations, and actions planned and taken**. For example, GAO publishes the reviewed entity response to the recommendations in their reports and issues follow up reports on progress with recommendations.

# Managing the review committee and review process

## Review Committee Leadership and Membership

The review committee chair should have the following attributes:

- Dispassionate
- Can adjudicate disputes among members
- Has prior experience with the review organization's review committee process
- Has broad expertise relevant to the review scope

Review committee compositions should include representation of the key technical expertise necessary to carry out the review, as well having gender, age and social diversity. Review organizations may engage both internal and external subject matter experts. Typically, review organizations maintain a list of subject matter experts and contacts for recommendations on additional subject matter experts, or work with additional agencies to convene necessary expertise. For example, when the GAO does not have

sufficient internal expertise, expert panels may be developed in conjunction with NASEM. For many studies, it can be beneficial to have one or more committee members that bring the perspective of local and affected communities. Multiple experts should have differing backgrounds for key technical expertise to ensure diversity of thought and views are included in committee deliberations. Having only a single expert in key areas can bring unbalanced perspective. Teams should include experts that have capabilities and experience with working across disciplines – for reviews to add value they need to be good at breaking down knowledge silos and transecting ideas.

**Good practice includes disclosure and review, including formal documentation, of potential biases and conflicts of interest for each candidate review committee member.** Failure to appropriately address review committee composition balance and assurance to be free of conflicts of interest can adversely impact the credibility of both the specific strategic review and the organization carrying out the review. NASEM has a defined process for committee selection that includes:

- Call for nominations & conduct interviews of review committee candidates;
- A provisional committee slate is internally approved, then announced publicly with a 20 day public comment period;
- A conflict of interest and balance discussion and documentation with the committee membership (see (NASEM, 2022) for additional details)
- Addressing any identified composition and balance gaps
- An internal memo documenting the process and final NASEM approval of committee membership.

## The Consensus Study Process

The consensus study process as defined by NASEM is illustrated in Figure 2. All of the review organizations participating in the workshop used similar approaches, although individual steps and processes may be somewhat different, in response to organizational charters and jurisdictions.

Two themes emerged as central to successful reviews:

- Quality of information gathered: It's important to understand information available, protection of sensitive information, and mechanisms/examples for how that's accomplished. Clarity of communication, and purpose/scope, context/need is also important. Evaluation and assessment should be on-going to ensure the review remains between the guardrails of scope.
- Quality of team membership: Importance of team members having diversity of background/experience. Team members should have a duality- have familiarity on the ground, but also being able to have 30,000 ft high altitude perspective of the issues at hand. Also, it is important to avoid perceptions/reality of conflicts of interest. Multiple visits to the same location should involve cycling/rotating team member composition to provide fresh perspective.

Experience indicates that during a review it is important to have people who have previously worked together effectively, but it is also important to have a diversity of perspectives to avoid group think by bringing in new talent and new ideas. However, it is also important to stay on task and deliver a product based on a clear and adaptable plan, schedule and resources. From a regulator's perspective, important group characteristics include balance of views, people that have a questioning and critical attitude, experts in technical matters. Group makeup also depends on the types of information that need to be unpicked. From an individual perspective, it's important to have group members who perform a rigorous review, but do not get side-tracked and focus on desired outcomes from the review. Leaders should expect the unexpected. Unexpected events and circumstances can arise during a review, but the leader also needs to defend the integrity of the process when considering responses to unexpected events, review process modifications and challenging comments.

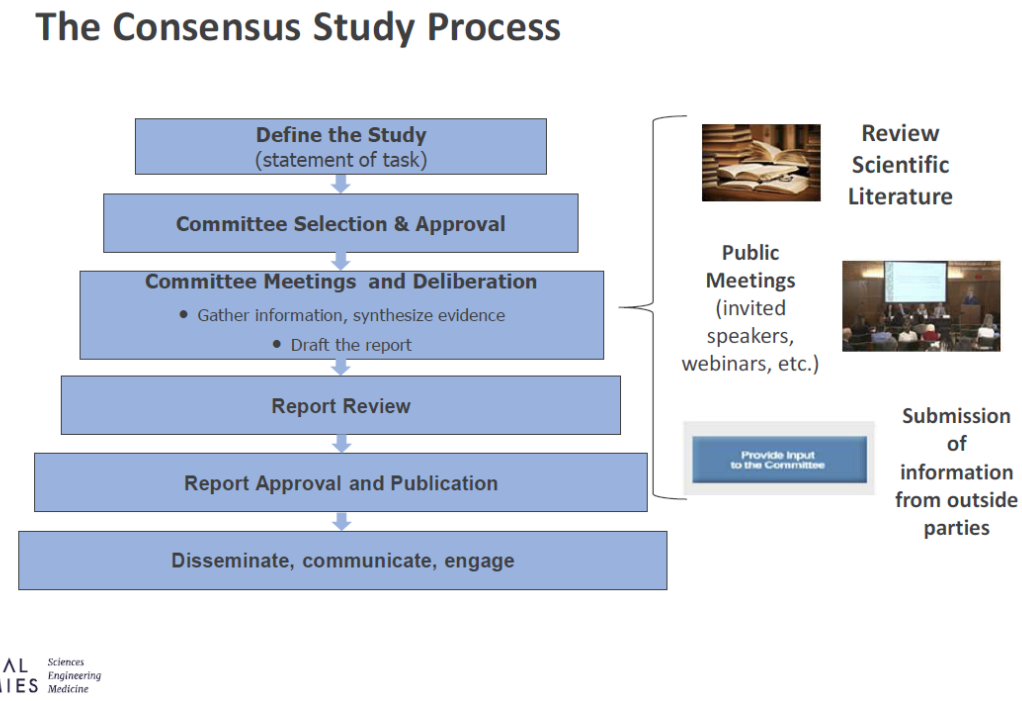


**Figure 2. A summary of the consensus study process as defined by NASEM.**

# A good practices check list

A summary level check list of items for planning and carrying out a strategic independent review is provided below. The reader is encouraged to consider the more detailed information within the previous sections of this report when using the check list.

1. A draft Review Charter has been prepared that defined the review context, objectives, scope, methods, evidence basis and schedule.

2. An independent Review Organization that adheres to identified good practices has been selected to carry out the review.

3. Relevant stakeholders have been identified along with respective interests, authorities, roles and opportunities for input relative to the review subject matter and the review process.

4. Input on the draft Review Charter has been obtained from the identified stakeholders and considered during refinement of the review charter in conjunction with the independent review organization.

5. A detailed Communications Plan for the review has been developed.

6. A review committee chairperson and committee members have been selected, free of conflicts of interest, and considering diversity in expertise, review experience, backgrounds and demographics. Multiple committee members are included with overlapping expertise in key areas.

7. The final Review Charter, review committee membership, and review processes have been briefed according to the Communications Plan.

8. The review has been executed according to the Review Charter, documented practices of the Review Organization, and the Communications Plan. Transparency has been maintained with respect to information gathering, review processes and schedule, while protecting restricted information because of security, safety and confidential business information requirements. Confidentiality has been maintained with respect to Review Committee deliberations and draft conclusions, recommendations and reports.

9. The draft Review Report has been reviewed by the Review Organization for conformance with the Review Charter and by the organizations reviewed for factual accuracy. The reviewed organization has been provided to provide a response to review recommendations for inclusion in the final Review Report.

10. Stakeholders have been engaged and briefed on the Review Report according to the Communications Plan.

11. Follow up on the Review Report recommendations is on-going and documented.

# Next steps

The following were suggestions for next steps following the workshop:

- Development of an international Community of Practice around the process of independent reviews for nuclear decommissioning, initially engaging the workshop participants;
- Spend additional time discussing the tools for engaging varied communities and stakeholders;
- Describe in a document the roles and responsibilities of everyone involved in a review project - who needs to be involved - and an understanding of timelines;
- A guide that has (international) credibility and sponsorship from the organizations attending the workshop would be useful to people responsible for different parts of the review process (e.g., review initiators/customers, review organizers, review committee participants);
- If the long-term goal is the development of a consensus standard, the development of a "body of knowledge" to document present applicable processes, lessons learned, etc. would be useful;
- Another meeting/workshop, potentially in person, would be good with the topics of the most interest being the focus; and,
- Best Practices pamphlets could be produced to help communicate the independent review process and benefits.
- A more formal expert group could be convened to further develop the ideas and to develop independent review case studies illustrating the various points.

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# Acknowledgements

This report summarizes an on-line workshop that was held during two, one-half day sessions, June 1 and 10,2022. IT support was provided by Jack Sherriff (Wilson Sheriff, UK). The workshop organizing committee consisted of Ben Jackson (Environment Agency, England), David Kosson (Vanderbilt University and CRESP, US), Megan Harkema (Vanderbilt University and CRESP, US), Simon Wilson (Wilson Sheriff, UK) and Jack Sherriff.

The organizing committee gratefully acknowledges the assistance in organizing this workshop provided by Peter Orr (Environment Agency, England), The National Audit Office (UK), the U.S. Department of Energy, Office of Environmental Management and Office of Enterprise Assessment, the Government Accountability Agency (US), the International Atomic Energy Agency, and the National Academies of Science, Engineering and Medicine (US).

Financial support for the workshop was provided by the Environment Agency.

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# List of abbreviations

| | |
|---|---|
| CoRWM | Committee on Radioactive Waste Management (UK) |
| CRESP | Consortium for Risk Evaluation with Stakeholder Participation (US) |
| DOE | Department of Energy (US) |
| DOE-EA | DOE Office of Enterprise Assessment (US) |
| DOE- EM | DOE Office of Environmental Management (US) |
| EA | Environment Agency (England) |
| GAO | Government Accountability Office (US) |
| IAEA | International Atomic Energy Agency |
| IAEA- ARTEMIS | International Atomic Energy Agency, Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation |
| INTOSAI | International Organization of Supreme Audit Institutions |
| NAO | National Audit Office (UK) |
| NASA | National Aeronautics and Space Administration (US) |
| NASEM | The National Academies of Sciences, Engineering and Medicine (US) |
| NEA | Nuclear Energy Agency (OECD) |
| OECD | The Organisation for Economic Cooperation and Development |
| OUO | Official use Only |
| TA | Technical Authority |
| UK | United Kingdom |
| US | United States |

# Appendix 1 - Workshop agenda

**Online Workshop**
**Good Practices for Independent Strategic Reviews in Nuclear Decommissioning:**
**Learning from Experience**

Session 1 – 1 June 2022

| | | |
|---|---|---|
| 1400 (UK Time) | **Welcome**<br>**Workshop purpose and programme for the day** | **Andy Mayall** – Environment Agency (England)<br>**Simon Wilson**, facilitator |
| 1415 | **When are independent strategic reviews needed?**<br>- What are the most important considerations in framing a review?<br>- When have they failed and why?<br>- When have they been successful and why? | **Peter Gray**, Director, National Audit Office (NAO, UK)<br>**Nathan Anderson**, Director Natural Resources & Environment, Government Accountability Office (GAO, US)<br>**Vladimir Michal**, Decommissioning Team leader, International Atomic Energy Agency (IAEA, AT)<br><br>*Whole group discussion* |
| 1500 | Break | |
| 1515 | **Defining the scope of an independent strategic review**<br><br>- What are key scope elements?<br>- Review and gathering input on the scope while it's under development<br>- Defining objectives and expected outcomes<br>- What are good practices and pitfalls to avoid? | **Philippe Derycke**, Nuclear Energy Agency – Cooperative Programme for Decommissioning (NEA-CPD, FR)<br>**Kevin G. Kilp**, Director, Environment, Safety and Health Assessments, Office of Enterprise Assessments, U.S. Department of Energy<br><br>*Discussion: 4 breakout rooms (each group starts by considering one of the issues)*<br><br>Group 1: What are key scope elements?<br>Group 2: Review and gathering input on the scope while it's under development<br>Group 3: Defining objectives and expected outcomes<br>Group 4: What are good practices and pitfalls to avoid? |

| | | |
|---|---|---|
| 1600 | Feedback from breakout discussions | **Simon Wilson**, facilitator |
| 1615 | **Transparency and communications**<br>- When, how and with whom should information about the review be shared?<br>- When, how and from whom should input be solicited?<br>- When should committee deliberations be in open session and materials be publicly accessible?<br>- How should the committee engage with the media? | **Derek Lacey**, Deputy Chair Committee on Radioactive Waste Management (CoRWM, UK)<br>**David Moore**, Chair Nuclear Legacy Advisory Forum (NuLEAF, UK)<br><br>*Whole group discussion* |
| 1700 | **Review of day 1 and adjourn Session 1** | **Andy Mayall** – Environment Agency (England) |

Session 2 – 10 June 2022

| | | |
|---|---|---|
| 1400 (UK Time) | **Welcome and update** | Welcome and programme for the day – facilitator |
| 1410 | **Responding to Accidents and Unplanned Events**<br>- What are the roles of Independent Strategic Reviews in response to accidents and unplanned events?<br>- What are special or unique considerations? | **Brenda L. Hawks**, Associate Deputy Assistant Secretary for Field Operations Oversight and Chief of Nuclear Safety, Office of Environmental Management, U.S. Department of Energy<br><br>*Whole group discussion* |
| 1455 | **Comparing Review Processes** | **David S. Kosson**, Distinguished Professor of Engineering and Gass Family Professor of Energy and the Environment, Vanderbilt University, Principal Investigator, Consortium for Risk Evaluation with Stakeholder Participation (CRESP, US)<br><br>*Whole group discussion* |
| 1540 | Break | |
| 1550 | **Managing the review committee and review process**<br>- Selection of leadership and members<br>- Conflict of interest and maintaining independence<br>- Structuring the review process<br>- Maintaining quality of review products<br>- Good practices and pitfalls to avoid<br>- Gathering information and stakeholder input | **Charles D. Ferguson**, Senior Board Director<br>Board on Chemical Sciences and Technology<br>Nuclear and Radiation Studies Board<br>National Academies of Sciences, Engineering, and Medicine (US)<br><br>*Discussion: 4 breakout rooms (each group starts by considering one of the issues):*<br>Group 1: Selection of leadership and members<br>- Conflict of interest and maintaining independence |

| | | |
|---|---|---|
| | | Group 2: Structuring the review process<br>- Maintaining quality of review products<br>Group 3: Good practices and pitfalls to avoid<br>Group 4: Gathering information and stakeholder input |
| 1635 | Feedback from breakout discussions | |
| 1650 | **Summary & Next steps**<br>- Development of a workshop report<br>- Is a good practices guide needed? | **David S. Kosson**, Vanderbilt University & CRESP (US)<br>**Ben Jackson**, Environment Agency (England) |
| 1700 | **Adjourn Session 2** | |

# Appendix 2 – Workshop participants

**Workshop Chairpersons**

- Ben Jackson, Nuclear Regulator, Environment Agency (England)
- David Kosson, Distinguished Professor of Engineering, Vanderbilt University and Principal Investigator of CRESP (US)

**UK Participants**

- AWE
- Committee on Radioactive Waste Management (CORWM)
- Decom North Sea
- Department of Business, Energy and Industrial Strategy (BEIS)
- EDF Energy
- Environment Agency
- National Audit Office
- Nuclear Decommissioning Authority (NDA)
- Nuclear Legacy Advisory Forum (NuLEAF)
- Office for Nuclear Regulation (ONR)
- Offshore Petroleum Regulator for Environment and Decommissioning (OPRED)
- The Royal Society
- Scottish Environment Protection Agency (SEPA)
- Sellafield Ltd
- Tradebe

**US Participants**

- Consortium for Risk Evaluation with Stakeholder Participation (CRESP)
- Department of Energy, Office of Enterprise Assessments,
- Department of Energy, Office of Environmental Management
- Energy Communities Alliance
- Government Accountability Office (GAO)
- New York University School of Law
- Oregon State University
- Rutgers University
- The National Academies of Sciences, Engineering and Medicine
- Vanderbilt University

**International Participants**

- Atomic Energy of Canada Limited (AECL)
- International Atomic Energy Agency (IAEA)

- Nuclear Energy Agency (NEA-OECD), Cooperative Programme for Decommissioning
- Vattenfall (Sweden & Germany)

# Appendix 3 – Presenter biographies

**Nathan Anderson**

*Director, Natural Resources & Environment, U.S. Government Accountability Office (GAO)*

Mr. Nathan Anderson is a Director in GAO's Natural Resources and Environment team. He oversees work on two High Risk areas—project and contract management at the Department of Energy and the U.S. government's environmental liabilities.

Nathan joined GAO in 2001. He has served as a Director on the Homeland Security and Justice team, where his work focused on Coast Guard and maritime security and critical infrastructure protection issues. He has also served as an Assistant Director on the Natural Resources and Environment team, where he examined DOE nuclear waste clean-up issues.

Nathan earned a master's degree in public policy from Georgetown University. Nathan earned a bachelor's degree in economics from Whitman College. Nathan also holds a graduate certificate in international business management from Oxford University. He completed American University's Key Executive Leadership Certificate Program in 2018.

**Philippe Derycke**

*Director, Orano*

Mr. Philippe Derycke is Orano's Director and Project Manager for the dismantling of downstream installations of the Orano fuel cycle (UP2-400 plant in La Hague). His responsibilities also include risks, performance, operational excellence, and Compliance of the Decommissioning and Waste Strategic Planning Division (DPS2D).

**Charles D. Ferguson**

*Senior Director, Nuclear Radiation and Studies Board and Board on Chemical Sciences and Technology, National Academies of Sciences, Engineering, and Medicine*

Dr. Charles D. Ferguson is the director of the Nuclear and Radiation Studies Board in the Division on Earth and Life Studies at the National Academies of Sciences, Engineering, and Medicine. Previously, he was the president of the Federation of American Scientists (FAS). Prior to FAS, he worked as the Philip D. Reed senior fellow for science and technology at the Council on Foreign Relations (CFR), where he specialized in nuclear issues, and served as project director for the Independent Task Force on U.S. Nuclear Weapons Policy chaired by William J. Perry and Brent Scowcroft. Before CFR, he was the scientist- in-residence at the Monterey Institute's Center for Nonproliferation Studies, where he co-authored the book The Four Faces of Nuclear Terrorism (Routledge, 2005) and was lead author of the January 2003 report Commercial Radioactive Sources: Surveying the Security Risks. For his work on security of radioactive sources, he was

awarded the Robert S. Landauer Memorial Lecture Award from the Health Physics Society in 2003. He is also the author of Nuclear Energy: What Everyone Needs to Know (Oxford University Press, 2011). In addition, he has worked as a physical scientist in the Office of Nuclear Safety at the U.S. Department of State, and he has served as a nuclear engineering officer and submarine officer in the U.S. Navy. He is an elected fellow of the American Physical Society in recognition of his service to public policy and public education on nuclear issues. Dr. Ferguson earned a BS in physics with distinction from the U.S. Naval Academy and MA and PhD degrees, also in physics, from Boston University.

**Peter Gray**

*Director, UK National Audit Office*

Mr. Peter Gray is currently responsible for the UK National Audit Office's value for money audit work relating Business, Energy, and Industrial Strategy. His responsibilities include the NAO's work on the Nuclear Decommissioning Authority. Peter has over 30 years experience of auditing major government programmes. He was responsible for the NAO's work on the rescue of the banking system in the wake of the 2008 banking crisis, coordinated the NAO's work looking at the preparations for Brexit and has conducted audits on organisations as varied as the BBC, the Bank of England, and the NHS. In the early 2000s he was responsible for some of the first NAO reports looking at the preparations for nuclear decommissioning.

**Brenda Hawks**

*Associate Deputy Assistant Secretary for Field Operations Oversight and Chief of Nuclear Safety, Office of Environmental Management, U.S. Department of Energy*

Ms. Brenda L. Hawks has over 35 years of nuclear and quality experience including qualifications as a Chief Refuelling Engineer for nuclear submarines at Charleston Naval Shipyard, Facility Representative at Y-12 Enriched Uranium Operations, and other senior management positions in nuclear safety, operations, and quality assurance to ensure effective and safe mission and project success.  She has a Master of Science degree in Polymer Chemistry with a Chemical Engineering minor and two Bachelor of Science Degrees in Chemical Engineering and Polymer Chemistry.

**Kevin Kilp**

*Director, Environment, Safety and Health Assessments, Office of Enterprise Assessments, U.S. Department of Energy*

Mr. Kevin G. Kilp is the Director of the Office of Environment, Safety and Health Assessments within the Department of Energy's (DOE) Office of Enterprise Assessments. The office is responsible for implementing an independent assessment program to evaluate environmental, nuclear safety, worker safety and health, and emergency management programs across the DOE complex. He previously served as the office's Deputy Director. Before assuming that role, Mr. Kilp served as the Director of EA's Office of Worker Safety and Health Assessments where he was responsible for directing the

conduct of analyses of occupational safety and health risks, issues, and performance, and leading assessments to provide critical feedback and objective information on occupational safety and health programs and performance throughout the DOE and National Nuclear Security Administration.

**David S. Kosson**

*Gass Family Chair in Energy and the Environment, Distinguished Professor of Civil and Environmental Engineering, Professor of Chemical Engineering, Professor of Earth and Environmental Sciences, Vanderbilt University*

*Principle Investigator, Consortium for Risk Evaluation with Stakeholder Participation*

Dr. David S. Kosson is the Gass Family Chair in Energy and the Environment, and Distinguished Professor of Civil and Environmental Engineering at Vanderbilt University, where he also has appointments as Professor of Chemical Engineering, and Professor of Earth and Environmental Sciences, and is the Director of the Environmental Engineering Laboratory. Professor Kosson is the Principal Investigator for the multi-university Consortium for Risk Evaluation with Stakeholder Participation Consortium for Risk Evaluation with Stakeholder Participation (CRESP) supported by the Department of Energy to improve the risk-informed basis for remediation and management of nuclear waste from former defense materials production and nuclear energy. Professor Kosson's research focuses on management of nuclear and chemical wastes, including leaching assessment, process development and contaminant mass transfer applied to groundwater, soil, sediment, and waste systems.

Professor Kosson's research on waste management and environmental remediation allows new understanding of the fundamental behavior of chemical and radionuclide contaminants in wastes, engineered systems, and the environment to impact major decisions and policy. For example, work by his research group in collaboration with other faculty and international partners has resulted in establishment of the U.S. Leaching Environmental Assessment Framework (LEAF), which is now being used for national policy decisions and regulations on waste management in the U.S. and other countries.

Professor Kosson has participated in or led many external technical reviews on nuclear waste processing and environmental remediation for the Department of Energy including for tank wastes and a range of technology approaches at Hanford, Savannah River, WIPP and Idaho sites. Professor Kosson also has provided expertise and leadership for the National Academies, and as advisory to the Department of Defense, for two decades on demilitarization of chemical weapons in the United States and abroad. Professor Kosson has authored more than 200 peer-reviewed professional journal articles, book, book chapters and other archival publications. He received a Ph.D. in Chemical and Biochemical Engineering from Rutgers University, where he subsequently was Professor of Chemical and Biochemical Engineering. Prof. Kosson served as the Department Chairman for Civil and Environmental Engineering at Vanderbilt University from 2000 through 2012.

**Derek Lacey**

*Deputy Chair, UK Committee on Radioactive Waste Management (CORWM)*

Dr. Derek Lacey was appointed to the Committee on Radioactive Waste Management in November 2019. Derek has recently completed a term as a Director at the International Atomic Energy Agency. He previously had roles as Deputy Chief Inspector in the Office for Nuclear Regulation (ONR) and Head of Nuclear and Radioactive Waste Management Policy at the UK Department for Energy and Climate Change.

**Vladimir Michal**

*Acting Section Head, Decommissioning and Environmental Remediation, International Atomic Energy Agency (IAEA)*

Mr. Vladimir Michal is Acting Section Head of Decommissioning and Environmental Remediation (Department of Nuclear Energy). Previously he was Decommissioning Team Leader from 2011. He is involved in many decommissioning related activities and support of various Member States, including development of the IAEA publications and implementation of collaborative projects.

Mr. Michal was a decommissioning project manager before the IAEA career to deal with A1 and V1 NPPs decommissioning projects (Bohunice, Slovakia) and support of other decommissioning activities in several Central and Eastern Europe countries.

**David Moore**

*Chair, NuLeaf*

Cllr. David Moore was born in Seascale, adjacent to the Sellafield site, and raised his family there. His grandchildren are now the 6th generation to be raised in the village. He worked in the family business all his life and has served as a Parish Councillor and a Borough Councillor representing Seascale for over 36 years. He was a Retained Fire Fighter with Seascale Fire Station for 42 years, retiring in 2013 to allow him more time to devote to community/council work. During the last five years he has served on the Directly Elected Mayors Executive with responsibility for Nuclear and Corporate Services. Cllr Moore has been Deputy Mayor of Copeland for the last three years. He is also the Councils representative on Nuleaf and is the current Chair. In his role as a Parish Councillor he was elected in 2005 as Chairman of the West Cumbria Site Stakeholder Group and enjoys working with the nuclear industry to ensure that the community views are represented.

# Appendix 4 – Workshop presentations

National Audit Office

# When are independent strategic reviews needed?

Peter Gray

The UK's independent public spending watchdog

June 2022

1

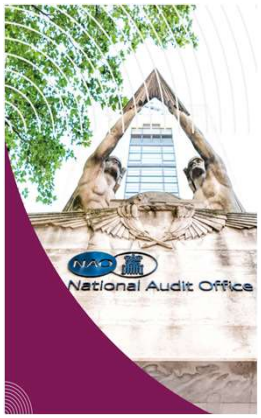
## I will cover…

- The role of the NAO and a bit about the independent reviews that we carry out.
- Some thoughts about when independent reviews are needed and how we might get the best from them.



2

# Role of the National Audit Office (NAO)




- We are the UK's independent public spending watchdog.
- We support the UK Parliament in holding government to account for the money it spends and help improve public services. We do this by:
  - auditing the financial statements of all central government departments, agencies and other bodies;
  - undertaking value for money audits and investigations; and
  - supporting the work of the Committee of Public Accounts, which takes our reports as evidence for its enquiries.
- We are not part of the government's structures and processes for providing assurance about programmes.
- We do not question the merits of policy objectives.



3

# What types of review do we carry out?

## Value for Money (VfM) reports

- VfM reports are where we report on the effectiveness, efficiency and economy of government spending and tend to include:
- a conclusion on value for money; and
- recommendations.

## Investigations

- These 'investigations' are designed to set out the facts of an event or situation.
- They tend not to include a conclusion on value for money or recommendations.

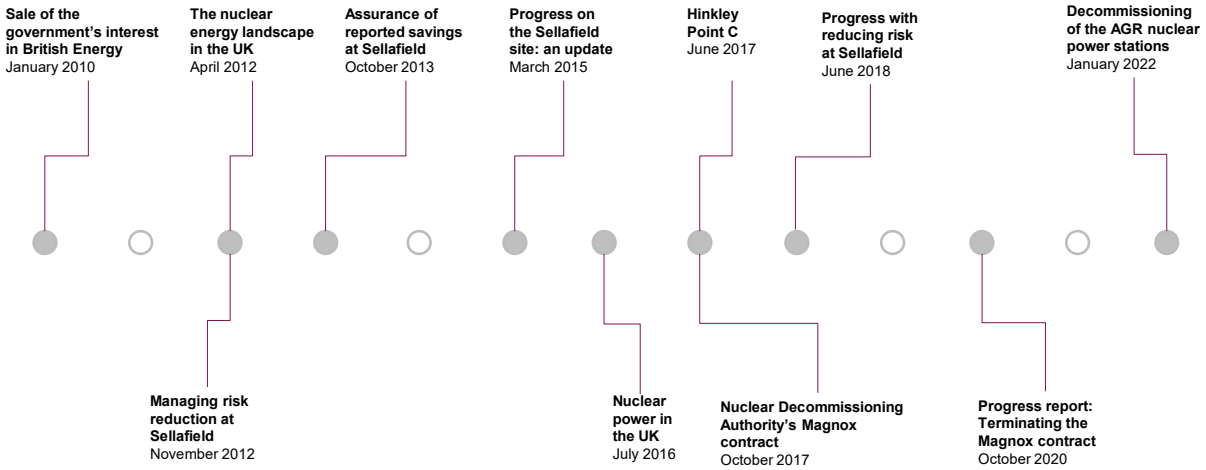


4

# When do we carry out our reviews? (1)

- In deciding whether to undertake a review we are focused on the risk to value for money, and our ability to add value.
- Limited resources mean that we cannot cover the entire nuclear portfolio each year so our interventions must be targeted to be relevant and impactful.

## Our reviews in the nuclear sector since 2010



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# When do we carry out our reviews?

- A NAO review could be triggered by, for example:
  - Early stage investment appraisals or the development of new delivery model to provide an assessment of the critical early development stages and risks ahead (Hinkley Point C, 2017)
  - Completion of major phase of programme and examinations of preparations for next stage including risks (Decommissioning of the AGR nuclear power stations, 2022).
  - A major failing in a programme with a clear impact on value for money (Our reports on the Magnox contract in 2017 and 2020) .
  - Part of a regular programme of follow-up reviews on progress and responses to previous recommendations (Our work on Sellafield).
- The timing of our reviews is not necessarily determined by a programme's approval points or key decisions.



6

## What value can a NAO review add?

- Our independence and powers mean that we can provide an objective appraisal of the main issues and can offer a new perspective.
- We can surface issues that might otherwise not receive attention.
- We can examine issues that cut across organisational boundaries.
- We can draw upon previous work across government that may be relevant to the programme under and scrutiny (good and bad).
- We have a key role in helping parliamentarians ask the right questions of often large complex public programmes.



7

## Some thoughts about getting the best from independent reviews

- Independent reviews provide an alternative perspective that is a vital addition to programme assurance processes and reviews.
- Ideally they should be timed to offer the most valuable insight.
- Investing in independent reviews early is critical. Project development and initiation remains the point at which most value can be lost.
- Reviewers and the reviewed need to invest time in getting the working relationship in the right place.
- Project and programme sponsors and managers should be open to independent review – the reviews are there to support them.
- The review does not end with the report – follow-up is important in influencing change.



8

National Audit Office

# Thank you

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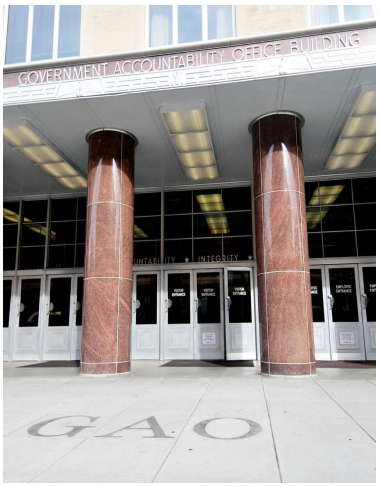
9

## When Are Independent Strategic Reviews Needed?

- **Considerations in framing reviews**
  - Scope
  - Risks
  - Priorities
- **When have reviews encountered challenges?**
  - Evidence collection without evidence assessment
- **When have reviews succeeded and why?**
  - Right-sizing methods
  - Routine evidence assessment






1

## Considerations In Framing Reviews: Environmental Liabilities Framework

1. **Understanding Scope**

Is scope of contamination known?

- If yes, is it accurately reflected, or are portions of the scope of contamination not yet estimable?
  - If yes, move to step 2.
  - If not, are proxy estimates available to give decision-makers an idea of additional future costs?
    - ❖ If no, there is a potential finding.
- If no, investigations are needed, and there is a potential finding if the agency has no plans for them.

2. **Understanding Risks**

Are risks to human health and the environment known?

- If yes, are risks adequately communicated to potentially affected parties?
  - If yes, move to step 3.
  - If no, risk communication is needed, and there is a potential finding if the agency has not taken steps.
- If no, risk characterization is needed, and there is a potential finding if the agency has no plans for it.

3. **Understanding Prioritization**

Does the federal program have a prioritization or decision-making rule to selecting cleanup activities?

- If yes, is prioritization aligned primarily on the basis of risk to human health and the environment?
  - If yes, how long will it take to complete cleanup based on historical annual funding levels?
  - If not, are the other prioritization criteria reasonable? If not, there may be a potential finding.
- If no, a risk-informed decision-making rule is needed, and there is a potential finding.



2

## Considerations In Framing Reviews (cont'd)

### Environmental Justice Considerations

- Federal agencies, to varying degrees, have obligations or commitments to (1) protect the public from existing environmental and health hazards and (2) avoid creating new hazards.
- In the U.S., federal agencies are to make achieving environmental justice part of their missions by addressing the disproportionate impacts on disadvantaged communities.
- Environmental justice considerations may expand your potential findings and recommendations to help the federal government better fulfill its obligations and commitments and mitigate disproportionate environmental impacts on minority and low-income communities.
- For example, in developing actions to predict, monitor, and respond to groundwater contamination, federal agencies could study and consider the effects on tribes and minority communities that rely on fishing for food.





## When Have Reviews Encountered Challenges?

Evidence collection without evidence assessment:

- Sometimes, review teams spend time learning the subject matter without thinking in parallel about design methods that will yield compelling evidence.
- Occasionally, review teams neglect to assess condition, criteria, cause, and effect while collecting evidence.
- Regarding "cause," some reviews do not meet their potential because teams identify symptoms of problems rather than root causes.

# When Have Reviews Succeeded & Why?

- Right-sizing methods

FIGURE 24: AUDITOR'S TOOLBOX

| Basic Audit Tools | More Specialized Audit Tools |
|---|---|
| Interviews | Expert panels |
| Documentation reviews | Focus groups |
| Site visits | Database analyses |
| Questionnaires and surveys | Economic analyses |
| Case studies | Scientific analyses [a] |
| Obtaining expert opinions | International benchmarking [b] |

[a] Scientific analyses may include, for example, the taking and analysis of water samples.
[b] International benchmarking involves comparing the audited entity's programs or activities against similar programs or activities that have been implemented in other comparable countries.

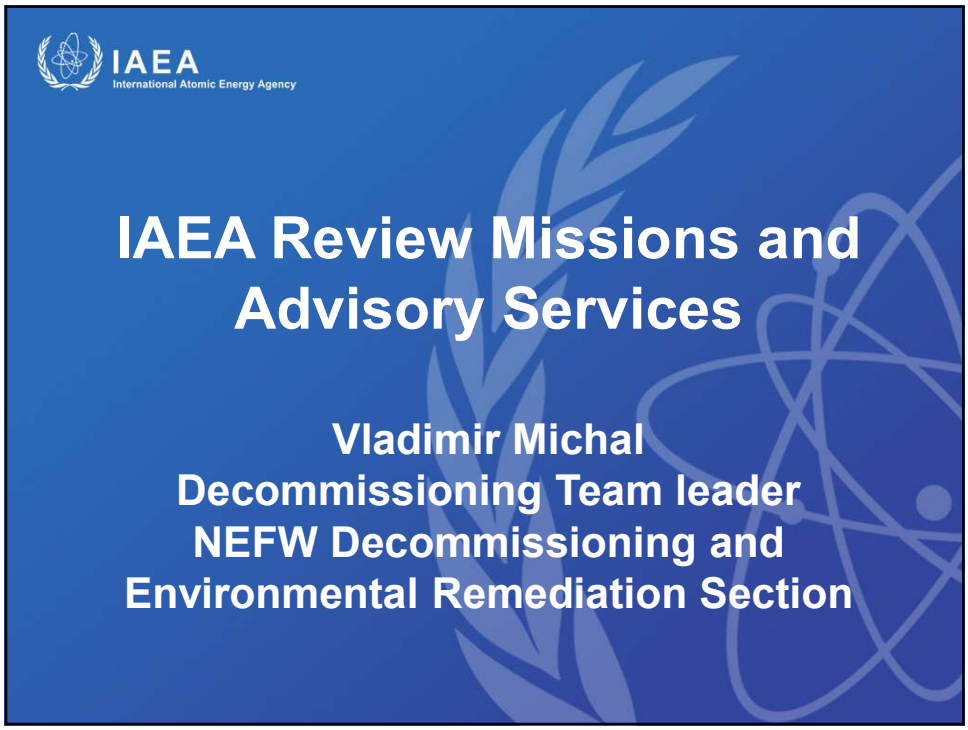




# When Have Reviews Succeeded & Why (cont'd)

- Routine evidence assessment

| Planned Methodology | Where we are *(Current results of each major piece of work—what can we say right now?)* | Strength of existing evidence *(Type of evidence, limitations, sufficiency, corroboration, cause identified, etc.)* | Where we are going *(Remaining work if existing evidence is not yet sufficient)* |
|---|---|---|---|
| **Objective 1 – Insert Reporting Objective 1** | | | |
| **Finding(s) – (*What does ALL of the collected evidence say about the objective?*)** | | | |
| *1. Insert Finding* | | | |
| Work Segment 1 – describe method | Describe what our existing evidence allows us to say (compared to criteria if applicable). | Describe whether the evidence we have sufficient to answer the objective? If not, what additional evidence is needed? | Describe additional audit work we think we will need to complete to ensure we address the objective. |
| Add Additional Work Segments as Needed | | | |
| *Finding is finalized (with stakeholder consultation):* ☐ | | *Testimonial evidence is corroborated:* ☐ | |


IAEA
International Atomic Energy Agency
IAEA Review Missions and Advisory Services
Vladimir Michal
Decommissioning Team leader
NEFW Decommissioning and Environmental Remediation Section

1

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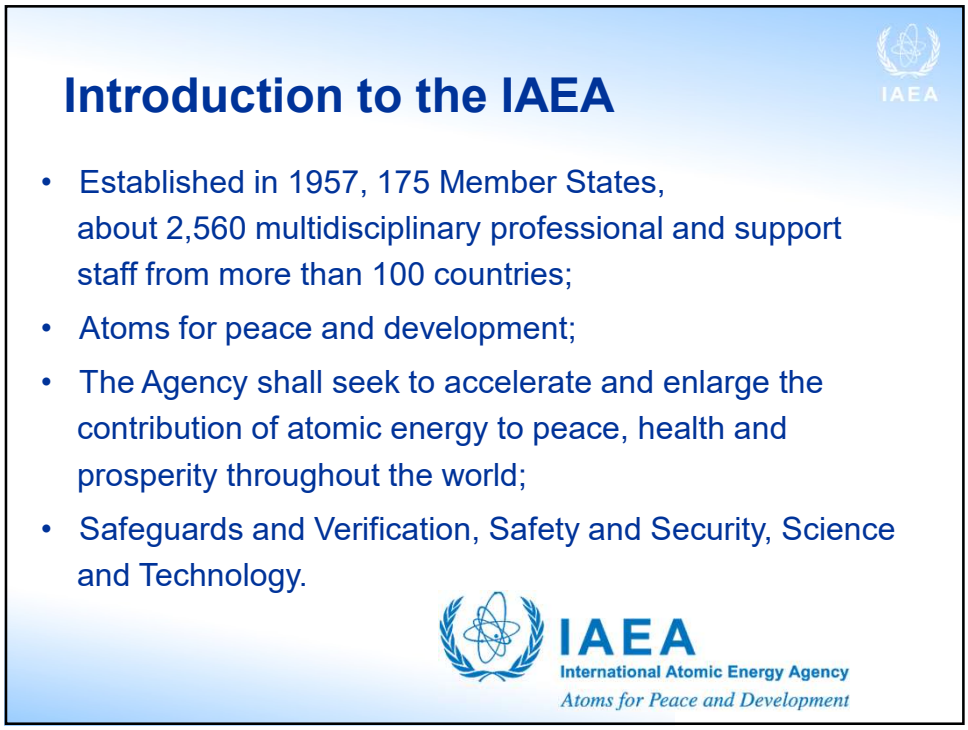

Introduction to the IAEA
IAEA
• Established in 1957, 175 Member States, about 2,560 multidisciplinary professional and support staff from more than 100 countries;
• Atoms for peace and development;
• The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world;
• Safeguards and Verification, Safety and Security, Science and Technology.
IAEA
International Atomic Energy Agency
Atoms for Peace and Development

2


3

# IAEA Review Missions and Advisory Services

- Over 30 IAEA Peer reviews and Advisory services plus ad-hoc reviews;
- Several examples:
  - Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (ARTEMIS);
  - Integrated Regulatory Review Service (IRRS);
  - Integrated Nuclear Infrastructure Review (INIR);
  - International Nuclear Security Advisory Service (INSServ);
  - Operational Safety Review Team (OSART);
  - Safety Aspects of Long Term Operation (SALTO);
  - Technical Safety Review (TSR);
  - Uranium Production Site Appraisal Team (UPSAT);
  - Ad-hoc reviews – e.g. on Fukushima Daiichi decommissioning activities.

4

## Some related considerations

- IAEA reviews are requested by Member States organizations;
- Review Guidelines are available to support preparation and implementation of the review;
- Review principles and basis & Review domains and topics;
- Preparation of the review → objectives, ToR (incl. scope, basis for the review, review team, organizational arrangement, background and supporting materials, reporting and deliverables, schedule, funding, references etc.), preparatory meeting(s), self-assessment (if any);
- The Review mission → introductory meeting(s), discussions with counterpart, review team meetings, findings & preparation of the draft report, fact-checking and factual comments;
- Reporting outcomes → final report (might be publicly available), feedback to the IAEA;

5

## Some related considerations

- The follow-up review → objectives, process, follow-up mission, reporting.

- Important points for success:
  - Precise definition of scope,
  - Selection of knowledgeable reviewers including the best possible review team leader,
  - Detailed planning of the review process administrated by coordinators (both for the IAEA and counterpart);
  - Open discussions with counterpart during preparatory meeting(s) and review mission;
  - … reporting and deliverables …

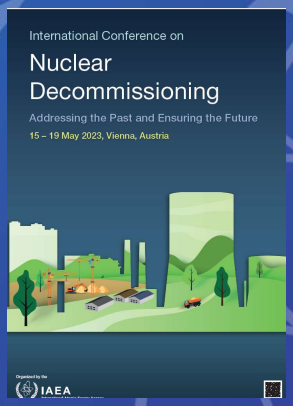
6

IAEA
International Atomic Energy Agency

*Thank you!*


**@IAEANE**

**www.iaea.org/nuclearenergy**




**https://www.iaea.org/events/decom2023**

# Scope of independent review

Good practices for independent strategic reviews in nuclear decommissioning

Online workshop

Philippe Derycke

June 1st, 2022

OECD/NEA – CPD Program

orano



# Summary

# 1 - Purpose

## Defining the scope of an independent strategic review

- What are the key scope elements ?
- How should review and gathering on the scope occur while it's under development ? Who should be consulted ?
- How should the objectives and expected outcomes be developed and specified ?
- What are good practices and pitfalls to avoid ?



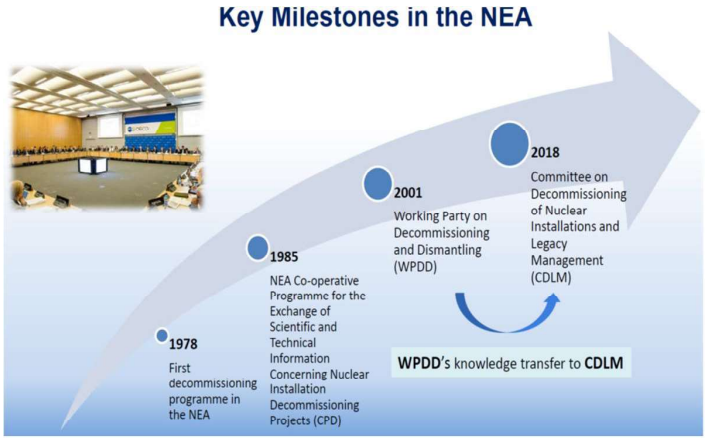


# 2 - NEA : CPD and TAG governance

**The NEA Co-operative Programme for the Exchange of Scientific and Technical Information Concerning Nuclear Installation Decommissioning Projects (CPD) was established in 1985**

- The CPD Management Board is the governance body and meets once a year in Paris
- The Technical Advisory Group (TAG) meets on site, twice a year

TAG is focused on technical aspects, based on actual hands-on/off decommissioning experience

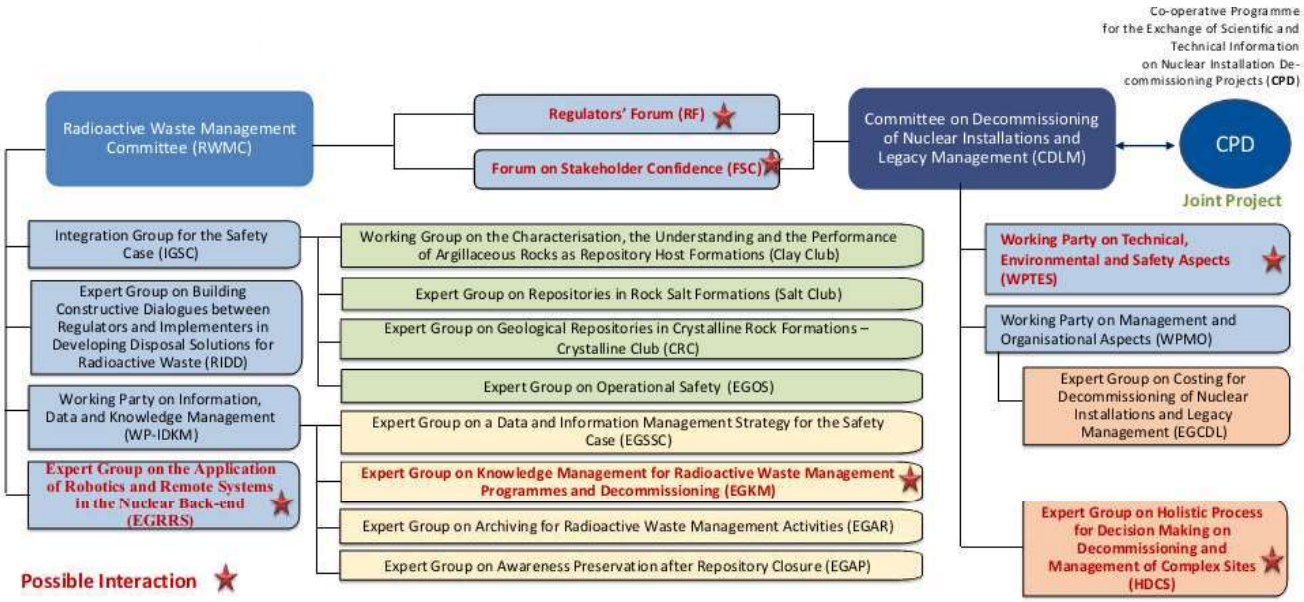



The current CPD Agreement is in force from 2019 – 2023

The Radioactive Waste Management Division (RWMD) is responsible for the Radioactive Waste Management Committee (RWMC) and the Committee on Decommissioning of Nuclear Installations and Legacy Management (CDLM)

The CPD/CDLM Interface Statement describes the relationship between the CPD and the CDLM

# 2 - NEA : structure of RWMC and CDLM






# 2 - Objectives of CPD and TAG

**Pursuant to Article 5 of the Statute of the OECD Nuclear Energy Agency, the NEA is entrusted with promoting the formation of joint undertakings for the production and uses of nuclear energy for peaceful purposes, endeavouring to secure the participation of the greatest possible number of countries**

**The objective of the CPD is to acquire information from operational experience in decommissioning nuclear installations that is useful for future projects**

- **Decommissioning project descriptions and plans**
- **Data obtained from research and development associated with a decommissioning project**
- **Data resulting from the execution of a decommissioning project and lessons learned from such execution**

**Current status of CPD : 56 active projects members of CPD (28 organisations from 18 countries)**

- **Reactors D&D : 33 projects**
- **Fuel cycle D&D : 23 projects**

# 2 - TAG : exchanges of information

**Content of TAG meetings** (3 days meetings, twice a year)

- **Update of projects (progress & recent achievements, main challenges and difficulties etc.)**
- **Thematic sessions (ex: asbestos management, waste clearance, measurements etc.)**

**Status of exchanged information**

- **Exchanged information covered with confidentiality agreement** (personal NDA signed by each participant before each meeting)

**Feedback**

- **The TAG meeting is a relevant forum to identify D&D projects with similar issues and challenges**
  - Ex : retrieval of GCR fuel structures at Orano La Hague (silos 115 & 130) vs MSSS project at Sellafield (project just admitted to CPD program at TAG#71 (May 2022))
- **Following TAG meetings, bilateral exchanges can be organized**



# 3 - Orano experience
## Design Authority vs Technical Authority

**Design Authority : in charge of the conformity to the applicable regulations (safety, nuclear security, technical performances specified by the customer)**

- **This authority validates the conception and the final project/product conformity to te specification**

**Technical authority : provides a technical control and gives advises on the ability to master the risks for products & process (technology, process qualification, technical references and norms)**

- **Ensures the successfull completion of the selected solution**
  - Choice/decisions of technical options
  - Selection of relevant scenarios (ex: waste pre-treatment)
- **Main areas of activity of technical authority** (case of legacy waste retrieval projects)
  - Development and qualification of waste routes and new waste packages
  - Optimisation of concept and cost of waste disposal projects
  - Elaboration of waste technological roadmap
  - Sites and facilities environmental remediation

# 3 - Orano experience
## Technical Authority

### Challenges

- **To identify experts who are not taking part to the project team**
  - Experts from the company, or from external entities
  - Challenging constraint, since experts are generally a limited ressource
- **What is the appropriate schedule to initiate the technical authority ?**
  - At the end of project phases (basic design, detailed design). Link with projects maturity approach
  - In case of tough point during project execution

### Status of information arising from TA

- **Conclusions of TA are only for advise purpose**
  - Final decisions to be taken by the project owner
- **TA information status**
  - TA reports/conclusions not public,
  - but can be disclosed to the regulator




# 4 - Requests from french regulator
## ASN & DGEC

### ASN requests

- **to perform a follow-up of the project schedule margins, and make regular report to the regulator**
- **to provide a benchmark of project management best practices**
  - for complex projects in non-nuclear field
  - for foreign projects in nuclear field

### DGEC requests

- **Legacy waste retrieval projects : to reinforce the risk management**

orano

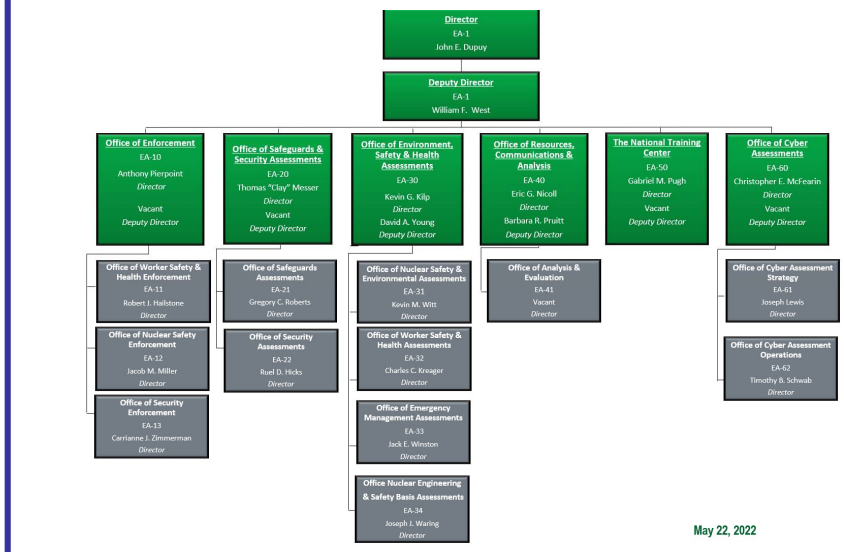
Giving nuclear energy its full value

# EA-30 Office of Environment, Safety and Health Assessments

**Briefing for**
**Nuclear Decommissioning**
**Independent Review Workshop**

**June 2022**

1

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## Office of Environment, Safety and Health Assessments

**EA-30's Mission**

Conducts independent evaluations that provide objective information and constructive feedback on programs for and performance in protecting workers, the public, and the environment from the nuclear and industrial hazards associated with DOE's past and present operations, with a particular focus on nuclear facility construction projects and high-hazard nuclear operations.

**EA-31 Office of Nuclear Safety and Environmental Assessments**

- Radiological hazards with a focus on hazardous nuclear facilities and operations

**EA-32 Office of Worker Safety and Health Assessments**

- Occupational safety and health programs and performance

**EA-33 Office of Emergency Management Assessments**

- Emergency management programs and performance

**EA-34 Office of Nuclear Engineering and Safety Basis Assessments**

- Nuclear safety engineering, safety bases, and performance analysis of hazardous nuclear facilities and operations

3

3

# Requirement

## DOE O 227.1A

"Independent Oversight appraisals must be prioritized on areas of greatest potential risks…Higher priority and greater emphasis is placed on conducting Independent Oversight appraisals of high consequence activities, such as nuclear project design, construction and commissioning; high hazard nuclear operations…Other areas of consideration for Independent Oversight appraisals are organizations whose performance may present significant risk (e.g., less than expected safety or security performance records and/or serious or recurring incidents or violations of requirements)."

4

4

U.S. DEPARTMENT OF ENERGY

Office of Environment, Safety and Health Assessments

EA Enterprise Assessments

**Current Focus Areas**

- Oversight of Nuclear Facility Construction Projects
- Nuclear Safety Oversight of Operations Supporting Increased Pit Production
- Issues Management and Findings Follow-up
- Analysis of Site Safety Culture Surveys
- Work Planning and Control - Electrical Safety Focus
- Construction Worker Safety and Health
- Emergency Management Program Effectiveness

5

5

U.S. DEPARTMENT OF ENERGY

EA Enterprise Assessments

# Essentials of Planning Process

- Advanced Planning/Coordination
- Assessment Plan finalized including selection of team members
- Data Call/Documents Requested
- Team expertise (Subject Matter Experts) aligned with scope and specific areas assigned
- Logistics: travel, access, activities to observe, interviews, and working space

6

6

# Some observations on transparency and communications

**Derek Lacey**, Deputy Chair Committee on Radioactive Waste Management (CoRWM, UK)

Department for Business, Energy & Industrial Strategy

1

## Summary

Observations on transparency and communication of nuclear topics:

- The case for openness and transparency is settled
- Transparency and communication of nuclear topics is recent

Observations on current UK practice

Department for Business, Energy & Industrial Strategy

2

**The case for openness and transparency is settled**

OECD (e.g. basis for good governance)

OECD/NEA (e.g. essential for trust in regulators)

IAEA (substantial investment in public communication since 2014)

UK information on nuclear policy, strategy and regulation easily accessible

Department for Business, Energy & Industrial Strategy

3

**Transparency and communication of nuclear topis is recent**

**Introduction by the Chair**
The Committee on Radioactive Waste Management was asked by Government in ***2003*** to make recommendations for the long-term management of the UK's higher activity wastes that would both protect the public and the environment, and ***inspire public confidence***. To do this, we have combined a technical assessment of options with ethical considerations, examination of overseas experience and ***a wide-ranging programme of engagement both with the public and with interested parties (stakeholders).***

From *Managing our Radioactive Waste Safely, CoRWM's recommendations to government*, July 2006

Department for Business, Energy & Industrial Strategy

4

**Observations on current UK practice**

Public Accounts Committee Inquiry and National Audit Office Report on AGR defueling and decommissioning, January 2022

BEIS consultation *Towards fusion energy: proposals for a regulatory framework,* October 2021 (and CoRWM interim position paper)

MOD *Nuclear Liabilities Management Strategy*, May 2022

*NDA Strategy*, March 2021

Regulator communications e.g. Environment Agency major review of Sellafield Ltd's Radioactive Substances Activities (RSA) permit, September 2020, ONR chief inspector on management of ageing facilities, October 2021

Community communications - Mid Copeland GDF Community Partnership, second newsletter, May 2022

Department for Business, Energy & Industrial Strategy

# Comparing Review Processes: Good Practices

**David S. Kosson, Ph.D.**
Distinguished Professor of Civil and Environmental Engineering
Consortium for Risk Evaluation with Stakeholder Participation (CRESP)
Vanderbilt University

Online Workshop
Good Practices for Independent Strategic Reviews in Nuclear Decommissioning: Learning from Experience

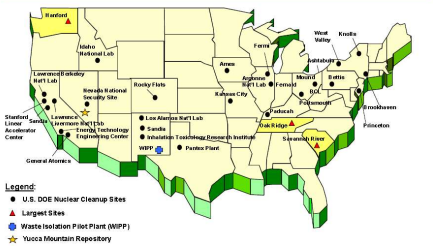
June 10, 2022

1

Support safe, effective, publicly-credible, **risk-informed management of existing and future nuclear waste** from government and civilian sources through independent strategic analysis, review, applied research and education.

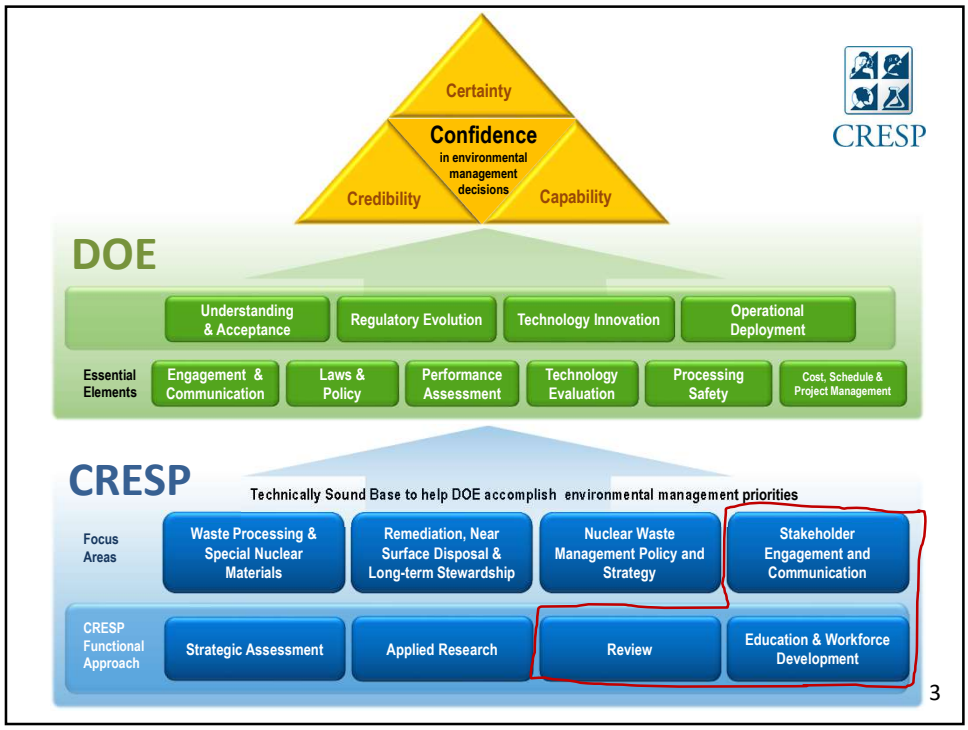
www.CRESP.org


*The U.S. Department of Energy's Cleanup Sites*




VANDERBILT UNIVERSITY · HOWARD UNIVERSITY · RUTGERS · GEORGIA TECH · Oregon State University · NYU · WISCONSIN · TEXAS TECH UNIVERSITY · CRESP

2

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## Review Attributes Considered

- Context
- Review Organization
- Review Scope Development
- The Review Committee and Review Participants
- The Review Process & Tools
- Review Products and Outcomes

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## Organizations Considered

- International Atomic Energy Agency, Integrated Review Service for Radioactive Waste and Spent Fuel Management, Decommissioning and Remediation (IAEA – ARTEMIS)
- National Academies of Sciences, Engineering and Medicine (NASEM)
- National Aeronautics and Space Administration (NASA)
- Government Accountability Office (GAO)
- Department of Energy, Office of Enterprise Assessment & Office of Environmental Management (DOE-EA, DOE-EM)
- Consortium for Risk Evaluation with Stakeholder Participation (CRESP)

  ➢ Further informed by questionnaire responses, personal experience and academic literature

5

5

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## Context

➢ **Strategic reviews support future government decisions that impact major program direction, organization or alternatives selection with potential impacts to the regional economy, infrastructure or environment.**

➢ "Addressing these issues is often a difficult and complex endeavor, particularly in instances where governments must balance competing demands and interests while attempting to develop effective responses." (INTOSAI, 2013).

➢ Who is the review customer?
➢ What is motivating the review?
➢ What decisions and actions may be impacted?
➢ Who are the stakeholders?

6

6

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## Review Organization

- Independence – organizationally and resources
- Documented review process and procedures
- Routine independent review of review scopes, products and processes
  - Standing review boards
  - Project specific review panels
- Importance of constructive relationships and dialogue between Review Organization, Customer, Reviewers and Reviewees.

➢ **Reviews should be viewed as opportunities and not a trial**

7

7

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## Review Scope Development

- Clear definition of
  - Context
  - Objectives and Questions to be addressed
  - Constraints (e.g., legal or regulatory)
  - Lines of inquiry
  - Supporting documentation and review tools to be used
  - Review Committee expertise
  - Stakeholder representation and input
- Iterative development in collaboration with Customer
  - Input from Reviewed Entity and Stakeholders
  - Take the necessary time to get it right!

8

8

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# The Review Committee and Review Participants

- Transparency with respect to expertise, composition and bias; absence of conflicts of interest
- Diversity – Expertise and Demographics

**Exhibit 4.** Attributes of Project Reviews as Defined by Cross-Case Analysis of Four NASA Projects

| Category | | Attributes |
|---|---|---|
| Reviewer—those that participated on the project review boards | Size | Lean to effectively communicate among reviewers and the project team and to efficiently perform reviews. |
| | Competence | Experienced in performing project reviews and technical expertise in a specific subject matter. |
| | Independence | People independent to the funding and management organization. |
| | Authority | Limited authority over the project. |
| Reviewee—those in project management and on the project team that participated in the reviews. | Competence | Technical experience and experience in performing and participating project reviews. |
| | Culture | Fear of failure or arrogance can develop a "protective shield" toward outside opinion. |
| Review type | Peer | Review from a subject matter expert, occurring on an informal basis, and independent from the project. |
| | Semi-Formal | Tied to milestones in the project, occur as rolling gates and not formal schedules. |

Sauser, B.J. (2006) *Engineering Management J.*, 18(4)11-18.

9

9

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# The Review Process & Tools

FIGURE 24: AUDITOR'S TOOLBOX

| Basic Audit Tools | More Specialized Audit Tools |
|---|---|
| Interviews | Expert panels |
| Documentation reviews | Focus groups |
| Site visits | Database analyses |
| Questionnaires and surveys | Economic analyses |
| Case studies | Scientific analyses [a] |
| Obtaining expert opinions | International benchmarking [b] |

[a] Scientific analyses may include, for example, the taking and analysis of water samples.
[b] International benchmarking involves comparing the audited entity's programs or activities against similar programs or activities that have been implemented in other comparable countries.

International Organization of Supreme Audit Institutions (INTOSAI) Working Group on Environmental Auditing (2013) Auditing Water Issues: An Examination of SAIs' Experiences and the Methodological Tools They Have Successfully Used. ISBN 978-9949-9061-4-7, available at http://www.environmental-auditing.org

10

10

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# The Review Process & Tools

**FIGURE 14: AUDIT MATRIX FOR THE SAI OF THE UNITED STATES' "ENERGY-WATER NEXUS: A BETTER AND COORDINATED UNDERSTANDING OF WATER RESOURCES COULD HELP MITIGATE THE IMPACTS OF POTENTIAL OIL SHALE DEVELOPMENT" REPORT[3]**

| Objectives / Researchable Question(s) | Audit Criteria, Key Information Required, Source(s) of Information | Scope and Methodology | Challenges Encountered in Conducting the Audit | Audit Results and Key Findings |
|---|---|---|---|---|
| To perform this audit, the Government Accountability Office (GAO) examined:<br><br>1) what was known about the potential impacts of oil shale development on surface water and groundwater;<br><br>2) what was known about the amount of water that may be needed for commercial oil shale development;<br><br>3) the extent to which water will likely be available for commercial oil shale development and its source; and<br><br>4) federal research efforts to address impacts to water resources from commercial oil shale development. | **Criteria**<br>• Law - *Energy Policy Act of 2005*<br>• Regulations proposed by the Department of the Interior on oil shale development<br>• Departmental mission statements<br>**Required Information and Its Sources**<br>• Information on potential water-related impacts of oil shale development, obtained from:<br>- studies published by public and private research entities;<br>- agency documents; and<br>- interviews with federal and state officials, as well as representatives of the oil industry and environmental groups.<br>• Information on the amount of water needed for oil shale development and the likely availability of water for this purpose, obtained from:<br>- Studies on oil shale development and interviews with the authors; and<br>- Water estimates and projections produced by federal and state agencies.<br>• Information on federal research efforts, obtained from a review of documentation and interviews with officials from federal and state agencies, universities, the oil industry, and water experts. | This audit examined the state of knowledge and activities related to potential oil shale development in the states of Colorado and Utah, as these are the areas in which the oil industry is most interested in developing oil shale deposits. To perform this evaluation, GAO:<br>• ***Analyzed studies*** on the water requirements of oil shale development. This analysis was limited to studies published in 1980 or later, and included studies prepared by federal agencies, academics, and private research entities.<br>• ***Reviewed agency documentation,*** such as the environmental impact statement on oil shale development prepared by the Bureau of Land Management.<br>• ***Interviewed*** a variety of stakeholders involved in oil shale development or research, including officials from federal and state agencies, industry representatives, environmental group representatives, authors of the studies identified in the literature review, and academics. In addition, the audit team interviewed water experts and other specialists (e.g., geologists) ***to obtain their expert opinions*** and to validate the accuracy of the different studies and data GAO was analyzing.<br>• ***Conducted site visits*** to oil shale demonstration projects. | A senior member of the audit team reported that it was challenging for GAO to develop estimates of the amount of water required for commercial oil shale production due to:<br>• resistance from oil industry members to sharing proprietary data on oil shale technologies; and<br>• general uncertainty about the unproven technologies themselves.<br><br>As a result of these limitations, the audit's data on the water needs of oil shale development were presented as a range of potential values rather than a specific numerical estimate. | Although oil shale development could have significant impacts on the quality and quantity of water resources, this audit was unable to determine the magnitude of these impacts due to the unproven nature of oil shale technologies and the lack of reliable information on the status of water resources in the region.<br><br>Nevertheless, GAO attempted to quantify the expected total water needs for oil shale production by providing a range of potential estimates based on its analysis of research studies and limited assistance provided by external experts. Using this data and information obtained from interviews with government officials and other stakeholders, the audit team found that the size of the oil shale industry in Colorado and Utah could eventually be limited by water availability issues.<br><br>In addition, GAO reported that its interviews with officials and water experts revealed there were insufficient data to understand the baseline conditions for water resources in the oil shale regions of Colorado and Utah. Furthermore, this problem is exacerbated by the lack of coordination between the federal and state agencies that conduct water-related oil shale research and those that regulate water. |

International Organization of Supreme Audit Institutions (INTOSAI) Working Group on Environmental Auditing (2013) Auditing Water Issues: An Examination of SAIs' Experiences and the Methodological Tools They Have Successfully Used. ISBN 978-9949-9061-4-7, available at http://www.environmental-auditing.org





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# Review Products and Outcomes

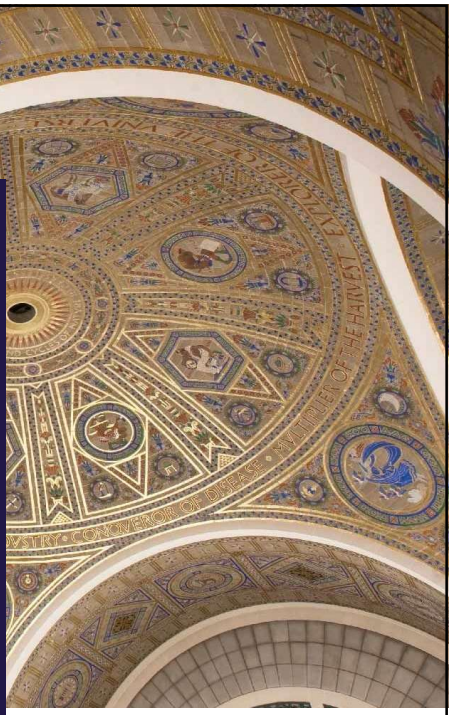
- Review Report
  - Independent report review for adherence to scope and adequate foundations for conclusions and recommendations, absence of bias
  - Factual accuracy review
  - Reviewed entity response
- Review Report Briefing
  - Reviewed entity
  - Customer(s)
  - Stakeholders
- Media Plan
- Outcomes Tracking
  - Follow up to recommendations
  - Actions planned and taken

NATIONAL ACADEMIES Sciences Engineering Medicine

# Managing Review Committees and Review Process: Practices of the National Academies

Online Workshop on Good Practices for Independent Strategic Reviews in Nuclear Decommissioning.

*Charles D. Ferguson, Ph.D., Senior Director, Nuclear and Radiation Studies Board and Board on Chemical Sciences and Technology*



1

## The Origin of NAS and Why This Matters

**President Lincoln signed a congressional charter forming the National Academy of Sciences and Art in 1863**

**Left to Right:**
**Benjamin Pierce; Alexander Bache; Joseph Henry; Henry Wilson; Abraham Lincoln; Louis Agassiz; Charles Henry Davis; Benjamin Gould**

"…the Academy shall, whenever called upon by any department of the Government, investigate, examine, experiment, and report upon any subject of science or art…"

NATIONAL ACADEMIES Sciences Engineering Medicine

2

# The National Academies Today (NASEM)

***We marshal the energy and intellect of the nation's critical thinkers to respond to policy challenges with science, engineering, and medicine at their core.***

**3 Honorary Societies**

**John L. Anderson**
President, National Academy of Engineering

**Marcia McNutt**
President, National Academy of Sciences

**Victor J. Dzau**
President, National Academy of Medicine

**7 Program Units**

- Division on Behavioral and Social Sciences and Education
- Division on Engineering and Physical Sciences
- Division on Earth and Life Studies
- Division on Policy and Global Affairs
- Gulf Research Program
- Health and Medicine Division
- Transportation Research Board

NATIONAL ACADEMIES Sciences Engineering Medicine

3

## Strengths of the National Academies work

- **Stature and breadth** of Academies' memberships and ability to access the nation's (*as well as other nations*') top experts
  - Honorific organizations and program units span all areas of science (natural and social), technology, engineering, and medicine.
- **"Pro bono" nature** of committee service
  - More than 7,000 experts from a range of sectors and disciplines serve pro-bono on the committees each year.
- **Independence, scientific objectivity, balance**
  - Private, nongovernment, nonprofit organization.
- **Quality control procedures**
  - FACA Section 15 provides requirements specifically for the National Academies to provide advice directly to the federal government.
  - Public transparency.
  - Rigorous peer review.

NATIONAL ACADEMIES Sciences Engineering Medicine

4

# Federal Advisory Committee Act Section 15

- (a) In general.--An agency may not use any advice or recommendation provided by the National Academy of Sciences or National Academy of Public Administration that was developed by use of a committee created by that academy under an agreement with an agency, unless-- (1) the committee was not subje… …mittee created after the date… …as appointed in accordance w… …y complied with--
- (A) subsection… …) subsection (b)(2) and (5),
- (b) Requireme… …lic notice of the names and br… …ny shall determine an… …academy determines su… …its best efforts to ensure that (A… …erformed, unless such conflict i… …mbership is fairly balanced as d… …ny will be the result of the A… …appoint to serve on the commi… …) The Academy shall determin… …meetings of the committee to… …s the Academy determines th… …e available to the public, at reas… …s, or employees of the Academ… …) The Academy shall make ava… …eting that is not a data gathering meeting, unless the Academy determines that the summary would disclose matters described in section 552(b) of title 5, United States Code. The summary shall identify the committee members present, the topics discussed, materials made available to the committee, and such other matters that the Academy determines should be included. (5) The Academy shall make available to the public its final report, at reasonable charge if appropriate, unless the Academy determines that the report would disclose matters described in section 552(b) of title 5, United States Code. If the Academy determines that the report would disclose matters described in that section, the Academy shall make public an abbreviated version of the report that does not disclose those matters. (6) After publication of the final report, the Academy shall make publicly available the names of the principal reviewers who reviewed the report in draft form and who are not officials, agents, or employees of the Academy.

- 20-day public comment period
- No individual appointed to serve on the committee has a conflict of interest that is relevant to the function to be performed
- When the committee meets in closed session, members of the public are provided brief summaries that include the list of committee members present
- All information-gathering meetings of the committee are open to the public unless the information is classified or official-use-only
- Any unclassified written materials provided to the committee by individuals who are not officials, agents, or employees of the Academies are maintained in a public access file that is available for examination.

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5

# The Consensus Study Process


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6

## The Consensus Study Process


- An issue is identified and discussed between a potential sponsor and NASEM staff
- Staff explore the questions and issues that should be considered related to the topic, including potential collaborations
- Sponsor and staff agree on a Statement of Task

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7

## The Consensus Study Process


- Call for nominations & conduct interviews
- Provisional committee slate is internally approved, then announced **publicly**
- 20 day public comment period
- COI/Balance discussion
- Address any gaps
- Internal memo and final approval

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8

## Conflict of Interest and Balance Discussion Questions

- Describe your background, qualifications, and interests with regard to the study topic. What can you contribute to the current study?
- Do you hold strong views regarding the study issues and have you taken a public position based on these views (e.g., op-eds, congressional testimony)?
- Do you have financial interests (e.g., consultancies, financial holdings, research funding) related to the study that might represent a conflict of interest?
- Have you answered "yes" to any of the questions in Part II of the disclosure form?
- Are you an author of work that is of central importance to the committee's task?
- Are you serving as an expert witness or other capacity in any relevant legal matters?

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9

## Advice on Selection of Committee Members

- Seek diversity in all its forms.
- Need to ensure that all areas of expertise are covered.
- Try to have more than one expert per major area of expertise.
- Select Chair to be someone who is:
  - Dispassionate
  - Can adjudicate disputes among members
  - Has prior experience with the National Academies study process
  - Has a broad set of expertise—that is does not necessarily have to have deep expertise on a particular subject area

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10

10

## The Consensus Study Process


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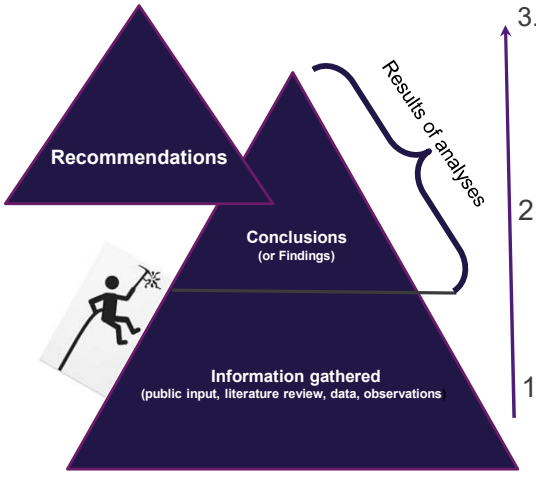
11

## Forms of Advice in Consensus Studies




3. Recommendations, if any, are based on conclusions/findings and outline action steps for a specified actor.
2. Build conclusions (or "findings") from the committee's analyses of the gathered information/evidence.
1. Begin with gathering information/evidentiary support.

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12

## Report Review

**What it is:** As a final check on the quality and objectivity of the study, all Academies reports undergo a rigorous, independent external review by experts whose comments are provided anonymously to the committee members.


**What is done:**

- Informal review of final draft from relevant board directors and division staff
- Formal review coordinated by the Report Review Committee (RRC)
  - Independent set of outside experts
  - RRC oversees the review process
  - Required to consider all reviewer points
  - Reviewers assess whether the report addressed the Statement of Task
  - *Reviewers' comments are kept confidential*

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13

## Maintain Confidentiality

- **Honor the Rules:** Respect the confidentiality of committee deliberations, report drafts, and other committee materials that are shared during the study.
  - All closed session discussions and deliberations are **confidential**. (Closed sessions include committee teleconference calls)
  - All draft report materials (outlines, draft sections, etc…) are **confidential** work products of the committee.

- **Maintain Safe Spaces:** Staff and Chair will respect the confidence of members who approach them for private conversations.

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14

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