

Sustainability considerations in nuclear decommissioning –improving practices and reframing the issues

Decommissioning is a normal and inevitable stage in the lifetime of a nuclear facility. It involves the timely, safe and environmentally responsible removal of radioactive waste and other materials, leading to a progressive and systematic reduction in radiological and other hazards. Decommissioning is undertaken on the basis of planning and assessment to ensure safety, protection of workers and the public, and protection of the environment. While the need to ensure protection of the environment is a well-established aspect of nuclear decommissioning, additional considerations relating to the environmental impact of decommissioning activities and addressing broader issues of sustainability are receiving ever-increasing attention.

Initiatives to reduce the environmental impact and promote sustainability in nuclear decommissioning to-date have related to radioactive waste management, including enhanced efforts to implement the waste hierarchy. Together with supply chain partners, initiatives have included efforts to reduce the environmental footprint of decommissioning activities generally through refining the selection and use of materials and improvements in methods, and through supporting actions such as improving environmental 'housekeeping' for operations and facilities, and encouraging use of low-emission vehicles and collective transport options for personnel. The current approaches will lead to reductions in the environmental footprint of decommissioning activities, but are unlikely to achieve a fundamental improvement in decommissioning from a sustainability perspective. Nonetheless, such initiatives are worthwhile in their own right and should be pursued as part of the continuous improvement of nuclear decommissioning activities.

This paper will argue that the current conceptual approach to nuclear facility decommissioning is a fundamental limitation and that a reframing is necessary if sustainability is to be genuinely addressed. When we talk about nuclear decommissioning, we are usually referring to the final phase of a once-through nuclear facility life-cycle. This life-cycle starts with design and construction, then a long period of operation, then shutdown and decommissioning. So when we talk about a facility life-cycle we typically mean a 'cradle-to-grave' system rather than a cyclical process. This paper will suggest a wider framing of the issue, so that from the outset considerations of how and to what extent a facility and its equipment will be reused should be embedded in design and construction, and that future use of a site will be integrated into development plans. This would enable broader and deeper engagement with sustainability and circular economy considerations systematically throughout the life-cycle.

The current interest in advanced reactor designs and SMRs offers an ideal opportunity to begin to implement a new more sustainable and circular approach to nuclear decommissioning already at the design stage. While it is not possible to fully implement such an approach now for facilities already in decommissioning or currently operating, there is nevertheless a responsibility to seek to address sustainability considerations through continuous improvement of the way in which decommissioning is conducted. Moreover, decommissioning of the current fleet of nuclear facilities offers an opportunity to test and refine the approaches and inform design choices for the next generation of facilities.

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