

Current trends in decommissioning and environmental remediation of nuclear facilities

By Juan José Zaballa Gómez



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The decommissioning and environmental remediation of civil nuclear facilities represents a considerable challenge for the countries involved in this activity around the world. It includes aspects and problems associated with management, technology, safety and the environment.

Over the past few decades, operators worldwide have acquired important experience in the decommissioning and environmental remediation of nuclear sites. A large number of nuclear facilities have ceased operations, and it is envisaged that this number will increase considerably over the coming years. Seventeen power reactors have already been decommissioned, out of more than 150 power reactors shut down or undergoing decommissioning, while more than 180 research reactors have been shut down or are being decommissioned with more than 300 already fully decommissioned. A total of 170 other nuclear cycle facilities have been shut down or are being decommissioned and a further 125 have been completely decommissioned. Spain is one of the countries with experience and activity under way in this field.

It has been demonstrated that decommissioning activities can be performed without creating additional risks to health, safety or the environment, and that it is a mature industrial activity.

But what are the fundamental elements that make this activity possible? In our experience, the complete cycle is related to the effective availability of three key elements: a regulatory legal framework that guarantees safety, the necessary provisions with regards to the funding and availability of resources, and access to technologies and experience in this field including the presence of logistical and management solutions for the resulting materials, particularly spent fuel and radioactive waste.

It is necessary to establish a suitable legal framework that clearly defines the responsibilities of the different stakeholders, including the authorities. The transition from operation to dismantling and decommissioning requires changes to the regulatory framework to ensure that the required measures associated with the specific risks of this type of project are adopted in a way that facilitates its implementation, while respecting the established safety requirements.

The importance of R&D

It is, therefore, necessary to provide continuity to research, development and innovation activities in order to develop and improve techniques and technology. This effort should respond to the specific characteristics of decommissioning and environmental remediation, which are unique in that they are dominated by non-routine operations, subject to continuous changes in the environment and risk profile. It must be developed in an environment that simultaneously requires ongoing improvement in safety conditions, project management efficiency and the associated costs.

A critical aspect in these activities is the required separation of non-radioactive materials from radioactive waste. This process minimizes the amount of waste requiring special treatment and management due to its radiotoxicity.

The availability of facilities and management pathways for the materials generated during decommissioning up to their final disposal, particularly for radioactive waste and spent nuclear fuel, ensures that no responsibility is passed on to future generations. Consequently, a lack of management pathways and destination facilities may generate difficulties in the approval process and, in all cases, adds uncertainties regarding the final costs.



Training young professionals

These activities require the availability of personnel and qualified contractors. The nuclear sector is dealing with an ageing professional workforce faced with the difficulty of attracting and keeping young professionals that can replace them. This situation affects both regular operations as well as, and perhaps more so, decommissioning and environmental remediation.

Public acceptance is a necessary condition and is essential for the effective execution of these activities. In this respect, there is wide consensus regarding the responsibility of the operators and authorities when it comes to facilitating responsible and informed participation of a wide range of stakeholders in decision-making.

Participants in these activities in any country should be prepared for the

unexpected. A diverse range of factors — political, economic, social, regulatory and environmental — may influence the development of these activities from their initial planning phase right up to their finalization.

Last but not least, I wish to turn to costs and funding for decommissioning and environmental remediation. The costs vary significantly, depending on the type of facility, the dismantling strategy, the objective of freeing the sites, the proximity and availability of infrastructure for managing the resulting materials, the regulatory framework and regulations in force. In this respect, increasing attention is being given to ensuring the availability of sufficient financial resources to execute and complete these activities in a way that avoids liabilities being passed on to future generations.

Enresa has repurposed the turbine building into a radioactive waste management facility at the José Cabrera nuclear power plant.

(Photo: Enresa)