

## HUMAN RESOURCE DEVELOPMENT FOR RADIATION SAFETY IN MOLTEN SALT REACTORS

KHAOULA KHARAZ CHIHAB \*, SERGIO MARTÍN PERAL, GENÍS GUILLEM MIMÓ , JOSÉ MANUEL VERA VALVERDE , WILLIAM RICARDO VARGAS ACERO AND ALEX DUMONT

*Polytechnic University of Catalonia, Av. Diagonal 647, 08028, Barcelona, Spain*

\* Corresponding author email: [khaoula.kharaz@estudiantat.upc.edu](mailto:khaoula.kharaz@estudiantat.upc.edu)

The successful deployment of Molten Salt Reactors (MSR) in Europe requires a well-developed human resource strategy to ensure a skilled workforce capable of handling the challenges of this advanced nuclear technology. Unlike conventional reactors, MSRs utilize liquid fuel, necessitating specialized training in reactor operation, safety management, and regulatory compliance. Building and sustaining expertise in these areas is crucial for the success and public acceptance of this technology. A primary challenge in MSR implementation is the need for an extensive workforce skilled in radiation protection, reactor physics, and molten salt chemistry. The continuous circulation of radioactive fission products demands proficiency in real-time exposure monitoring, neutron flux control, and advanced containment strategies. To address this, a structured capacity-building strategy is required, integrating international safety standards such as IAEA guidelines and aligning with the evolving regulatory landscape. This strategy must follow a methodological framework with clearly defined phases, including needs assessment, to identify key competencies required for MSR operation and regulation; curriculum design, integrating theoretical knowledge with hands-on training; and implementation of innovative training tools, such as virtual reality simulations, AI-driven platforms, and digital twins to enhance practical learning while minimizing exposure risks. Additionally, international collaboration among academic institutions, research centers, and industry stakeholders is essential to facilitate knowledge transfer, support exchange programs, and foster a new generation of nuclear professionals. The strategy must also include regulatory and policy integration, ensuring alignment with safety requirements, and a system for evaluation and continuous improvement to regularly assess training outcomes and update methodologies to meet evolving industry needs. By adopting this structured approach, Europe can secure the long-term sustainability, safety, and competitiveness of MSRs, addressing the current skills gap and reinforcing its position as a global leader in next-generation nuclear technologies while contributing to energy security and decarbonization goals.

114\_abstract\_yg