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Invited Talk: From compliance to competence: How Nuclear Safeguards education is changing the nuclear workforce paradigm

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The evolving landscape of nuclear energy marked by the deployment of small modular reactors (SMRs), the development of advanced fuel cycles and rising geopolitical tensions is fundamentally reshaping the requirements for nuclear safeguards. No longer limited to ensuring regulatory compliance, safeguards now demand a highly competent, adaptive, and technologically literate workforce. This shift calls for a new paradigm in education and training: one that fosters critical thinking, interdisciplinary collaboration, and a deep understanding of emerging verification technologies.

Special attention is given to the role of the European Nuclear Education Network (ENEN) as one of the main catalysers of this transformation. By integrating academic excellence with hands-on training and international collaboration, ENEN serves as a bridge between educational institutions and real-world nuclear safeguards practice. Such instrumentation such as the ENEN2plus mobility programme, nuclear safeguards theoretical and hands-on practical courses, scientific competitions and academic programmes are key enablers of this competence-based shift driven by ENEN.

This paper explores how safeguards education is transitioning from a compliance-focused model to a competence-oriented approach and examines the implications of this shift for workforce development in the nuclear sector. Diverse audiences from inspectors and engineers to regulators, researchers, legal and policy advisors require customized learning pathways that reflect their roles in safeguarding nuclear materials in increasingly complex environments.

The paper concludes with practical recommendations on how educational strategies can be aligned with the demands of the nuclear renaissance, particularly in areas such as digital safeguards (e.g., tomographic techniques, AI-assisted material accountancy or surveillance, etc.), small modular reactors (SMR) technologies evolving and strategic capacity-building in politically sensitive regions. This evolution in safeguards education is not only enhancing professional readiness but is also helping to ensure the long-term resilience and credibility of the global non-proliferation regime.

Technical Track

Education and Training

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