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## Human-Centred Computing for Assisting Nuclear Safeguards

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With the rapid evolution of enabling hardware and software, technologies including 3D simulation, virtual reality (VR), augmented reality (AR), advanced user interfaces (UI), and geographical information systems (GIS) are increasingly employed in many aspects of modern life. In line with this, the nuclear industry is rapidly adopting emerging technologies to improve efficiency and safety by supporting planning and optimization of maintenance and decommissioning work, as well as for knowledge management, surveillance, training and briefing field operatives, education, etc.

For many years, the authors have been involved in research and development (R&D) into the application of 3D simulation, VR, and AR, for mobile, desktop, and immersive 3D systems, to provide a greater sense of presence and situation awareness, for training, briefing, and in-situ work by field operators. This work has resulted in a unique software base and experience (documented in numerous reports) from evaluating the effects of the design of training programmes and briefing sessions on human performance and training efficiency when applying various emerging technologies. In addition, the authors are involved in R&D into the use of 3D simulation, advanced UIs, mobile computing, and GIS systems to support realistic visualisation of the combined radiological and geographical environment, as well as acquisition, analyses, visualisation and sharing of radiological and other data, within nuclear installations and their surroundings.

The toolkit developed by the authors, and the associated knowledge base, has been successfully applied to various aspects of the nuclear industry, and has great potential within the safeguards domain. It can be used to train safeguards inspectors, brief inspectors before inspections, assist inspectors in-situ (data registration, analyses, and communication), support the design and verification of safeguards systems, conserve data and experience, educate future safeguards inspectors on general principles (E-learning materials), etc.

### Country or International Organization

Norway

**Primary author:** SZŐKE, István (Institute for Energy Technology)

**Presenter:** SZŐKE, István (Institute for Energy Technology)

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