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## The European R&D project INSIDER: Acting on the upstream stages

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### Abstract

The EURATOM work programme project INSIDER (Improved Nuclear Site Characterization for Waste minimization in Decommissioning under Constrained Environment) was launched June 2017. This 4 year project has 18 partners. It aims at improving the management of contaminated materials arising from Decommissioning and Dismantling (D&D) operations by proposing an integrated methodology for radiological characterization. This methodology is based on advanced statistical processing and modelling, coupled with adapted and innovative analytical and measurement methods, with respect to sustainability and economic objectives. In order to achieve these objectives, the approaches will be then applied to common case studies in the form of Inter-laboratory comparisons on matrix representative reference samples and benchmarking. Assessment of the outcomes will be used for providing recommendations and guidance resulting in pre-standardization texts.

**KEYWORDS:** *Decommissioning, Sampling strategy, R&D, characterization, European project*

### Introduction

Decommissioning and Dismantling (D&D) operations are strongly dependent on the facilities history and on the inventory of present radionuclides. These D&D projects produce large volumes of materials with different radioactivity concentration levels. The material management is a major technical, and societal challenge, strongly being subject to economical optimization. Under constrained environments new methodologies are necessary for a more accurate initial estimation of the contaminated materials, resulting waste volumes and timely planning [1].

A new European project called INSIDER has been accepted by the European commission in 2017. INSIDER is coordinated by CEA and includes 18 European partners from 10 member states. Its objectives are to improve D&D operations of nuclear facilities with medium (MA) and high radioactivity (HA) levels and/or other constrained environments with respect to operational decommissioning efficiency, safety and costs, as well as confidence in safety of facility/site end-state, and the quantities and characteristics of resulting radioactive waste, in particular concerning subsequent storage and disposal end-points. This falls within the general objectives of demonstrating that the nuclear industry is fit for taking responsibility for retiring a range of facilities and sites without imposing undue economic, socio-political, or radiological burdens, as well as protecting natural resources and land for present and future generations.

The radiological characterization of a facility prior to performing any D&D and remediation operations is a crucial step in the definition of a viable decommissioning scenario [2]. This scenario must be robust and optimized not only with regards to technical issues, produced waste amount and workers dosimetry, but also with regards to costs, deadlines and safety. Concerning the D&D of sites in a MA/HA environment, the initial stages of in-situ characterization are often very constrained by accessibility issues. Today, information can be gained from the reconstitution of a 3D vision of a facility or of the components to be characterized. However, this reconstitution is partly based on off-site laboratory analyses leading to technical and cost difficulties in the realization of representative samples.

The objective of this project is, firstly, to improve the management of waste coming from nuclear sites under D&D operations, but especially to direct D&D operations, so that the production of waste is optimized on the basis of criteria such as minimization of generated volumes, limitation of over-categorized waste, limitation of generated waste and effluents as engaged doses on sites during the D&D operations, in a sustainable approach.

## Technical objectives and structure of the project

The project aims at improving knowledge of the radiological state of nuclear facilities under decommissioning operations in a MA/HA environment and any other constrained environment by coupling three approaches:

1. Statistical and geostatistical sampling
2. Efficient in-situ measurements and,
3. Compatible and rapid analytical methods minimizing effluents in traditional radioactivity measurement laboratories (potentially in the future, in mobile laboratories).

The heart of the technical innovative part of the project is to improve the sampling strategy taking into account different types of measurement data, with different but known levels of accuracy.[2],[3]

In-situ analysis techniques are of paramount importance for initial cartography. In constrained environment they must be complemented by more detailed off-site measurements. Realistic knowledge of their performance is important, without systematic optimization.

The main final outcome of this project must be to set on methodological guides, support to pre-standardization commission's program, based on the inventory of techniques/methods and associated analytical performances, reference materials and their characteristics, and corresponding statistical processing tools.

The INSIDER project addresses 3 use cases: a fuel cycle facility, a nuclear power plant and a post accidental remediation. Each one is representative for different kind of constraints.

The methodologies will be applied to the 3 use cases in the form of benchmarking and an interlaboratory comparison (ILC), both proficiency testing [4] and/or method validation [5]. The ILC will deal with synthetic reference samples produced within the project by European metrology laboratories. The benchmark will deal directly on real, past or present, D&D selected worksite from SCK-CEN (Belgium), JRC Ispra (European Joint Research Center Italy) and CEA (France).

Six technical axes are addressed by the 6 work-packages of the project, in accordance with the organization described in figure 1.

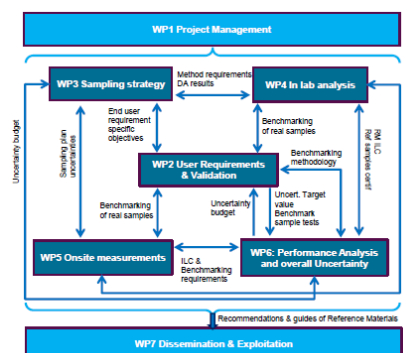


Figure 1: INSIDER PERT diagram

## Conclusions

The INSIDER project is working towards recommendations and guidelines for improving decision making of the industrial implementation for decommissioning and remediation activities. The practical project implementation includes documenting, testing, verifying and assessing characterization methodologies for the selected test cases. Thereby, a key contributor is effective knowledge sharing within the scientific community. Final assessment of the outcome will strengthen the recommendations and guidance, and promoting and sharing European expertise through guide and pre-normative texts

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