Topical Session 3
WP8 Sarec - WP17 CSFD Interactions

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OBJECTIVES OF THE WORK PACKAGES

WP8 – SAREC: RELEASE OF SAFETY RELEVANT RADIONUCLIDES FROM SPENT NUCLEAR FUEL UNDER DEEP DISPOSAL CONDITIONS:

This work package aims to improve **quantification and mechanistic understanding of the release of safety relevant radionuclides** covering most representative types of spent nuclear fuel (SNF). Together with increased knowledge of the fuel evolution both prior and posterior to contact with ground water, this will be used to **better predict the radionuclide source term for post-closure safety assessment.**

WP17 – CSFD: CRITICALITY SAFETY FOR FINAL DISPOSAL:

Explore the **optimization potential of the technical and administrative measures** available for ensuring **criticality safety in final disposal,** attain an improved understanding of their methodological validation and experimental verification, and further consolidate the **technical basis of the criticality safety argumentation for final disposal of fissile wastes.**

ENSURE SAFE FINAL DISPOSAL

WP8 – SAREC: RELEASE OF SAFETY RELEVANT RADIONUCLIDES FROM SPENT NUCLEAR FUEL UNDER DEEP DISPOSAL CONDITIONS:

- Only fuel with acceptable characteristics are allowed in the repository (WAC)
- Definitions of fuel related Safety functions are scientifically sound
- Releases in case of barrier failures can be quantified
- An adequately quantified source term is important when optimizing the barrier system

WP17 – CSFD: CRITICALITY SAFETY FOR FINAL DISPOSAL:

- Explore methods to ensure criticality safety in the repository post-closure phase
- Develop approaches to carrying out the post-closure criticality safety assessment in the Deep Geological Repository (DGR) long-term evolution

LINKS/SYNERGIES BETWEEN OUR WPS

(conclusions from 1st AWS)

- Source term! "Inverse" relationship: WP-8 is concerned with the amount of radionuclides released, while WP-17 is concerned with what remains...
- **For crit. safety rather detailed computational models (implies scenarios) are required**
  - Canister degradation scenarios
  - Fuel degradation scenarios (fissile material accumulation either inside or outside of the canister)
  - Burn-up credit: which radionuclides can we take credit for?
- **Perspective from WP-8:**
  - Canister evolution after failure – only some effects of corrosion products are taken into account, but understanding the process is important for potential additional scenarios (e.g. sorption, co-precipitation)
  - Full radionuclide inventory of fuel is important to know to estimate fraction released.

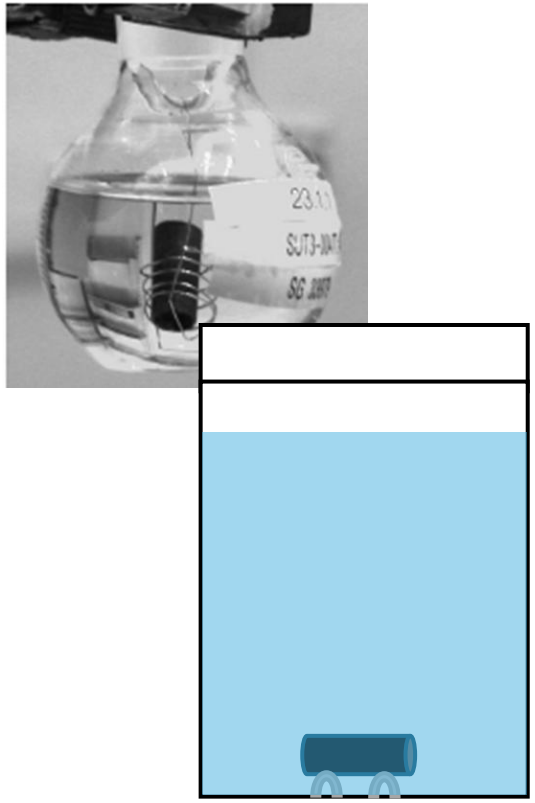
REDUCE THE UNCERTAINTIES

- **Initial Fuel Inventory:**
  - UOX fuel: tools exist and have proved their accuracy; update if necessary and verify experimental values for radionuclides that are becoming 'measurable' (e.g. Difficult To Measure)
  - MOX fuel, doped UOX fuel (e.g. Gd-doped, new fuels for SMRs)

- **RNs release from SNF**
  - Analytical techniques and methods are usually very efficient, though there is room for improvement in some cases.
  - Interest in the determination of the redox state of certain radionuclides
  - Conceptual models: fraction "immediately" released followed by congruent matrix dissolution

- **Radionuclides distribution and Isotopic composition**
  - When sampling solution, does one capture radial variations, or do we only measure effects of the outer diameter of the pellet ?
  - The effect of burnup & fracture patterns that may influence the accessibility of the pellet core to water

LEACHING EXPERIMENT – WHAT REMAINS IN THE SNF SAMPLE ?



Measurements and analyses during and after leaching experiment

- Gas phase (Xe, Kr)
- Solution (RNs release)
- Sorption (wall, tubes, sample holder…)
- (Re-)precipitation (surface of the sample, colloids)

Analyze of the SNF sample after leaching

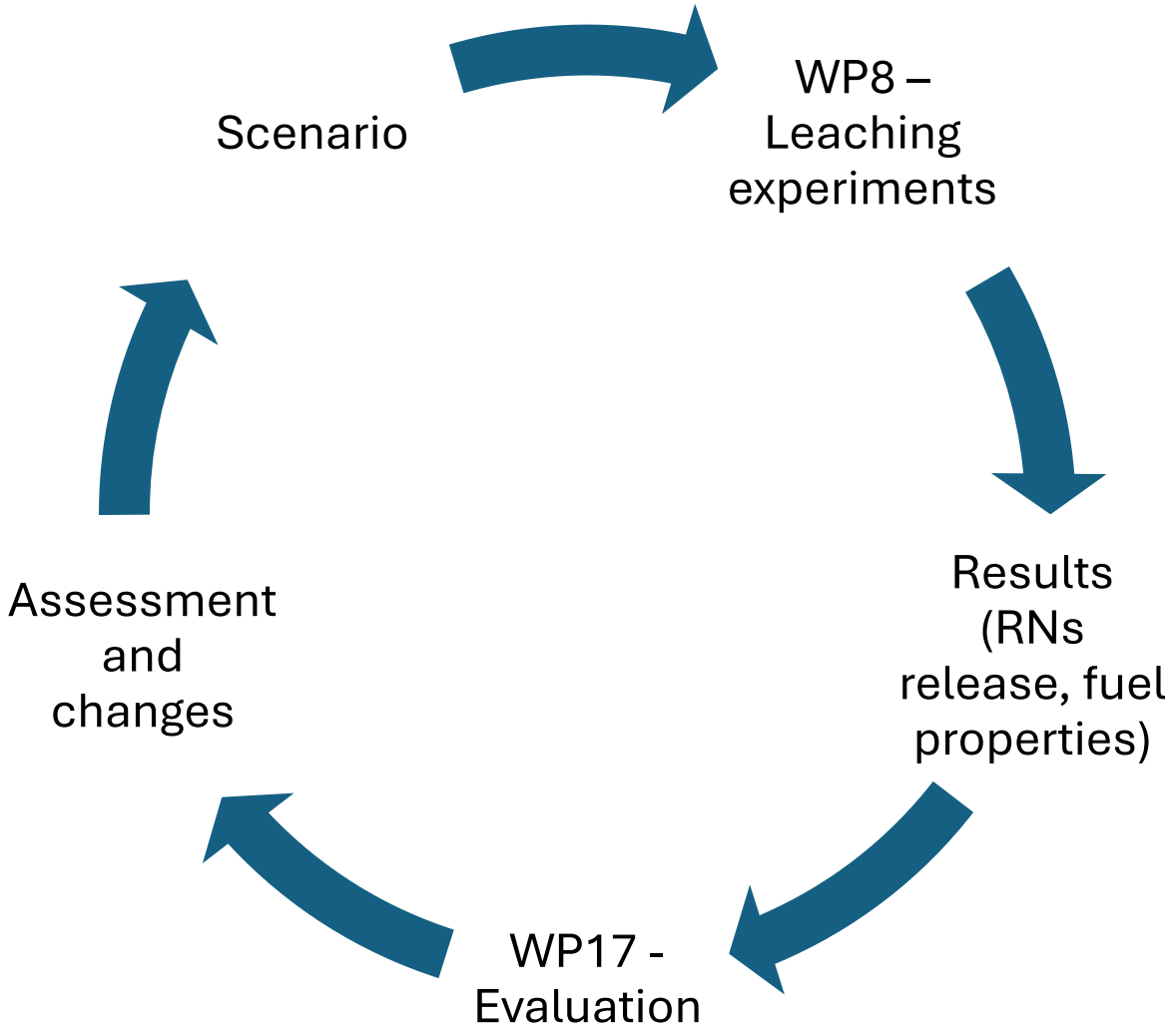
- Complete dissolution of the samples, inventory:
  - Full sample
  - Axial or radial distribution

Representativeness of ONE sample

- Duplicate
- Experimental procedure

All these results are crucial for safety assessment

A STRATEGY FOR AN OPTIMIZED SCENARIO



ON-GOING…

The work packages develop glossaries and collaborate to ensure that all synergies, including those regarding terminology, are taken into account

- Safety assessment: "safety case" in some countries or "safety demonstration
- Instant Release Fraction (IRF) / Accessible Fraction of the Inventory (AFI)
- Deep Geological Repository (DGR) / Geological Disposal Facility (GDF)

European Partnership on Radioactive Waste Management

Open for discussion and new opportunities

Thank you for your attention!

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