Joint Activities update
EF preparation

EF Meeting N°3

Joint Activity N° 1

TSWG/TEP

Waste forms and their behaviour – FIRST NUCLIDES

SRA	Key Topic : N°2	Topic : 1	Topic priority : High

Leader: Bernhard Kienzler, KIT-INE, Karlsruhe

EG Members = end-user s:
ANDRA
Enresa
Nagra
BWMi
Ondraf/Niras
SKB

EF Participants: See next slide

Other

grant agreement no. 295722, the FIRST-Nuclides project, Budget: 4,741,261 € 2,494,513 € EU contribution

The Consortium (1)

1. Partners / Beneficiaries

Hungarian Academy of Sciences, Centre for Energy Research

Subatech

2. Associated Groups (AG)

Groups participating at their own costs with specific RTD contributions or particular information exchange functions, or mobility measures (for European AGs only)

Joint Activity N° 1

TEP

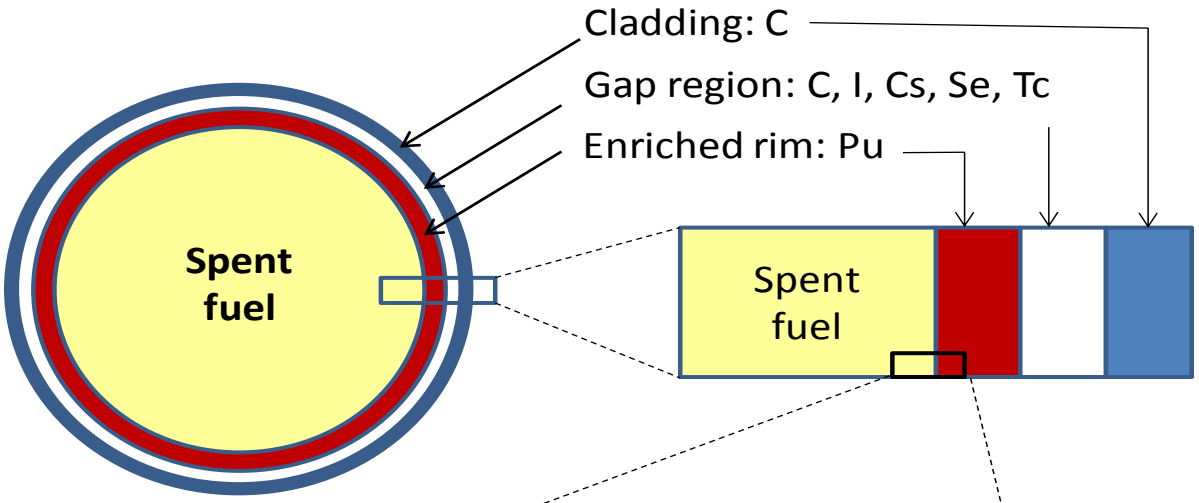
Objectives and Expected Results of the Joint Activity

Objectives: Fast / Instant Release of Safety Relevant Radionuclides from Spent Nuclear Fuel

- Improvement in understanding.
  - high *burn-up UO_2, linear power, temperature, ramping, ...*
- Relationship FGR and release of non-gaseous FPs
  - *gases, ^{135}Cs, ^{129}I, ^{14}C compounds, ^{79}Se, ^{99}Tc and ^{126}Sn.*
- Grain boundary effects.
- Chemical speciation of relevant elements.

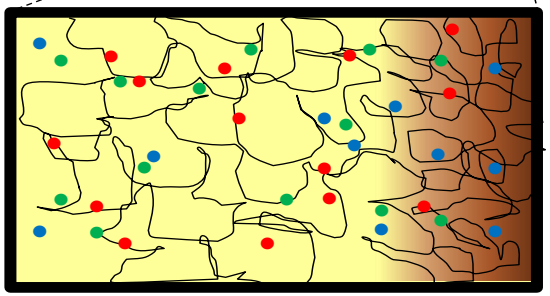
01. Jan. 2012 – 31.Dec. 2014

Complex structure of spent fuel



fuel grains
U, Pu, Ln, Sr

fission gas bubbles
Kr, Xe, I



Grain boundaries
C, I, Cs, Se, Tc

Rim
enriched with Pu

ε-particles
metallic precipitates
Mo, Ru, Pd, Tc, Rh
Ag, Cd, In, Sb, Sb

oxide precipitates
Rb, Cs, Ba, Zr, Nb
Mo, Tc

IGD-TP

Work Programme:

WP 1: Samples and tools

Selection, characterization and preparation of and set-up of tools for handling and transportation of the highly radioactive material

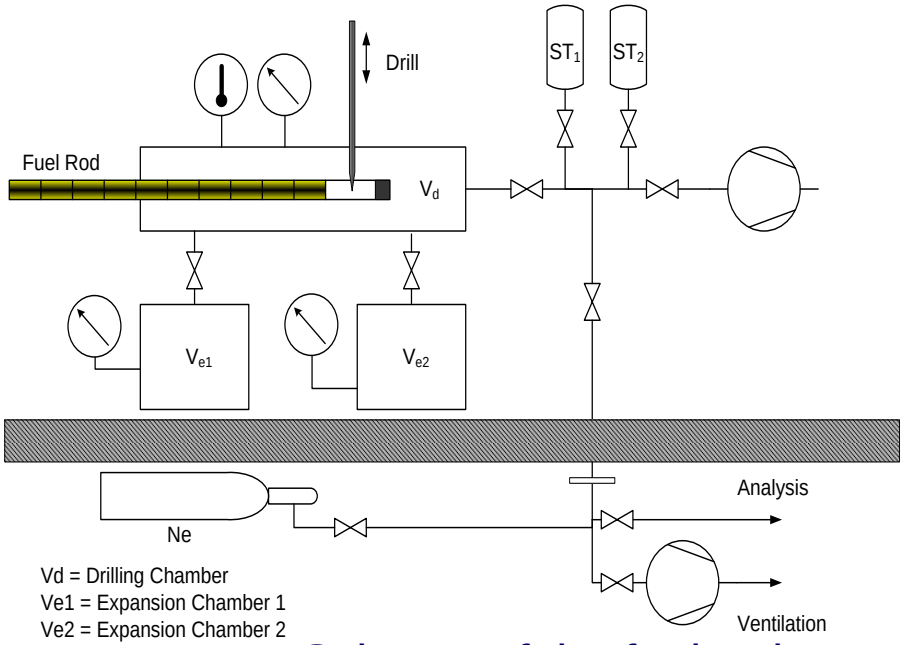
WP leader: Volker Metz (KIT)

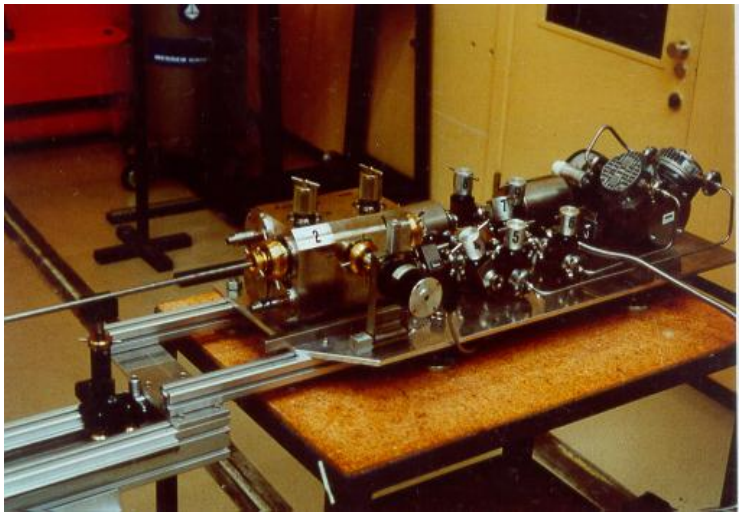
		PWR	BWR	THTR / VVER
Discharge		**1989 -2008**	**2005 – 2008**	
Pellet	Enrichment	**3.80 – 4.94 %**	**3.30 -4.25 %**	2.4 -16.8%
Irradiation	Burn-up	**50.4 – 70.2 GWd/t**	**48.3 – 57.5 GWd/tU**	
	Cycles	2 - 14	5 – 7	
lin. Power	average	**186 -330 W/cm**	**160 W/cm**	130 – 228 W/cm
FGR		**4.9 – 23 %**	**1.2 – 3.1 %**	

WP 2: Gas release and rim and grain boundary diffusion

WP leader: Detlef Wegen (JRC-ITU)

- Experimental determination of fission gas release





Scheme of the fuel rod puncturing device.

by JRC-ITU

- Experimental investigation of rim / grain boundary diffusion

WP 3: Dissolution based release

WP leader: Karel Lemmens (SCK·CEN)

- Dissolution based radionuclide release and to the extent possible the chemical speciation of the relevant isotopes.

Partners: **KIT-INE, JRC-ITU / CTM, PSI, Studsvik, EK (MTA), SCK•CEN**

Agreement on experimental details to cover the whole range of conditions:

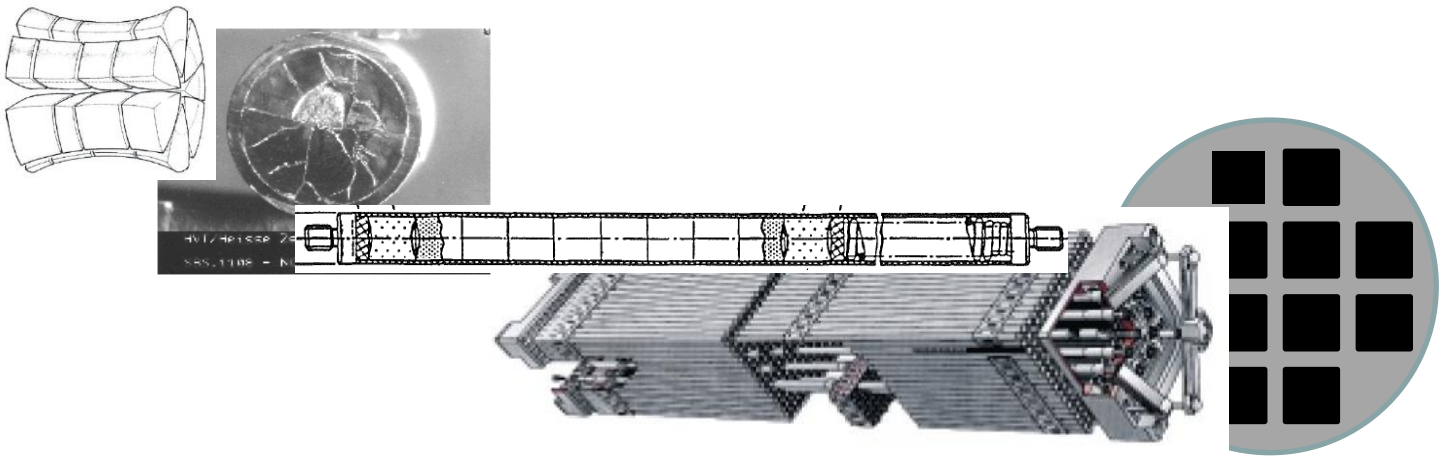
- Samples/sample preparation (powder – pellets)
- Conditions (oxic – anaerobic)
- Groundwater

WP4: Modelling

WP leader: Joan de Pablo (CTM/UPC)

Aims of the conceptual and numerical modelling

- Quantify the fast/instant release fraction of fission products.
  - *FP migration along the grain boundaries and fractures,*
  - *effects of defects in the cladding on the fast release.*
- Up-scaling from fragments/pellets to fuel assemblies.



- Modeling the chemical state of relevant elements.
- Delineation from matrix dissolution process.

WP5: Knowledge, reporting and training:

WP leader: Alba Valls (AMPHOS21)

- Knowledge management and documentation of the State-of-the-Art with regular up-dating.
- Stepwise build-up of scientific-technical reporting
- Dissemination and Communication,
- Training

Please see the project webpage

www.firstnuclides.eu