DE LA RECHERCHE À L'INDUSTRIE

SANDA WP5 Status Report

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DES/IRESNE/DER

Institut de recherche sur les systèmes nucléaires pour la production d'énergie bas carbone

Recall

- **WP5 objectives**
  - Perform impact studies and S/U analyses, analyze experiments, in order to relate (JEFF) ND improvements to end-user needs for selected applications
  - Performing new validation experiments in existing experimental facilities
- **Practical goal**
  - Focus on *selected* nuclear data and a *selection* of nuclear systems for which significant pre-design work has already been done
  - Get reliable estimates of ND errors and uncertainties for selected nuclides-reactions → JEFF4 needs and work plan
  - Assess impact on selected nuclear systems (reactors and fuel cycles) → End-user needs + missing experiments

Tasks

- **T5.1 – Sens. analyses, impact studies, unc./corr. estimates, expected gains**

Selected systems: ESFR/ASTRID, MYRRHA, JHR, adv. LWRs, MSRs, waste…

- **T5.2 – Validation studies for the above applications, by performing analyses of available relevant integral expts. and inferring trends in nuclear data**

Relevant experiments from IRPhE, ICSBEP, SINBAD, SFCOMPO,…

- **T5.3 – New validation experiments and needs for new integral data**

Experiments in selected existing facilities : GELINA, LR-0, TAPIRO

Tasks, Subtasks, Partners, Deliverables

	Tasks / Subtasks	Partners	Deliverables
T5.1	**Impact studies, sensitivity analyses, and assessment of needs**	**CIEMAT**, CEA/DEN, CNRS/LPSC, SCK-CEN, JSI, KIT, UPM, IRSN	
T5.1.1	Impact studies and sensitivity analyses		M24
T5.1.2	Assessment of (JEFF) nuclear data needs		M36 (milestone)
T5.2	**Validation studies (using existing expts)**	**UPM**, CEA/DEN, CIEMAT, JSI, KIT, NRG, IRSN	
T5.2.1	Assessing correlations in integral expts.		M36
T5.2.2	C/E validation and trends		M42, M48
T5.3	**New integral experiments**	**CEA/DEN**, CVREZ, ENEA, JRC	
T5.3.1	Experiments at GELINA		M42
T5.3.2	Experiments at LR-0		M42, M48
T5.3.3	Experiments at TAPIRO		M42

Status of WP5 on Nuclear Data Validation and Integral Experiments

M24

T1

D.5.1 Report on sensitivity analysis methods; *CIEMAT*, LPSC, UPM, CEA; M24

D.5.2 Report on ESFR, MYRRHA, and ALFRED sensitivity and impact studies; *SCK*, CEA, UPM; M24

D.5.3 Report on JHR sensitivity and impact study; *CEA*; M24

D.5.4 Report on HLW sensitivity and impact study; *KIT*; M24

D.5.5 Report on assessment of nuclear data needs; *CEA*, CIEMAT, UPM, SCK, KIT; M36

T2

D.5.6 Report on correlations between integral experiments; *CIEMAT*, JSI, CEA, UPM; M30

D.5.7 Report on reactor and shielding C/E validation and nuclear data trends; *UPM*, JSI, CEA; M42

D.5.8 Report on critical benchmark C/E validation and nuclear data trends; *NRG*, IRSN; M42

D.5.9 Report on C/E validation and nuclear data trends; *UPM*, CEA, JSI, NRG, IRSN; M48

T3

D.5.10 Report on experiments at JRC Geel using MINERVE samples; *CEA*; M42

D.5.11 Report on integral experiments at LR-0; *CVREZ*, CEA; M42

D.5.12 Report on integral experiments at TAPIRO; *ENEA*, CEA; M42

D.5.13 Report on new integral experiments and needs; *CEA*, JRC, CVREZ, ENEA; M48

M42/48

The first partner listed for each deliverable is the responsible for the deliverable.

T5.1 Status

- **T5.1.1 – Sensitivity analyses, impact studies, unc./corr. estimates:** completed with delays

  Studies performed for selected systems: ESFR, ASTRID, MYRRHA, ALFRED, JHR, waste storage

  D5.1 – Report on sensitivity analysis methods: M24 + 2 months ☺ 😐

  D5.2 – Report on ESFR, MYRRHA, ALFRED sensitivity studies: M24+14 m. ☺ 😐

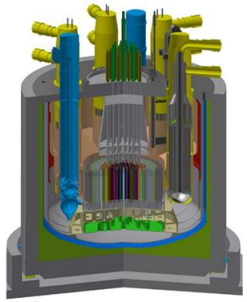
  D5.3 – Report on JHR sensitivity and impact study: M24 + 14 months ☺ 😐

  D5.4 – Report on HLW sensitivity and impact study: M24 + 14 months ☺ 😐

- **T5.1.2 – Assessment of (JEFF) nuclear data needs:** ongoing, delayed

  D5.5 – Synthesis of Subtask 5.1.1 findings (M5.1): M36 + 9 months ☺ 😐

T5.1 Status



Reactor	Response	Target accuracy (OECD/NEA WPEC SG46)	Uncertainty [%] 33g Sensitivites 33g JEFF-3.3 COV
ESFR	k-eff	0.3%	1.04 ± 2.5E-04
	Coolant density	5%	25.69 ± 1.2E-01
	Doppler+300K	5%	4.25 ± 5.4E-01
	Doppler-300K	5%	4.00 ± 5.0E-01
	Control	3%	1.96 ± 1.1E-02
ASTRID	k-eff	0.3	0.97 ± 2.0E-04
	Coolant density	5%	15.78 ± 5.2E-02
ALFRED	k-eff	0.435%	0.88 ± 1.6E-04
	Coolant density	5%	6.82 ± 2.7E-01
	Doppler+300K	5%	6.91 ± 6.2E-01
	Doppler-300K	5%	3.57 ± 3.3E-01

T5.2 Status

- **T5.2.1 – Assessing correlations in integral experiments:** still ongoing, delayed

  Relevant experiments from IRPhE, ICSBEP, SINBAD, SFCOMPO,… analysed: sodium void, Doppler, iron shield, neutron absorbers, depleted fuel inventory…

  Importance of different types of uncertainties and (missing) correlations studied

  D5.6 – Report on correlations between integral expts: M30 + 12 months ☺ 😐

- **T5.2.2 – C/E validation and trends:** ongoing

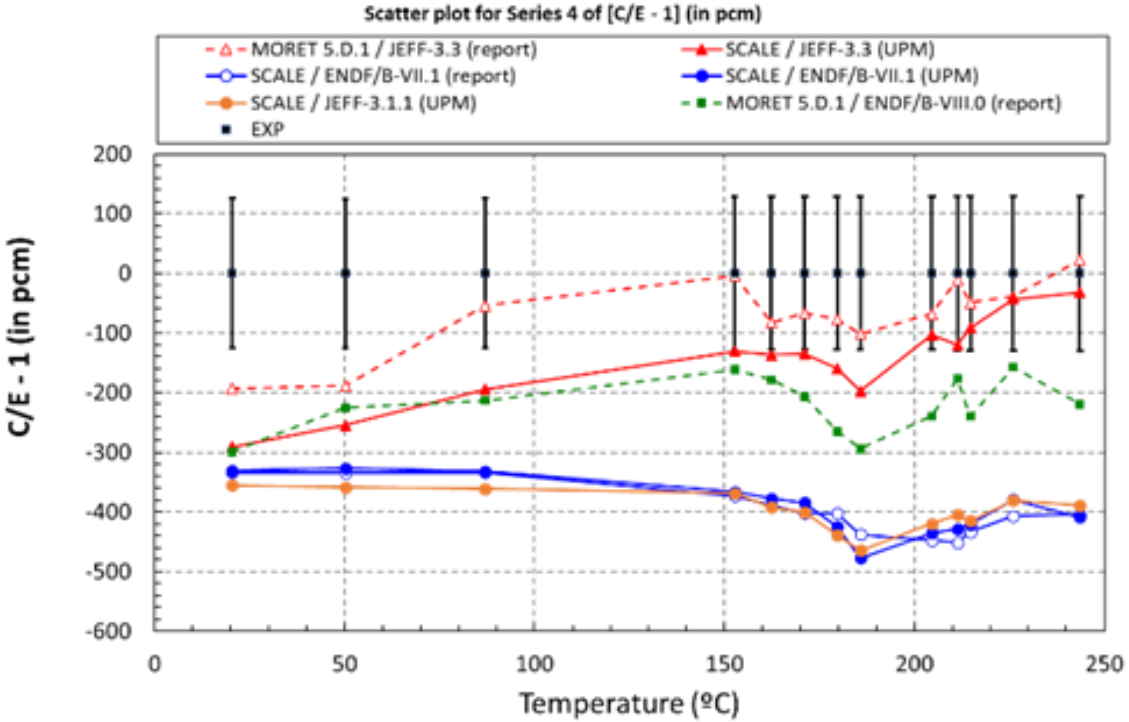
  D5.7 – Report on reactor and shielding C/E validation: M42

  D5.8 – Report on criticality benchmark C/E validation: M42

  D5.9 – Synthesis report on C/E validation and nuclear data trends: M48

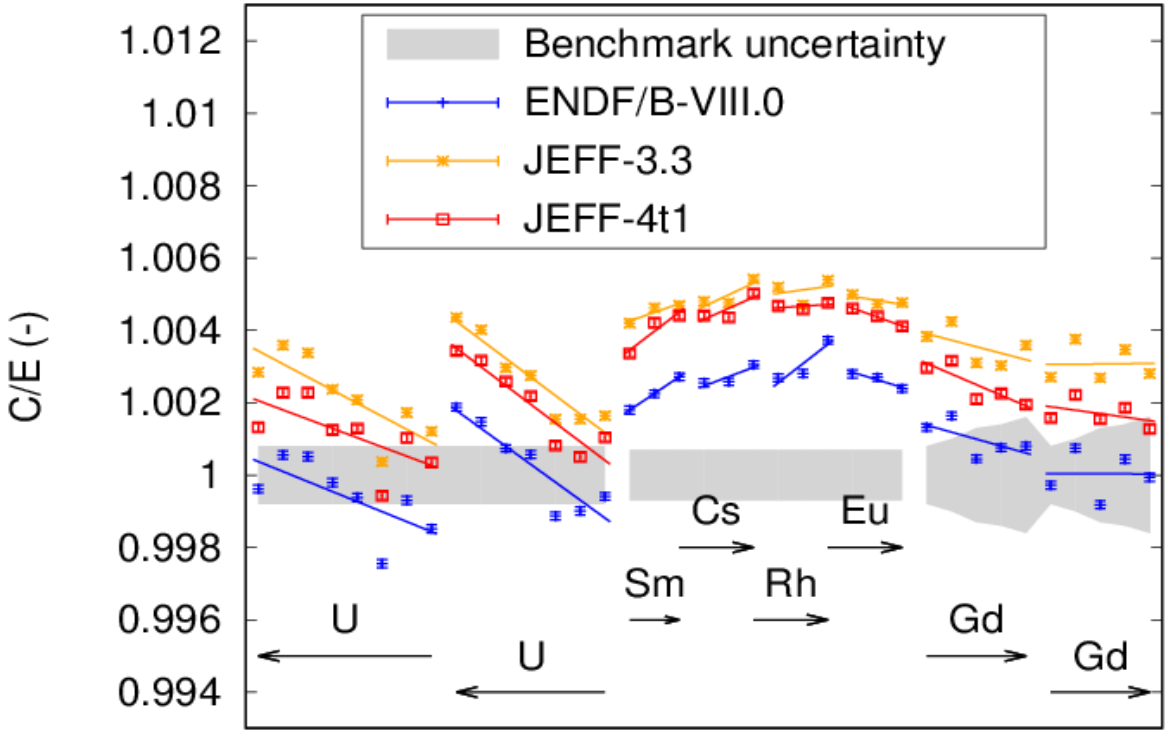
T5.2 Status

C/E results for the SEFOR benchmark, discussed at a recent JEFF meeting



T5.2 Status

C/E results for the LEU-MISC-THERM-003, 5, 6 benchmarks, also discussed at a recent JEFF meeting



T5.3 Status

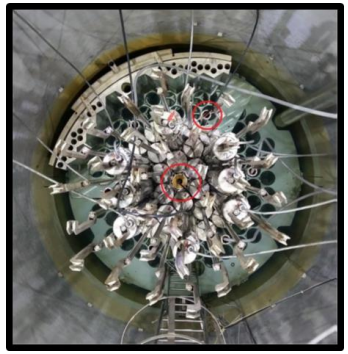
- **T5.3.1 – Neutron Resonance Transmission Analysis (NRTA) measurements at the JRC Geel GELINA facility using MINERVE samples:** still ongoing, delay

  Facility largely unavailable because of pandemic and upgrades (new beam line in 2020, new RF transformers, new radiation safety protection system in 2021)

  Experiments postponed from Sept. 2020 to 2022 (ongoing)

  D5.10 – Report on expts w/ MINERVE samples: M42 + 9 months 😐

T5.3 Status



- **T5.3.2 – Pile noise experiments at CV Rez LR-0:** ongoing, delayed

  Measurements of kinetics parameters using different acquisition systems

  First (HLUK) experiment planned in May 2020, postponed several times because of the COVID pandemic. Done in July 2021

  Second (MIRROR) experiment done in October 2022

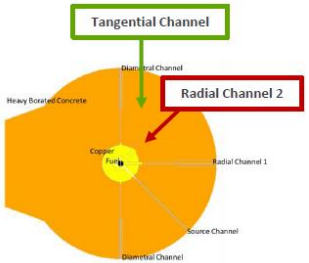
  D5.11 – Report on integral expts in LR-0: M42 + 9 months 😐

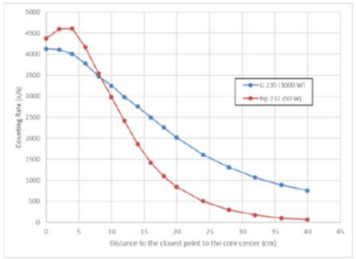
T5.3 Status

- **T5.3.3 – Measurements of Np, Am, Cm (and Pu, U) actinide spectrum-averaged cross sections at the ENEA/TAPIRO fast reactor:** ongoing, delayed

  Phase 1: New, calibrated, miniature fission chambers prepared by CEA for spectral characterization of exp. channels, shipped to ENEA in 2020 and 2021

  Measurements initially scheduled in 2020, postponed because of pandemic and unavailability of the TAPIRO facility. A first set of them was done in October 2021 in two TAPIRO channels, a second set was scheduled in 2022…





T5.3 Status

Phase 2: Work started in early 2022 with the specification of an **americium** fission chamber, to be fabricated by CEA. **No Cm chamber**, too complicated

Transfer to ENEA of this Am chamber + a reference U238 chamber in 2023

Measurements are scheduled in 2023…

D5.12 – Report on actinide measurements at TAPIRO: M42 + 16 months 😐☹

- **T5.3 Synthesis report:** delayed

D5.13 – Report on new integral experiments and needs: M48 + 12 months 😐

Summary

- **WP5** has been impacted, directly and indirectly, by the Covid pandemic

  Direct impact caused by impossibility to access experimental facilities. Indirect impact caused by adjustment to lockdown and post-lockdown, remote work conditions, changes in internal priorities… Yet, most of the planned work will be done, with delays of 12 months or less in all but one deliverables (D5.12)

- **Tasks**

  - T1 – Sens./impact studies done for various systems
    Deliverables delayed to M26-M45
  - T2 – Work still ongoing on C/E analysis of integral experiments + correlations
    Deliverables postponed to M42-M48
  - T3 – Delays, but work done or ongoing, difficulties with only one experiment
    Deliverables rescheduled to M51-M60