

OperaHPC: OPEN HPC thermomechanical tools for the development of eATF fuels

OBJECTIVES

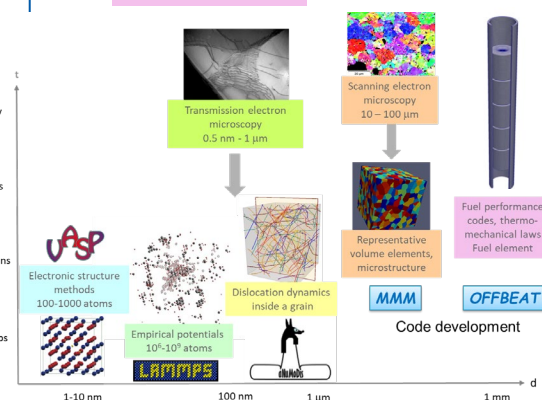
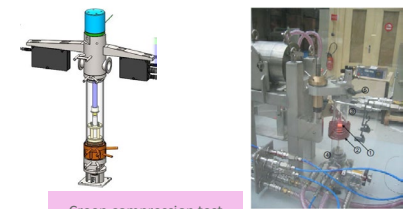
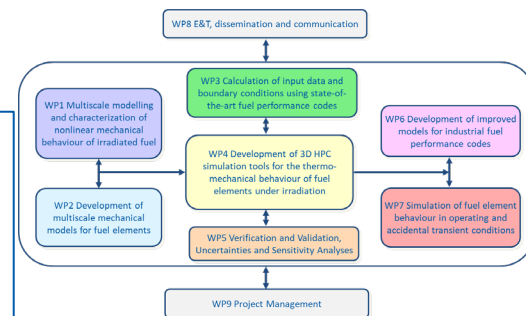
- Development and improvement of **High Performance Computing simulation tools** for fuel element behavior in Gen2&3 nuclear reactors
- Integration of this **advanced simulation approach** in the industrial framework
- Education and Training focused on the **link between basic research, open source development and industrial applications**

EXPECTED IMPACTS

- ✓ Basic research results with a multi-scale characterization of fuel mechanical behavior based on **experiments coupling with simulation**
- ✓ 3D simulation **open source codes** for the fuel element behavior at engineering and microstructure scales
- ✓ Qualification of 3D codes with **Verification, Validation and Uncertainties Analysis**
- ✓ Improved industrial model based on **Machine Learning and AI methods**
- ✓ Fuel safety analysis with advanced tools for Gen 2&3 reactors including enhanced **Accident Tolerant Fuel** concepts.
- ✓ Open publications, Workshops, Schools, MOOC dedicated to fuel performance codes

HIGHLIGHTS

- Experimental device for **creep tests on irradiated fuel** samples,
- **Physical data** for fuel mechanical properties
- Improved **physics-based mechanical laws** for fuel and cladding
- Validated **open source computational tools** for thermomechanical simulation :
 - ✓ **MMM** mesoscale (microstructure scale) code
 - ✓ **OFFBEAT** engineering scale simulation code (fuel element)
 - ✓ Prototype tool (**meshless SPH** method)
- **Improved models** for industrial Fuel Performance Codes
- **Safety assessment** for operating transients and **DBA** (state of the art fuel and eATF).



PARTNERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
CEA	CIEMAT	EDF	ENEA	FRAMATOME	LEI	NINE	POLIMI	SINTEC	UJV REZ	UNIPI	VTT	KTH	JRC	PSI	EPFL	BANGOR	NNL

DURATION

Start: November 1st 2022 – Duration 54 months

EVENTS

CONTACTS

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