

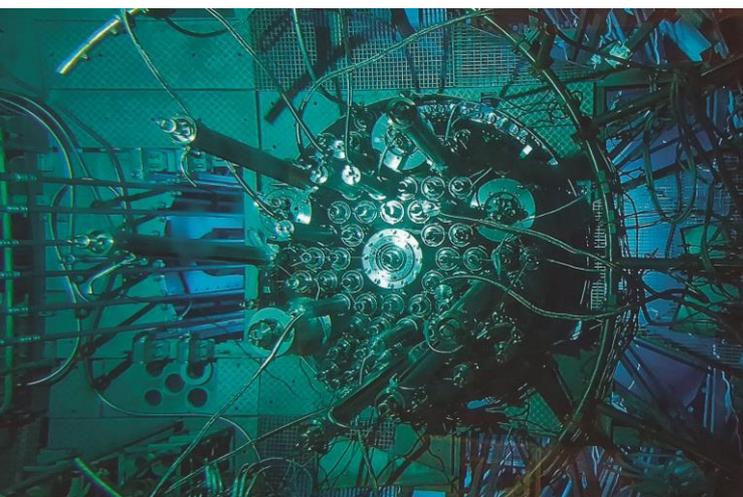
Sustaining Multinational Nuclear Fuel and Materials Testing Capacities for Safety, Industry and Science

The FIDES framework will help regulators, their technical support organisations, research organisations and the industry to consolidate their needs and resources in order to create a dynamic for implementing Joint Experimental Programmes (JEEPs) in the key nuclear fuel and materials facilities around the world

The safe, reliable and efficient operation of nuclear power plants requires nuclear fuel and materials (F&M) technology to evolve and for their performances to be optimised. Achieving this requires solid experimental evidence, which can only be obtained from test facilities with the ability to perform neutron irradiation under representative steady state or transient conditions. F&M test facilities are essential for:

- validating safety margins, simulation tools, and demonstrating operational performance;
- assessing material behaviour in the context of the long-term operation programmes;
- developing advanced F&M.

However, the number of available test facilities around the world are in significant decline. In the past five years, several major research reactors that provided testing services for the nuclear community were shut down after over fifty years of service. These included the Halden reactor in Norway, the OSIRIS in France, the JMTR in Japan, the NRU in Canada, among others. Regulators and their technical support organisations, research organisations, and the industry all require F&M testing capacities on an ongoing basis. In particular, the availability of test facilities for loss-of-coolant accidents, reactivity-initiated accidents and power ramps, is crucial.



BR2 reactor of SCK•CEN (Copyright © SCK•CEN).

A new NEA joint undertaking: FIDES

In recent months the NEA has organised a series of workshops, bringing together participants from utilities, fuel vendors, regulatory bodies and their technical support organisations, research institutes, and experimentalists. The discussions have confirmed that a multinational framework is required to address current and future experimental needs. As a result, the international community is now coming together under the aegis of an NEA initiative to form a new multinational framework for in-pile fuels and material testing as a new NEA joint research undertaking - the Framework for Irradiation Experiments (FIDES). This long-term endeavour has received strong support from NEA member countries.

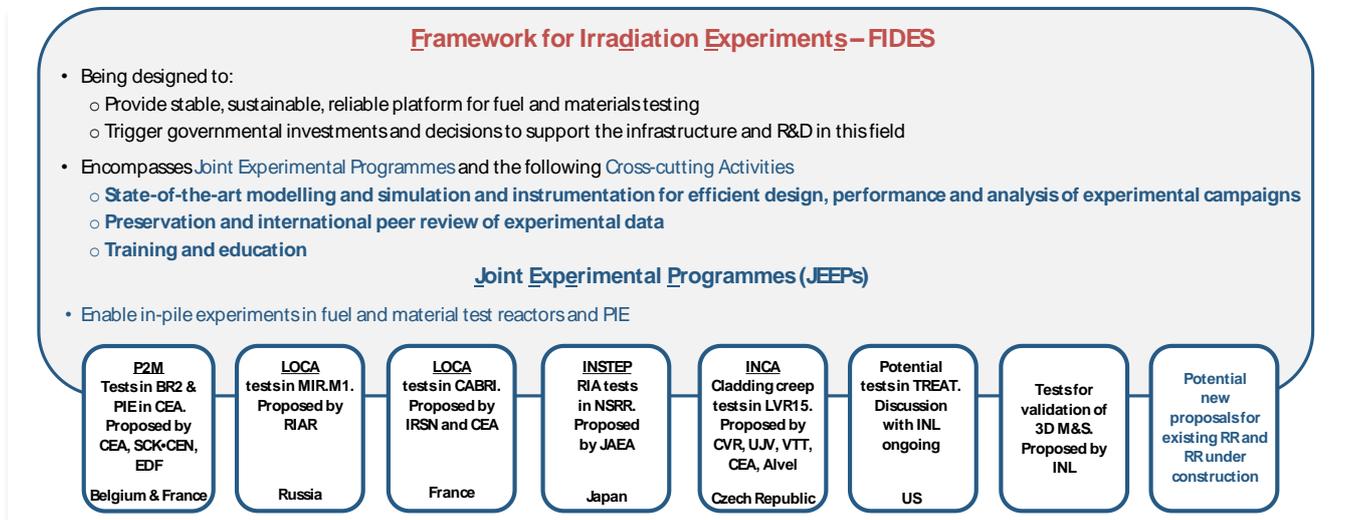
FIDES objectives

- Identify and prioritise the needs of the nuclear energy community, including regulators and their technical support organisations, the industry and the research organisations;
- Identify and assure access to research facilities around the world in the most efficient way and facilitate high priority experiments at those facilities;
- Define and implement a co-ordinated multilateral programme that meets short- and long-term experimental needs;
- Promote and sustain relevant state-of-the-art capacities: infrastructure, technology and skills;
- Establish the conditions necessary for conducting experiments on a bi-lateral contract basis.

By consolidating the needs and resources from the involved parties, FIDES will provide the framework for implementing its Joint Experimental Programmes (JEEPs) in a co-ordinated way.

FIDES concept and budget

Contributions to the FIDES budget will be commensurate with those provided for the NEA Halden Reactor Project (HRP). They will finance cross cutting-activities and partly fund JEEPs. FIDES activities will be overseen by the Governing Board (GB). Parties wishing to initiate a JEEP will constitute the core group for the experimental campaign and provide a substantial part of its funding, the rest being covered with FIDES fees. The core group will retain exclusive rights to guide the experimental programme. The FIDES GB will approve each



JEEP. As was the practice with the HRP, the data from each JEEP will be shared with all FIDES members. The FIDES structure and current JEEP proposals are shown in the figure above.

Why FIDES?

The FIDES framework will create a co-operative dynamic for sustained investment in the worldwide experimental capacity. These investments will include new experimental devices in existing facilities or new research reactors by:

- providing continuity and sustainability in the strategic field;
- building a collective awareness of needs and capabilities
- identifying gaps that require investments and facilitating related implementations;
- optimising value of experimental campaigns through cross-cutting activities:
 - state-of-the-art instrumentation and modelling & simulation;
 - preservation and quality management of experimental data;
 - professional development and educational activities;
- addressing practical issues (nuclear fuel transport and waste management and others).

Current status

Currently, six JEEPs at different stages of maturity have been proposed:

- Programme for quantifying thermomechanical clad load mechanisms during LWR slow transient (P2M) at the BR2 reactor in Belgium and at the CEA hot cells in France.
- Programme for studying fuel rod behaviour under LOCA conditions at the MIR.M1 reactor in Russia.

- In-pile Creep Studies of ATF Claddings (INCA) at the LVR-15 material test reactor in Czech Republic.
- Programme for studying PWR fuel rods behaviour under LOCA conditions at the CABRI reactor in France.
- International NSRR Test Programme for LWR fuels (INSTEP) which considers possible RIA tests on additive fuels at the newly restarted NSRR facility in Japan.
- Missing Pellet Surface (MPS) experimental programme using conventional LWR fuel to support 3D modelling and simulation.

A meeting was organised in September 2019 to prepare the kick-off of FIDES, where the first three JEEP proposals and draft agreements for the Framework and JEEPs were reviewed. The NEA is currently updating the agreements to accommodate the feedback from participants, and intends to circulate the final versions of the agreements for in early 2020. FIDES and the most mature JEEP proposals, P2M, LOCA RIAR and INCA, are expected to start by 2021.

Next steps

NEA invites interested organisations to support FIDES through:

- providing financial support on a continuous basis, and at a commensurate level with that made for the HRP;
- identifying experimental needs and priorities;
- continuing to maintain and invest in experimental facilities that will participate in FIDES.

Further information

For further information, please contact the NEA Secretariat:

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