

The Jules Horowitz Reactor: A new high performance MTR (Material Testing Reactor) working as an International User Facility in support to Nuclear Industry, Public Bodies and Research Institutes.

Seminar at French Embassy in Japan (April 2019)

Context

Material Testing Reactors (MTR) have provided an essential support for nuclear power programs over the last 50 years within the nuclear community.

However, the large majority of these Material Test Reactors (MTRs) will be more than 50 years old this decade, leading to the increasing probability of some shutdowns for various reasons (life-limiting factors, heavy maintenance constraints, possible new regulatory requirements...). The last recent example is the definitive phase-out of the OECD/NEA Halden reactor end of June 2018.

On the other hand, associated with hot laboratories for the post irradiation examinations, MTRs remain key structuring research facilities for the benefit of the nuclear community.

MTRs address the development and the qualification of innovative materials and fuels (such as the ATF-Accident Tolerant Fuels- under development) under irradiation with sizes and environment conditions relevant for nuclear power plants in order to optimize and demonstrate safe operations of existing power reactors as well as to support future reactor design:

- Nuclear plants will follow a long-term trend driven by the plant life extension and management, reinforcement of the safety, waste and resource management, flexibility and economic improvement.
- In parallel to extending performance and safety for existing and power plants to come, R&D programs are taking place in order to assess and develop new reactor concepts (SMR, Generation IV reactors) that meet sustainability purposes.
- In addition, for most nuclear countries, keeping competences alive through Human Capacity Building is a strategic crosscutting issue; developing and operating a new and up-to-date research reactor appears to be an effective way to train a new generation of scientists and engineers.

The future JHR Material test Reactor

The Jules Horowitz Reactor (JHR) is a new Material Testing Reactor currently under construction at CEA Cadarache research center in the south of France. It will represent –once in operation by 2023-2024- a major international research infrastructure for scientific studies dealing with material and fuel behavior under irradiation. This reactor will also contribute to medical Isotope production.

The reactor will perform R&D programs for the optimization of the present generation of Nuclear Power Plants (NPPs), support the development of the next generation of NPPs (mainly LWRs) and also offer irradiation capabilities for future reactor materials and fuels.

JHR is fully optimized for testing material and fuel under irradiation, in normal and non-normal Conditions:

- with modern irradiation loops producing the operational condition of the different power reactor technologies,
- with major innovative embarked in-pile instrumentation and out-pile analysis to perform high-quality R&D experiments,

- with high thermal and fast flux capacity to address existing and future NPP needs.

JHR is designed, built and will be operated as an international user-facility open to international collaboration. This results in several aspects:

- a partnership with the funding organizations gathered within an international consortium,
- setting-up of an international scientific community around JHR through seminars, working groups to optimize the experimental capacity versus future R&D needs.
- preparation of the first JHR International Program potentially open to non-members of the JHR consortium.

It will answer needs expressed by the nuclear industry (utilities, fuel vendors...) and the scientific community (R&D institutes, TSO...).

Consequently, the JHR facility will become a major scientific hub for cutting edge research and material investigations (multilateral support to complete cost effective studies avoiding fragmentation of scientific effort, access to developing countries to such state of the art research reactor facilities, supra national approach....).

Objectives of the seminar

The following topics will be addressed during the seminar:

- Updated progress of the JHR construction (civil work and mechanical equipments)
- Detailed presentation of the JHR performances and its experimental capacity under development
- The JHR International Community via its consortium
- The preparation of first international Joint Programs through NEA framework

Some photos:

