JHR collaboration and Melodie follow-up

Ville Tulkki, Caitlin Huotilainen, Petri Kinnunen
VTT Technical Research Centre of Finland Ltd

Scope of the SAFIR2018 JHR project

JHR collaboration and Melodie follow-up consisted of two tasks: (i) the Finnish working group activities, along with information dissemination to the stakeholders, and (ii) the follow-up of the in-pile reactor tests of the first delivered in-kind contribution, the MeLoDIE biaxial creep test device.

Jules Horowitz Reactor

Jules Horowitz Reactor (JHR), a new European material testing reactor (MTR), is currently under construction at CEA Cadarache research centre in France. JHR will offer modern experimental capabilities to study material and fuel behaviour under irradiation. JHR will be a flexible experimental infrastructure that will meet both the industrial and public needs within the European Union related to present and future Nuclear Power Reactors. JHR is designed to provide a high neutron flux to run highly instrumented experiments to support advanced modelling giving prediction beyond experimental points.

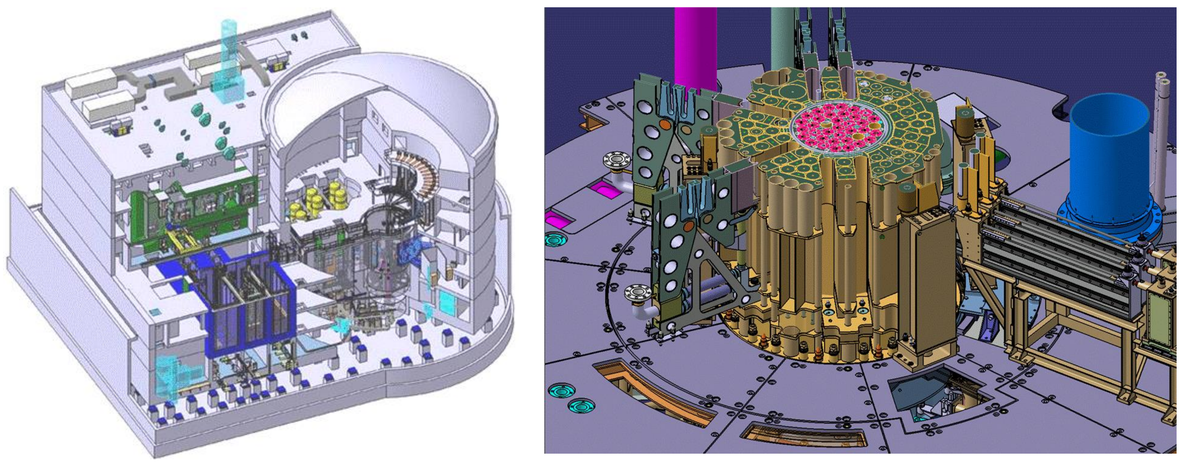
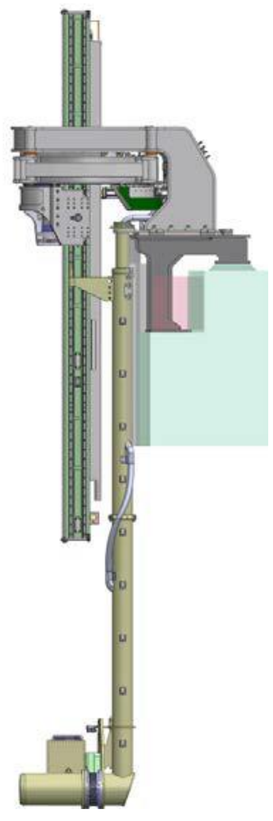


Figure 1. *Left figure: The layout of the Jules Horowitz Reactor complex, with reactor building located in the right, spent experimental fuel storage pools in lower left side and the hot cells for specimen preparation and examination upper left.*
Right figure: The core of the reactor (purple) hosts material irradiation experiments requiring high neutron flux, whereas the fuel experiments and low flux irradiations are located in the beryllium reflector.

Finnish in-kind

Finland is participating in the construction of Jules Horowitz Reactor with an in-kind contribution, which includes Underwater Gamma spectrometry and X-ray radiography (UGXR) and Hot-cell Gamma spectrometry and X-ray radiography (HGXR) systems as well as a Mechanical Loading Device for Irradiation Experiments (MeLoDIE). With this in-kind contribution, Finland will have the possibility to utilise the new JHR research infrastructure dedicated to nuclear safety related research with 2% access rights.



MeLoDIE

The MeLoDIE, Mechanical Loading Device for Irradiation Experiments, was delivered to CEA in 2012 as a part of the Finnish in-kind contribution to the JHR construction project. It is a device for studying of the irradiation creep of a Zircaloy-4 fuel cladding tube specimen. The instrumented test device has the capability to control the biaxial loading and to measure the biaxial strain of the specimen online.

Working Group activities

The JHR Working Groups have been preparing for future operation of JHR, by surveying experimental R&D needs, preparing proposals for pre-JHR activities and disseminating information on the progress of JHR construction.
Pre-JHR activities include proposed R&D projects using currently available infrastructure (reactors and hot laboratories). Currently, the consortium is supporting the P2M OECD/NEA JP proposal as well as preparing various structural material investigation projects.

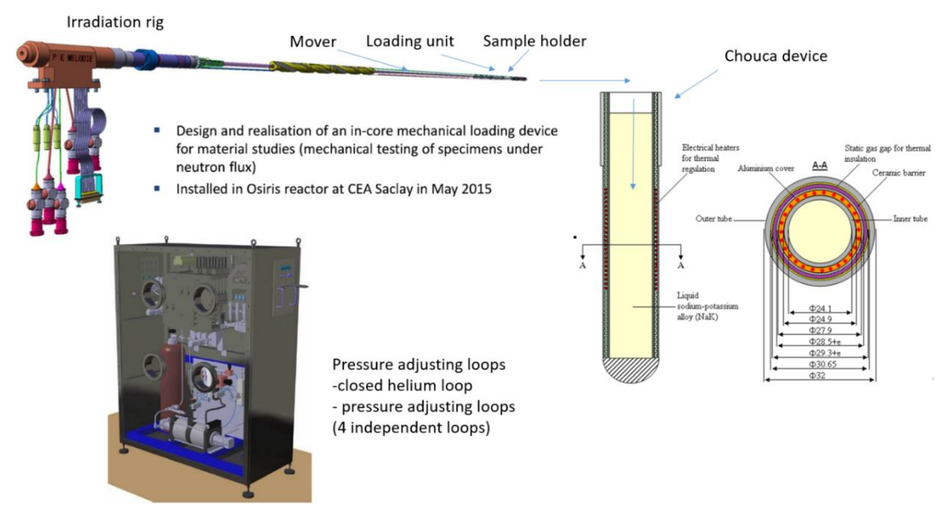


Figure 2.*The MeLoDIE experimental setup includes a sample holder, a Chouca irradiation capsule, a glove box containing a gas management system and a safety box for the sample holder, another glove box for the Chouca capsule, above-water lines and underwater lines for connecting the pneumatic and electrical lines between the glove box and the sample holder.*

Conclusions

- **Jules Horowitz Reactor is a future Material Testing Reactor under construction in Cadarache, France.**
- **Finland is participating in JHR project with in-kind contribution that includes designing and manufacturing several devices, which are vital for experimental activities and capabilities.**
- **JHR Working Groups prepare the future experimental projects at JHR. Much of the collaboration is to be initiated before JHR commissioning by utilising existing infrastructure.**
- **The closure of Halden Reactor has created an urgent need for new form of collaboration in the field of irradiation experiments.**

Contact
Ville Tulkki
Tel. +358 20 722 6114
ville.tulkki@vtt.fi