



French Neutron Scattering Facilities: the need for a national strategy

Neutron scattering allows us to address many of the challenges our society is confronted with, in the areas of fundamental research, the environment, health and energy. Between 2015 and 2035 the number of neutron beamlines in America and Asia will increase by between 45% and 90% respectively¹. These investments position these regions as world leading in addressing societal challenges.

Until recently, France was a world leader in the neutron landscape. It produced, alongside Germany, the second largest number of publications (behind the USA), with more than 8000 papers between 2005 and 2015². French scientists enjoyed priority access to two complimentary research reactors: the European High-Flux Reactor (RHF) managed by the Institut Laue-Langevin (ILL) at Grenoble, the world's leading neutron source in terms of beam-quality and instruments, and the Orphée reactor at CEA-Saclay.

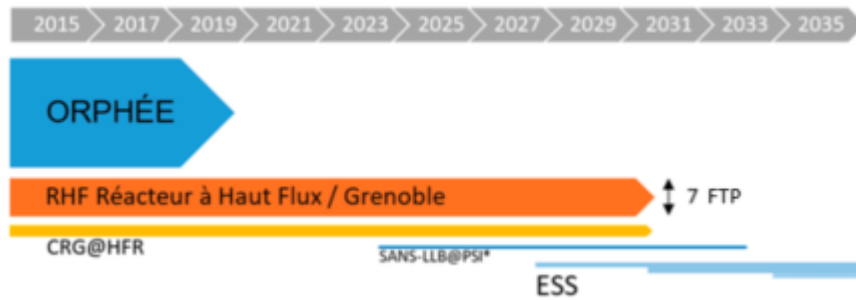
The Orphée reactor was permanently shut down in 2019. Current strategic scenarios foresee the closure of the ILL in 2030 – or at best 2033, despite there being no technical or regulatory restrictions on running ILL beyond this. At the same time, the start-up of the European Spallation Source (ESS) has been seriously delayed: while 22 instruments were supposed to be available to ESS users by 2025, current planning indicates only 15 instruments operational by 2030³ (in contrast to 33 neutron instruments at the ILL). Only 8 instruments will be running at the ESS in 2027, albeit with a much-reduced source power in the initial running period. Lastly, France should participate in the running of the ESS at maximum level of 14% while it currently uses 25% of the available beam time at the ILL.

The “full-time equivalent” (FTE) number of neutron instruments available to French researchers was reduced from 29 to 9 with the closure of the Orphée reactor in 2019 and it could drop to 2 instruments FTE at the ESS after the closure of ILL. For perspective, this should be compared with 86 FTE instruments at neutron sources in Germany, the UK and Switzerland, as well as the additional instruments available to these countries via the ESS.

¹ This increase reflects the proactive policy adopted by the United States at Oakridge and NIST, as well as the construction of facilities in South America. The increase in the number of instruments in Asia is mainly due to the ramp-up of new sources in China.

² T. Gutberlet et al., *Neutron News* 29:2 (2018) 18-24. *Do neutrons publish? A neutron publication survey, 2005–2015.*

³ [How the European Spallation Source will put Europe at the forefront of neutron science](#), H. Schober (2023)



*Evolution of French neutron scattering resources. The width of the horizontal bars corresponds to the FTE number of instruments available to French neutron scientists (CRG: Collaborating Research Group, partly French instruments installed around the European RHF reactor in Grenoble; * PSI: Paul Scherrer Institut in Switzerland, SANS-LLB: small angle spectrometer).*

According to current planning, FTE French neutron instruments which accounted for 13% of the world's total in the 2000s, will only correspond to 1% in 2035. *The Société Française de la Neutronique* (SFN) therefore considers that it is necessary to:

- **Continue running the ILL in Grenoble up to 2033 and beyond**, to guarantee a large enough overlap as the ESS source power increases. This overlap is essential in the maintenance and development of world-class neutron research in France.
- **The construction of a new national source**, to maintain and develop the competency of the user community and to maximise the return on the enormous investment that France and Europe are making in the construction and running of the ESS. We propose to utilise new technology to construct a HiCANS (High Current Accelerator-Driven Neutron Source), less onerous to construct than a new reactor. To do this, it is urgent that the ICONE project be funded now, in order to achieve the construction of a source that will offer comparable performance to that of the Orphée reactor. Thanks to its expertise in neutron science, France would benefit from the first source of this type in the world.

The organizing committee of the SFN calls on the science minister as well as the principle scientific authorities concerned, the CNRS and the CEA, to adopt an ambitious strategy for the future of neutron scattering in France.

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