



25th September 2023

UK Neutron Scattering Group Position on the Future of the ILL

The high-flux reactor at the Institut Laue-Langevin (ILL) in Grenoble, France, is the world's most powerful and productive neutron source. It provides neutron beamtime to around 1500 researchers every year, for state-of-the-art experiments tackling forefront challenges in the life sciences, materials science, physics, chemistry, engineering and archaeology. The ILL is jointly owned by the associate members of Germany, France and the UK and has been in operation for 51 years as the world's highest-flux neutron source.

In September 2021, the next operating agreement for the running of the ILL reactor and extending the original ILL convention – the "[6th Protocol](#)" [1] – was signed by the associates:

"The very-high-flux-reactor shall operate at least until 31 December 2030. By 31 December 2027 at the latest, the Governments shall decide on the continuation of the operation of the reactor. Unless by this date the Governments agree by consensus to extend the operation of the reactor, the final shutdown of the reactor shall take place on 31 December 2030. If the Governments agree by consensus to extend the operation of the reactor, the final shutdown of the reactor shall take place on 31 December 2033."

ILL 6th Protocol, p7

It seems clear from this text that the ILL reactor is not intended by the associates to run beyond 2033. The ILL convention will continue to be "tacitly extended from year to year" during the decommissioning period of the ILL reactor. It is unknown how long the decommissioning period will be.

The UK Neutron Scattering Group (NSG) is a special interest group of the Royal Society of Chemistry (RSC) and the Institute of Physics (IOP), working to support and represent all UK-based neutron scientists. Over the past year the NSG has been considering its position with regard to the ILL reactor closure, in consultation with its members *via* a user survey and panel discussions at the annual UK Neutron and Muon Science and User Meeting (NMSUM 2023) held at the University of Warwick in April 2023. As part of our analysis of the UK neutron landscape, **the closure of the ILL reactor was identified as the number one threat to our community**. Discussion of this point at NMSUM 2023 with a panel of facilities directors and user representatives resulted in the following conclusions being made:

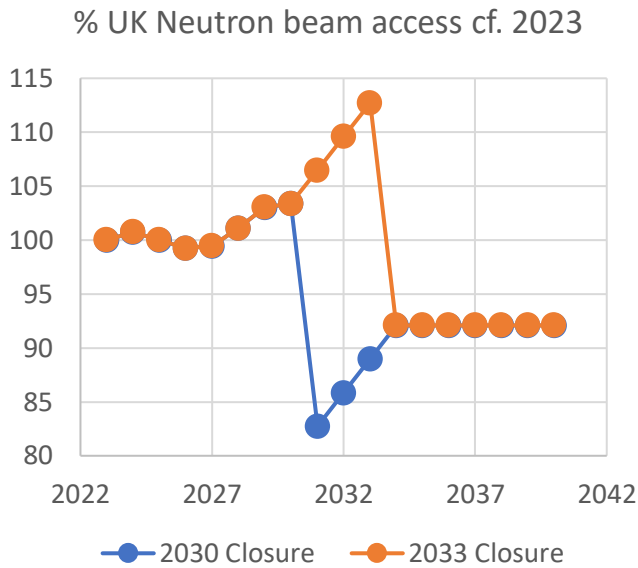


Figure 1. Forecast of neutron beam days available to UK neutron users as a percentage compared with 2023 under the two ILL closure scenarios currently being considered. This updates the figure shown in the STFC Neutron Review Update (2020) [2] taking account of the ISIS Endeavour programme [3]. We assume that ESS will run with 15 completed instruments from 2030. Further ESS instruments may be funded in future calls.

- Closure of the ILL would be a major setback to UK science with significant negative impact on life sciences, materials discovery and fundamental science.
- The European Spallation Source (ESS), a new, next-generation neutron source currently under construction in Lund, Sweden, **will never be able to make up for loss of capacity or capability if the ILL reactor is closed under the current ESS instrument funding plan** (see below).
- The threat of ILL closure is already having an impact on ILL staff morale and operations and drastically limiting the long-term career prospects of early-career UK-based scientists.

There was a clear desire from users at NMSUM 2023 to keep the ILL reactor running well beyond 2033, with delegates asking what they could do to make this happen. The UK NSG is, therefore, engaging to press for the urgent re-evaluation of the future of the ILL reactor by the associate members. Closure of the ILL in 2030 or 2033 will result in a severe loss of capacity for UK neutron users which **will never be offset by operation of the ESS**. Even in the short-term, following the proposed closure of the ILL reactor, the completed ESS instruments will not be running optimally for a period of 3-5 years from start-up, based on experience at the ILL and the ISIS Neutron and Muon Source, Didcot, UK. Figure 1 shows our forecast of neutron beamtime availability to UK users under the two ILL reactor closure scenarios. Closure of the ILL reactor in either 2030 or 2033 will result in a 20% drop in capacity, even taking into account the extra beam days afforded by the recently funded ISIS Endeavour programme [3]. **In either scenario, pre-ILL closure levels of beamtime for UK users will never be recovered.**


Perhaps more serious is the loss of key capabilities in which the ILL is the current world-leader, and which neither the ESS nor ISIS will ever be able to replicate. These include unique experimental techniques in neutron diffraction and spectroscopy (4-circle diffraction, three-axis spectroscopy, high-resolution (sub- μeV) spectroscopy, and polarized neutron scattering) that are essential for studies in diverse fields from protein structure and function to quantum and energy materials. The ILL Endurance programme [4] is nearing completion in 2024 and

has enabled major instrument upgrades and brand-new instruments (SHARP+, SAM, XtremeD, PANTHER, RAINBOWS). It is crucial now that both new and experienced users of the ILL are afforded the opportunity to benefit from this state-of-the-art instrumentation and capitalise on the enormous investment by the associates and partners of the ILL. To close ILL prematurely following this infrastructure investment would be a major setback to UK science.

Very little is known within the UK neutron user community concerning the cost implications of the closure of the ILL reactor. The UK budgetary commitment to the ILL is likely to remain very significant during the period of reactor decommissioning. The costings of the various scenarios including the operational ramp-up of the ESS have not been made available to us, and cost has not been given as a reason for ILL reactor closure in the 6th Protocol. **In fact, there has been no official reason given for the decision to close the ILL.** We request that the full reasons behind the decision to close the ILL reactor are made known to our user communities in advance of any final decision.

In summary, the NSG's position is that we should continue to operate the ILL reactor up to 2033 and beyond. There is no technical reason why the ILL reactor should not continue to operate well beyond 2033. Continued operation of the ILL ensures that:

- The UK neutron community continues to be well provided for with access to world-class neutron instruments.
- The European neutron community remains vibrant in the face of recent national source closures [5].
- The next generation of neutron scatterers is trained and nurtured *via* the ILL PhD programmes and the ILL early-career 5-year contract staffing model.
- Loss of key capabilities and expertise in neutron diffraction and spectroscopy are avoided.



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References:

- [1] <https://shorturl.at/eV127>
- [2] <https://www.ukri.org/who-we-are/stfc/planning-strategy-reviews/neutron-strategic-review/>
- [3] <https://www.isis.stfc.ac.uk/Pages/Endeavour.aspx>
- [4] <https://www.ill.eu/users/instruments/modernisation-programmes/endurance>
- [5] Recent closures include: BENSFC, Helmholtz Centre, Berlin and the Orphée reactor at the Laboratoire Léon Brillouin, Saclay.