Strategic Plan for Neutron Sciences at Oak Ridge National Laboratory

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Neutron sources provide key techniques for advancing the science and technology of materials important in biology, chemistry, physics, and engineering. Oak Ridge National Laboratory (ORNL) operates two distinctive, powerful neutron facilities; the Spallation Neutron Source (SNS) and High Flux Isotope Reactor (HFIR). Together, these facilities are potent tools for understanding materials and energy and their conversion, synthesis, and control. We have identified four science priorities, quantum materials, materials synthesis and performance, soft molecular matter, and biosciences, that are under continuous development through ongoing consultation with ORNL staff, users, expert advisory committees and workshops involving the broader science community. These science priorities drive the development of our sources, instruments, and other enabling technologies. An immediate objective of our strategic plan is to close neutron scattering capability gaps that impede progress in our science priority areas by introducing new and unique capabilities at both SNS and HFIR. Instrument capabilities at SNS and HFIR are expanding, broadening the opportunities for science over increasing length, energy, and time scales. A growing suite of sample environments is allowing neutron research to be performed under more extreme conditions. Projects are underway to better integrate neutron sciences with high-performance computing. Our longer-term strategic vision is to build a Second Target Station (STS) at the Spallation Neutron Source. The STS will provide a high-flux, short-pulse, long-wavelength neutron source to expand the reach of neutron scattering to longer length and time scales, opening insights into the structure and dynamics of mesoscale phenomena, macromolecules, and interfaces. The stewardship of a continuous neutron source, short-wavelength pulsed source, and long-wavelength pulsed source will allow us to optimize our suite of neutron techniques across the complex.