



NextGen MURR
University of Missouri

The Neutron Beam Science Vision for NextGen MURR

9-22-2026

**National Organization of Test, Research & Training Reactors
Annual Conference 2026**



NextGen MURR

University of Missouri

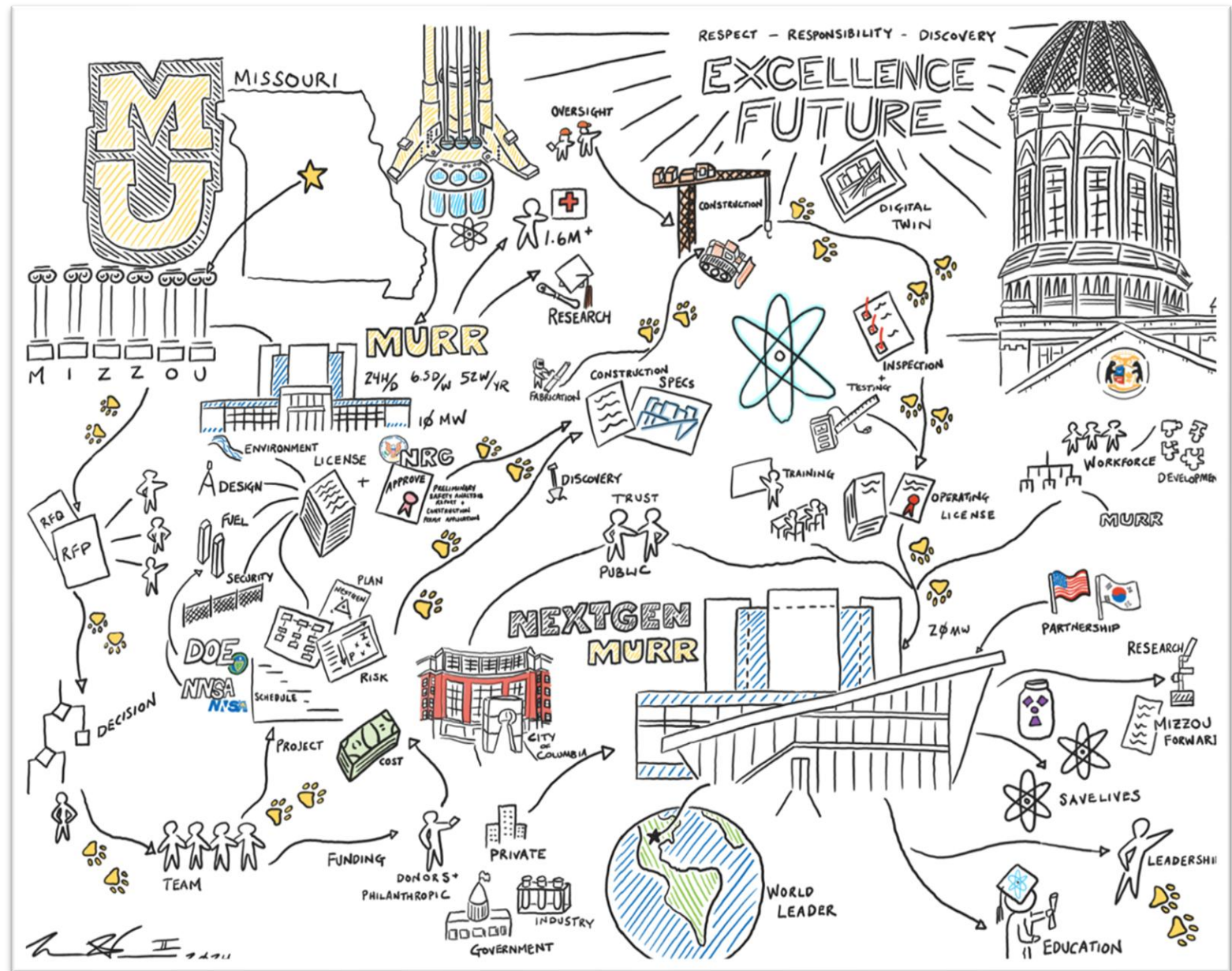
VISION:

The Nation's Center for Nuclear Excellence

Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

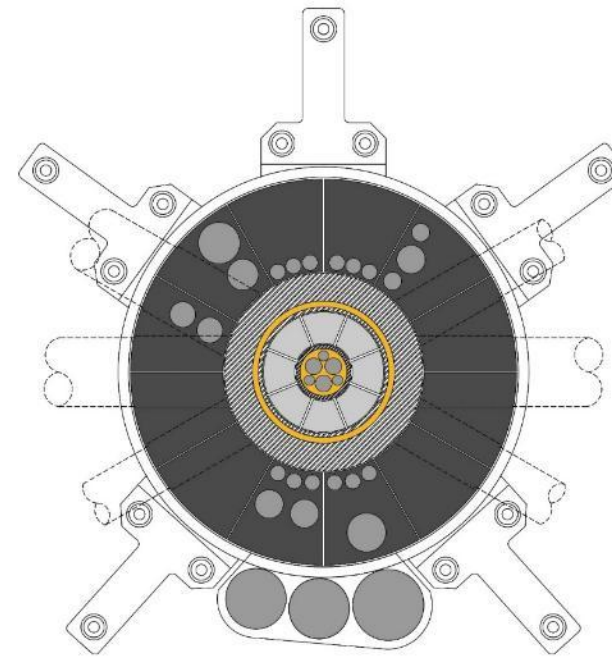
MISSION:

To establish a world-class center for nuclear excellence - advancing MURR's mission to positively impact society through leadership in nuclear science research, education, production of critical materials, and strategic partnerships to improve and save lives across Missouri, the nation, and the world.



MURR is Unique in the World

- Operating power & design
 - 10 MW - Largest U.S. University Research Reactor
 - High peak flux (neutron intensity)
- Schedule
 - 24 hours a day
 - 6.5 days a week
 - 52 weeks per year
- Radioisotope Expertise
- Neutron Beam Science Capability
 - 6 thermal beam ports, 4 instruments





- Only three U.S. reactors provide high-power¹ neutron sources.
- With limited, aging facilities, U.S. risks losing ground to foreign sources, which are rapidly expanding neutron science capabilities.



¹ Per RTI International's May 2024 report titled, *Assessment of the Retrospective and Prospective Economic Impacts of Investments in U.S. Neutron Research Sources and Facilities from 1960 to 2030*, High-power neutron sources are defined as spallation or nuclear reactors with greater than 10 MW of power.



NextGen MURR

Vision – Initial Design Concepts



MURR >>> NextGen MURR (NGM)

NextGen MURR

- Higher power (20 MW+)
- Higher capacity for isotope production
- State-of-the-art neutron guide hall
- Expandable ecosystem concept

MURR

- Reliable reactor operating 52 weeks/year at 10MW
- Strong position as only US supplier of multiple medical isotopes with vibrant nuclear medicine ecosystem
- Strong position in neutron beam and other research

- 1. US medical isotope leader**
Save and improve lives through expanded nuclear medicine pipeline and production
- 2. National nuclear science and research facility**
Expand neutron beam and nuclear science research capabilities
- 3. Secure new US supply chains**
Expanded industry collaboration with new silicon + industrial isotope production capabilities
- 4. Developing the next generation nuclear leaders**
Through education, research and workforce development

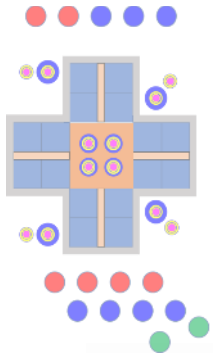
“NextGen MURR represents our commitment to research that changes lives. It will allow Mizzou to lead the nation in producing critical medical isotopes while opening new frontiers in science, engineering and patient care.” – President Mun Choi



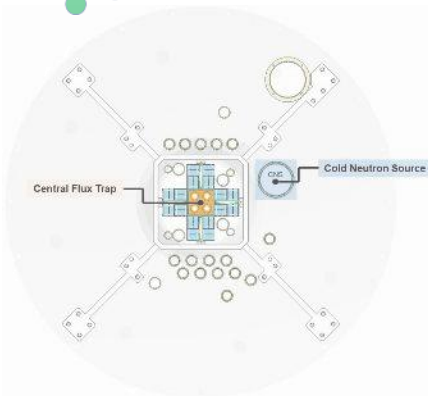
NextGen MURR: Integrated Nuclear Ecosystem



HALEU Fuel
($5.3 \text{ g/cm}^3 \text{ U}_3\text{Si}_2$)



Reactor Position Optimization:
Radioisotope + NTD
Silicon Production +
Nuclear Science



High Thermal Flux Volumes
(>MURR)



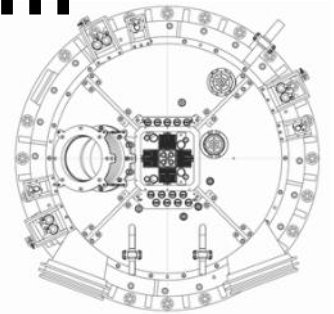
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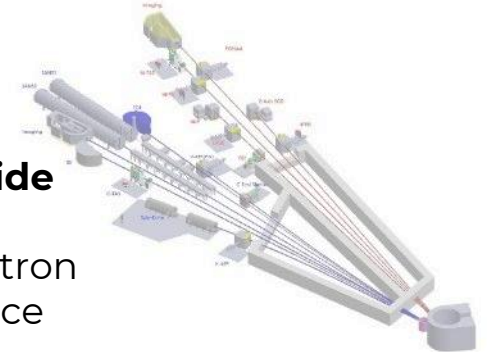
Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

**20+ MWth
104(c) License
8-10 Year Timeline**

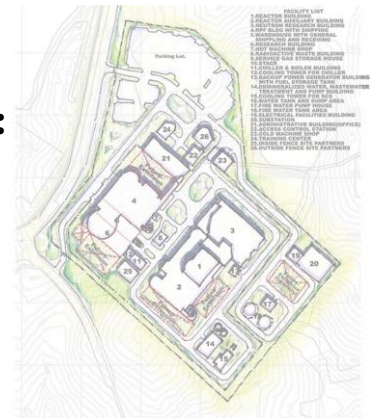
Cold and Thermal Guides



Neutron Guide Hall:
National Neutron Beam Science Facility



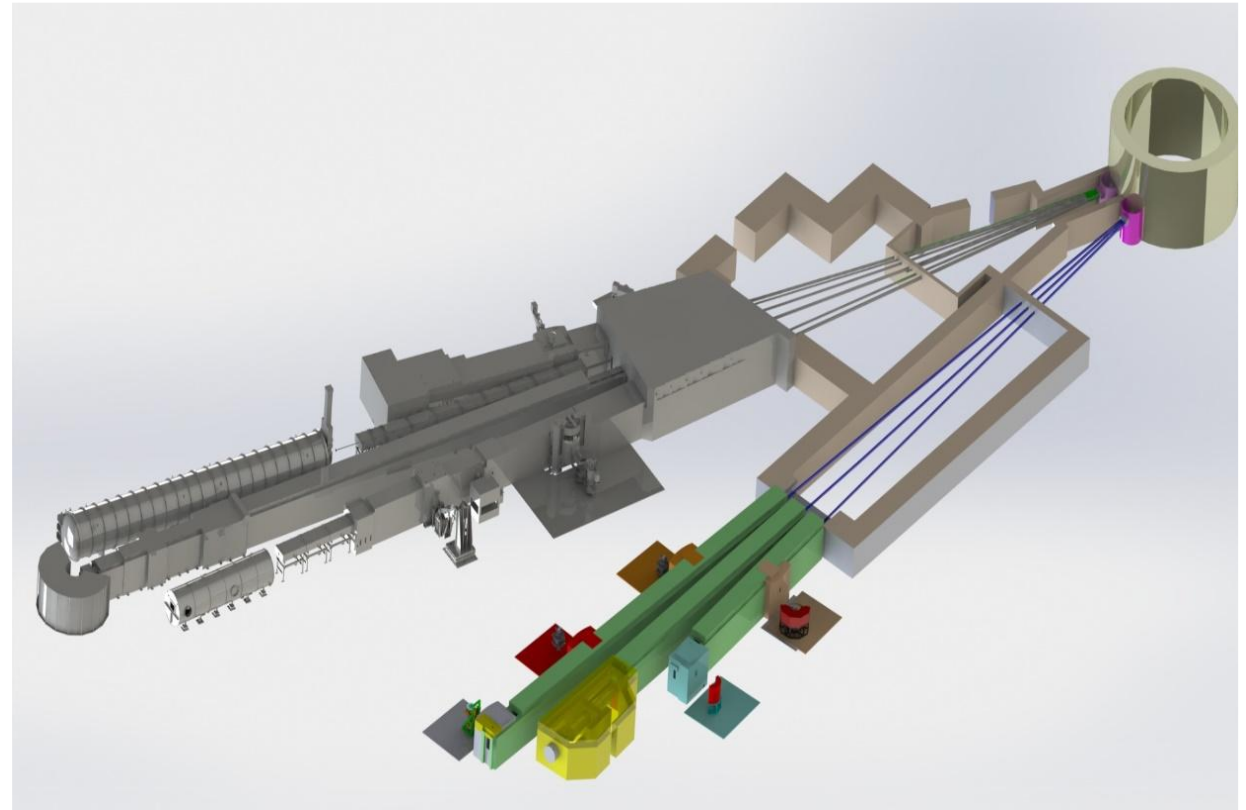
Optimized Site Layout:
Research, Guide Hall,
Radioisotope Processing,
Workforce Development



NextGen MURR will serve as an asset of national strategic significance in both radioisotope supply and research excellence.

Beam Science Vision

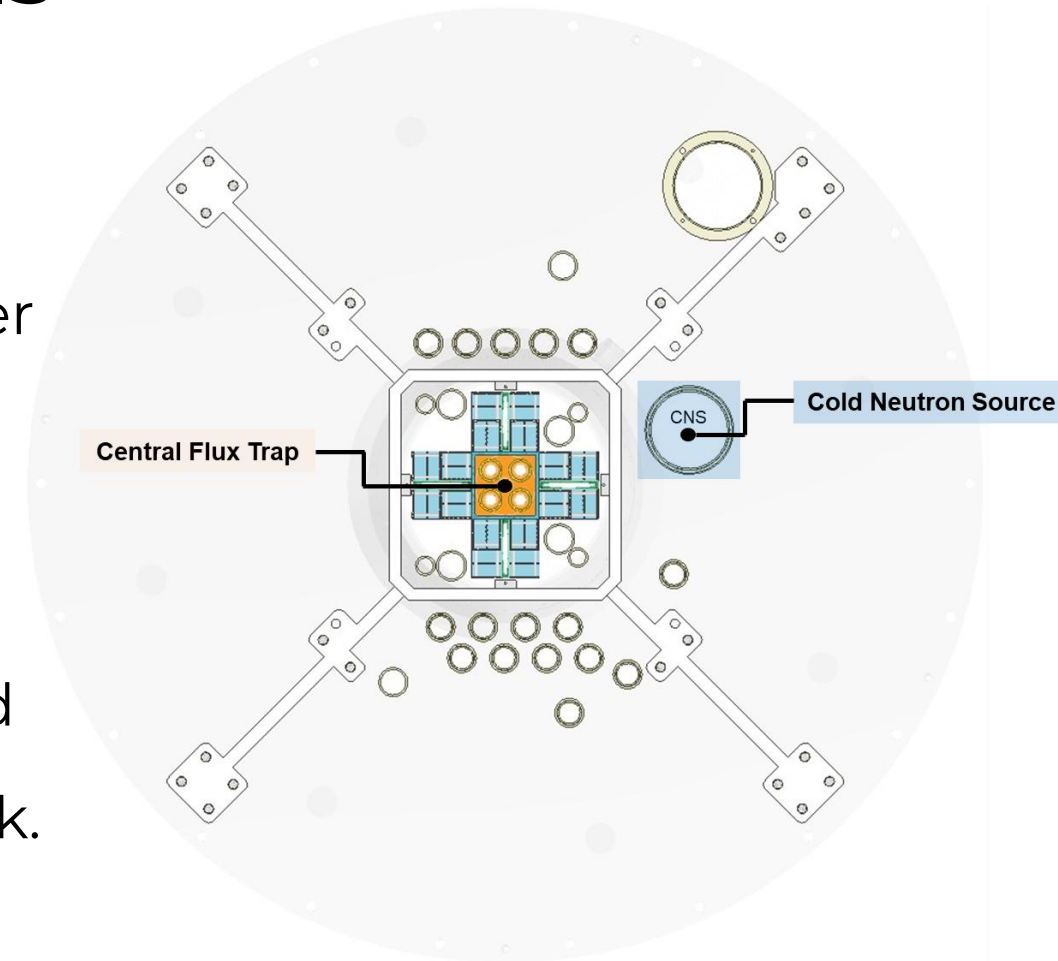
- Two thermal and two cold neutron beam ports
- Capacity to support 15-20 instruments
- Use of neutron guides to transport neutrons to a guide hall
- Reactor operation with or without cold neutron source installed



Preconceptual Design Details

Cold Neutron Source (CNS)

- Positioned to avoid interaction with isotope mission
- Moderator Chamber w/ heat exchanger
 - Liquid Hydrogen or Deuterium moderator
 - Thermal Siphon Effect used to maintain cryogenic liquid state
 - Buffer tank for pressure control
- Vacuum & Helium Chambers designed as pressure boundary capable of withstanding rapid reaction due to leak.

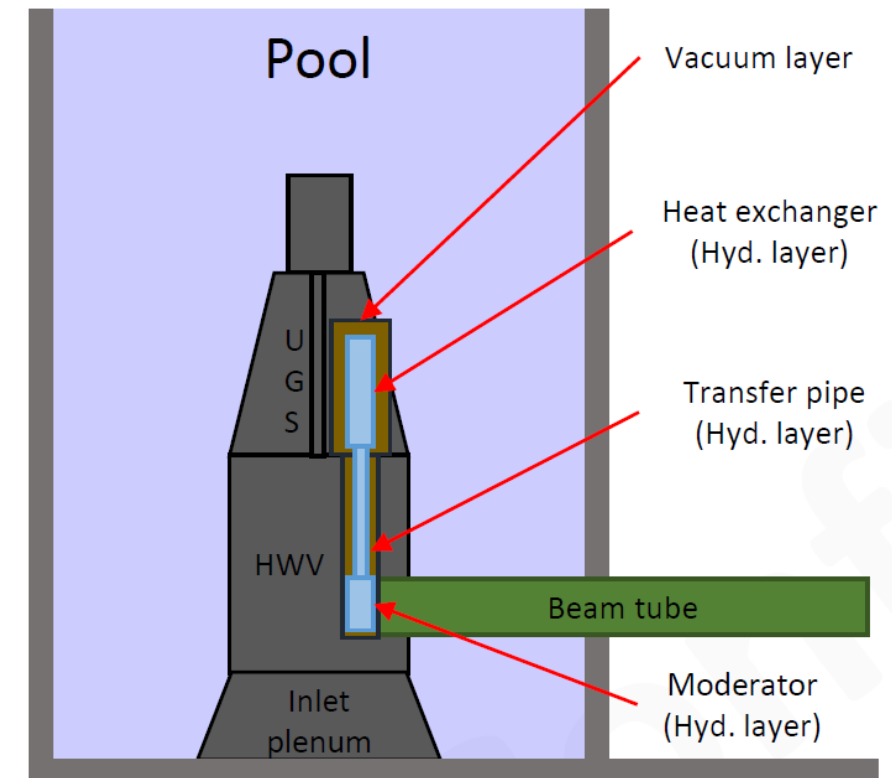


Preconceptual Design Details

Cold Neutron Source (Cont.)

- Vertical Accessibility for IPA (In-pool Assembly)
- IPA designed to remain in-place without impacting functionality while reactor is at-power due to failure of the refrigerator system, provided there is not a moderator leak.
- Plug designed to replace the IPA to support reactor operation w/o immediate replacement
- Defense-in-depth (n+1) approach for refrigerator, vacuum, and helium blanket systems.

Vertical type CNS



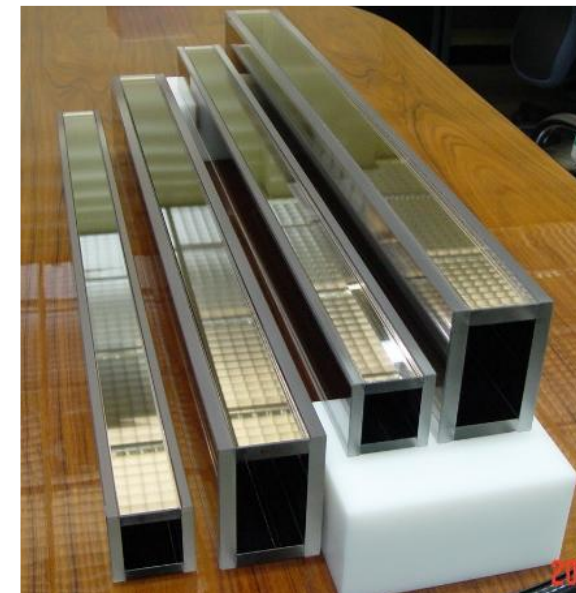
Preconceptual Design Details

Neutron Guide Technology

In-Pile Plug & Primary Shutter

Supermirror guide reflectivity

- Cold Neutrons: $M = 2$
- Thermal Neutrons: $2 \leq M \leq 3$ (location specific)



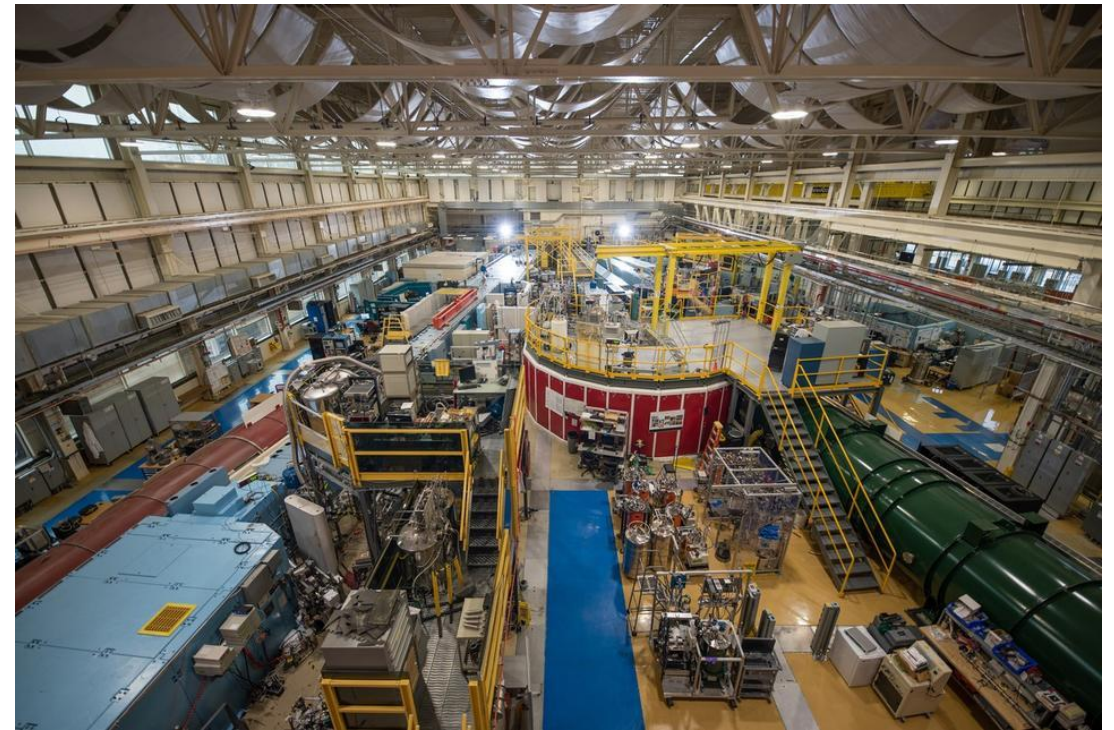
		Beam port	Reactor hall	Guide hall
Cold neutron guide	Materials	Al or soda-lime glass	NBK-7	Boro-float
	M values(supermirror)	$M=2$	M2	M2
Thermal neutron guide	Materials	Al or soda-lime glass	NBK-7	Boro-float
	M values(supermirror)	$M=2$	M2 & M3	M2 & M3



Neutron Guide Hall Benchmarks



High-Flux Advanced Neutron Application Reactor (HANARO)
Daejeon, Republic of Korea



NIST Center for Neutron Research (NCNR)
Gaithersburg, Maryland



2026 American Conference on Neutron Scattering (ACNS)

- July 12-16: ACNS in Detroit, MI
 - NextGen MURR Presentation July 14th
- July 17: Satellite Workshop for University-Based Sources
 - Hosted by MU to support both MURR and NextGen MURR Neutron Scattering Programs
 - Summary Report published [University Neutron Workshop](#)



Research Reactor
University of Missouri



ACNS



NextGen MURR
University of Missouri

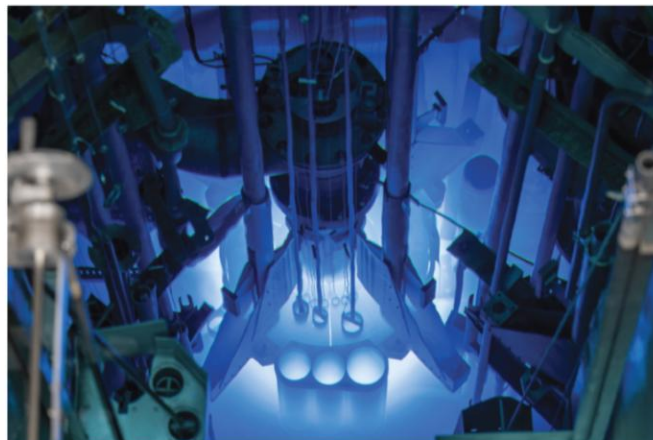


NSSA
NEUTRON SCATTERING SOCIETY
OF AMERICA

[Workshop Register](#) [Abstract Submission](#) [Schedule](#)

University-Based Neutron Sources Workshop

ACNS-Satellite Workshop on Friday, July 17th, 2026 in Detroit, MI



[Abstract Deadline: May 22nd](#) [Register Deadline: June 12th](#)

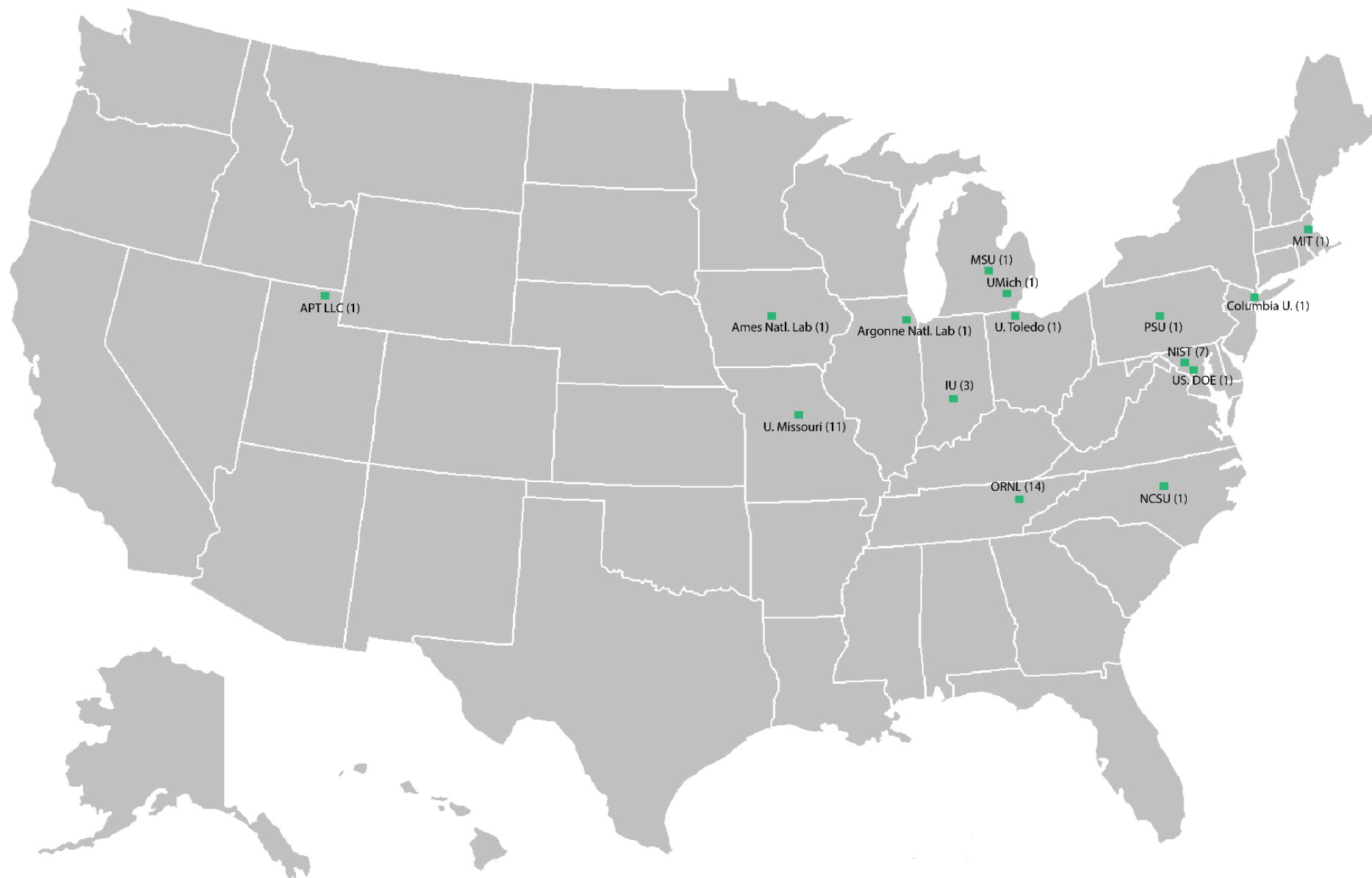
This workshop aims to enhance collaboration among university-based neutron scientists by highlighting the role of university neutron sources in expanding the user community. It focuses on improving access to instruments, increasing capabilities, and nurturing the next generation of neutron researchers. The event will showcase achievements in facilities and instrumentation, fostering strategic partnerships for collaborative research and facility development. Free lunch!

FOR MORE DETAILS, REGISTER & SUBMIT ABSTRACT, GO TO





Workshop Attendees





Workshop Attendees



Neutron Scattering Workshop

ACNS Highlights:

- Documented national need for more neutrons
 - Produced workshop white paper
- National labs have overlapping, long-term outages scheduled
 - Opportunity for University Research Reactors to fill gap
 - DOE Workshop proposed
- Received design inputs to ensure NGM is desired destination for Users



Advantages of University-based Program

Academic User Advantages:

- Training Ground to
 - test experimental set-ups,
 - optimize sample environments,
 - gain hand-on experience
- Extension of neutron coursework across institutions
 - Beam time offered in tandem with a semester class
- Leverage University-wide Research infrastructure
 - University-wide access to complementary scientific instruments for performance of complementary characterizations
 - Access to sophisticated sample preparations and environments
 - Access to guidance from university expertise



Neutron Scattering Workshop

Recommended Initial Instrument Suite:

Cold Instruments:

- *SANS (Small Angle Neutron Scattering)*
- *Neutron Imaging*
- *Focusing Reflectometer*
- *Triple Axis Spectrometer*
- *Neutron Spin-echo*

Thermal Instruments:

- *Neutron Imaging*
- *Residual Stress Diffractometer*
- *Single Crystal Diffractometer*
- *High-Resolution Powder Diffractometer*
- *Triple-axis Spectrometer*



NextGen MURR VISION:

The Nation's Center for Nuclear Excellence

Securing the world's most valued destination for nuclear science and technology opportunities and expanding the supply of critical materials for generations to come

NextGen MURR will serve as an asset of national strategic significance

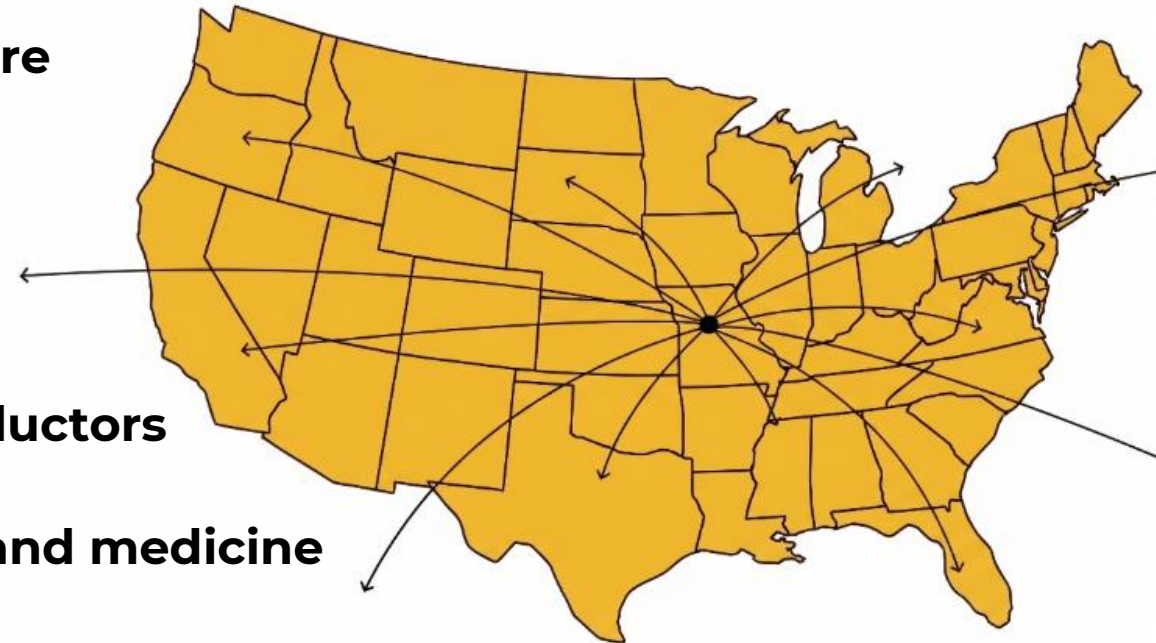
Strengthening national security of supply for the future

Develop the next generation nuclear workforce.

Ensure life-improving treatments for U.S. patients

Establish new domestic supply chains for semiconductors

Advance the U.S. research portfolio in technology and medicine





The University of Missouri's vision is to build upon the 60 years of safe, reliable, and innovative operation of the University of Missouri Research Reactor (MURR), to pursue a new, state-of-the-art, research reactor, NextGen MURR.

NextGen MURR will serve as an asset of national strategic significance in both radioisotope supply and research excellence.

NextGen MURR will secure the nations radioisotope supply, ensuring life-improving treatments are provided to U.S. patients, and will secure excellence within the nations research portfolio, leading the technological and medical advancements of the future.



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