

U.S. Nuclear Regulatory Commission  
38<sup>th</sup> Annual Regulatory Information Conference

# RIC2026

Regulation, Innovation and  
Collaboration for a Safer Tomorrow

March 10-12, 2026

Bethesda North Marriott Hotel  
and Conference Center  
Rockville, MD

#NRCRIC2026

NRC.gov



## DOE/NRC Collaboration for Criticality Safety Support for Commercial-Scale HALEU Fuel Cycle and Transportation (DNCSH) Project

Office of Nuclear Material Safety and Safeguards  
Division of Fuel Management  
Nuclear Analysis and Risk Assessment Branch

The Collaboration between the Department of Energy (DOE) and NRC for Development of Criticality Safety Benchmarking Data for HALEU Fuel Cycle and Transportation (DNCSH) Project is an initiative to develop and provide critical benchmarking data for the safe handling and transport of HALEU fuel. The goal of the DNCSH Project is to support the licensing and regulation of advanced nuclear reactors and the associated HALEU fuel cycle by filling gaps in criticality safety data, which is essential for ensuring safety during commercial-scale operations and transportation. Data developed under this project will include publicly available critical experiments with configurations representative of HALEU fuel cycle and transportation scenarios, as well as basic nuclear data for nuclides and compounds relevant to the HALEU fuel cycle that are currently missing or under-represented in cross-section libraries used for criticality safety analyses. This digital exhibit will describe the NRC and DOE collaboration and the ongoing DNCSH activities being conducted to support the NRC.



U.S. DEPARTMENT OF  
**ENERGY**

 **U.S. NRC**  
United States Nuclear Regulatory Commission  
*Protecting People and the Environment*



U.S. DEPARTMENT  
of **ENERGY** | Office of  
Science



**Mission:**

Enable new data sources such that the NRC and industry can innovate and assess the safety of HALEU-based systems in the fuel cycle stages: enrichment, fabrication, transport, staging, and storage

# DNCSH Project

**Authority:**

Energy Act of 2020 and Inflation Reduction Act

**Timeline:**

All funds committed by end of FY 2026  
All work finalized by end of FY 2028

## Congressional mandate

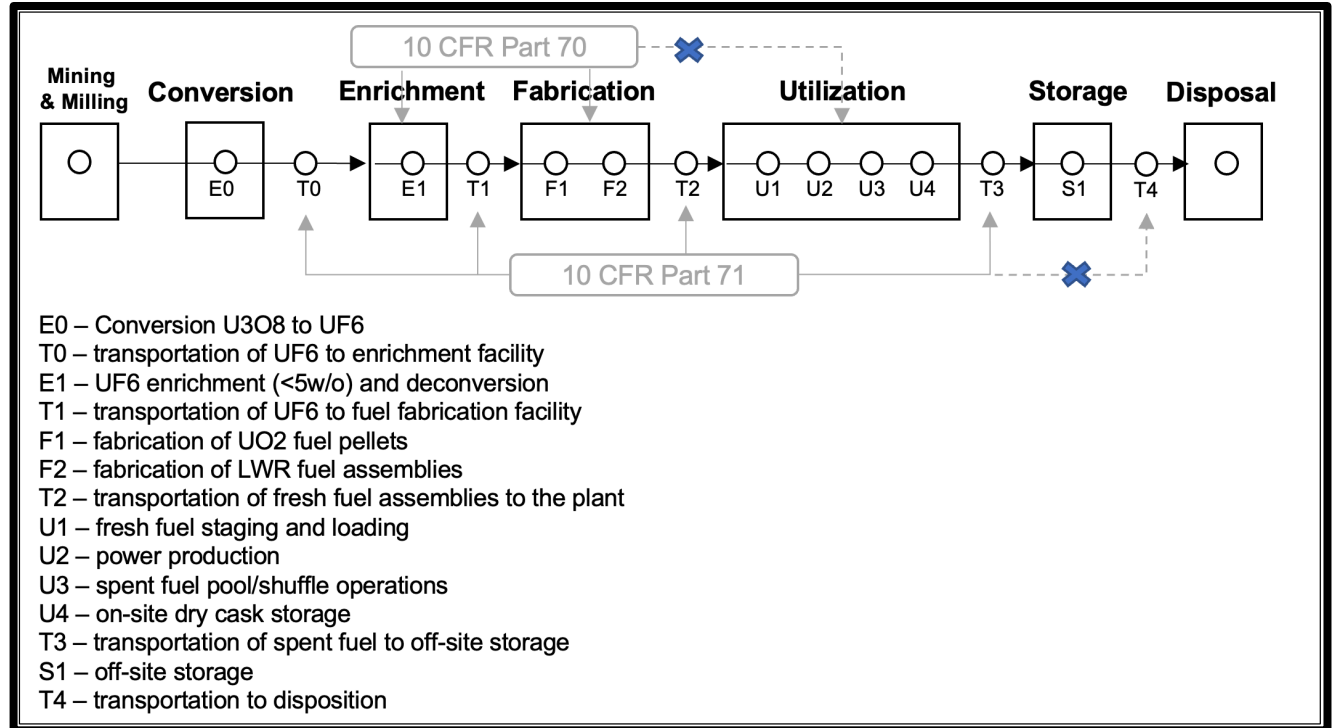
(A) shall develop, in consultation with the Commission, **criticality benchmark data** to assist the Commission in—

- i. the licensing and regulation of special nuclear material fuel fabrication and enrichment facilities under **Part 70** of title 10, Code of Federal Regulations; and
- ii. certification of transportation packages under **Part 71** of title 10, Code of Federal Regulations;

(C) Shall, to the extent practicable—

- i. by January 1, 2024, support commercial entity submission of such transportation package designs to the Commission for certification by the Commission under Part 71 of title 10, Code of Federal Regulations; and
- ii. **encourage the Commission to have such transportation package designs** so certified by the Commission within 24 months after receipt of an application;

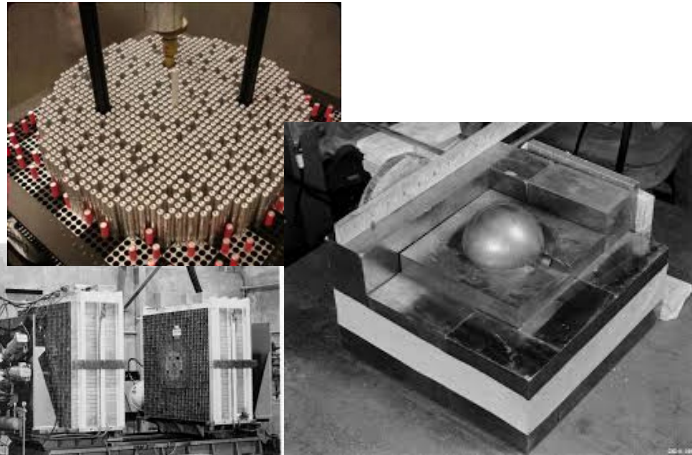
## Fuel cycle stages relevant for Part 70/71



# DNCSH Project Focus

## Critical Experiments

Experimental configurations representative of the nuclear, chemical, and physical parameters of HALEU fuel in fuel cycle and transportation operations.



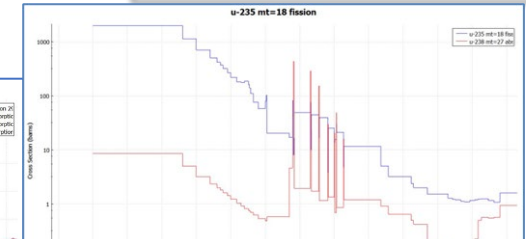
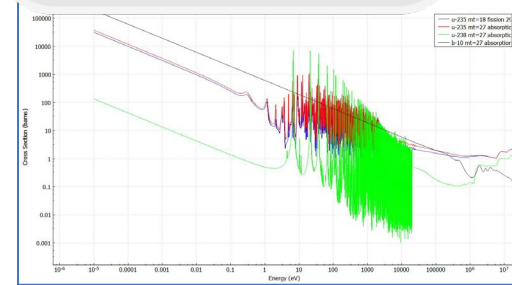
Goal is to have multiple experimental configurations publicly available for criticality code validation in the International Criticality Safety Benchmark Evaluation Project (ICSBEP) Handbook.

## Nuclear Data

### ENDF

Physics data:  
thermal scattering law,  
resonance data,  
energy distributions,  
fission yields, decay  
constants, etc.

Neutron data measurements for nuclides and reactions that are missing or under-represented in current ENDF data relevant to HALEU fuel cycle and transportation.



Goal is publicly available nuclear data distributed with latest version of ENDF.



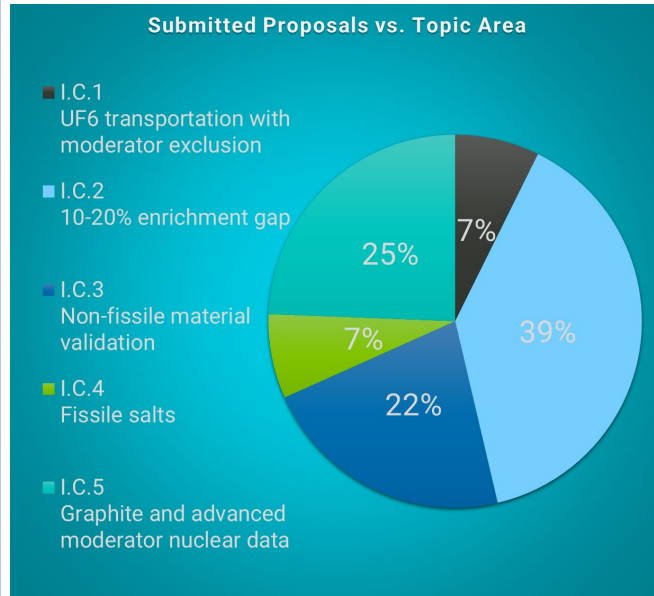
# DNCSH Process

Experiments and data measurements proceed via a series of Calls for Experiment and Analysis Work Packages (EAWs), each focusing on a particular gap in validation and nuclear data.

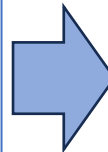
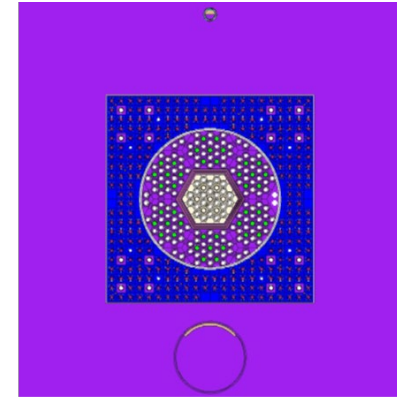
DOE and NRC management team issues Call for EAWs identifying focus area. Industry, National Laboratory, and/or Academic proposals, led by a National Laboratory, are evaluated by the DOE/NRC management team, selected proposals are funded

Proposals consist of historic experiments that can be turned into ICSBEP benchmarks, new benchmark experiments, or new nuclear data measurements.

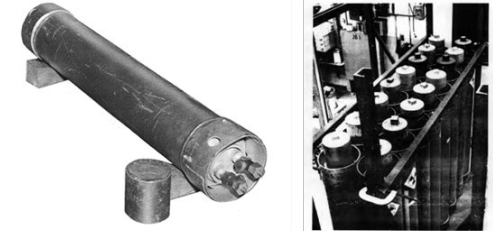
## EAW Call #1:



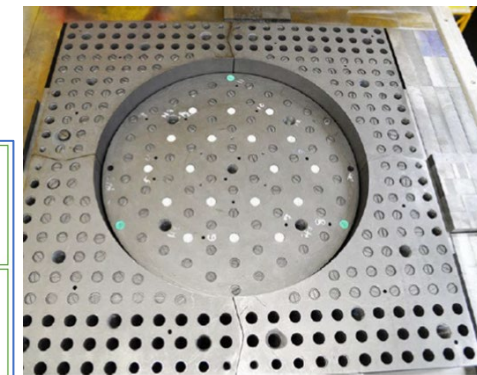
Government, Industry, Academic, and National Laboratory Partnerships through Call # 1:

**eDeimos Experiments with Westinghouse for new HALEU Benchmarks**  
- LANL with Westinghouse (NCERC, USA)



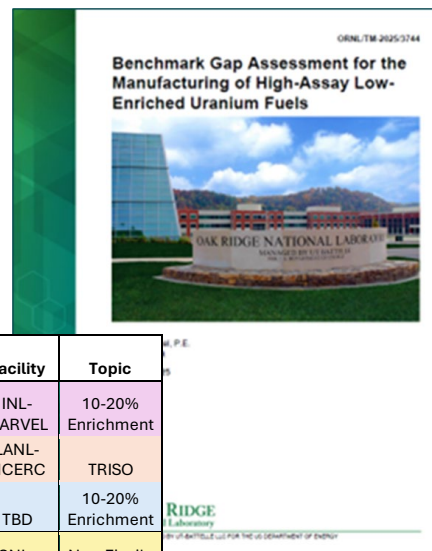
**Benchmark of Historical Y-12 Critical Experiments with UF<sub>6</sub> Cylinder Model 8A Cylinders**  
- LLNL with ORNL, CS Engineering, UT (Y-12, USA)



**THETA: TRISO-form HALEU-fueled Experiment for Transport Applications**  
- LANL with Kairos (NCERC, USA)

## EAW Call #2:

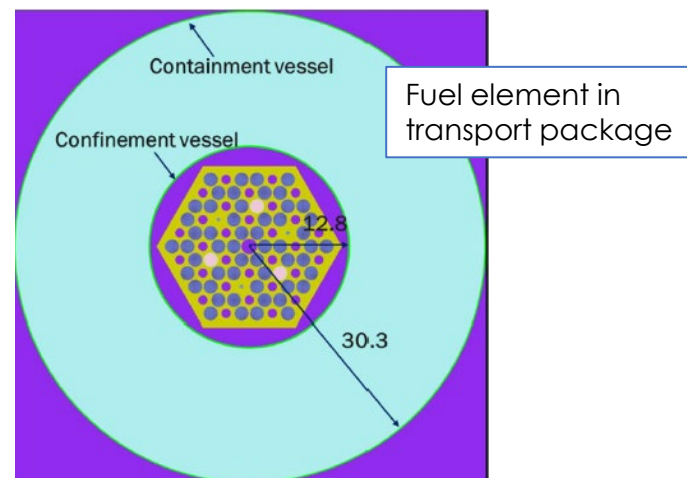
Public workshop held August 27, 2025. Focus of EAW Call #2 is HALEU and Non-LWR **fuel cycle processes**. Gap analysis report published prior to Call, estimating most important gaps in critical benchmark data.



Accepted proposals under EAW Call #2

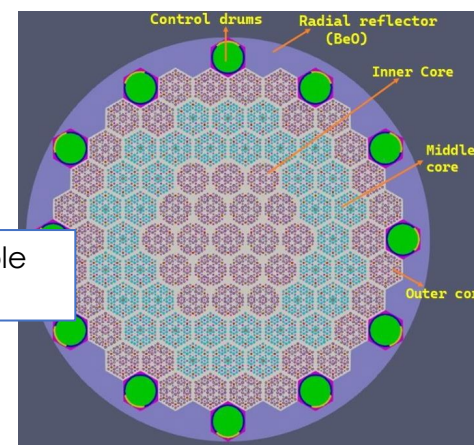
	Proposal Name	Industry Partner(s)	Additional Partners	Facility	Topic
INL	Benchmark Evaluation of the MARVEL Dry Critical Configuration	Radiant, Nano, Westinghouse	ANL, LLNL	INL-MARVEL	10-20% Enrichment
LANL	CACTUS: Careful Analysis of Criticality in TRISO Utilizing Systems	N/A	N/A	LANL-NCERC	TRISO
LLNL	Benchmark of LLNL's Super Kukla Fast Burst Reactor	N/A	INL	TBD	10-20% Enrichment
PNNL	Gadolinium Benchmark Experiments with 7PuCX Fuel	Framatome	SNL	SNL-SPRF/CX	Non-Fissile Material
SNL	Chloride Salt Critical Experiment	TerraPower	LLNL	SNL-SPRF/CX	Fissile Salts
	Historical Benchmark Evaluation of Space Nuclear Propulsion Critical Experiments	N/A	N/A	N/A	TRISO
ORNL	Surrogate-UF6 (SURUF6) Experiment: Intermediate Spectrum Experiment for UF6 Transport Packages	Urenco	LANL	LANL-NCERC	UF6 Transport
	Integral Transmission-Attenuation Measurements of Fluorine in Neutron Beam of UMass Lowell Research Reactor	N/A	N/A	UMass Lowell Research Reactor	Nuclear Data
	Nuclear Data for Structural Alloys: Temperature-Dependent Transmission and Inelastic Neutron Scattering Validated Phonon Machine Learned ENDF TSL Evaluations	TerraPower	N/A	ORNL-SNS, ISIS-STFC	Nuclear Data
	Investigation of TRISO Coating Layers via Neutron Scattering Measurements and Atomistic Simulations	N/A	Univ. of Tennessee	ORNL-SNS	Nuclear Data

## EAW Call #3:

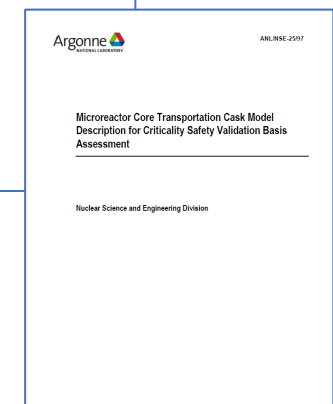
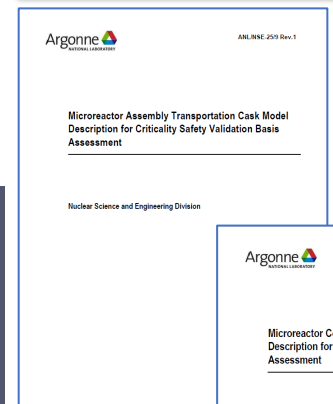


Fuel element in transport package

Full transportable microreactor



Public workshop scheduled for March 18, 2026. Focus of EAW Call #3 will be **microreactors**. Gap analysis reports published prior to Call, estimating most important gaps in critical benchmark data.



## NCERC:

**National Criticality Experiments Research Center**, managed by LANL at the National Nuclear Security Site in Nevada. NCERC has the equipment and expertise to conduct experiments on fissionable material at or near critical. This equipment includes 4 critical experiment machines.

Godiva



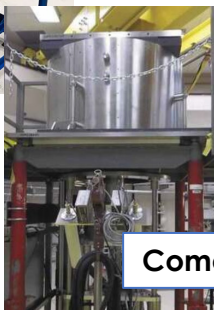
Flat Top



Planet



Comet



## Facilities

### Spallation Neutron Source

produces neutrons with a system that delivers short (microsecond) proton pulses to a steel target filled with liquid mercury through a process called spallation. Those neutrons are then directed toward state-of-the-art instruments for nuclear data measurements.



## SNS:



## SPRF/CX:

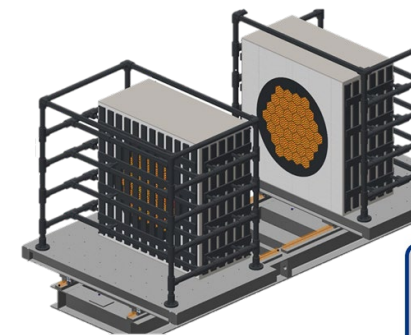
**Sandia Pulsed Reactor Facility / Critical Experiments**, at Sandia National Laboratory provides a flexible, shielded location for performing critical experiments that employ different reactor core configurations and fuel types. The facility is also available for hands-on nuclear criticality safety training.



### System Physics Advanced Reactor Critical

facility at INL is a proposed critical facility partially funded by the DNCSH Project. It aims to enhance national criticality experiment infrastructure, support the DOE stakeholders, and advance nuclear technology through reliable and versatile experimental facilities.

## SPARC:



*Other academic and National Laboratory facilities used as necessary*

**DNC SH is well-positioned to help the U.S. nuclear industry meet the President's Executive Orders (EO14156, EO14299, EO14300, EO14301, EO14302) with the project touching on each of the below points:**

1. Speed Up Nuclear Reactor Licensing



2. Add 300 Gigawatts of New Capacity by 2050



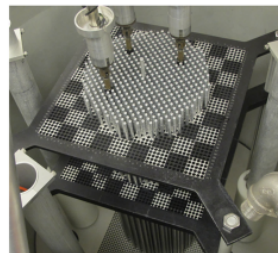
3. Lay the Groundwork for Faster Reactor Testing



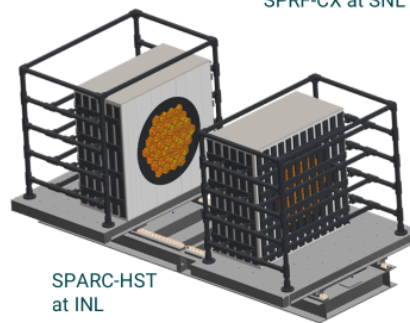
4. Deploy for Artificial Intelligence and Military



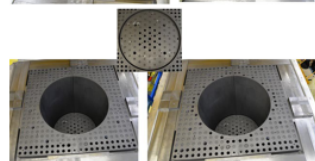
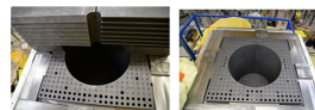
5. Explore Fuel Recycling and Reprocessing



SPRF-CX at SNL



SPARC-HST at INL



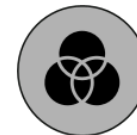
Deimos at NCERC



6. Amp up Domestic Nuclear Fuel Production



7. Bolster the American Nuclear Workforce



8. Assess Spent Nuclear Fuel Management



9. Expand U.S. Nuclear Energy Exports



## Additional Information

For questions or comments about material in this presentation, please contact Drew Barto in the NRC Office of Nuclear Material Safety and Safeguards, at [Andrew.Barto@nrc.gov](mailto:Andrew.Barto@nrc.gov).

For more information about the DNCSH Project, please visit the following website:

