

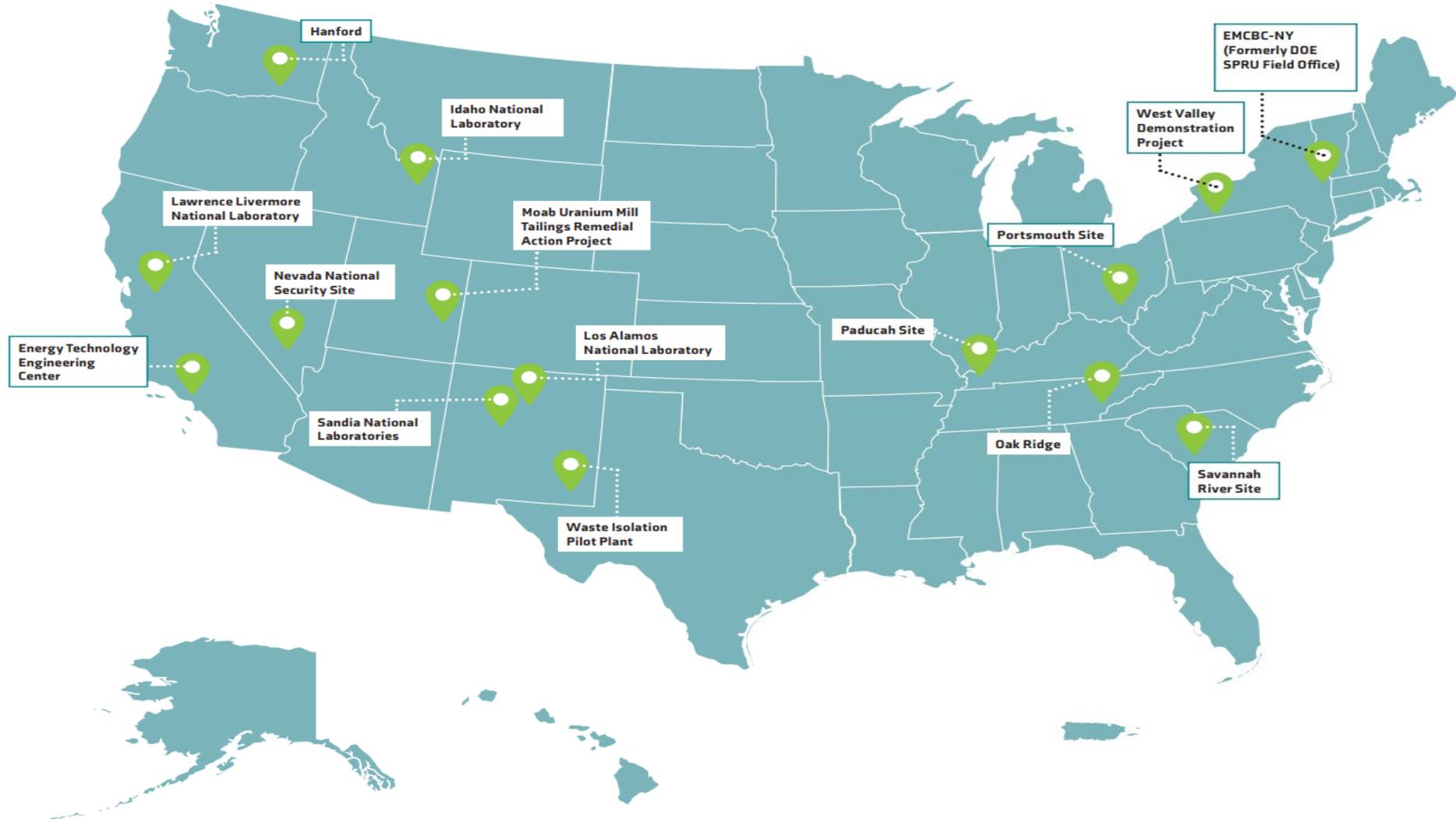
NCSP Support for DOE Environmental Management through DOE-EM NCS Needs Program

Alexander Lang (ORNL), Robert Wilson
(DOE-EM), and Doug Bowen (ORNL)

February 23, 2023

NCSP TPR 2023

DOE-EM Complex

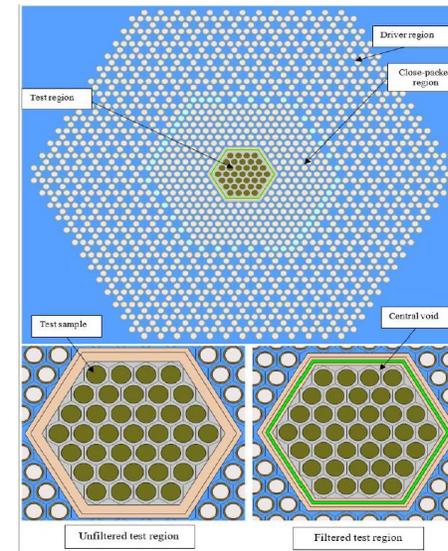


Source: DOE-EM, "EM Strategic Vision: 2022-2023".

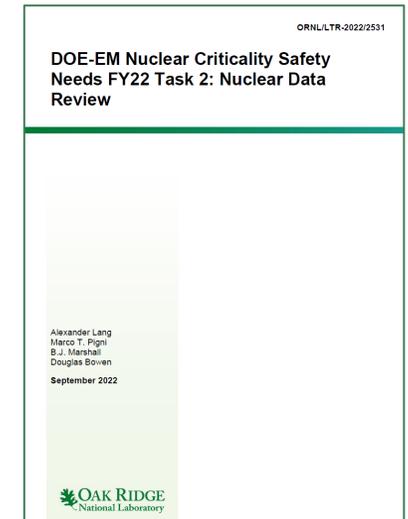
DOE-EM NCS Needs Program

Person	Position	Role	Contact
Robert. E. Wilson	DOE-EM Nuclear Criticality Safety Program Manager	Program Manager	Robert.Wilson@emcbc.doe.gov
Alexander Lang	ORNL Nuclear Criticality Safety Group	Task Executioner	langa@ornl.gov

- Gather EM-NCS technology needs and coordinate with NCSP
 - Nuclear Data Needs
 - Integral Experiment Needs
 - Methods and Code Development
- Provide NCS support
 - Training on NCS tools
 - NCS Program Support
- Develop Work Packages for NCS issues
 - Find support to address issues related to NCS issues
 - Survey progress



STEM-NEXUS model for 7uPEX Critical experiment facility [1]



[1] Alexander Lang, et. al. "DOE-EM Nuclear Criticality Safety Needs FY22 Task 2: Nuclear Data Review", ORNL/LTR-2022/2531 (September 2022).

Development of the NCSP

- 97-2 Recommendation
 - DFNSB recognizes additional problems while progress is made on implementation of 93-2
 - Guidance in the past was tailored towards criticality safety in the production of nuclear weapons. DOE missions have changed substantially, and guidance of other types of activities are needed

“It is particularly important that guidance be developed to help in analyzing the safety of cleanup operations and the handling, storage, and shipping of miscellaneous containers that include fissionable material mixed with other material.”

[97-2 Recommendation Timeline](#)

NCSP becomes fully supported by Defense Program

- NCSP served all DOE offices and projects
 - DOE could not provide consistent funding to the Criticality Safety Program
 - The DFNSB would not recognize the program as stable until the funding issue is resolved
 - In 2002, DOE restored funding and NCSP became fully funded and managed by the Defense Program
- In 2002, NCSP is separated from DOE-EM
 - This initiated a survey of DOE-EM NCS Technological Needs for NCSP

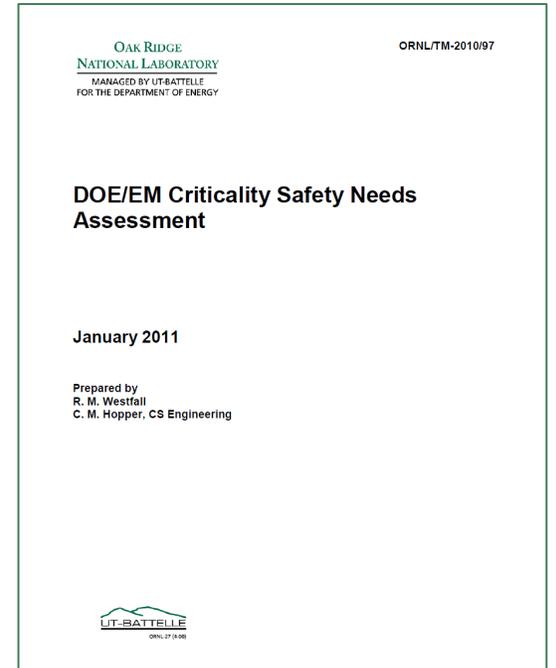
DOE EM NCS Needs 2002 Survey

- Focus was on NCSP technology needs and EM missions planned within a few years:
 - Site-specific projects at SRS, INL, and Hanford
 - Technology needs from Nuclear Data, Methods and Codes, Integral Experiments, AROBCAD
- Nuclear Data
 - Conclusion that cross section measurements were not needed at this time
 - Covariance data was determined as the primary focus for use of AROBCAD
- Methods and Codes
 - Development of SCALE 5.0 and utilization of ENDF/B-VI and covariance data
 - Development AROBCAD. DOE-EM was the priority for this capability
 - AROBCAD capabilities in SCALE's S/U code TSUNAMI
- Integral Experiments
 - Assumed NCSP will provide all the IE capability needed for EM and will continue to be responsive to priority EM needs
- The NCSP has supported nearly all the needs from the 2002 survey.



2008 Workshop Series

- A series of 5 workshops were conducted starting in 2008
- Focus expanded to include improvements in controls, analysis, and regulations.
- 11 Topical Needs were identified during the workshop
 - Each Topical Need was assigned a team for the workshop series
- 32 Technological Needs were determined
- Details provided in the [2011 Assessment Report](#)

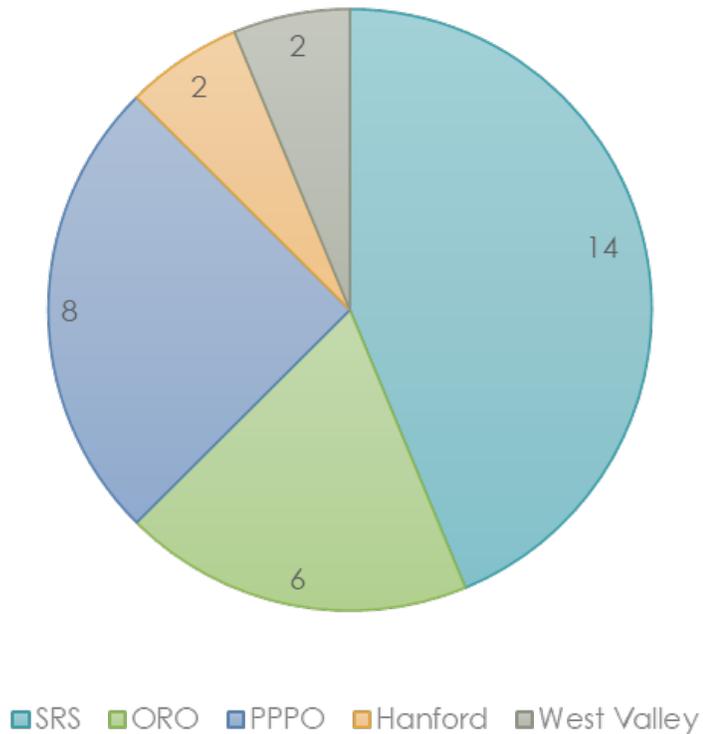


2008 Workshop Topical Needs Addressed

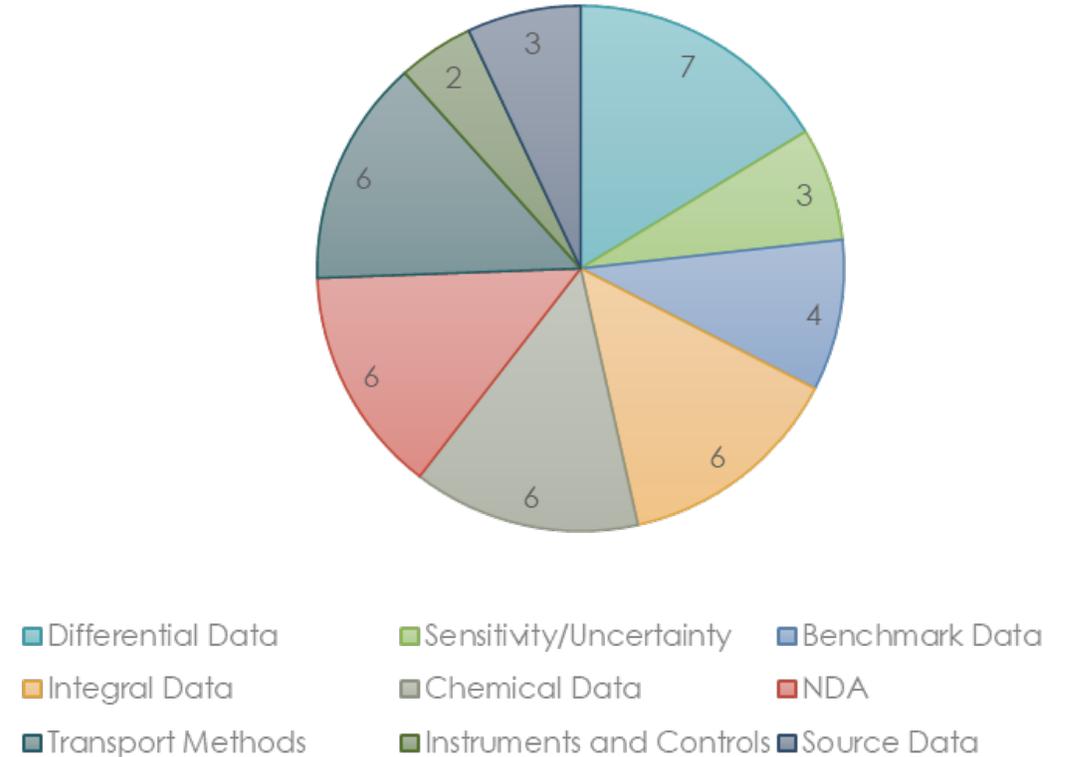
ID	Description
TN-01	Regulatory Inconsistencies and Implementation Problems
TN-02	Inadequate Criticality Safety Evaluations
TN-03	Problems Related to Fissile Mass Characterization
TN-04	Complex Wide Repository for Criticality Safety Evaluations
TN-06	Criticality Accident Alarm System Application during Decontamination and Decommissioning
TN-07	Experiments and/or data need to enhance EM mission work and reduce cost/schedule
TN-09	DOE contracting practices and effect on NCS programs
TN-10	Retiring workforce and industry growth are creating deficiencies in qualified staffing
TN-11	Funding, resources, contractor & DOE Management Commitment, Support, and Monitoring

2008 Workshop - Technological Needs from TN-07

Technological Needs by Site



Technological Needs by Type

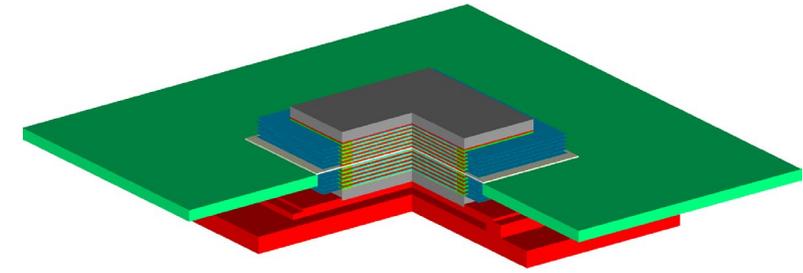


Support from NCSP for technological issues from 2008 Workshop

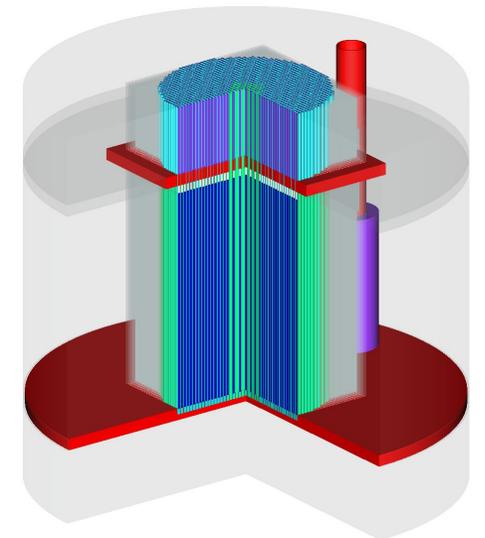
- Support to INL
 - Nuclear data improvements for 11 nuclides
 - Th-232, U-233, U-235, U-238, Pu-239, Pu-240, Mn-55, Cr-53
- Support to Hanford Site
 - Nuclear data improvements for 6 nuclides including Cu, Ca, Ce
 - IER-519
- Support to Oak Ridge Operations
 - S/U tools development allowed overall uncertainties in the subcritical margins to be addressed
- Support to Savannah River Site
 - Improvement in Ti cross section uncertainty resulted in reducing uncertainty in the subcritical margin from ~4% k_{eff} to less than 1% k_{eff}
 - Integral Experiment with Ti (LCT-097 and LCT-099)

Current Activities

- Recent review of nuclear data for absorbers Hanford Tank Farms and Savannah River Site [1]
- Continued support for Hanford Tank Farm retrieval of contents where large Pu particulates could segregate from absorbers
- Continued support for Hanford Tank Farm for Pu-Bi agglomerates identified within tanks
- Assessment of integral experiments to support the reliability of cross-sections to support CSEs at Hanford Tank Farms and Savannah River Site
- **Workshop to collect DOE/EM site NCS needs**
 - Determine continued needs addressed in [2011 Assessment Report](#)
 - Collect current NCS needs
 - Currently set for June 2023



Model of Planet for PMM-002 Benchmark. Same System for IER-519



Model of 7uPEX for LCT-097 Benchmark. Similar System to IER-441.

[1] Alexander Lang, et. al. "DOE-EM Nuclear Criticality Safety Needs FY22 Task 2: Nuclear Data Review", ORNL/LTR-2022/2531 (September 2022).

Acknowledgements

- Thanks to DOE-EM for continual support in addressing NCS needs
- Thanks to NCSP for addressing needs from the EM NCS community
- Thanks to those involved in DOE-EM NCS Needs task for open, honest, and constructive communication in helping resolve NCS challenges