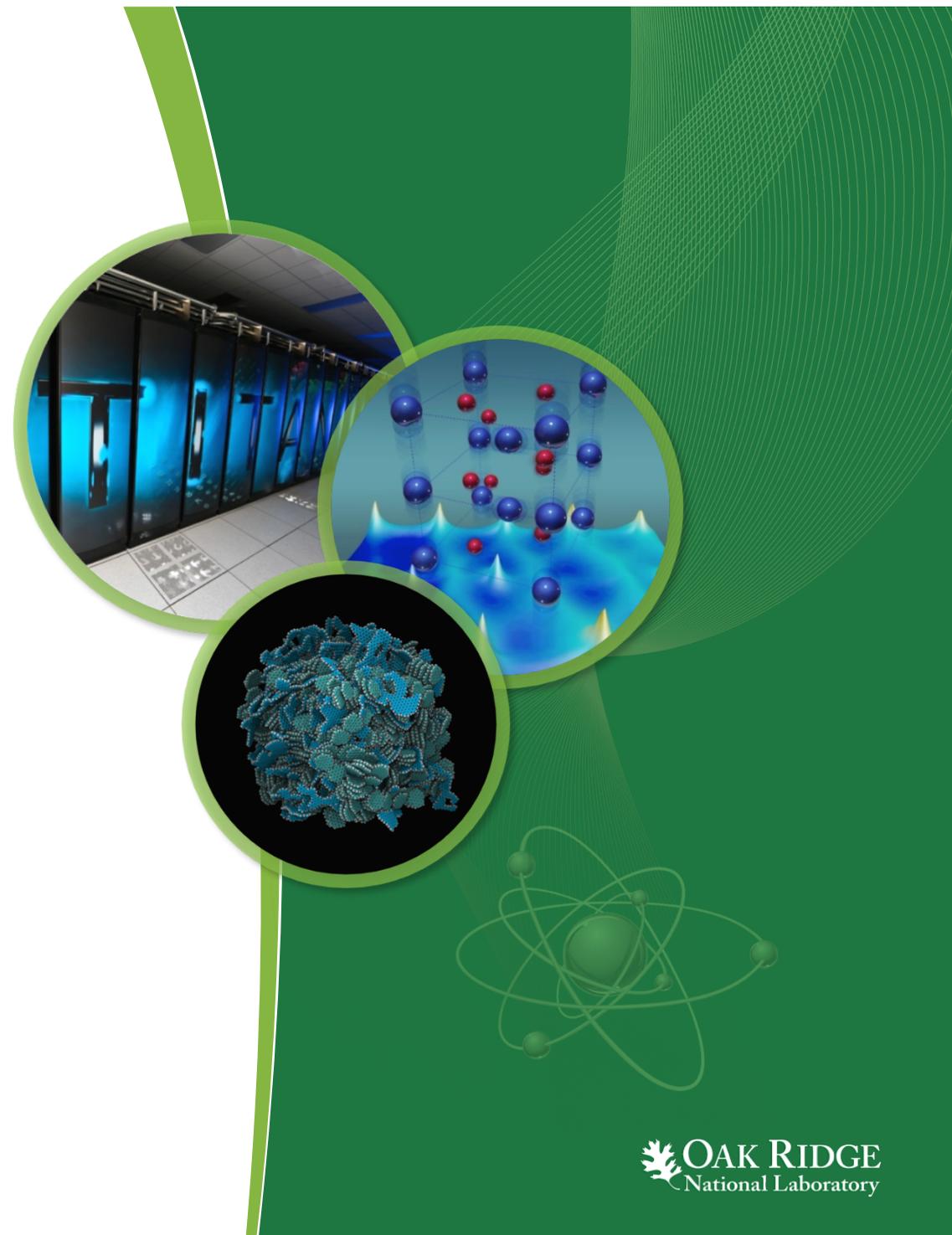


About the NCSP & Technical Program Review

Douglas G. Bowen

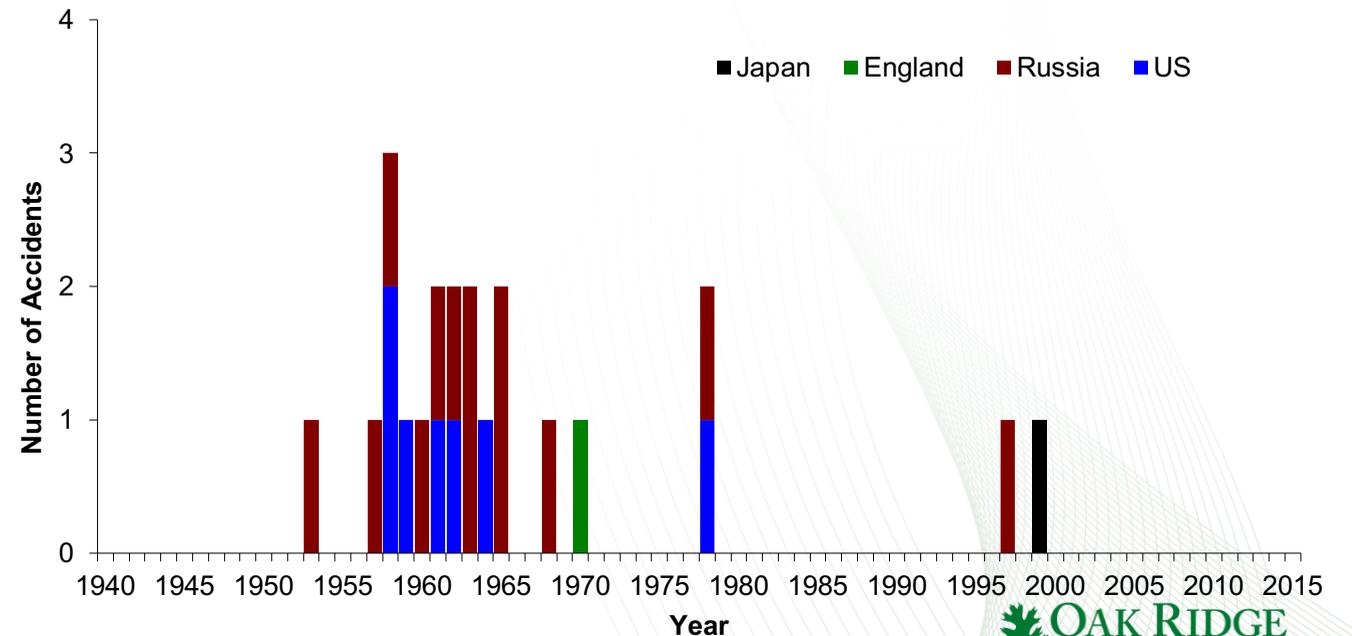
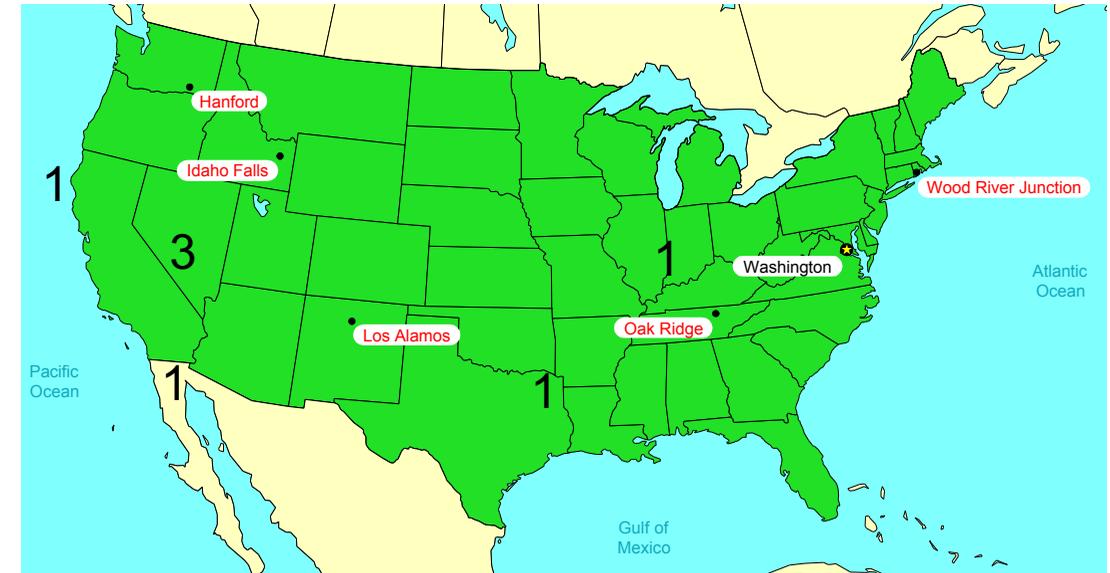
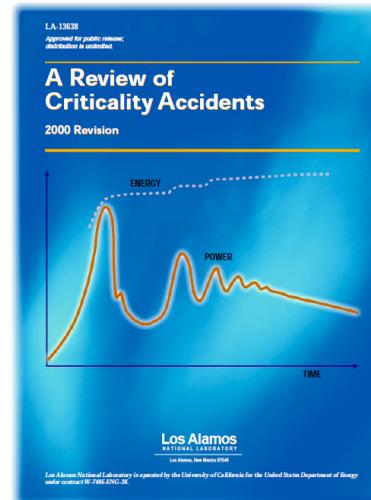
NCSP Execution Manager
Group Leader Nuclear Data and Criticality Safety Group
Reactor and Nuclear Systems Division
Oak Ridge National Laboratory

March 27, 2018
2018 NCSP Technical Program Review



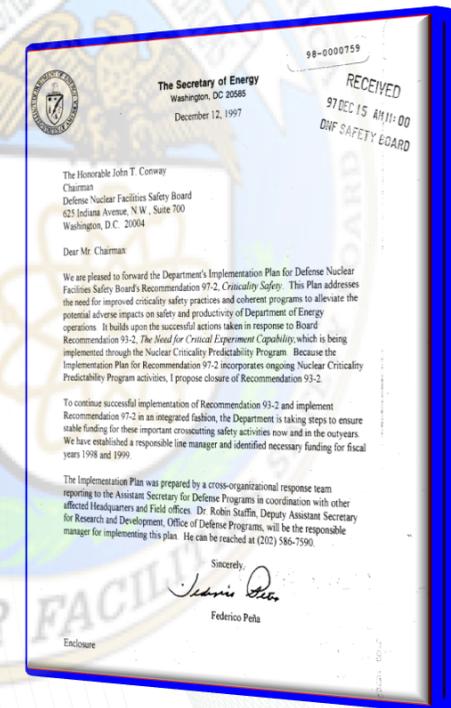
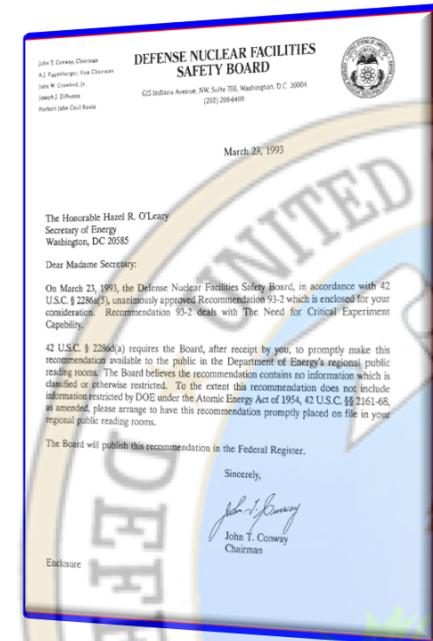
History & Drivers for US NCSP

- **Criticality Accident:** release of energy as the result of inadvertently producing a self-sustaining or divergent chain reaction
- 22 Process Facility Criticality Accidents
 - 21 involving solution/slurry (4 chemistry “gone bad”)
 - 1 involving metal ingots
 - 0 involving powders, transportation, or storage
- Consequences
 - 9 deaths (US-2, Japan-2, and Russia-5)
 - 3 personnel required limb amputations
- Accident frequency
 - 1957-1970; ~1 to 2 per year
 - 1970+; ~1 every 10 years



History & Drivers for US NCSP

- Defense Nuclear Facilities Safety Board (DNFSB) or “Board”
 - Independent organization within executive branch of US Government, reporting to the President and Secretary of Energy regarding public health and safety issues at DOE defense nuclear facilities
- Two key DNFSB Recommendations
 - DNFSB 93-2, March 23, 1993
 - Need for a general purpose critical experiment capability that will ensure safety in handling and storage of fissionable material.
 - DNFSB 97-2, December 12, 1997
 - Need for improved criticality safety practices and programs to alleviate potential adverse impacts on safety and productivity of DOE operations
 - Encompassed DNFSB 93-2 while broadening scope to address important cross-cutting safety activities needed to ensure nuclear criticality safety throughout DOE Complex



Current NCSP Work Sites



NCSP Organization and Overview

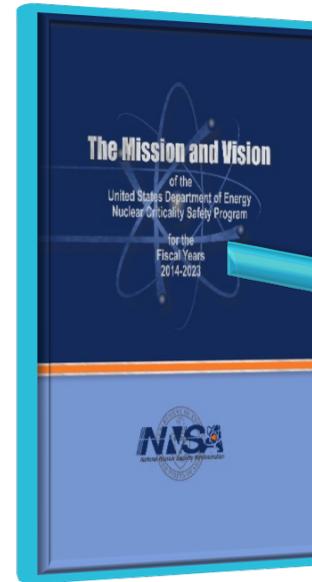
- Mission

Provide sustainable expert leadership, direction and the technical infrastructure necessary to develop, maintain and disseminate the essential technical tools, training and data required to support safe, efficient fissionable material operations within the Department of Energy.

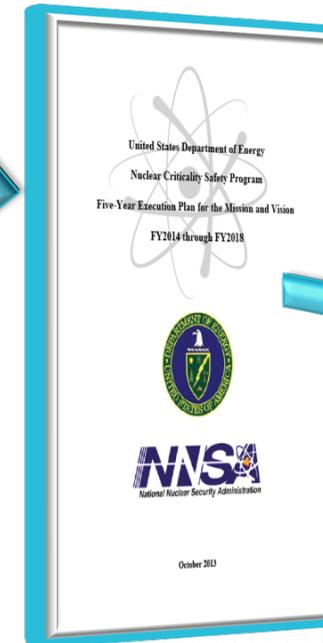
- Vision

Continually improving, adaptable and transparent program that communicates and collaborates globally to incorporate technology, practices and programs to be responsive to the essential technical needs of those responsible for developing, implementing and maintaining nuclear criticality safety.

10 Year Mission & Vision



5 Year Plan

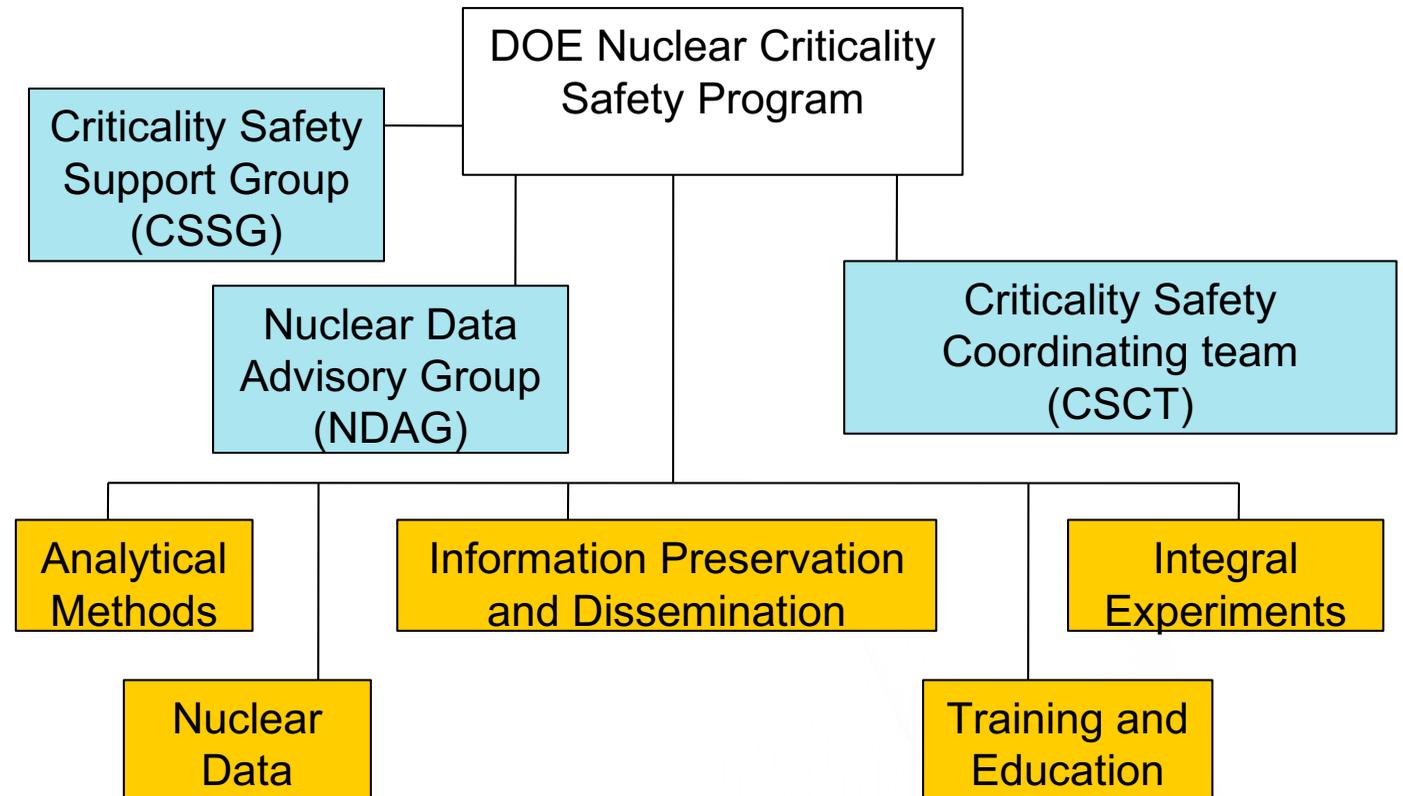


Work Tasks



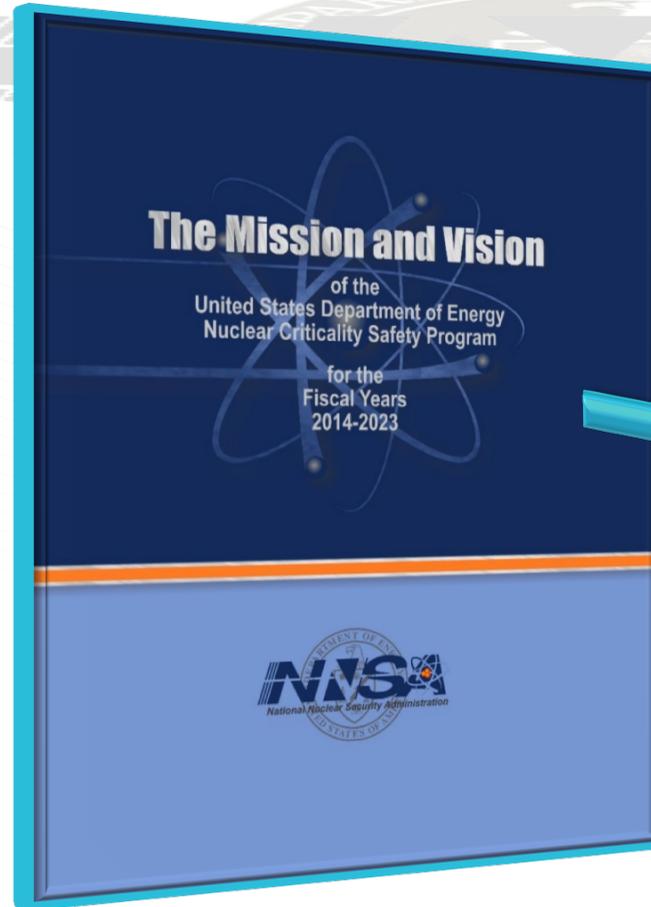
NCSP Technical Elements

- **Analytical Methods (AM)** – Maintain and improve the Production Codes and Methods for Criticality Safety Engineers (MCNP, SCALE, AMPX, and COG)
- **Nuclear Data (ND)** – Perform Measurements of Basic Nuclear (Neutron) Physics Cross-Sections and Generate New Evaluated Cross-Section Libraries and Covariance Data for Use in Production Criticality Safety Codes
- **Information Preservation and Dissemination (IPD)** – Protects Valuable Analyses and Information Related to Criticality Safety (includes ICSBEP)
- **Training and Education (T&E)** – Web-based training modules and 2-week Hands-On Criticality Safety Course for Criticality Safety Engineers, Line Management, and Oversight Personnel



- **Integral Experiments (IE)** – Critical and Subcritical Experiments at the Critical Experiments Facility (CEF) at the Device Assembly Facility (DAF) in Nevada and SNL Pulse Reactor Facility– provides integral tests of codes and data

US DOE NCSP AM M&V



Example AM Goals

Color Code	
	High Priority
	Medium Priority
	Low Priority
	STRETCH

6 Analytical Methods (AM)

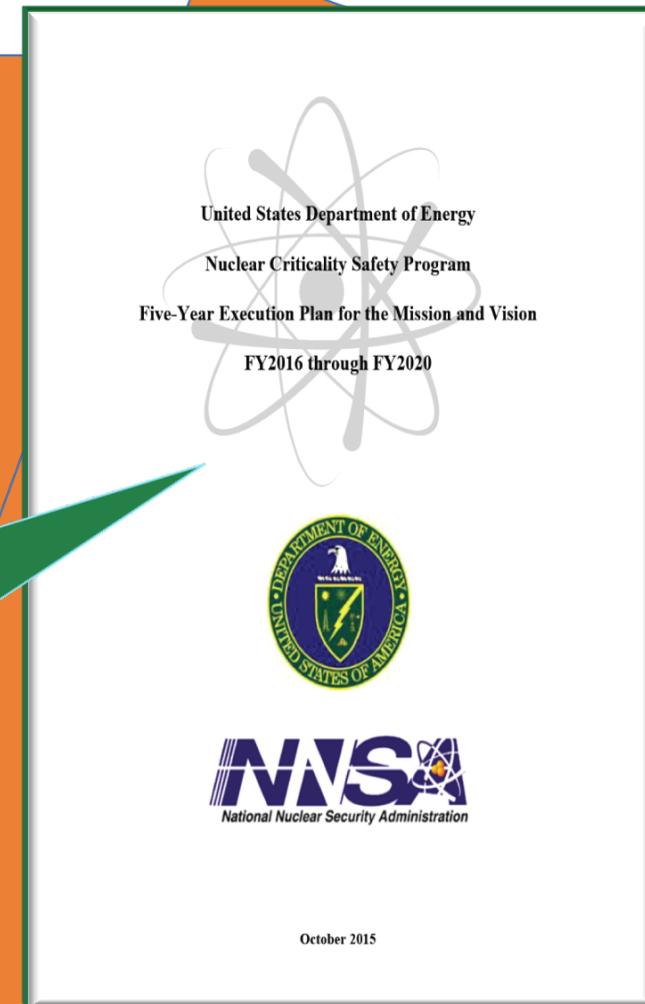
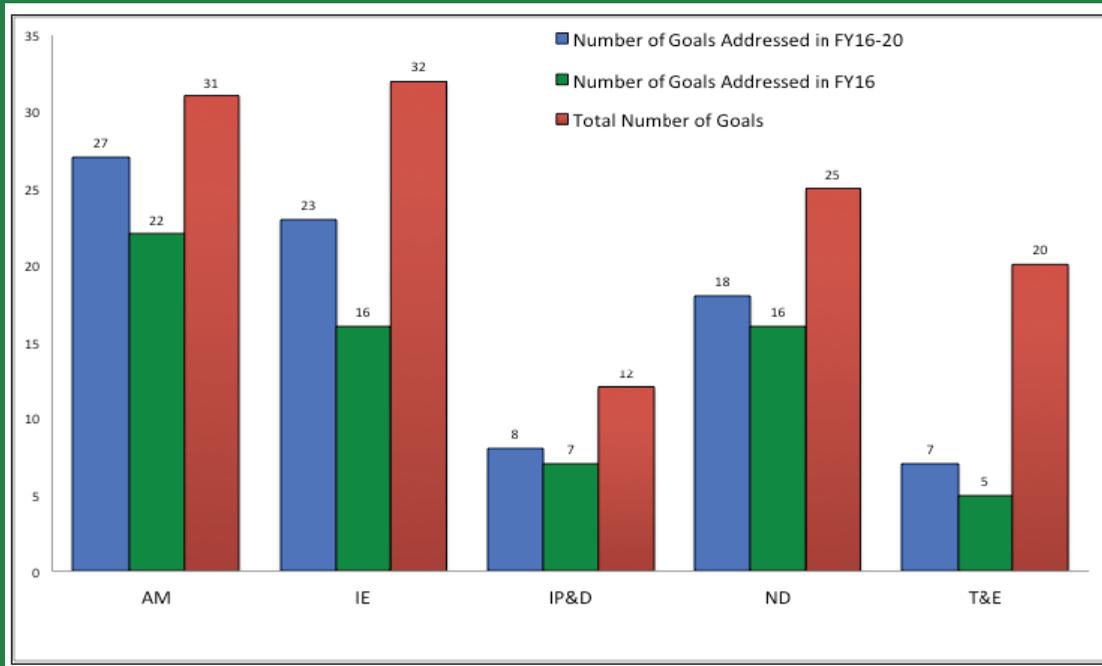
Analytical Methods - Budget and Technical Priority Rankings

Attributes	Goals	5y	10y
		Budget Priority	Technical Priority
Personnel:			
Cross-section processing developers	Develop and implement succession plans to maintain cross-section processing expertise		
Radiation transport developers	Develop and implement succession plans to maintain radiation transport expertise		
Processing codes and data libraries:			
Ability to process <ul style="list-style-type: none"> Input evaluations in "standard" formats from all international compilations Reaction cross section/energy/angle Covariances (reaction/energy/angle) 	Develop and maintain more than one independent cross-section processing code system		
	Update processing codes to process new, modern ENDF/B data format		
	Process new covariance evaluations for thermal scattering law data, collision kinematics, fission energy distributions		
Ability to create code dependent libraries <ul style="list-style-type: none"> Continuous-energy Multi-group 	Produce continuous-energy, multi-group, and covariance data libraries for use in radiation transport code systems		
Software Quality Assurance (SQA) of processing codes and libraries	Develop and maintain processing software and data libraries under SQA		
	Develop and utilize comprehensive verification/validation suite to allow cross-code comparison of processing results from ENDF formats		
Computational <ul style="list-style-type: none"> Multi-platform Multiple Operating systems, compilers Adaptable, sustainable (languages, etc.) 	Deploy cross-section processing code systems for operation on multiple computing platforms and operating systems		

Annual Work Planning Documented in NCSP Five Year Plan

- Five Year Plan defines specific work tasks in each technical program element
 - Work tasks designed to achieve NCSP M&V 5-year and 10-year goals
 - Five Year Plan updated each FY—enables NCSP to be adaptive to emerging needs in DOE Complex

Number of NCSP M&V Goals Addressed in FY16-20 Five Year



- NCERC is located within the DAF at the NNS
- NA-10 (DP) Approved Security Category I / Hazard Category 2 Nuclear Operations on May 8, 2011
- DOE Nuclear Criticality Safety Program (NCSP), NA-511, is the principal programmatic sponsor
 - NCERC also supports NA-20 (Defense Nuclear Non-Proliferation), NA-40 (Emergency Operations), NA-80 (Counterterrorism and Counterproliferation), DTRA, DHS, NASA and a variety of other WFO customers

What is NCERC?

- A collection of general purpose laboratories capable of subcritical, delayed, and super-prompt critical operations using large quantities special nuclear material

The NCSP mission is to provide sustainable expert leadership, direction, and the technical infrastructure necessary to develop, maintain, and disseminate the essential technical tools, training, and data required to support safe, efficient fissionable material operations within DOE.

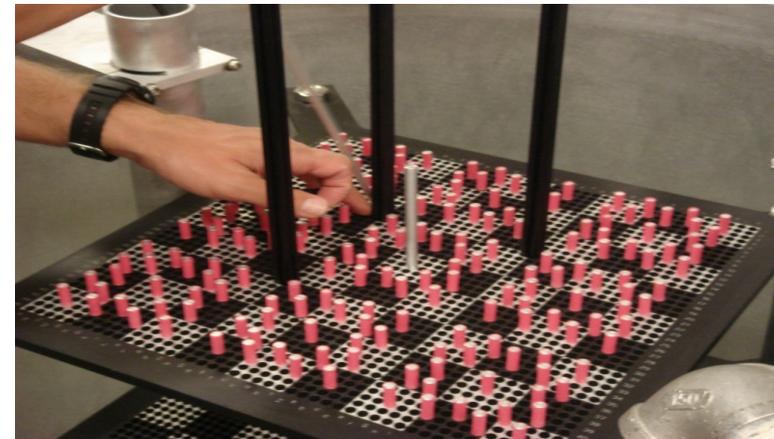
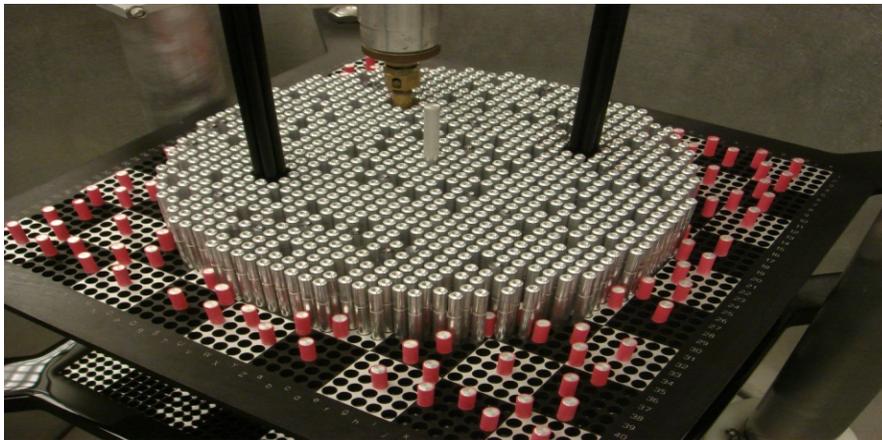
The Mission and Vision of the United States Department of Energy Nuclear Criticality Safety Program



Critical Experiments at Sandia National Laboratories, Albuquerque, NM

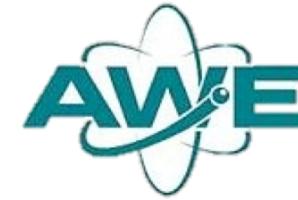


- Maintain the capability to perform water moderated low-enriched lattice critical experiments in the Sandia Critical Experiments Facility.
- Two enrichments available: 4.3% and 6.9% Enriched in U-235.
- Primary Mission is to provide hands-on criticality safety training including uncleared personnel.

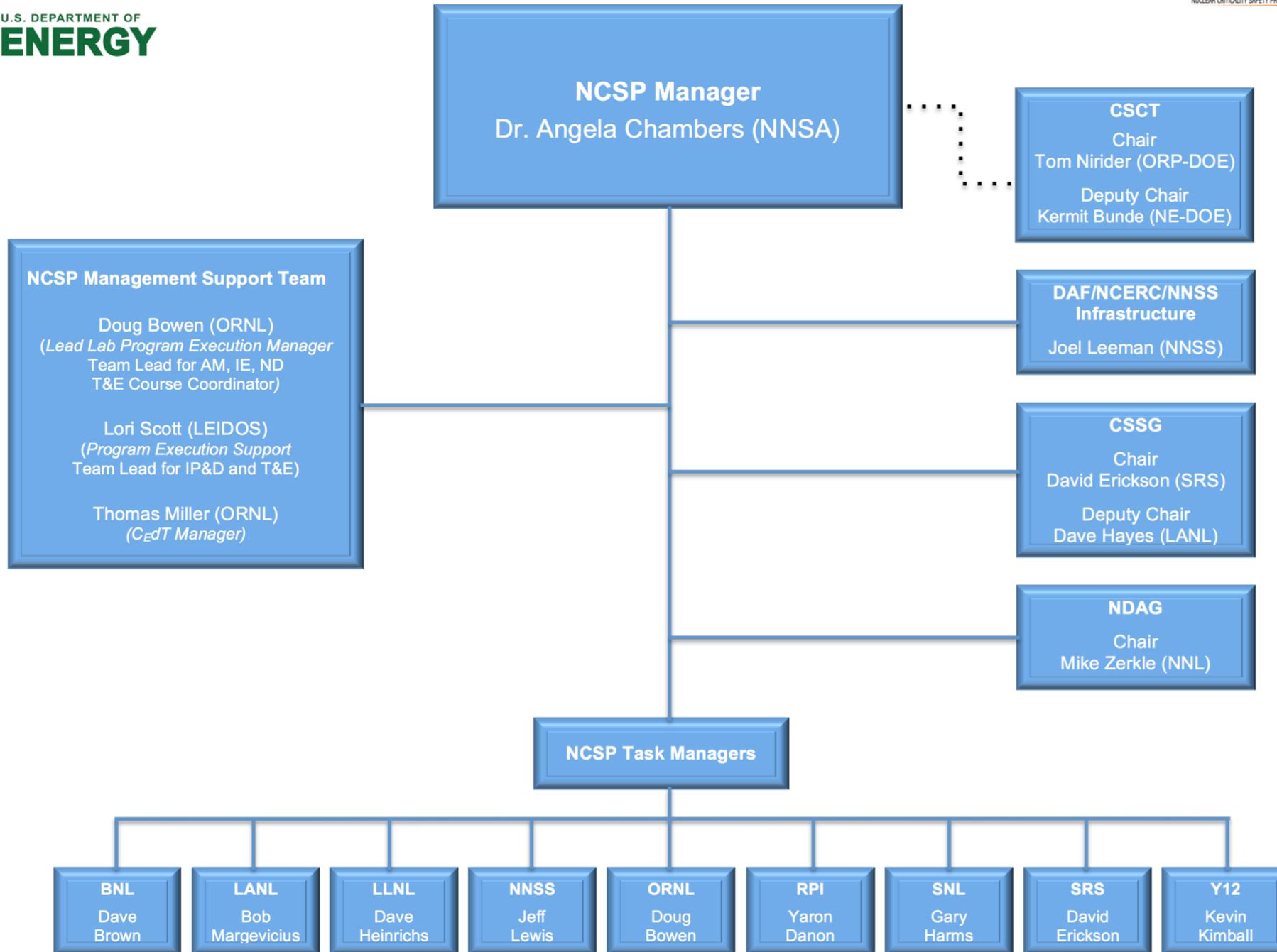


NCSP International Partners

- Atomic Weapons Establishment (AWE), UK (JOWOG-30)
- Institut De Radioprotection et De Sûreté Nucléaire (IRSN), France (Formal MOU with NCSP)
- Commissariat à l'Énergie Atomique et aux Énergies Alternatives (CEA), France (Nuclear Data Evaluations)
- Institute for Reference Materials and Measurements (IRMM), Belgium (Differential Nuclear Data Measurements)
- Organization for Economic Cooperation and Development (OECD) / Nuclear Energy Agency (NEA), Headquarters in France (ICSBEP, WPEC, and WPNCS)



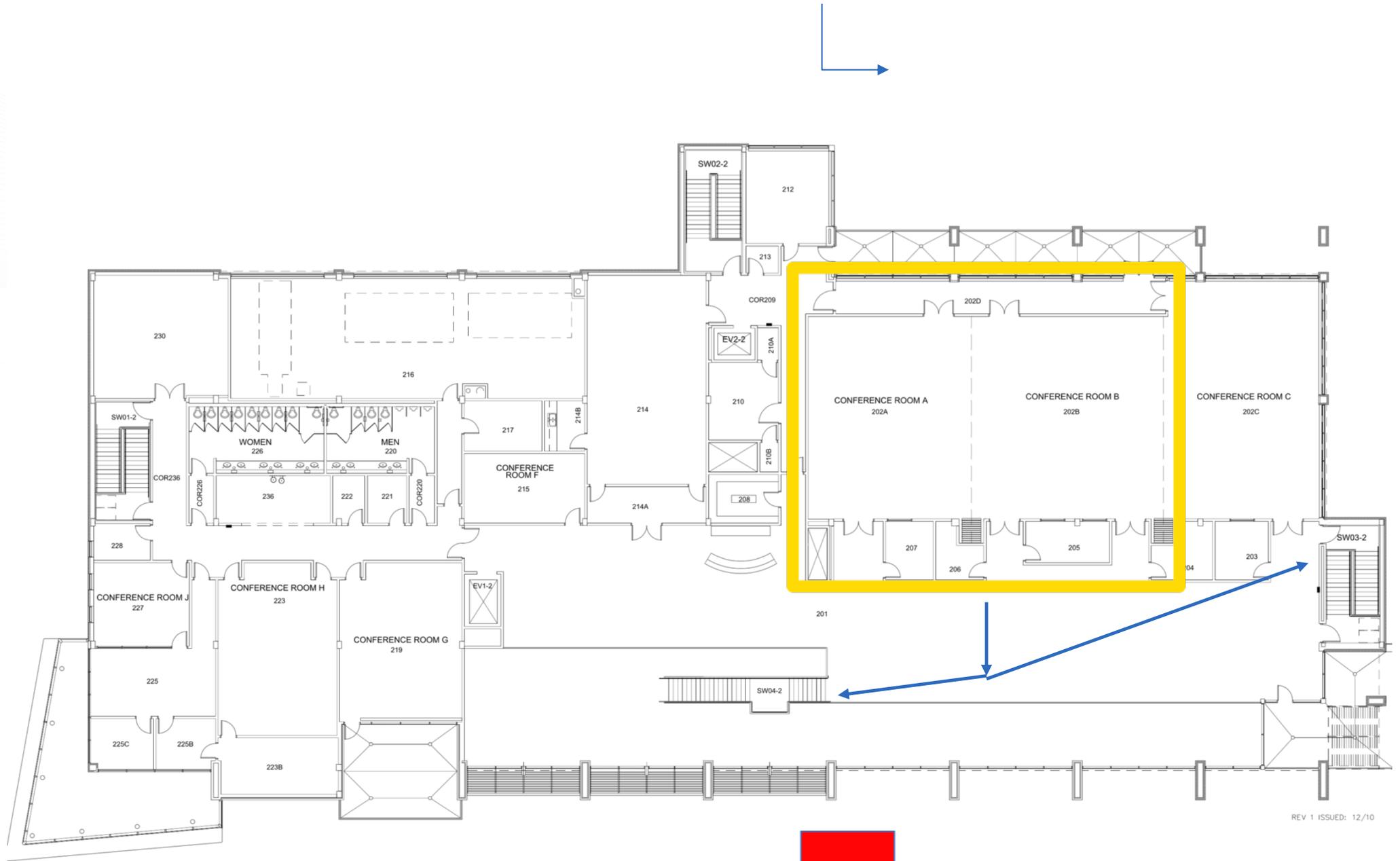
Nuclear Criticality Safety Program's (NCSP) Organization Chart



Summary

- US NCSP is a mature program that:
 - Maintains the infrastructure necessary to ensure safe, efficient operations with fissionable materials
 - Identifies and integrates a Mission and Vision with 5-year work plan to achieve program goals in the following technical focus areas:
 - Analytical Methods (AM)
 - Nuclear Data (ND)
 - Information Preservation and Dissemination (IP&D)
 - Integral Experiments (IE)
 - Training and Education (T&E)
 - Relies on strong working relationships with US national laboratories, universities, and international collaborators to provide needed capabilities to accomplish NCSP goals

Safety Briefing



BUILDING 5200 SECOND FLOOR PLAN

REV 1 ISSUED: 12/10

Security Briefing

- No classified discussions
 - Classified discussion can be arranged, if necessary
- Personal and government issued computers allowed
- Personal and government issues cellphones allowed

Conference Room Availability

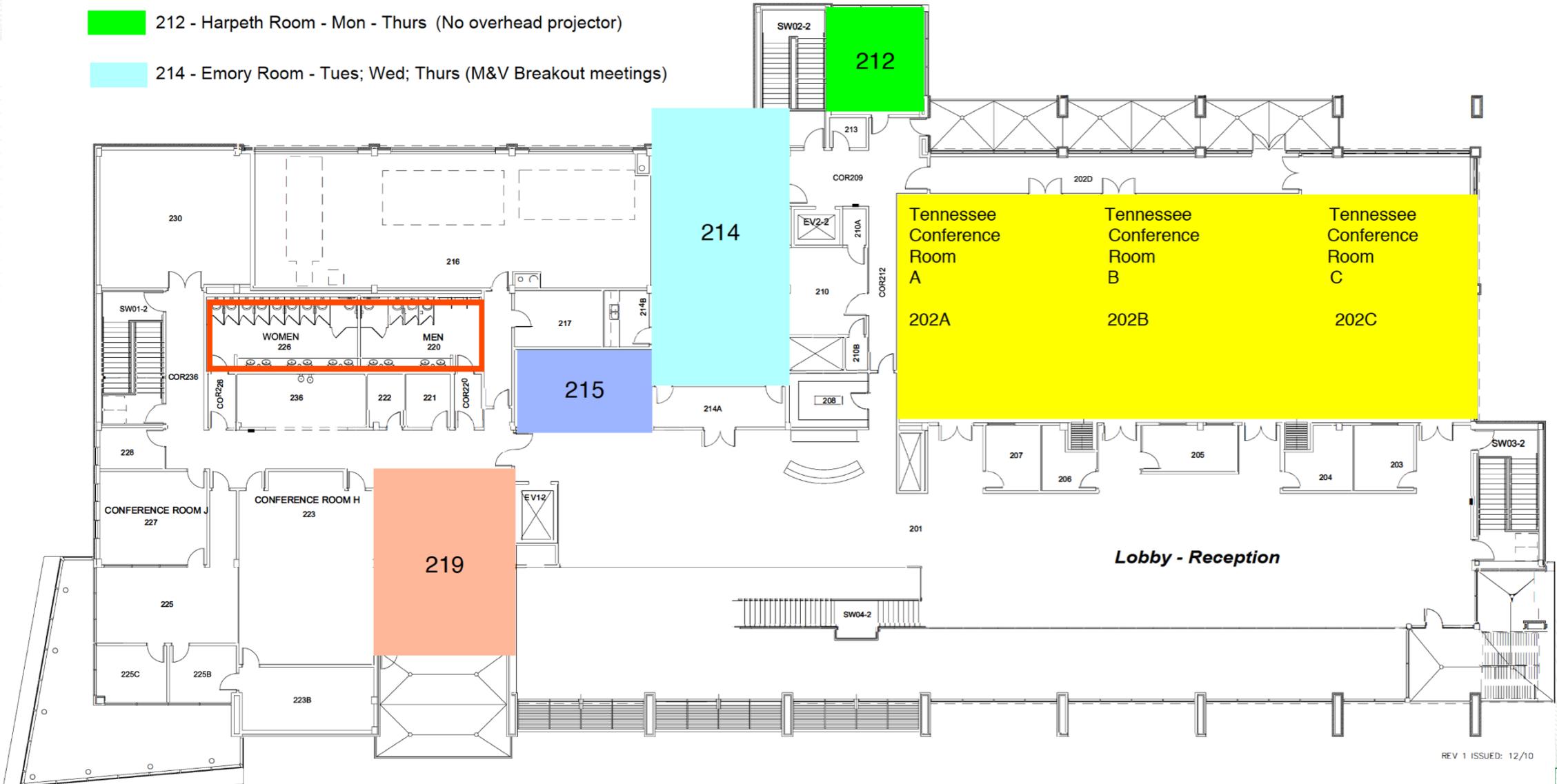
215 - Buffalo Room - Mon; Tues (except 11:30 - 12:30); Wed; Thurs (M&V Breakout Meetings)

219 - Cumberland Room - Mon (AMWG); Thurs (M&V Breakout Meetings)

212 - Harpeth Room - Mon - Thurs (No overhead projector)

214 - Emory Room - Tues; Wed; Thurs (M&V Breakout meetings)

202 C - CSSG on Mon, M&V on Thurs
202 A & B - TPR on Tues and Wed



REV 1 ISSUED: 12/10

