OAK RIDGE National Laboratory

ORNL NCSP Training and Education Support for FY2021

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2022 NCSP Technical Program Review
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U.S. DEPARTMENT OF ENERGY

ORNL Approved Training and Education Tasks for FY 2021

ORNL Training and Education (TE) Tasks	Budget ($K)
ORNL-TE1	
Manage and Provide Instruction for the DOE Nuclear Criticality Safety Training and Education Program	99
ORNL-TE3	
Hand-Calculation Primer Expansion, LA-14244-M	99
ORNL-TE5	
On-Site Introductory Training for the NCS Practitioner on Modern Approaches to Validation Using Sensitivity and Uncertainty Analysis Tools	0
ORNL-TE11	
Revision of the LA-12808 Nuclear Criticality Safety Guide	148
ORNL-TE12	
Design of a Subcritical Assembly at ORNL for Use with the CSO Courses	124
Grand Total	470

ORNL TE1—Manage and Provide Instruction for the DOE Nuclear Criticality Safety Training and Education Program (1)

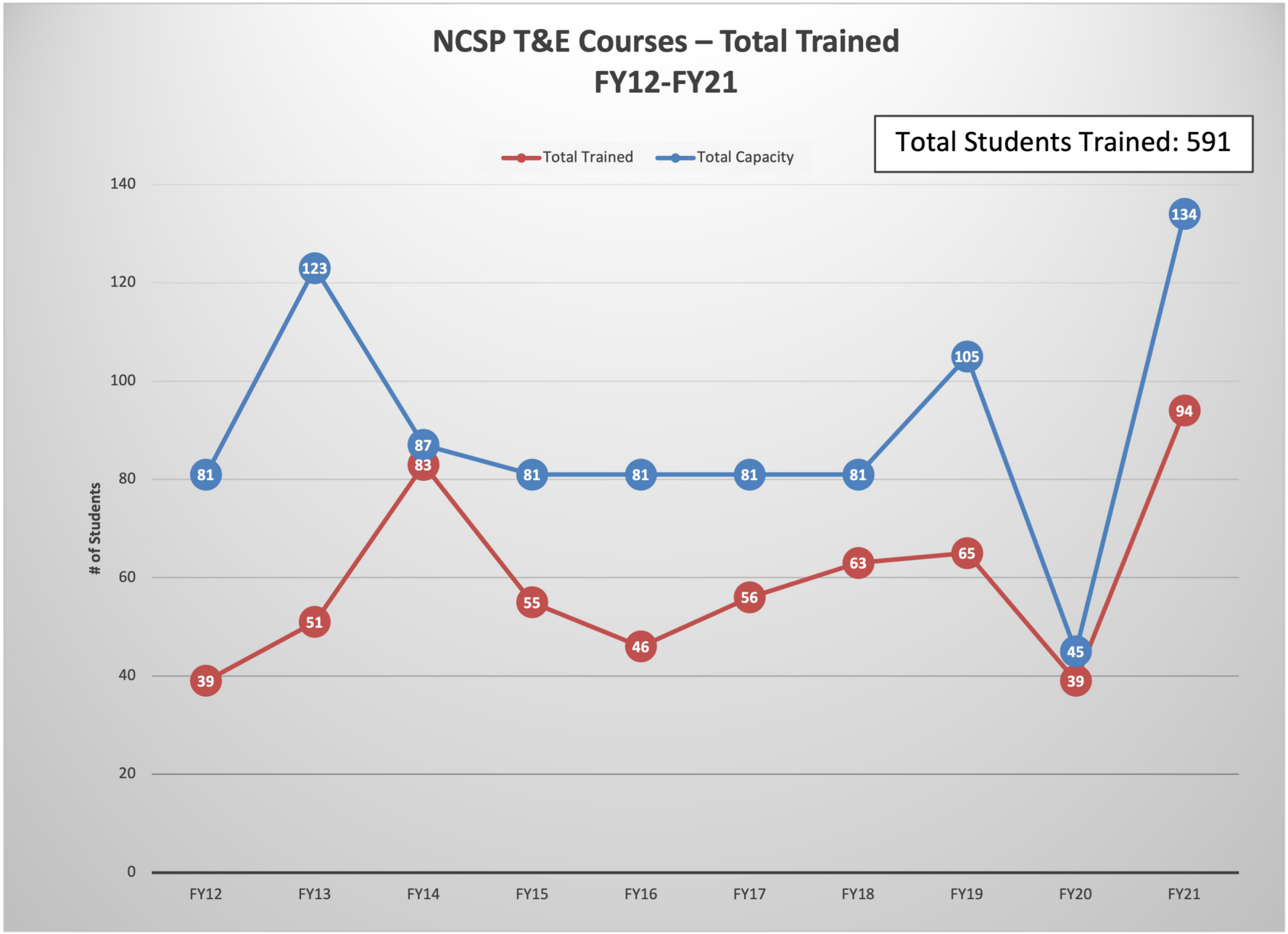
- Q1
  - Archived FY 2020 course materials in accordance with the course procedure
  - Nov 2020 – NCERC Y-12 special course completed (10 students) – 6 student backlog needing to take second week (July and Aug 2021 made up)
  - Planning for a virtual lecture course week for the 2-week hands-on course in Jan 2021 was initiated. WebEx was procured for this and other NCSP needs
- Q2
  - Planned and executed the virtual lecture portion of the Jan 2wk-HOC for 22 students; Student feedback was good for virtual course;
  - SNL (12 students) and NCERC (10 students) portions of the Jan 2wk-HOC postponed due to COVID-19 issues
  - SNL 1-wk Manager/CSO scheduled for April was delayed due to COVID-19
  - 1-week CSO/Manager NCERC course planning performed

ORNL TE1—Manage and Provide Instruction for the DOE Nuclear Criticality Safety Training and Education Program (2)

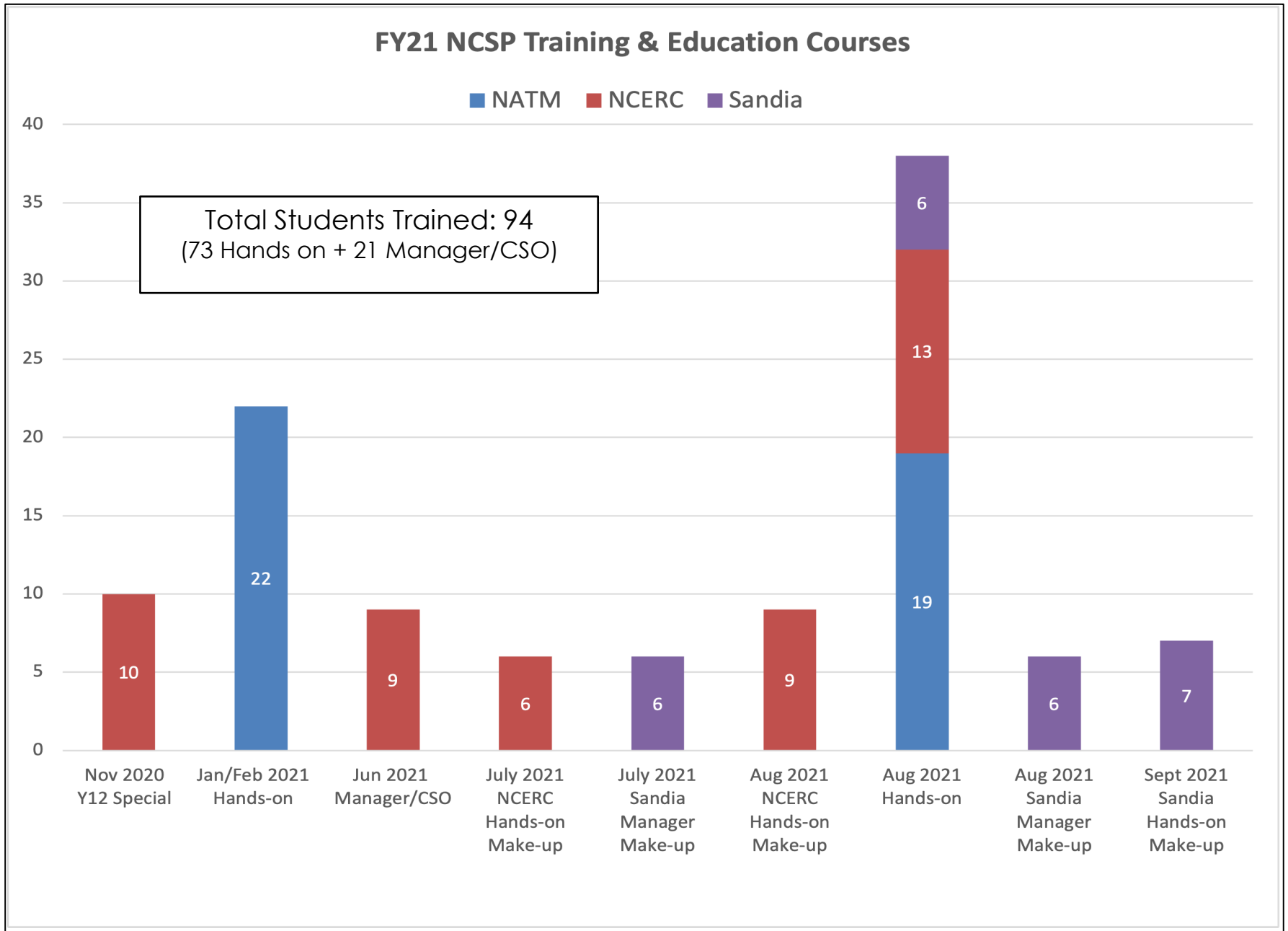
- Q3
  - 1-week CSO/Manager NCERC course completed on schedule June 7-11, 2021, for 9 students (CSO course pilot delayed by 1 year)
  - Planning efforts started early in the quarter to make up all the postponed courses and eliminate student backlog; new course dates provided to students
- Q4
  - July 2021 – NCERC 2wk-HOC Make up session #1 completed (6 students)
  - Aug 2021 – NCERC 2wk-HOC Make up session #2 completed (9 students)
  - Aug 2021 – 2wk-HOC completed as scheduled at NATM, SNL, & NCERC (19 students, 6 SNL, 13 NCERC)
  - Aug 2021 – SNL 2-wk HOC Make up session (6 students)
  - Sept 2021 – SNL 2-wk HOC Make up session (7 students)

2-week Hands-on Courses	
SANDIA PORTION – Makeup Course #2	Make-up session 2 - September 27-October 1, 2021
NCERC PORTION – Makeup Course #1	Make-up session 1 - July 12-16, 2021
NCERC PORTION – Makeup Course #2	Make-up session 2 - August 9-13, 2021
2-Week Hands-on Course – August 9-20, 2021	Regularly scheduled
1-Week Manager Courses	
Sandia Manager Course – July 12-16, 2021	Make-up session - July 12-16, 2021
Sandia Manager Course – August 30-Sept. 4, 2021	Make-up session - August 30 - September 4, 2021

NCSP Training and Education Course Statistics (3)

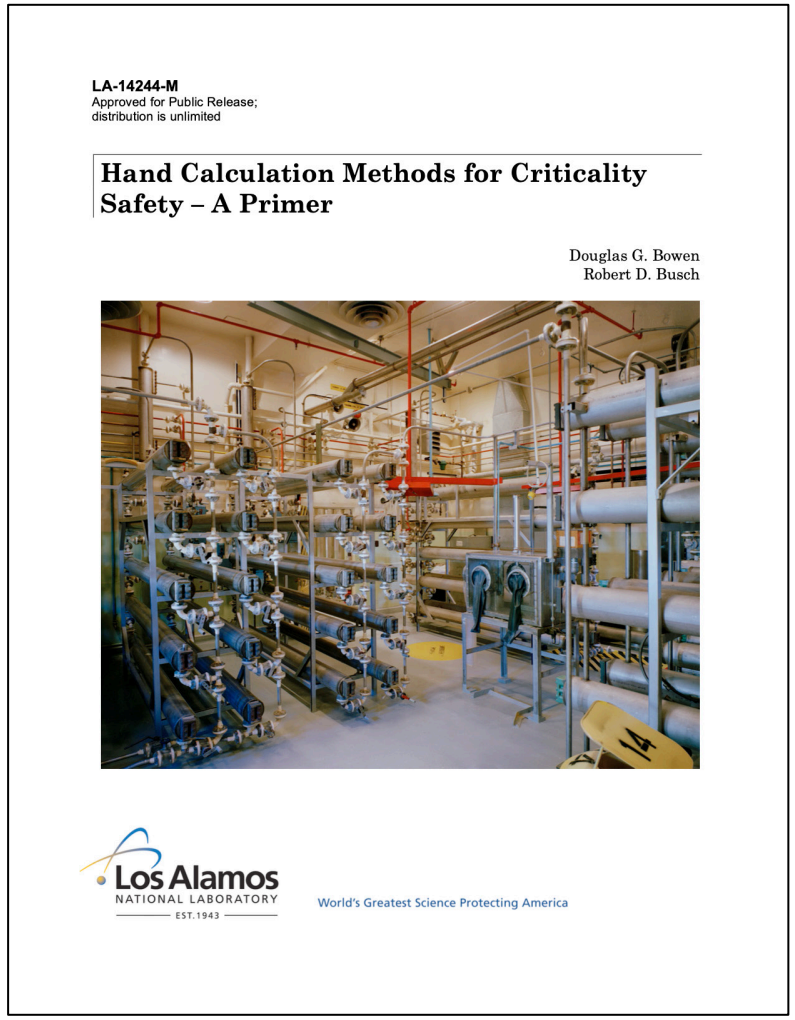


NCSP Training and Education Course Statistics (4)



ORNL TE3—Hand-Calculation Primer Expansion, LA-14244-M

- **Status**: delayed; but good progress was made in FY2021
- ~60% of document completed in FY2021 (100% drafted now – reviews in progress)
- Addition of new example problems in progress for typical NCS applications (single-unit and array problems)
- Solid angle method chapter has been revised due to variability of applicability
- Web-based sample problem complement in progress
  - All data needed to complete a problem will be available
  - HTML format—to be linked to NCSP website (NCSET modules) and linked to the NCSP training course
  - Graduate student work delayed by COVID-19 and transition to a new purchase order system
- ORNL report will be completed in FY22 on budget
- NCSD topical paper submitted


LA-14244-M
Approved for Public Release;
distribution is unlimited

Hand Calculation Methods for Criticality Safety – A Primer

Douglas G. Bowen
Robert D. Busch

Los Alamos NATIONAL LABORATORY EST. 1943

World's Greatest Science Protecting America

ORNL TE5—On-Site Introductory Training for the NCS Practitioner on Modern Approaches to Validation Using Sensitivity and Uncertainty Analysis Tools

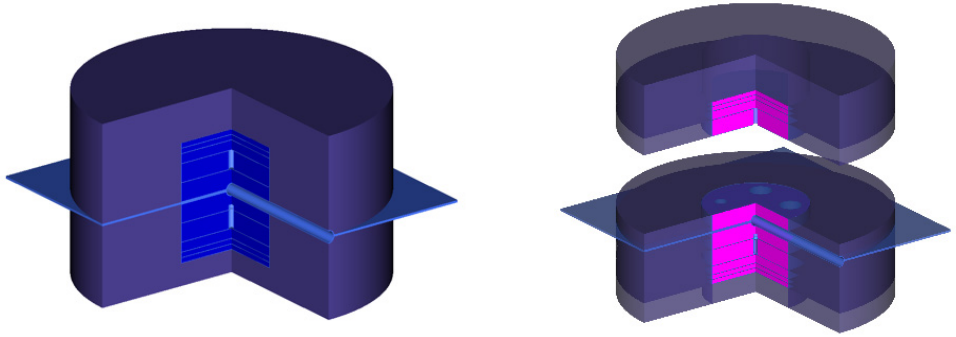
- This task is performed in collaboration with LANL
- The one-day class introducing S/U tools to NCS practitioners was taught via WebEx on Tuesday, April 27, and Wednesday, April 28, 2021
  - LANL and ORNL staff coordinated to deliver the training to approximately
  - 21 practitioners attended the 2-day course
    - Most attendees were from BWXT, Nuclear Fuel Services, Idaho National Laboratory, or DOE in Idaho

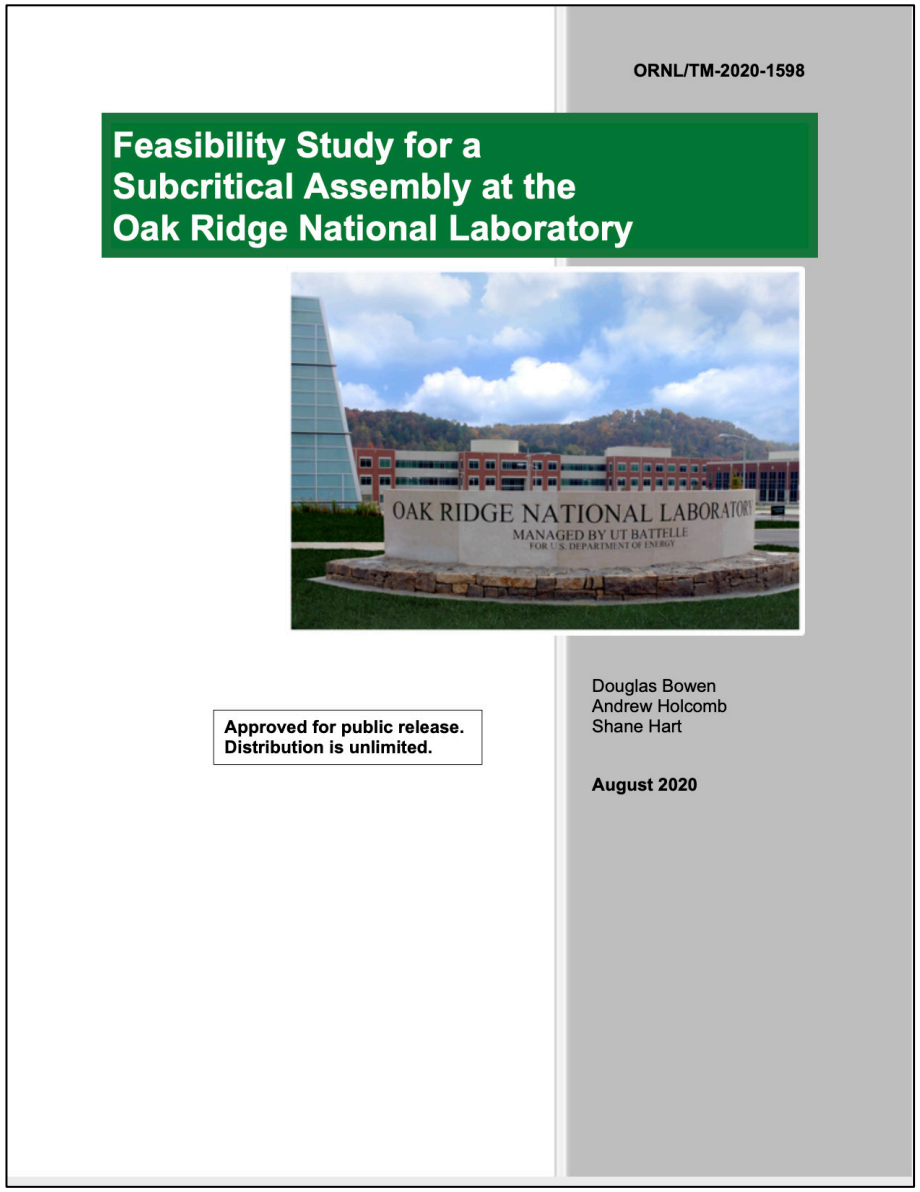
ORNL TE11—Revision of the LA-12808 Nuclear Criticality Safety Guide

- All references have been compiled for a new reference list for this new guidance document. The document write up is in progress and a rough draft should be completed by FY22Q3.
- Calculations completed to update critical mass curves in LA-12808
- Document will be much more extensive in scope and will cover all aspects of NCS using the ANS-8 series standards, accident lessons learned, applicable CSSG recommendations, and modern NCS publications
- Resource limitations have delayed progress, although
- New guide to be completed by the end of FY2022

ORNL TE12—Design of a Subcritical Assembly at ORNL for Use with the TE Courses

- Feasibility study was successful; ORNL report published in 2020; FY2021 focused on final design, siting and receiving fuel from Y-12
- HALEU fuel; graphite reflected (AGN-201M fuel and assumptions)
- ORNL DOE field office and management are supportive
- Formal validation is in progress
- At least four experiments can be performed to examine 1. mass, 2. interaction, 3. moderation, and 4. effects of adding neutron absorbers to the assembly
- Final report to be completed by the end of FY2022





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