CNS | consolidated nuclear security, llc

PANTEX PLANT | Y-12 NATIONAL SECURITY COMPLEX

# Sharing of Good Industry Practices:
# NCS Engineer Training Qualification Program

**Amber McCarthy**

*amber.mccarthy@cns.doe.gov*

Nuclear Criticality Safety Engineer

# Presentation Summary

## Overview of training program

- Description of qualification process
- Highlight strengths and best practices
- Discussion questions

# Training Program Overview

## NCS Engineer Classifications

- EIT – Engineer-In-Training
  - BS in Engineering
  - Nuclear Engineering
  - Understanding of reactor physics
- NCSE – Nuclear Criticality Safety Engineer – Fully Qualified
  - Two years experience at a nuclear site, includes one year at Y-12
  - Completion of Y-12 Specific Tasks
  - Hands-on DOE criticality safety course
- Sr. NCSE – Senior Nuclear Criticality Safety Engineer
  - Ten years NCS experience, includes five years at Y-12

Y-12 National Security Complex
Managed and Operated by
Consolidated Nuclear Security, LLC

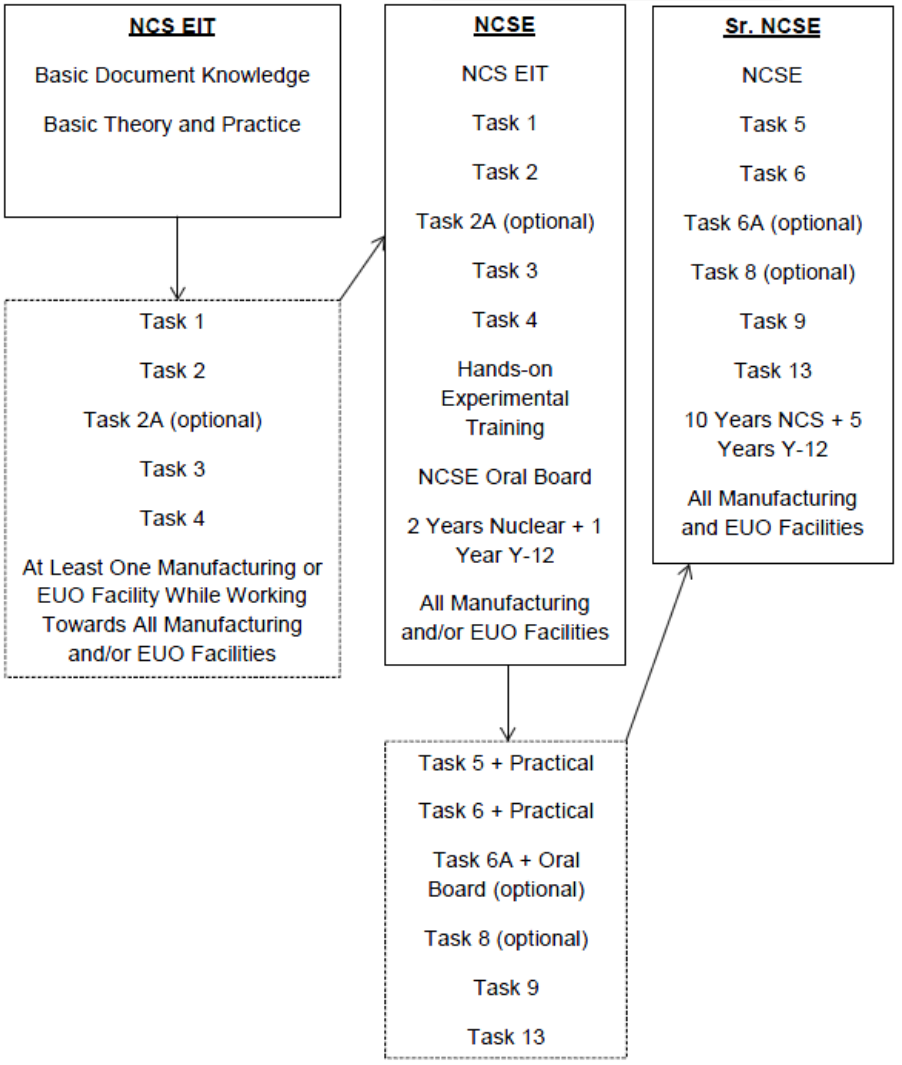
# Training Program Overview

## NCS Engineer Training Requirements

- Solid boxes contain minimum requirements
- Dashed boxes contain additional tasks they may work toward qualifying in

## Good Practices

- Requirements met primarily through completion of work supporting production operations
- EIT rotating shadows are assigned to the NCSE leads and receive exposure to multiple facilities



# Basic Theory & Practice Knowledge, Basic Document Knowledge

## Hand calculation problems

- Reading critical mass/volume charts
- Single unit
- Arrays

## Review DOE Orders/ANSI-ANS Standards

- Plant level procedures
- Operating level procedures

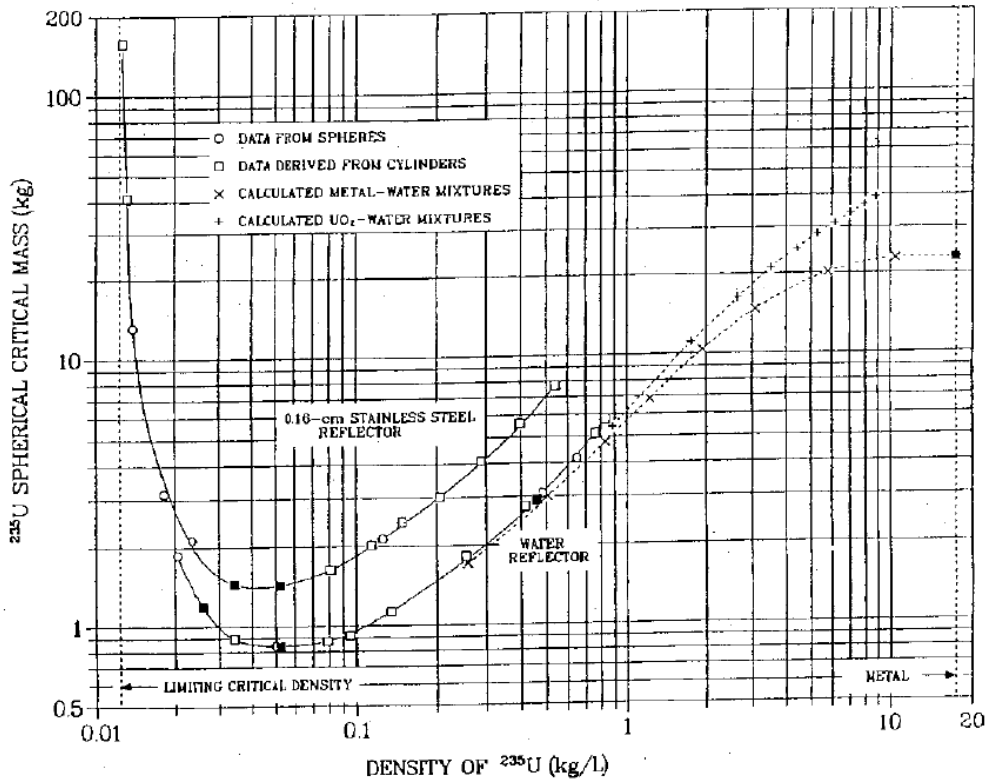



*Fig. 10. Critical masses of homogeneous water-moderated U(93.2) spheres. Solution data appear unless indicated otherwise.*

# Basic Facility Knowledge

**Complete facility tours supported by respective NCS group**

**With a mentor**

- Review NCS requirements in each building
- Read and review TSR/SAR

**Manufacturing Facilities**

| | |
|---|---|
| QP 50401696 | NCS 9215 |
| QP 50401686 | NCS 9204-2/2E |
| QP 50401698 | NCS 9720-05 |
| QP 50401729 | NCS SNM Vehicle (optional) |
| QP 50589904 | NCS HEUMF 9720-82 |

**EUO Facilities**

| | |
|---|---|
| QP 50401690 | NCS 9206 |
| QP 50401692 | NCS 9212 E-Wing |
| QP 50401694 | NCS 9212 Remainder |
| QP 50401702 | NCS 9995 |

# Task 1

## Process Reviews

- Review processes approved by CSEs to ensure requirements are being met and are consistent with current process conditions
  - Conduct and document three operational reviews
- Reviews inventory control procedures
- Other reviews according to Y70-164

# Task 2

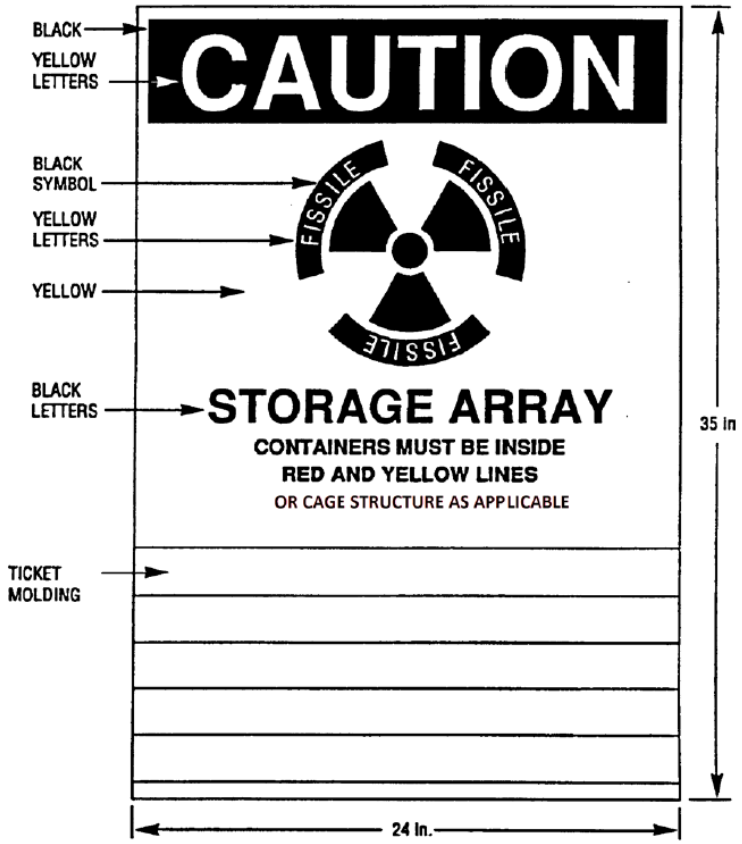
## NCS Evaluation and Documentation

- Review DOE standards & Y-12 procedures
- Discuss multiple specified topics with a mentor
  - CAAS, NCS controls, margins of safety, critical experiments, normal conditions, contingencies, NDA, etc…..
- CSA, CSR suspensions, reactivations, cancellations
- Revise three CSEs
  - Major revisions and updates
- Review site SAR and TSR

# Task 3

## Implementing Document Approval

- Operating procedures
  - Minimum three procedures
- Design drawings
  - Minimum two drawings
- Passive design features subject to degradation
- Postings
- SSC grading worksheets
- Surveillance data sheets

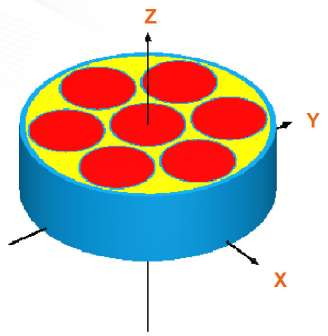



*Example Fissile Storage Array Posting*

# Task 4

## Computations

- Perform NCS calculations with computer codes
- Review current validation documents
- Discuss with a mentor:
  - Cross sections, validations, monte carlo methods, monte carlo pitfalls, margins of subcriticality and upper subcritical limits, area of applicability
- Attend training course for either MCNP or SCALE
- Complete three calculations using the same code



# NCSE Oral Board

## Practical Examination

- Assess depth and breadth of NCS knowledge
- QVO (Qualification Verification Official) and two qualified NCSEs
- Questions from all areas of qualification process


# Task 13

## Field Response to Abnormal Conditions

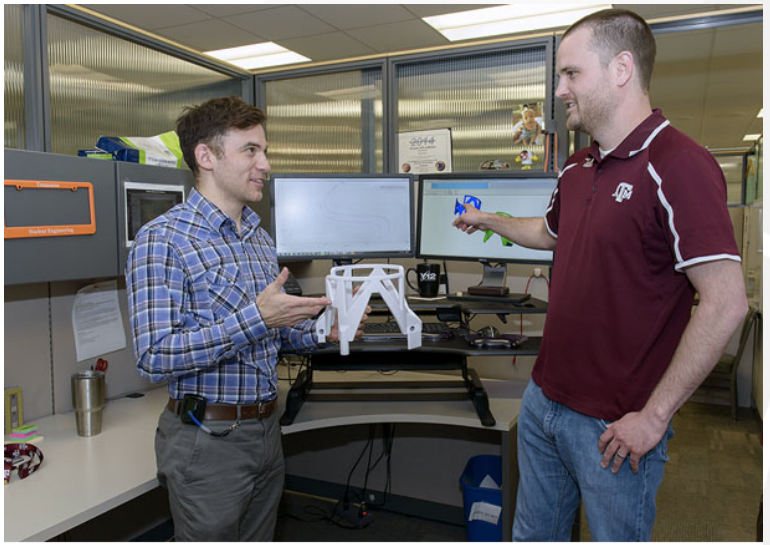
- Response to NCS occurrence deficiency or minor non-compliance
- Minimum of three documented field responses
- Qualification allows NCSE to be on-call

## Abnormal Response Simulator

- Training area – NCS fissile containers
- QVO conducts back-off scenarios
- NCSE volunteers

# Additional Tasks for NCSEs

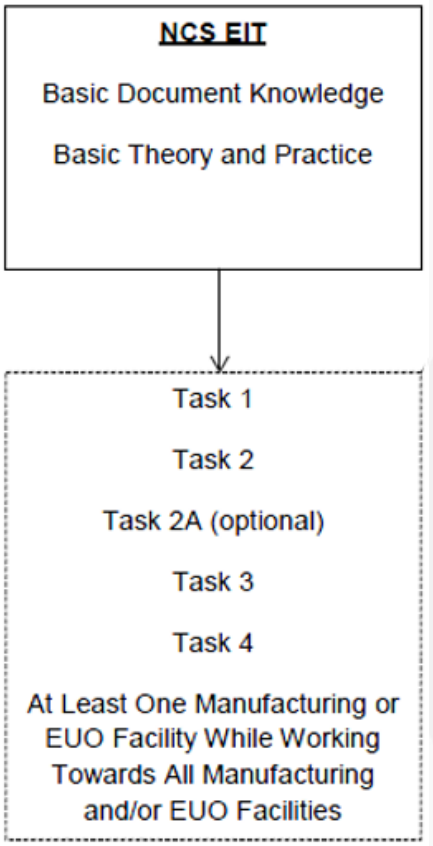
- **Experienced Personnel Evaluation Board**
  - Expedited qualification process for those with prior NCS experience outside of Y-12
- **Two-Year Requalification**
  - Requires documentation of completed NCS works and professional development
- **Task 5** – Computation Review
- **Task 6** – NCS Evaluation/Criticality Safety Process Study Review
- **Task 9** – Order Compliance and NCS Procedures



# NCS New Hires – Classroom Training

**Y-12 onboarding 15+ new NCS engineers**

- New hires start no later than July 2019
- Streamline time with mentors
- Presenters scheduled weekly through next year



## Discussion Questions

- Are there additional NCS training practices not yet discussed other sites find beneficial?
- Is there a topical area in the scope of NCS training that is particularly difficult to develop?
- How is the NCS mentor/mentee relationship fostered?
- What challenges are anticipated training the next generation of NCSEs?

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