Nuclear Criticality Safety Program Roadmap 2021
Report and Status of Improvements
Mission Engineering
Y-12 Operations
Performance Excellence
4/8/2021
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Y-12’s mission invests in NCS people, processes, and systems to ensure safe mission delivery

To fulfill this mission, we have:

- Established ownership and standards
- Improved Nuclear Criticality Safety Program (NCSP) oversight
- Increased NCSP support
- Developed and maintained a resource loaded, integrated schedule
- Completed Inadvertent Accumulation Prevention Program (IAPP) revitalization

In addition we will:

- Complete implementation of remaining key elements for addressing process drift, Sep 2021
- Complete prove in of the 5 year cycle for Criticality Safety Evaluation (CSE) updates, Sep 2021
- Establish the foundation for integrated production training, Sep 2021
Our Journey

Roadmap provides the comprehensive plan to address NCSP issues

**MID 2018**
Y-12 Senior Leadership paused all operations with risk of uranium accumulation, and directed ongoing extent-of-condition reviews to be accelerated and expanded. A formal process was established for safely resuming each paused operation.

**MID 2017 - EARLY 2018**
Y-12 discovered multiple instances of unexpected accumulation of enriched uranium in Building 9212. In each instance, Y-12 paused the subject operations, investigated the cause of the accumulation, and took necessary corrective actions to safety resume work.

**LATE 2018 - 2019**
More than a dozen assessments were performed by contractor, federal, and other external stakeholders to evaluate elements of the Y-12 NCS Program and fully identify the scope of the programmatic weaknesses that contributed to the accumulation issues.

**MID 2020**
Y-12 completes the majority of corrective actions, and planned improvements are underway, including development of an integrated NCS schedule as well as establishment of a site level management and integration function.

**GOAL**
Healthy and Continuously Improving NCSP

**2021**
Y-12 completes the remaining corrective actions and demonstrates capability to continue on the journey of continuous improvement.
Personnel Training and Qualification

Completed Actions:

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<th>Year</th>
<th>Actions</th>
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| 2018 | • Practical Evaluation Curriculum updated  
|      | • Briefed Lessons Learned  
| 2019 | • Conducted Production Pauses  
|      | • Updated NCS Fissile Worker training  
|      | • Updated NCS Training for Supervisors  
|      | • Conducted One Mission Pauses  
|      | • Issued NCS and Production Training Improvement Plan  
| 2020 | • Completed ANSI 8.19 training for supervisors and support personnel  
|      | • Improved Supervisor/operator qualifications  
|      | • Established On-the-Job training  
|      | • Issued Process Engineering improvement plan  
|      | • Initiated Statistical process control program  
|      | • Initiated Familiarization Briefings  
| 2021 | • Initiated training on the CSE controls for hands-on workers and supervisors  
|      | • Developed formal training for field walk down instructions  
|      | • Implemented oral board process for Production Supervisors  
|      | • Issued Process Engineering training and qualification program  

Actions in Progress:

- Institutionalize formal training to hands-on workers and supervisors on CSE controls (Apr 2021)
- Update Criticality Safety Officer (CSO) training profiles (Apr 2021)
- Conduct briefings on the CSE controls for technical staff (Sep 2021)
- Transition on-the-job training (OJT) responsibilities from Production to Training (Sep 2021)
Execution of NCS Duties and NCS Program Maintenance

Completed Actions:

- Established an integrated, resource loaded schedule
- Added CSE implementation to schedule
- Established clear roles, responsibilities, accountabilities, and authorities
- Dedicated role for NCS programmatic integration
- Initiated Systematic Review process

- Established a comprehensive metric for tracking NCS deficiencies and minor non-compliances and understanding the causes
- Identified weaknesses in container and material handling
- Issued guidance for accomplishing systematic reviews
- Update integrated schedule for systematic reviews

Actions in Progress:
- Complete improvements to the general handling procedure (Jul 2021)
- Conduct an independent assessment of the improved general handling procedure (Sep 2021)
## Inadvertent Accumulation Prevention Program (IAPP) Revitalization

### Completed Actions:

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<th>Year</th>
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| 2018 | • Reviewed all open recommendations  
      • Performed walk downs of operations |
| 2019 | • Improved guidance (Y70-162, *Inadvertent Accumulation Prevention Program*)  
      • Created links between Criticality Safety Evaluations (CSEs) and IAPP for consistent reports  
      • Required IAPP report review during annual Operational Review  
      • Updated qualification and trained NCS Engineer and Criticality Safety Officer |
| 2021 | • Conducted independent assessment of IAPP  
      • Completed revision of all IAPP reports |

Revitalization and institutionalization support program endurance
Large Geometry Exclusion Area (LGEA)

Completed Actions:

- Updated database of equipment items in Large Geometry Exclusion Area (LGEA)
- Performed surveillances

Actions in Progress:

- Completion of self-identified weaknesses in LGEA program (Jun 2021)
- Establish site level uranium solution control program preventing collection of concentrated uranium solution in unfavorable geometry equipment and containers (Jun 2021)
- Address identified issues with work execution and non-compliant items entering LGEAs (Oct 2021)
- Establish long-term requirements in the maintenance command media to address the concerns addressed by SO-Y-12-21-0004 (Dec 2021)

New documented standards ensure early detection and swift response
Out of Service (OOS) Equipment

Completed Actions:

- Updated qualification and conducted training for NCSE & CSO
- Established formal criteria for cleanout and isolation
- Removed 5 systems per modern criteria

Actions in Progress:

- Initiated disposition of legacy OOS equipment
- Reviewed uranium hold-up in OOS equipment
- Included disposition of legacy OOS equipment in extended life program
- Removed 11 systems per modern criteria

Complete activities to bring OOS equipment into compliance with formal criteria established as part of NCS program updates (May 2021)

Enhanced OOS program requirements establish NCS compliance
CSE Updates & Implementation

Completed Actions:

- **2017**
  - Evaluation and identify Potential Nuclear NCS Issues (PNI)
- **2018**
  - Process documentation walk down
  - Collaborative hazard analysis evaluation process
  - Develop health of CSE metric to govern updates
- **2019**
  - Review administrative after-the-fact measurement-based criticality safety controls for potential improvement
- **2021**
  - Revise CSE update scoping form to resolve legacy calculation assumptions not captured as controls

Actions in Progress:

- Eliminate implementation backlog for FY 2019 and FY 2020 Criticality Safety Evaluation (CSE) updates (Sep 2021)
- Complete 25 Criticality Safety Evaluation (CSE) updates to prove-in 5 year cycle (Sep 2021)
- Implement a Non-Special Nuclear Material CSE to provide consistency across multiple buildings (Aug 2021)

CSE Updates + Implementation enable consistent field execution
Change Management: Unintended Process Change (drift)

Strengthened recognition and barriers to reduce unintended process change
Actions to Address Unintended Process Change

Completed Actions:

✓ Established collaborative hazards analysis evaluation process to support development/update of CSEs (2018)
✓ Included hands-on worker as part of the Operational Review Process (2018)
✓ Improved maintenance, update, and control of IAPP reports and established links to CSEs, UHSP monitoring reports, and Operational Reviews (2019)
✓ Conducted Statistical Process Control training and initiated control charts (2020)
✓ Updated command media for Process Descriptions (2020)
✓ Completed ANSI 8.19 NCS training for supervisors and support personnel (2020)
✓ Established training for why behind the NCS controls (2021)

Actions in Progress:

➢ Update all process descriptions (May 2021)
➢ Initiate changes to the Integrated Safety and Change Control Process and the Technical Procedure Process to strengthen process drift recognition (Jun 2021)
➢ Benchmark high-reliability chemical process facilities (Aug 2021)
➢ Complete unintended process drift training (Sep 2021)
Floor Level Improvements

CSO and NCS Staffing

NCS Analysis and Controls

IAPP Process

Operational Reviews

Process Drift

Process Description

Training

Program Sustainability

Communication Multidisciplinary Teams

Procedures

Communication

Value Stream Organization alignment prevents organizations from operating in silos

Set High Standards

NCS command media have institutionalized improved processes

Continuous Improvement

CSE Updates remove ambiguity in controls, ensure consistent field implementation, and revisits technical basis

Verbatim Compliance & Understanding Controls

Systematic reviews ensure balance between procedures and training

Questioning Attitude

SMEs for processes are change agents for understood changes and recognition of process drift

Eliminate Undesirable Conditions

Implemented predictive methods to tie production activities to cleanout frequencies

Own the Outcome

IAPP updates tied to Uranium Holdup Survey Program measurements, CSE updates, and Operational Reviews

Participative Decision Making

Operational Reviews and Hazard Evaluations provide opportunity to communicate with hands-on worker and ensure compliance with requirements

Teamwork

Tiered escalation process provides problem solving at the level closest to the work and a structure to escalate action for quick resolution

NCS Analysis and Controls

IAPP Process

Operational Reviews

Process Drift

Process Description

Training

Program Sustainability

Communication Multidisciplinary Teams

Procedures

NCS Analysis and Controls

CSO and NCS Staffing

Floor Level Improvements

Verbatim Compliance &
Understanding Controls

Systematic reviews ensure balance between procedures and training
NCS Program Continuous Improvement

- Actions are focused on improvement and sustainability
  - We have improved oversight resulting in assessments and walk downs that have self-identified issues and set high standards
  - We have updated CSEs that improved/clarified control sets, incorporated operator feedback, and provided flexibility to production
  - We have changed procedures or processes that broke down stove pipes resulting in improved communications across organization reducing the likelihood of unanticipated process change
  - We have improved Production engagement and ownership of NCS Program

- While individual issues may still occur, the NCS program is in place to minimize their occurrence and respond appropriately when they do occur and CNS operations are safe to continue

- Continued management engagement and oversight will insure high standards are maintained

CNS is committed to institutionalizing long-term improvements to the NCS program