

## NUCLEAR CRITICALITY SAFETY PROGRAM

PROGRAM APPLICABILITY: 2600

**Note that, as discussed in 10 CFR Part 70.1 (d),(e), and Part 70.60, references in this procedure to 10 CFR Part 70.61 through 70.76 (IROFS and ISAs) do not apply to 10 CFR Part 76 licensees/certificatees.**

### 8801X-01 INSPECTION OBJECTIVES

The regulatee has a criticality safety program which provides reasonable assurance that fissile material activities are conducted safely and undue risk of inadvertent criticality is avoided.

#### 01.01 Nuclear Criticality Safety Program

- a. Determine whether the regulatee obtains NCS advice from NCS staff in an NCS program that is independent from production.
- b. Determine whether procedures adequately implement the NCS program.
- c. Determine whether NCS staff evaluate proposed process changes to establish appropriate NCS limits for controlled parameters, IROFS and NCS controls on process conditions.
- d. Determine whether NCS limits, IROFS and control systems identified in safety analyses are consistent with processes and operations and are adequate to assure that operations meet the performance requirements of 10 CFR Part 70.61.
- e. Determine whether NCS considerations commensurate with the potential risk of the operation are included in written administrative procedures which adequately implement the NCS program.
- f. Assure that NCS staff are adequately qualified in accordance with license commitments.
- g. Determine whether inspections and audits systematically look at specific NCS limits and controls (IROFS), including supporting bounding assumptions, on a time period required by the license or certificate.
- h. Determine whether NCS infractions including procedural violations and equipment or system failures related to NCS are reported, reviewed, resolutions tracked and trended and negative trends are addressed.

## 8801X-02 INSPECTION REQUIREMENTS

### 02.01 Nuclear Criticality Safety Program

#### a. Administrative Procedures

By discussion and review of documents, determine whether the authority and responsibilities of the NCS staff is defined in administrative instructions.

#### b. NCS Guidance

By discussion and review of documents, determine whether NCS staff provides technical guidance on all changed or new fissile material operations and procedures, including design; and on inspection, audit, and investigation results.

#### c. Independence

By discussions, determine whether NCS staff provides technical guidance independent of operations.

### 02.02 Administrative and Operating Procedures

#### a. NCS Program Procedures

Review a sample of changes selected based on risk and operational history, to determine whether changes to NCS administrative procedures for the NCS program are adequate and effectively implemented.

#### b. Administrative Procedures for NCS Evaluations

By review of documents and discussions, determine whether administrative procedures adequately implement the NCS program described in plant documents, including the license or certificate.

#### c. Operating Procedures

By review of documents and discussions, determine whether NCS considerations are included in written operating procedures.

#### d. Nuclear Criticality Safety Limits and Controls

Observations, discussions, and document reviews should establish that NCS limits on controlled parameters, IROFS and NCS control systems identified in the ISA and NCS evaluation are contained in written operating procedures.

#### e. Pre-Fire Plans

By review of documents and discussions, determine whether the regulatee maintains an adequate Prefire Plan.

02.03 Nuclear Criticality Safety Training and Qualification

a. Qualification of Staff

By discussion and, where appropriate, review of documents, determine whether the NCS staff including analysts and the senior reviewers are qualified to do their respective safety functions. Determine by discussion and document review whether only qualified staff perform safety functions for the establishment of new safety analyses and reviews of new operating procedures.

b. Oversight of training

Determine whether NCS staff is involved in development and oversight of NCS training.

c. Operator training

Determine whether the NCS training program addresses NCS aspects of facility hazards affecting fissile material operations.

02.04 Nuclear Criticality Safety Inspections, Audits, and Investigations

a. Reporting Infractions

Determine whether the inspection program requires that individuals having unescorted access to fissile material areas report suspected or known violations of NCS requirements and procedures.

b. Inspection Program

Determine whether the regulatee has a self-inspection program that causes management representatives and NCS staff to routinely inspect areas with fissile material to ascertain that procedures are being followed and that process conditions have not been altered to affect the NCS evaluation. Determine whether NCS staff inspect new installations to ensure that NCS controls are in place prior to startup.

c. Audit Program

Determine whether the regulatee has an audit program to assess the adequacy of the NCS program as required by the license or certificate. Determine whether an audit report is forwarded to plant management and appropriate staff. Determine whether corrective actions for findings are assigned to individuals and scheduled for completion. Determine whether plant management accepts or rejects audit recommendations.

d. Corrective Actions for NCS Events

Determine whether the regulatee develops, assigns, and carries out corrective actions to prevent recurrence of IROFS failure or other NCS limit or control violations. Determine whether the regulatee has a program to analyze and trend reportable events and to develop lessons-learned from the analyses.

02.05 Plant Activities

a. Plant Tour

By review of ongoing operations and discussions with operators at their work stations, develop and maintain familiarity with the facility, equipment, operations and procedures.

b. Adequacy of Controls

Determine whether NCS limits, IROFS and control systems identified in NCS analyses are in place, are consistent with processes and operations and are adequate to maintain operations within the safety margin.

c. Operations

Determine during plant walkdowns whether the conditions assumed in the ISA and NCS evaluation remain valid and whether IROFS and controls identified in the ISA and NCS evaluation are in place and adequate.

8801X-03 INSPECTION GUIDANCE

03.01 Nuclear Criticality Safety Program

- a. Administrative Procedures The authority and responsibilities of the NCS program should be defined in administrative instructions. The NCS technical program should include development and implementation of procedures governing activities under its control.
- b. NCS Guidance NCS staff should provide guidance on new and changed fissile material operations including design of equipment and processes, development of operating procedures, and review, correction and tracking of upset conditions.
- c. Independence NCS staff should provide technical guidance while remaining organizationally independent of operations.

03.02 Administrative and Operating Procedures

- a. NCS Program Procedures The NCS technical program should be a documented system with the authority and responsibilities of the NCS staff described in administrative and technical procedures. Responsibilities should include providing advice in process design; contributing to development and review of operating and maintenance procedures; evaluating proposed process changes; and establishing NCS limits, IROFS and control systems in the ISA and NCS evaluations.
- b. Administrative Procedures for NCS Evaluations Administrative procedures for performing NCS evaluations should: 1) require formal and comprehensive safety evaluations, 2) provide guidance to control safety evaluation format and content, 3) require safety evaluations for all process changes and new processes, 4) require evaluation and reporting to plant management of non routine events, and 5) require periodic revalidating and updating, as necessary, safety analyses and related documentation to ensure consistency with the current processes.

- c. Operating Procedures NCS considerations are included in written procedures through the participation, in accordance with risk significance, of NCS staff in their preparation, review and approval.
- d. Nuclear Criticality Safety Limits and Controls Observations, discussions, and document reviews should establish that NCS limits on controlled parameters, IROFS and NCS control systems identified in the ISA and NCS evaluation selected are contained in written operating procedures. NCS controls should be adequate to meet the performance requirements of 10 CFR Part 70.61.
- e. Pre-Fire Plans Adequate requirements should be established for moderation control within an Emergency Plan or a Prefire Plan.

#### 03.03 Nuclear Criticality Safety Training and Qualification

- a. Qualification of Staff NCS staff managing, performing, or reviewing criticality safety evaluations are expected to have appropriate educational background. Individuals performing independent reviews of evaluations should have experience doing NCS evaluations at the regulatee's facility. NCS staff should maintain familiarity with current safety standards, guides, and codes and maintain familiarity with the ISA and all plant operations. NCS staff should maintain familiarity with developments in NCS through attendance at NCS technical meetings and continuing education programs.
- b. Oversight of training NCS staff should be actively involved in development, review, presentation and oversight of NCS training for staff and operators.
- c. Operator training The NCS training program should be sufficient to address NCS aspects of facility hazards affecting fissile material operations. The training program should ensure that NCS controls based on employee training are adequately implemented. The NCS training programs should be performance based, with training proportional to the level of access to fissile material and the extent of responsibility for the operation.

#### 03.04 Nuclear Criticality Safety Inspections, Audits, and Investigations

- a. Reporting Infractions The regulatee should require staff to report nonconformances with NCS requirements without penalty. Suspected or known violations of criticality safety requirements should be promptly identified and evaluated with corrective actions assigned and entered into the corrective action program.
- b. Inspection Program The regulatee should have a program to assure that areas with fissile material are routinely inspected to ascertain that procedures are being followed and that process conditions have not been altered to affect the NCS evaluation. Inspections should be performed by trained and qualified staff who are familiar with the criticality safety analytical basis for the facility. NCS staff should be required to inspect new installations to ensure that controls required by the NCS evaluation are in place prior to startup. These inspections should be conducted, in consultation with operating personnel, by individuals who are knowledgeable in NCS and who, to the extent practicable, are not immediately responsible for the operation. Inspections should include overall criticality safety practices and compliance with procedures.
- c. Audit Program The regulatee should have an audit program to assess the adequacy of the NCS program. Audits should be performed by trained and qualified staff who are familiar with the criticality safety analytical basis for the facility. Audits for compliance with the NCS analytical basis should cover the entire facility in accordance with license

commitments. External audits of the NCS program should be performed regularly in accordance with the license or certificate. An audit report should be forwarded to plant management and to appropriate plant staff. Plant management should accept or reject audit recommendations. Corrective actions for risk significant findings should be assigned to individuals and scheduled for completion.

- d. Corrective Actions for NCS Events Corrective actions are developed upon discovery of nonconformances to reduce the probability of reoccurrence of the problem. NCS staff and appropriate management should review proposed corrective actions and corrective actions should be completed on schedule. Corrective actions are assigned to a specific employee and tracked to the extent that management knows the status. The regulatee should confirm the adequacy of corrective actions prior to completion. The regulatee should have a program to analyze and trend reportable events and to develop lessons-learned from the analyses.

#### 03.05 Plant Activities

- a. Plant Tour Walkdowns of the facility should be performed to establish and maintain familiarity with the facility, processes, equipment, procedures and status of operations. Confirm that NCS practices observed seem satisfactory.
- b. Adequacy of Controls Field review of new requirements and assumptions in NCS evaluations and analysis is the focus of this inspection effort. Operating procedures should contain NCS limits on controlled parameters and operating instructions for NCS control systems. Examination of process equipment should reveal the conditions assumed in the safety evaluation and the presence of controls identified in the evaluation. Observations and discussions with operators should determine whether operators follow procedures and know and understand process conditions, NCS limits on controlled parameters, and operation of NCS control systems.
- c. Operations Identify, in NCS evaluations completed since the last NCS inspection, assumptions, NCS limits, and IROFS and NCS control systems. Review of new requirements in ISAs and NCS evaluations should be the focus of this inspection effort. Operating procedures should contain NCS limits on controlled parameters and operating instructions for IROFS and NCS control systems. Examination of process equipment should verify the conditions assumed in the ISA and NCS evaluation and the presence and adequacy of controls identified in the evaluation.

#### 8801X-04 RESOURCE ESTIMATE

An inspection performed using this inspection procedure is estimated to require 72 hours of inspector resources for Category 1 facilities, 52 hours of inspector resources for Gaseous Diffusion Plants, 26 hours of inspector resources for Category 3 facilities, and 4 hours for small critical mass or fuel cycle facilities. This estimate is only for the direct inspection effort and does not include preparation for and documentation of the inspection.

## 8801X-05 REFERENCES

U.S. Code of Federal Regulations, "Domestic Licensing of Special Nuclear Material," Part 70, Title 10, "Energy."

---"Certification of Gaseous Diffusion Plants," Part 76, Title 10, "Energy."

---"Standards for Protection Against Radiation," Part 20, Title 10, "Energy."

U.S. Nuclear Regulatory Commission, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," NUREG-1520, March 2002.

---"Standard Review Plan for the Review of a License Application for a Mixed Oxide (MOX) Fuel Facility," NUREG-1718, August 2000.

---"Nuclear Criticality Safety Standards for Fuels and Material Facilities," Regulatory Guide 3.71, August 1998.

American National Standards Institute/American Nuclear Society (ANSI/ANS)-8.1-1998, "Nuclear Criticality Safety in Operations with Fissionable Materials Outside Reactors," American Nuclear Society, La Grange Park, IL, 1998.

---ANSI/ANS-8.3-1997, "Criticality Accident Alarm System," American Nuclear Society, La Grange Park, IL, August 29, 1997.

---ANSI/ANS-8.5-1986, "Use of Borosilicate-Glass Raschig Rings as a Neutron Absorber in Solutions of Fissile Material," American Nuclear Society, La Grange Park, IL, 1996.

---ANSI/ANS-8.7-1987, "Guide for Nuclear Criticality Safety in the Storage of Fissile Material," American Nuclear Society, La Grange Park, IL, 1987.

---ANSI/ANS-8.14-2004, "Use of Soluble Neutron Absorbers in Nuclear Facilities Outside Reactors," American Nuclear Society, La Grange Park, IL, 2004.

---ANSI/ANS-8.17-1984, "Criticality Safety Criteria for Handling, Storage, and Transportation of LWR Fuel Outside Reactors," American Nuclear Society, La Grange Park, IL, January 13, 1984.

---ANSI/ANS-8.19-1996, "Administrative Practices for Nuclear Criticality Safety," American Nuclear Society, La Grange Park, IL, 1996.

---ANSI/ANS-8.20-1991, "Nuclear Criticality Safety Training," 1991.

---ANSI/ANS-8.21-1995, "Use of Fixed Neutron Absorbers in Nuclear Facilities Outside Reactors," American Nuclear Society, La Grange, IL, 1995.

---ANSI/ANS-8.22-1997, "Nuclear Criticality Safety Based on Limiting and Controlling Moderators," American Nuclear Society, La Grange Park, IL, 1997.

---ANSI/ANS-8.23-1997, "Nuclear Criticality Accident Emergency Planning and Response," American Nuclear Society, La Grange Park, IL, 1997.

END