

NUCLEAR CRITICALITY SAFETY PROGRAM

PROGRAM APPLICABILITY: 2600

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 specialists in an NCS program that is independent from production.
- b. Determine whether procedures adequately implement the NCS program.
- c. Determine whether NCSF staff evaluate each proposed process change to establish appropriate NCS limits for controlled parameters and NCS controls on process conditions.
- d. Determine whether NCS limits and control systems identified in safety analyses are consistent with processes and operations and are adequate to maintain operations within the safety margin.
- e. Determine whether NCS considerations are included in written procedures and administrative procedures adequately implement the NCS program.
- f. To 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, including supporting bounding assumptions, on a time period required by the license.
- h. Determine whether NCS procedural violations, equipment, or system failures related to NCS are reported, reviewed, and that resolutions are tracked and trended and that negative trends are addressed.

8801X-02 INSPECTION REQUIREMENTS

02.01 Nuclear Criticality Safety Program

a. Administrative Procedures

Review a sample of changes, to determine whether changes to NCS administrative procedures for the NCS program are adequate and effectively implemented.

b. Qualification of Staff

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

c. NCS Guidance

By discussion and review of documents, determine whether NCS staff provides technical guidance on all changed or new special nuclear materials (SNM) operations and procedures, including design; and on inspection, audit, and investigation results. Determine whether NCS staff maintains familiarity with current safety standards, guides, and codes; maintains familiarity with all plant operations; and provides information in the NCS training programs. Determine whether the NCS staff is trained to do their function.

d. Independence

By discussions, determine whether NCS staff provides technical guidance independent of operations for the design of equipment and processes and for the development of operating procedures.

02.02 Administrative and Operating Procedures

a. By review of documents and discussions, determine whether NCS considerations are included in written procedures through the active participation of NCS engineers in their preparation and review.

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

02.03 Nuclear Criticality Safety Training and Qualification

a. Oversight of training

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

b. Qualification of Staff

NCS analysts and the senior reviewers are qualified to do their respective safety functions. Staff managing, performing, or reviewing criticality safety evaluations are expected to have appropriate educational background. NCS staff should maintain familiarity with developments in NCS through attendance at NCS technical meetings and continuing education programs.

02.04 Nuclear Criticality Safety Inspections, Audits, and Investigations

a. Inspection Program.

1. The regulatee should have an inspection program that requires every individual to report all detected violations of written NCS requirements to area supervision. Determine whether the NCS staff are required to inspect each new installation to ensure that controls required by the NCS evaluation are in place prior to startup. Suspected or known violations of criticality safety requirements should be

promptly identified and acted upon with NCS guidance in a reasoned and controlled manner. All reported items should be evaluated with corrective actions assigned and entered into the corrective action program.

2. The inspection program requires that individuals having unescorted access to SNM areas report all suspected or known violations of NCS requirements and procedures to the area supervision. This reporting should be "penalty free" and should be strongly encouraged so that management can take corrective action. The self-inspection program is expected to be formalized as a part of the criticality safety program and documented by procedure.
3. The inspection program should require that management representatives and NCS staff routinely inspect all areas with fissile material. All operations should be reviewed frequently (at least annually) to ascertain that procedures are being followed and that process conditions have not been altered to affect the NCS evaluation. 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. These audits should include overall criticality safety practices and compliance with procedures. Results of these reviews are expected to be documented and transmitted to management.

b. Audit Program.

1. Determine whether audit teams assess the adequacy of the NCS program as required by the license or certificate. Determine whether the audit team report is forwarded to plant management and to appropriate plant staff. Determine whether corrective actions for violations of written requirements are assigned to individuals and are scheduled. Determine whether plant management accepts or rejects each audit recommendation and that corrective actions are scheduled and completed or scheduled for completion.
2. The regulatee is expected to have an audit program to assess the adequacy of the NCS program. This audit program should be a management responsibility. A formal report of the audit team should be forwarded to plant management and to appropriate plant staff. Corrective actions for violations of written requirements should be assigned to individuals and should be scheduled. The plant management is expected to accept or reject each audit recommendation, assign responsibility for corrective action, and schedule and monitor the progress of the corrective action in a timely manner.

c. Corrective Actions for NCS Events

Following recovery from a criticality limit violation, corrective actions should be developed and carried out to reduce the probability of reoccurrence of the problem. Verify that the regulatee has a program to analyze and trend reportable events and to develop lessons-learned from the analyses. NCS staff should review proposed corrective actions and corrective actions should be completed on schedule. The regulatee should confirm the adequacy of corrective actions prior to completion.

02.05 Plant Activities

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

03.01 Nuclear Criticality Safety Program

- a. The authority and responsibilities of the NCS program should be defined in administrative instructions. The NCS technical program is expected to develop and implement procedures governing activities under its control.
- b. Staff managing, performing, or reviewing criticality safety evaluations are expected to have appropriate educational background.
- c. Individuals performing independent reviews of evaluations are expected to have at least two years experience doing NCS evaluations and at least one year of experience at the company's facility.
- d. NCS staff should maintain familiarity with developments in NCS through attendance at NCS technical meetings, continuing education programs, and personal contacts with other NCS specialists.

03.02 Administrative and Operating Procedures

- a. Overall Program The management control program related to criticality safety should be a documented system described in administrative and technical procedures. Specific authorities, responsibilities, and duties should be defined in the written administrative procedures.
- b. Nuclear Criticality Safety Limits and Controls Observations, discussions, and document reviews should establish that NCS limits on controlled parameters and NCS control systems identified in the NCS evaluation selected are contained in written operating procedures through participation by NCS staff.
- c. 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 of reports of non routine events and reporting to plant management, and 5) require periodic revalidating and updating, as necessary, safety analyses and related documentation to ensure consistency with the current processes.
- d. Pre-Fire Plans Adequate requirements should be established for moderation control within an Emergency Plan or a Prefire Plan.
- e. NCS Program Procedures The authority and responsibilities of the NCS staff should be defined in administrative instructions. The NCS technical program is expected to develop and implement procedures governing activities under its control. Responsibilities include providing advice in process design; contributing to development and review of operating and maintenance procedures; evaluating proposed process changes; and establishing NCS limits and control systems in NCS evaluations.

03.03 Nuclear Criticality Safety Training and Qualification

- a. 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.

- b. The NCS training programs are expected to be performance based, with training proportional to the position of responsibility. The criticality safety training curricula for all staff having access to SNM areas are expected to contain most core elements.

03.04 Nuclear Criticality Safety Inspections, Audits, and Investigations

- a. The regulatee requires staff to report all nonconformances with NCS requirements without penalty.
- b. Inspections, audits and investigations are performed by trained and qualified staff. Qualifications should include familiarity with the criticality safety analytical basis for the facility.
- c. Operational inspections should be performed on a daily or weekly basis by staff familiar with the operations.
- d. Audits for compliance with the NCS analytical basis should cover the entire facility in accordance with license commitments.
- e. External audits of the NCS program should be performed regularly in accordance with the license.
- f. Corrective actions are developed upon discovery of nonconformances.
- g. Corrective actions are assigned to a specific employee and tracked typically by a designator such as a number so that management knows the status.
- h. Corrective actions are reviewed by NCS staff before initiation and prior to close out to confirm adequacy.

03.05 Plant Activities

- a. Plant Tour. Tour the facility to establish and maintain familiarity with the entire process. 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 know and understand process conditions, NCS limits on controlled parameters and operation of NCS control systems, and follow procedures.
- c. Operations. During the review of NCS evaluations completed since the last NCS inspection, identify required management functions, equipment conditions, NCS limits for controlled parameters and NCS control systems, and operator and support staff activities that contribute to safe operation. Review of new requirements in these safety evaluations should be 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 verify the conditions assumed in the safety evaluation and the presence and adequacy of controls identified in the evaluation.

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.

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---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.

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American Nuclear Society, La Grange Park, IL, 1997.

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