

**GLOBAL NUCLEAR FUEL-AMERICAS LICENSE AMENDMENT REQUEST
DATED May 10, 2018
REQUESTS FOR ADDITIONAL INFORMATION
CHAPTER 5.0, "NUCLEAR CRITICALITY SAFETY"**

1. Describe the internal records management requirements for retaining records of criticality safety analyses as discussed in License Application (LA) Section 5.3.2.7, including time frames for retaining those records.

The proposed change removes the commitment that records of criticality safety analyses will be retained during the conduct of licensed activities and for 6 months following cessation of those activities or for a minimum of 3 years, and replaces it with a reference to "internal records management requirements." Criticality safety analyses are used to demonstrate that processes will be subcritical under normal and credible abnormal conditions, in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Paragraph 70.61(d). This must be maintained as part of the integrated safety analysis done in accordance with 10 CFR Section 70.62 and as required by 10 CFR 70.61(a).

2. Explain when pre-operational audits are considered appropriate to verify that the installed configuration of equipment agrees with the criticality safety analysis, in LA Section 5.4.1.1. Explain if this involves verifying that controls function as required.

The proposed change added the words "as needed" to the commitment related to pre-operational audits, and removed the statement about verifying that the controls "function as intended." Paragraph 70.61(e) of 10 CFR requires that the safety program of 10 CFR 70.62, which includes management measures, ensure that items relied on for safety will be available to perform their intended safety function when needed.

3. Explain what management measures are applied to passive and active engineered controls for criticality safety. The proposed change added the following sentence to LA Section 5.4.2.1: "Beyond appropriate installation, a passive engineered control requires no human action to perform its safety function." Management measures described consist of periodic inspections or verification measurement as appropriate. Passive engineered controls may be subject to corrosion, wear, etc., and may need other management measures to be applied to maintain them (e.g., maintenance). By stating that the only human action needed consists of "appropriate installation," this appears to preclude the need for management measures other than those explicitly mentioned. A similar phrase was added to LA Section 5.4.2.2 in regard to active engineered controls, where the only management measures specifically mentioned are periodic calibration and functional testing.

Paragraph 70.61(e) of 10 CFR requires that the safety program of 10 CFR 70.62, which includes management measures, ensure that items relied on for safety will be available to perform their intended safety function when needed.

4. Explain the reason for removing the following sentence from LA Section 5.4.4.2: "When only administrative controls are used for mass controlled systems, double batching is considered to ensure adequate safety margin." If double batching is not always considered under these conditions, describe how adequate safety margins in such cases will be ensured.

Paragraph 70.61(d) of 10 CFR requires that process be shown to be subcritical under normal and credible abnormal conditions, including an approved margin of subcriticality for safety. NUREG-1520, Section 5.4.3.1.7.3(4)(c), states that when overbatching is credible, the largest mass resulting from a single failure, including beyond double batching, should be considered in criticality safety analyses.

5. Clarify what is meant by a “primary criticality safety control parameter” in connection with moderation control in LA Section 5.4.4.3. The discussion defining moderation control areas (MCAs) and moderation restricted areas (MRAs) has been significantly revised. The distinction between an MCA and MRA depends on whether moderation is controlled in conjunction with other parameters or as the “primary” criticality safety parameter. These two conditions do not appear to be mutually exclusive or to cover all possible combinations of controls (e.g., moderation could be one of several controlled parameters, but another parameter being considered the primary one).

Paragraph 70.61(d) of 10 CFR requires that nuclear processes be subcritical under normal and credible abnormal conditions, and that preventive controls and measures will be used as the primary means of protection against criticality hazards. Moderation is one of the key parameters used to meet this requirement. This clarification is needed for clarity, and to ensure that adequate control measures are provided to MCAs and MRAs respectively.

6. In LA Section 5.4.4.3, clarify the difference between controls and barriers. The proposed change added the following wording: “Process evaluations for MCA/MRA designated areas shall explicitly identify the limits, controls, and engineered barriers for designated moderator control areas.”

Paragraph 70.61(d) of 10 CFR requires that nuclear processes be subcritical under normal and credible abnormal conditions, and that preventive controls and measures will be used as the primary means of protection against criticality hazards. NUREG-1520, Section 5.4.3.1.5(2)(a), among other places, refers to safety limits and controls; criticality controls may be passive engineered, active engineered, or administrative. If there is a distinction between controls and engineered barriers, clarification is needed to ensure that appropriate management measures are applied to each.

7. State in LA Section 5.4.4.3 how MCA and MRA will be marked and controlled.

NUREG-1520, Section 5.4.3.1.7.3(9)(c) states that moderation-controlled areas should be conspicuously marked and administrative controls established to prevent credible moderator intrusion. The current LA stated that such areas will be “posted” and describes the controls that will be applied in implementing such areas. The proposed change removes this discussion.

8. Describe how the impacts of firefighting on MCA are considered in your criticality safety analyses.

NUREG-1520, Section 5.4.3.1.7.3(9)(d) states that firefighting procedures for use in moderation-controlled areas should be evaluated in criticality safety evaluations, as well as the effects of a the fire and activation of fire suppression, and that restrictions on the

use of moderating firefighting agents be included in procedures and training. LA Section 5.4.4.3 states only that fire suppression methods are considered.

9. Describe the approach towards ensuring independence when sole reliance is placed on concentration control in LA Section 5.4.4.4. The proposed change removes the discussion of attaining independence to conform to the double contingency principle.

NUREG-1520, Section 5.4.3.1.7.3(10)(d), states that transfers to unfavorable geometry tanks relying on concentration control should entail dual-independent sampling and/or in-line monitoring. The commitment meeting the intent of this acceptance criterion was removed.

10. Explain why the sentence committing to establishing controls necessary to detect and/or mitigate the effects on internal concentration, except when assuming the most reactive credible concentration, was removed from LA Section 5.4.4.4.

NUREG-1520, Section 5.4.3.1.7.3(10)(a), states that controls are established to limit concentration unless the process has been demonstrated subcritical at optimum concentration. The commitment addressing this acceptance criteria was removed.

11. Explain how the continued presence of an absorber, its distribution, its concentration, and any other characteristics associated with nuclear criticality safety will be ensured for any neutron absorbers credited in criticality safety analyses for in-process fuel. State whether you are committing to American National Standards Institute/American Nuclear Society (ANSI/ANS) 8.21-1995 (R2011). Define what is meant by "in-process fuel."

NUREG-1520, Section 5.4.3.1.7.3(12), contains acceptance criteria for the use of neutron absorbers, including committing to ANSI/ANS-8.21. This standard pertains to the use of "fixed absorbers," which does not include such in-process forms as powders or solutions. The current LA only includes a provision for crediting integral absorbers in completed fuel rods.

12. Justify removing "the larger of" in LA Section 5.4.4.6, including justifying that a "12-foot air distance" and "the greatest distance across an orthographic projection of the largest of the fissile accumulations on a plane perpendicular to the line joining their centers" always provide neutron isolation between individual fissile material units.

Paragraph 70.61(d) requires that nuclear systems be demonstrated to be subcritical under normal and credible abnormal conditions. Units that are neutronically isolated may be modeled separately to make this demonstration. When neutron interaction exists or is credible, its effect must be addressed to provide reasonable assurance of subcriticality. The current LA states that units will be considered isolated if they are separated by the larger of a 12-foot air distance or the greatest distance across an orthographic projection as described above. This has been evaluated and approved by the U.S. Nuclear Regulatory Commission and is consistent with standard industry practice. The proposed change would allow the use of either criterion, rather than the greater of the two, without providing justification.

13. Clarify whether the criticality safety analyses described in LA Section 5.4.5.5 ensure that uncontrolled parameters will be evaluated assuming optimum or worst credible values, unless specified controls are implemented to limit parameters to a particular range of

values, and whether justification for evaluating uncontrolled parameters at less than their optimum values is provided in criticality safety analyses. In addition, clarify whether normal operating conditions are described, and system interfaces considered, in your criticality safety analyses.

NUREG-1520, Section 5.4.3.1.7.2(1)(a) contains the acceptance criteria related to evaluating uncontrolled parameters at their optimum or worst credible values. The current LA Section 5.4.5.5 describes the content of criticality safety analyses, which includes a summary of bounding assumptions, including modeling of worst credible conditions, and consideration of system interfaces. The proposed change would remove much of the detail in this section, including the discussion of parameter values for controlled and uncontrolled parameters. This information is needed to demonstrate subcriticality under normal and credible abnormal conditions, as required by 10 CFR 70.61(d).