

FCSS Interim Staff Guidance-04, Revision 0

Clarification of Baseline Design Criteria

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Issue

Additional clarification is needed of the staff guidance for Baseline Design Criteria (BDC) information and level of detail expected in Title 10 of the Code of Federal Regulations (10 CFR) Part 70 licensing submittals for new facilities and new processes at existing facilities.

Introduction

The purpose of this Interim Staff Guidance (ISG) is to provide guidance for the type of information and level of detail that the staff expects for submittals from licensees/applicants to address the BDC (when required). This ISG provides additional clarification and detail for the Integrated Safety Analysis (ISA) Summary review guidance contained in Section 3.4.3.2(4)d. of NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility." This ISG is expected to assist the U.S. Nuclear Regulatory Commission (NRC) technical staff in conducting efficient reviews of licensee/applicant commitments for the application of BDC to the design of new facilities and new processes,¹ at existing facilities.

Discussion

Section 70.64(a) of 10 CFR requires applicants and licensees to address and apply ten BDC in the design of new facilities and new processes at existing facilities, and to maintain the application of these criteria unless demonstrated as not needed in the ISA. Ten general criteria are specified and are required to be addressed in the applicant/licensee submittal and applied to the design. Their application is also required to be maintained by the licensee unless the ISA demonstrates that a given item is not relied on for safety or does not require adherence to the BDC.

Section 70.65(b)(4) of 10 CFR requires that the ISA Summary must contain information that demonstrates the licensee's compliance with the requirements of 10 CFR 70.64 for BDC, if applicable.

The regulatory requirements for BDC were intended to identify standard design methods and principles that should be applied, implemented, and maintained for the design of new facilities and new processes at existing facilities. Appropriate commitments addressing the BDC should assure that safety considerations and features are incorporated as the design is developed and

¹New processes at existing facilities are those that require a license amendment under 10 CFR 70.72 and are defined by NUREG-1520 as "system-level or facility-level design changes to process equipment, process technology, facility layout, or types of licensed material possessed or used. Generally, this definition does not include component-level design changes or equipment replacement."

not found to be needed or inadequate during the final design stage, construction, or operation. The appropriate implementation of BDCs should facilitate the licensee/applicant's safety program implementation and maintenance and the ISA demonstration of compliance with the performance requirements of 10 CFR 70.61.

Regulatory Basis

10 CFR 70.64(a) and 10 CFR 70.65(b)(4)

Technical Review Guidance

The guidance for the type of information and level of detail expected for submittals intended to address the BDC are as follows:

General Guidance

- The licensee/applicant should discuss how the design process provides for and assures incorporation of the BDC. Extensive or specific design features or details are not required, but may be useful for illustration or example. Commitments to specific industry consensus standards, codes, or management measures may be used to describe the methods and controls for BDC that are to be (1) applied during the design and (2) used to maintain the application of these criteria unless it is demonstrated that they are not required by the ISA.
- BDC commitments by reference to other commitments in the licensee/applicant's submittal, such as of its management measures, is encouraged as long as there is sufficient clarity and specificity of commitment and application.
- Additional management programs or systems specifically for application or implementation of BDC should not be needed provided that there are adequate specific commitments in, and/or references to, the licensee/applicant's management measures or other programs or systems.
- The licensee/applicant should identify and discuss separately each baseline design criterion as part of its submittal.
- The licensee/applicant should state clearly how the BDC are to be applied to the design of the new facility or process and how the actual design provides for each specified requirement.
- The licensee/applicant should confirm that the application of the BDC will be maintained, unless the ISA demonstrates that a given item is not relied on for safety or does not require adherence to the specified criteria. The controls to be applied for maintaining the BDC, and for demonstration that a given item is not relied on for safety or does not require adherence to the BDC should be described. Commitments in this area by reference to other commitments in the applicant/licensee's submittal, such as its

management measures (e.g. quality assurance or configuration management systems) may be acceptable provided that there is adequate clarity and specificity of commitments.

Specific Criteria Guidance

1. 10 CFR 70.64(a)(1), Quality Standards and Records

- The licensee/applicant should state clearly how the design of the new facility or process is developed and implemented in accordance with management measures (see Section 11 of NUREG-1520 for additional guidance on management measures).
 - a. The submittal should address how appropriate management measures are applied to the development and implementation of the design to provide adequate assurance that the items relied on for safety (IROFS) are adequate and available when called upon.
 - b. Reference to specific, definitive, and adequate commitments in other parts of the submittal, such as management measures, industry programs, or consensus standards may be sufficient.
- Information should be provided as to how appropriate records will be maintained. To avoid unnecessary duplication of information, the discussion could refer to information contained elsewhere in the license/application pertaining to applicable management measures.

2. 10 CFR 70.64(a)(2), Natural Phenomena Hazards

- The licensee/applicant should state clearly how the design of the new facility or process provides for adequate protection against natural phenomena with consideration of the most severe documented historical events for the site (see Section 3 of NUREG-1520. (Note: ISG-08, "Natural Phenomena Hazards," is in draft and may provide additional guidance in this area.)
- The discussion should specifically address how natural phenomena such as the following were considered in the design of the plant:
 - a. Earthquakes and volcanoes;
 - b. Stream flooding (runoff, dam failures, downstream blockages);
 - c. Coastal flooding (hurricanes, tsunamis, seiches);
 - d. Winds including tornadoes;
 - e. Ice and snow loadings;
 - f. Temperature extremes.

3. 10 CFR 70.64 (a)(3), Fire Protection

- The licensee/applicant should state clearly how the design of the new facility or process provides for adequate protection against fires and explosions (see Section 7 of NUREG-1520 for additional guidance on fire safety).
- If appropriate, the discussion should address how the design considered the following:
 - a. The use of Fire Hazards Analyses in the ISA and pre-fire planning;
 - b. The facility design in regard to building construction, fire areas, life safety, and ventilation;
 - c. Process fire safety including explosion protection;
 - d. Fire protection systems including detection and suppression;
 - e. Manual fire suppression capability.

4. 10 CFR 70.64(a)(4), Environmental and Dynamic Effects

- The licensee/applicant should state clearly how the design of the new facility or process provides for adequate protection from environmental conditions and dynamic effects associated with normal operations, maintenance, testing, and postulated accidents that could lead to the loss of safety functions.
- The licensee/applicant should discuss how the design ensures that IROFS will perform their safety functions under the environmental and dynamic service conditions in which they will be required to function and for the length of time their function is required.
- The licensee/applicant should discuss how the design ensures that non-IROFS will not prevent satisfactory accomplishment of safety functions of IROFS.

5. 10 CFR 70.64(a)(5), Chemical Protection

- The licensee/applicant should discuss how the design of the new facility or process provides for adequate protection against chemical risks produced from licensed material, facility conditions which affect safety of licensed material, and hazardous chemicals produced from licensed material (see Section 6 of NUREG-1520 for additional guidance on BDC for chemical process safety).

6. 10 CFR 70.64(a)(6), Emergency Capability

- The licensee/applicant should state clearly how the design of the new facility or process provides for the emergency capability (see Section 8 of NUREG-1520 for additional guidance on emergency management) to maintain control of:
 - a. Licensed material and hazardous chemicals produced from licensed material. The following should be discussed:

- ~ How the site, facility, or process was designed to process and store both licensed materials and hazardous chemicals either produced from licensed material or used in the process. The licensee/applicant may refer to its site-wide security plan, if applicable.
 - ~ Controls on the interface of hazardous chemicals with the licensed material process safety program.
- b. Evacuation of onsite personnel. The following should be discussed:
- ~ What criteria were used in the design of the facility to allow personnel to evacuate, e.g., time, dose, ease of egress.
- c. Onsite emergency facilities and services that facilitate the use of available offsite services. The following should be discussed:
- ~ What offsite services will be needed in an emergency at the facility;
 - ~ What criteria was used to design the facility to detect accidents;
 - ~ What criteria was used to design the facility to alert facility staff of an accident;
 - ~ What criteria was used to design the facility to notify and coordinate with both onsite and offsite personnel;
 - ~ What criteria was used to design the facility to allow for the transportation of personnel to onsite and offsite facilities or locations.

7. 10 CFR 70.64(a)(7), Utility Services

- The licensee/applicant should state clearly how the design of the new facility or process provides for the continued operation of essential utility services².
- The licensee/applicant could include design features such as the following as possible methods to ensure continued operation of essential utilities:
 - a. For large essential electrical loads - a diesel generator with automatic start on loss of normal electrical supply supported by periodic functional testing, periodic battery checks, and configuration control;
 - b. For small essential electrical loads - an uninterruptible power supply (UPS) supported by periodic functional testing, periodic battery checks, and configuration control.

²Essential utilities are the support systems that provide for the safety function of the IROFS, e.g., power, air supply, ventilation.

8. 10 CFR 70.64(a)(8), Inspection, Testing, and Maintenance

- The licensee/applicant should state clearly how the design of the new facility or process provides for adequate inspection, testing, and maintenance of IROFS to ensure their availability and reliability to perform their function when needed (see Section 11 of NUREG-1520 for additional guidance on management measures).
- The licensee/applicant could include design features for IROFS such as the following as possible methods to provide adequate inspection, testing, and maintenance to ensure their availability and reliability:
 - a. The capability for periodic test and inspection to assess the operability and performance of IROFS;
 - b. The capability to test the functions of IROFS such as active engineered controls as a completed functioning system and under appropriate design conditions.
 - c. The capability to perform needed maintenance actions or to identify system or component maintenance needs to assure availability of IROFS features that are relied upon in the ISA to meet the 10 CFR 70.61 performance criteria.

9. 10 CFR 70.64(a)(9), Criticality Control

- The licensee/applicant should state clearly how the design of the new facility or process provides for criticality control (see Section 5 of NUREG-1520 for additional guidance).
- The discussion should identify how the following were considered in the design:
 - a. Subcriticality under normal and abnormal conditions;
 - b. Criticality accident alarm system;
 - c. Implementation of double contingency.
- The licensee/applicant could indicate its preference in the selection of controls such as:
 - a. Engineered over administrative controls;
 - b. Favorable geometry design;
 - c. Two-parameter control.

10. 10 CFR 70.64(a)(10), Instrumentation and Controls

- The licensee/applicant should state clearly how the design of the new facility or process provides for the inclusion of instrumentation and control systems to monitor and control the behavior of IROFS.

- The licensee/applicant could include the following design features as possible methods to monitor the behavior of IROFS:
 - a. Failure detection diagnostics.
 - b. Information read-out in the control room or locally for variables (e.g., temperature, pressure) used in active engineered and augmented (sometimes referred to as enhanced) administrative controls.
 - c. Bypass indication for IROFS intentionally rendered inoperable more often than annually.

- The licensee/applicant could include in the design features such as the following to control the behavior of IROFS:
 - a. Manual initiation of each individual active engineered control ensuring that all associated safety actions occur at the system level with a minimal amount of manual controls/circuitry.
 - b. Completion of a safety function once it has been initiated (seal-in capability).
 - c. System restoration requiring deliberate operator action (for example, a valve closed as a result of an automatic safety actuation should not re-open automatically when the safety signal is restored; it should remain closed until re-opened by manual action).
 - d. Indication to the operator that a safety action has been initiated

Recommendation

This ISG should be utilized as additional guidance in conjunction with that in Section 3.4.3.2(4)d. of NUREG-1520.

References

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

U.S. Nuclear Regulatory Commission (U.S.) (NRC). NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility." NRC: Washington, D.C. March 2002.

Approved: _____/RA/_____ Date: _June 9, 2005
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