

## Design and Operational Requirements Issues

*Although risk assessments enable NRC to understand the risks and hazards from the operation of nuclear facilities, these methods are not perfect and a certain level of uncertainty is always present. To compensate for these uncertainties, the NRC complements risk-informed decision-making with the concept of defense in depth. Defense in depth is an approach to safety where multiple and redundant layers of protection are used to prevent accidents, mitigate consequences, and reduce uncertainty. Some of the ways through which NRC will implement a defense in depth approach for reprocessing facilities are: 1) establishing specific design criteria the facilities must meet; 2) requiring limits on the operations of the facility; and 3) requiring specialized training and qualifications for personnel operating these facilities.*

### **NRC'S DEFENSE IN DEPTH APPROACH TO NUCLEAR SAFETY**

Defense in depth is an element of the NRC's approach to nuclear safety that employs successive measures to prevent accidents or mitigate consequences from events or accidents at a nuclear facility. In addition, the concept of defense in depth is applied throughout many of aspects of NRC's licensing and oversight of nuclear facilities. These include, among others:

- Requirements for high quality design, fabrication, construction, and testing
- Requirements for designs with multiple barriers to radioactive releases
- Redundancy and diversity in safety systems
- Specific limits on facility operations
- Requirements for detailed emergency preparedness plans

Defense in depth is an important approach to increase safety assurance and compensate for uncertainty in the understanding of risks and hazards at nuclear facilities. In addition, the NRC's defense in depth approach serves as an

important complement to risk-informed decision making.

### **GENERAL DESIGN CRITERIA**

The NRC establishes minimum requirements for the design of nuclear facilities, to ensure that the facility provides:

- Assurance that structures, systems, and components (SSCs) important to safety will have the ability and reliability to perform their intended safety functions
- Assurance that uncertainties and errors from design and analysis are adequately addressed
- Adequate defense in depth
- Redundancy and diversity
- Assurances that balance of plant and unanalyzed situations do not negatively impact safety

NRC regulations frequently identify these minimum requirements as General Design Criteria (GDC) or Baseline Design Criteria (BDC).

### **REGULATORY GAPS DISCUSSED IN THIS SECTION:**

- ✓ Gap 7 – Licensed Operators and Criteria for Testing and Licensing Operators
- ✓ Gap 9 – Baseline Design Criteria / General Design Criteria
- ✓ Gap 11 – Technical Specifications

Currently, Appendix A to 10 CFR Part 50 contains the General Design Criteria applicable to nuclear reactors. Although the GDCs listed in Appendix A are not explicitly applicable to reprocessing facilities, many of them establish design or safety features that are analogous to those that would be potentially necessary for a reprocessing facility. NRC regulations in 10 CFR Part 70 also contain some BDCs that can be applied to reprocessing facilities. However, these BDCs are more applicable to the hazards of fuel cycle facilities that do not handle highly radioactive materials. Accordingly, the NRC may need to develop appropriate GDCs that properly encompass the operations and processes encountered in a reprocessing facility.

## TECHNICAL SPECIFICATIONS

In general, technical specifications are a set of limits, controls, or settings required to maintain the safe operation of production and utilization facilities. Technical specifications would establish the safety limits for processes at reprocessing facilities in order to guard against the uncontrolled release of radioactivity. Technical specifications may include settings for safety alarms, for automatic safety systems, or other protective equipment. Technical specifications are generally developed by the applicant during the licensing process, and their content is based on the proposed facility design, its proposed operating conditions, the types of safety systems that

will be used, and the level of safety protection they must provide. Technical specifications are reviewed and approved by NRC staff prior to operations, as are any changes.

The Atomic Energy Act, as amended, requires technical specifications for the licensing and operation of any production or utilization facility, such as a reprocessing facility. Accordingly, 10 CFR Part 50 establishes criteria for technical specifications. However, 10 CFR Part 70 does not require technical specifications. Under 10 CFR Part 70, the systems and controls needed to maintain safety are identified through a risk-assessment process called an Integrated Safety Assessment (ISA), and are identified as items relied on for safety (IROFS). The specific settings that these systems must meet to provide the required level of protection are determined through the ISA process.

Accordingly, the NRC will consider regulatory requirements for technical specifications for reprocessing facilities that bridges the gap between the use of technical specifications in 10 CFR Part 50 and the use of IROFS in 10 CFR Part 70. The NRC recognizes certain advantages in the use of risk assessment methodologies to implement technical specifications, and expects to adopt the use risk-informed considerations when determining the proper technical specification requirements.

## LICENSED OPERATORS AND CRITERIA FOR TESTING AND LICENSING OPERATORS

The Atomic Energy Act, as amended, requires the NRC to establish criteria for licensing operators of production and utilization facilities, determine the qualifications of individuals applying for operator licenses, and to issue licenses as appropriate. Accordingly, NRC regulations in 10 CFR Part 55 establish the criteria for testing and licensing operators. However, these regulations are not wholly applicable to operators of reprocessing facilities. The NRC will consider testing and licensing criteria for reprocessing facility operator, either by revising 10 CFR Part 55, or by including these criteria in a revised rule for reprocessing facilities.