# Cornerstone Development

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## Cornerstone Development

### 1.0 **Background**

In staff requirements memorandum (SRM) for SECY-11-0140, "Enhancements to the Fuel Cycle Oversight Process" (Agencywide Documents Access and Management System (ADAMS) Accession No. ML120050322), the U.S. Nuclear Regulatory Commission (NRC) directed its staff to continue their interactions with stakeholders to develop the optimal basis for fuel cycle facility cornerstones and to recommend a path forward that would help ensure safe operations at these facilities. In addition, the Commission directed the staff to consider the cornerstones in the context of fuel facility operation rather than whether they resemble those of the Reactor Oversight Process (ROP). Finally, the Commission stated that possibly a combination of hazard analysis- and operations-based cornerstones "could prove to be the optimal approach to help ensure safe operations."

In response to the Commission's direction in the SRM for SECY-11-0140, a working group of NRC staff from the Offices of Nuclear Material Safety and Safeguards, Nuclear Security and Incident Response, Nuclear Reactor Regulation, and Region II was established to develop the optimal basis for the cornerstones of the Revised Fuel Cycle Oversight Process (RFCOP).

### 2.0 **RFCOP Regulatory Framework**

The staff used a top-down hierarchical approach to develop the regulatory framework for the RFCOP. The foundation of the RFCOP regulatory framework, shown in Figures 1 through 4[1], is the NRC's mission. The NRC's mission is to license and regulate the Nation's civilian use of radioactive material to protect public health and safety, promote the common defense and security, and protect the environment.

The Commission established strategic goals to meet this mission in the NRC's Strategic Plan (NUREG-1614, Volume 6, "Strategic Plan: Fiscal Years 2014–2018," issued September 2014) (ADAMS Accession No. ML14246A439). The strategic goals of safety and security are to ensure the safe and secure use of radioactive materials. Each strategic goal has objectives that form the basis for the second level in the RFCOP regulatory framework, i.e. the strategic performance areas of Fuel Facility Safety and Safeguards. The relationship between the strategic performance areas and strategic objectives is described below.

- Fuel Facility Safety: Prevent and mitigate accidents and ensure radiation safety.

- Safeguards: Ensure protection of nuclear facilities and radioactive materials, and classified and Safeguards Information.

The NRC, through its oversight process, verifies that licensees meet their regulatory requirements and therefore satisfy the strategic objectives and the NRC's mission. In addition, NRC regulations require fuel cycle licensees to control the potential impacts to workers and the public from certain hazardous chemicals used at their facilities that are associated with processes involving radioactive materials. The memorandum of understanding (MOU) with the

[1] The details of how the staff derived Figures 1 and 2 are contained in Enclosure 2 to SECY-11-0140 (ADAMS Accession No. ML111180712). The derivation of Figures 3 and 4 is discussed in this document.

U.S. Occupational Safety and Health Administration (OSHA)[2] delineates the areas of responsibility of each agency regarding occupational safety and health.

The fundamental building blocks for the RFCOP are the cornerstones, shown as the third level of the regulatory framework (Figures 2 through 4; for Figure 1 the cornerstones are shown in the fourth level). The cornerstones are those aspects of licensee performance that are important to the mission and, therefore, merit regulatory oversight. Acceptable licensee performance in these cornerstones (i.e., meeting the objectives) helps demonstrate that the NRC's mission is met.

In developing each cornerstone, the staff identified the objective, the key attributes of licensee performance necessary to achieve the objective, and the areas the NRC needs to inspect to verify that the objectives of the cornerstones are met. For each inspectable area, the staff described the scope of the inspection activities and provided the basis.

## 3.0 **Consideration of Different Cornerstone Approaches**

In response to the SRM for SECY-10-0031, the staff developed the two cornerstone approaches and proposed them in SECY-11-0140 (ADAMS Accession No. ML111180705). These cornerstone approaches were named "hazards analysis" and "operations." In response to the SRM for SECY-11-0140, the staff considered these approaches as well as a combination that included elements of both. The discussion in the subsequent paragraphs focuses on the staff's consideration of the different approaches for the cornerstones of safety (except emergency preparedness) and provides the basis for recommending a cornerstone approach (or a set of cornerstones that could be applied to the RFCOP). The cornerstones of safety would support the NRC's mission from a safety perspective.

### 3.1 Consideration of the Hazards Analysis-Based Cornerstones

The origin of the hazards analysis-based cornerstones was a comment from the Advisory Committee on Reactor Safeguards (ACRS) during a June 20, 2011, briefing to the ACRS Subcommittee on Radiation Protection and Nuclear Materials. During the briefing, the staff discussed a cornerstone approach similar to the operations-based cornerstones, and a member of that ACRS subcommittee suggested the staff try to mirror or have symmetry with the ROP (see pages 16 – 20 of ADAMS Accession No. ML11193A208). The other members of the ACRS subcommittee agreed with the comment, and the staff, in response to the ACRS comment, developed the hazards analysis-based cornerstones. The ACRS documented their preference for the hazard analysis-based approach on October 17, 2011 (ADAMS Accession No. ML11284A143). The hazard analysis-based cornerstone approach is shown in Figure 1.

[2] Memorandum of Understanding between the U.S. Nuclear Regulatory Commission and the Occupational Safety and Health Administration, "Worker Protection at Facilities Licensed by the NRC," dated September 6, 2013 (ADAMS Accession No. ML11354A432).

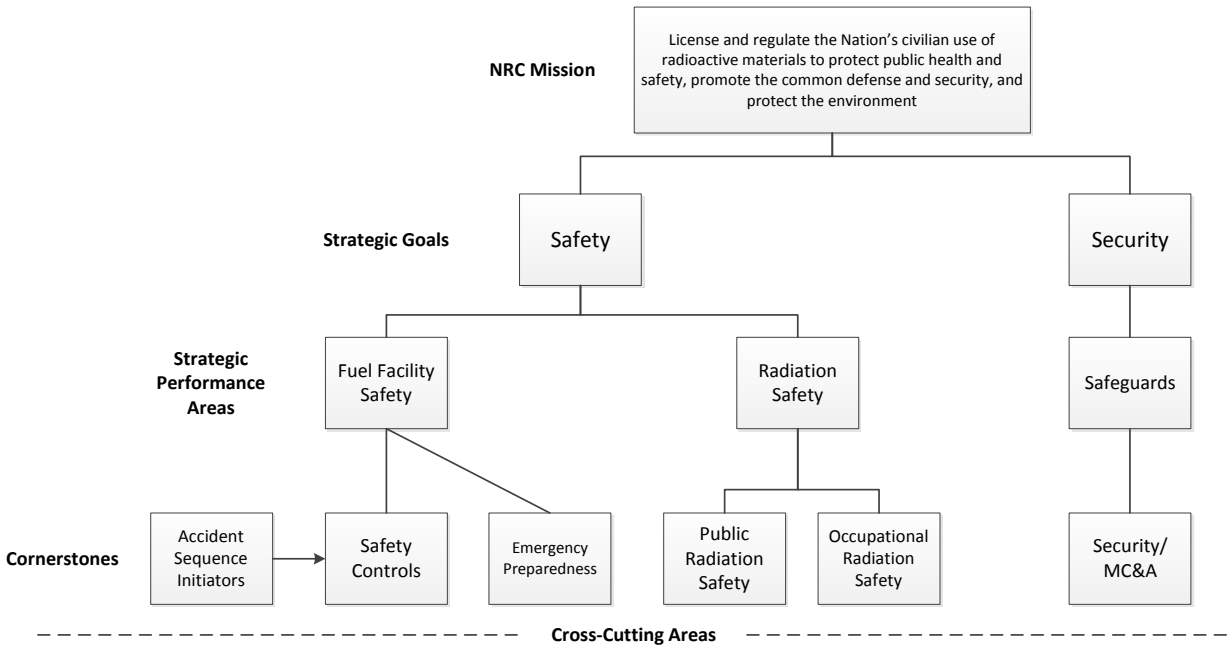


Figure 1. Hazard Analysis-Based Cornerstones (from SECY-11-0140)

The hazards analysis-based cornerstones are based on the licensees' typical approach to developing integrated safety analyses (ISAs). The ISA process is a procedure licensees continually apply to identify accident sequences and the items relied on for safety (IROFS) necessary to comply with Title 10 of the *Code Federal Regulations* (10 CFR), Section 70.61, "Performance Requirements." The licensee documents the ISA process, keeping the supporting documentation onsite at the fuel facilities and available for NRC inspection. A synopsis of the results is documented in the ISA Summary. The ISA Summary is a document that must be submitted with a license application and must contain the information specified in 10 CFR 70.65(b). It is important to note that security and MC&A are not included in the ISA. Security and MC&A are addressed in other documents such as Physical Protection Plans and Fundamental Nuclear Material Control (FNMC) Plans.

During the ISA process, licensees perform a process hazards analysis (PHA) to consider internal and external facility hazards that could become accident sequence initiators. Licensees then use the results of the PHA to identify the safety controls that would prevent accident sequences or mitigate the consequences. Typically, licensees designate only a subset of the safety controls identified in the PHAs as IROFS in order to comply with the performance requirements of 10 CFR 70.61. The licensees document the IROFS in the ISA Summary. The remaining safety controls are not included in the ISA Summary, resulting in an incomplete reflection of a fuel facility's full safety basis. Therefore, the staff concluded that a cornerstone approach based entirely on ISA summaries is not the optimal approach to assess the adequacy of safety-related operations at fuel cycle facilities. Additionally, because ISA summaries do not contain information related to safety margin, the staff may not consider important elements of a risk-informed decision making process, such as safety margin, by basing cornerstones entirely on ISA summaries.

These conclusions are consistent with the Commission's direction in the SRM for SECY-11-0140 to give "consideration to how the cornerstones would be understood in the context of fuel facility operation and less to whether they resemble those of the ROP." In reference to

developing the cornerstones in the context of fuel facility operation, industry stakeholders have stated that the hazard analysis-based cornerstones would negatively impact communication with stakeholders and create misunderstanding and confusion among facility workers, their clients, and the public (ADAMS Accession No. ML112490224). For example[3], according to licensees, employees trained in the licensee's current safety programs may become confused on how to maintain safety once introduced to terminology such as "accident sequence initiators". In addition to employees and members of the public near their facilities, licensees also consider their corporate partners as key stakeholders. Typically, licensees work with their corporate partners (e.g., international counterparts) to improve their safety programs. Licensees have stated new terminology would add complexity to those interactions and that the terminology in the operations-based cornerstones would allow them to work with their corporate partners even though regulatory requirements among them may differ.

In reference to giving less consideration to whether the cornerstones resemble those of the ROP, the staff recognizes that the hazards at fuel cycle facilities and nuclear power plants are different. The cornerstones of initiating events, mitigating systems, barrier integrity, and emergency preparedness are appropriate for the ROP because licensee performance in these areas directly relate to the reactor core. As stated in Inspection Manual Chapter (IMC) 0308, "Reactor Oversight Process Basis Document" (ADAMS Accession No. ML14164A209), for the reactor safety area to fail to meet the goal of adequate protection of public health and safety, an initiating event would have to occur, followed by failures in one or more mitigating systems, and ultimately failure of multiple barriers. If initiating events are not properly mitigated and multiple barriers are breached, a reactor accident could result which would compromise public health and safety. At that stage, the emergency plan is implemented as the last defense-in-depth measure for public protection.

In contrast to nuclear power plants, the hazards at fuel cycle facilities include toxic chemicals, fissile materials with the potential for inadvertent criticality, and radioactive materials. Acute exposure to radioactive materials has, except for plutonium facilities, relatively minor consequences when compared to toxic chemicals or exposures occurring within 20 feet of a criticality accident. Thus, except for a few large chemical sources, most hazards do not pose a significant risk to members of the public. Also, NRC regulations require protection of facility workers from certain chemical hazards based on the MOU with OSHA. Specifically, "the USNRC does not regulate substances before process addition to licensed material or after process separation unless the chemical potentially contact licensed material or cause an increase radiological risk." In addition, there is great diversity in the processes, equipment, and physical and chemical forms of radioactive material and an intimate, hands-on contact between operators and radioactive material. Finally, the designs of some types of safety controls are different both from nuclear power plants and among processes within a fuel cycle facility. For example, exposure to radioactive material and toxic chemicals are typically controlled through careful and robust containment and appropriate ventilation, and criticality is often controlled by the use of safe geometry equipment and independent controls on mass and moderation.

## 3.2 Consideration of the Operations-Based Cornerstones

[3] The discussion in this paragraph is based on remarks made by an industry representative during the September 23, 2011, briefing to the ACRS subcommittee on Radiation Protection and Nuclear Materials (ADAMS Accession ML11320A090 see pages 91-94 and 102-105).

The operations-based cornerstones reflect the licensees' typical approach to organizing their safety and security programs. The safety programs address the hazards at fuel cycle facilities and typically include environmental protection, radiation safety, chemical safety, fire protection, and nuclear criticality safety. These hazards are regulated under 10 CFR Part 20, "Standards for Protection against Radiation," 10 CFR Part 40, "Domestic Licensing of Source Material," and 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." Licensees are required by 10 CFR Parts 40 and 70 to develop safety analyses to support their operations. For 10 CFR Part 70 licensees, this includes the development of an ISA. The one operating uranium conversion plant developed an ISA to support licensing under 10 CFR Part 40. ISAs must jointly consider all relevant hazards including radiological, nuclear criticality, chemical, and fire. For the security programs, the protection of radioactive material and sensitive information are regulated under 10 CFR Part 73, "Physical Protection of Plants and Materials," 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material," and 10 CFR Part 95, "Facility Security Clearance and Safeguarding of National Security Information and Restricted Data." The operations-based cornerstone approach is shown in Figure 2.

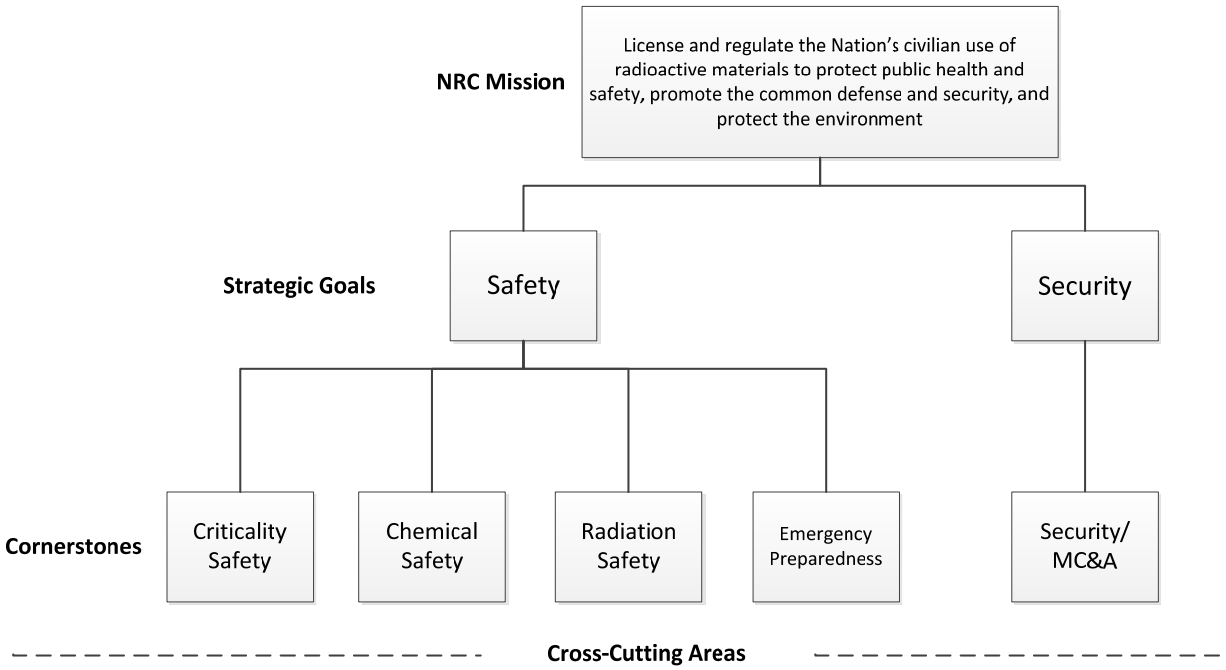


Figure 2. Operations-Based Cornerstones (from SECY-11-0140)

During the development of the operations-based cornerstones in 2011, the staff considered including a "Fire Protection" cornerstone because of its importance to facilitating safe operations. However, the performance requirements of 10 CFR 70.61 do not have consequences in terms of fire events. Instead, they have consequences in terms of radiological dose, exposure to chemicals (those within the NRC's jurisdiction), and nuclear criticality (70.61(d)). Therefore, the staff included fire protection as an inspectable area within the cornerstones of criticality safety, chemical safety, and radiation safety.

In the licensing review of fuel cycle facilities, the staff reviews a portion of all processes and relies on programmatic commitments related to safety and security in order to make a finding that there is reasonable assurance of adequate safety and security. During inspection, the staff verifies in a risk-informed and performance-based manner that licensees adequately implement

their safety and security programs. Based on the diversity of fuel cycle facilities and how they are licensed and inspected, the staff determined that the operations-based cornerstones provide an appropriate approach to verify that the NRC's mission is met. The staff also notes that the operations-based cornerstones provide an approach that is similar to the staff's current inspection program. Furthermore, there is consensus that the inspection program helps in meeting the strategic goals of ensuring safe and secure operations. The current inspection program uses insights from the ISA Summaries to inform the selection of inspection samples, and the staff expects this practice to continue.

3.3 Consideration of a "Combined" Cornerstone Approach

The staff considered a combined cornerstone approach, hazards analysis-based and operations-based, consistent with the Commission's direction in the SRM for SECY-11-0140. The combined approach is shown in Figure 3 and has the following cornerstones: Integrated Safety Analysis; Criticality Safety; Operational Safety (which includes chemical safety and fire protection); Radiation Safety; Emergency Preparedness; Security, and Material Control and Accounting. In the Fuel Facility Safety strategic performance area, the cornerstones work together by verifying adequate performance of the ISA process (i.e., the "Integrated Safety Analysis" cornerstone) and verifying adequate implementation of the safety controls and safety control support programs (e.g., management measures) in criticality, operational, and radiation safety.

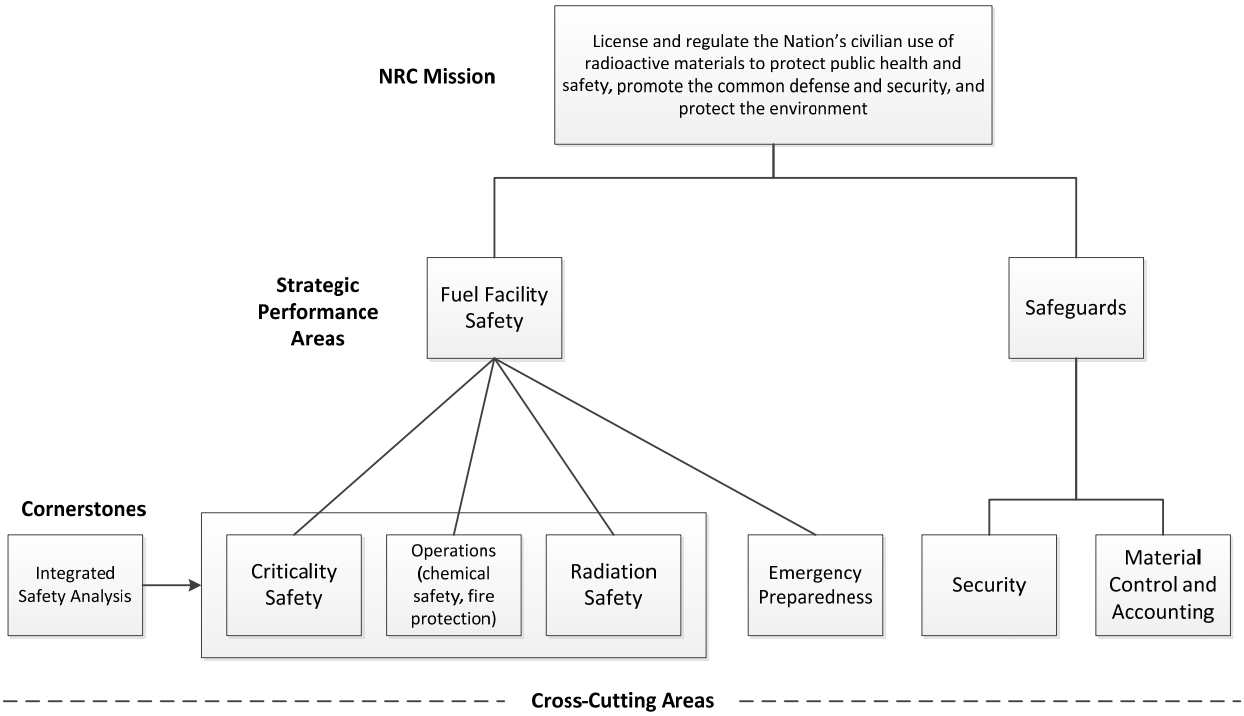


Figure 3. Combined Cornerstone Approach Considered by the Staff

The staff determined that the combined approach was not the optimal approach because confirming adequate performance of the ISA process would not provide enough data to assess a licensee's performance during operations. Currently, licensing reviews provide the regulatory vehicle for assessing adequate performance of the ISA process. In certain situations where NRC inspectors question whether a licensee properly screened an event as either not credible

or of low consequence, inspectors attempt to verify that the licensee properly applied assumptions and/or bounding calculations supporting the determination that the event is not credible or of low consequence. However, as this combined approach suggests, to develop an oversight procedure to inspect the ISA process may complicate and create unnecessary overlaps between the licensing and oversight processes.

## 4.0 **Staff's Recommendation**

After interactions with internal and external stakeholders, the staff recommends an approach similar to the "operations-based" cornerstones. The description of the staff's recommendation is provided in Section 4.1. The rationale of the staff's recommendation is discussed in Section 4.2, and the description of the recommended cornerstones is provided in Section 4.3.

### 4.1 Description of Staff's Recommendation

The staff's recommendation is shown in Figure 4 and includes the following cornerstones: Criticality Safety; Operational Safety; Occupational Radiation Safety; Public Radiation Safety; Emergency Preparedness; Security, and Material Control and Accounting.

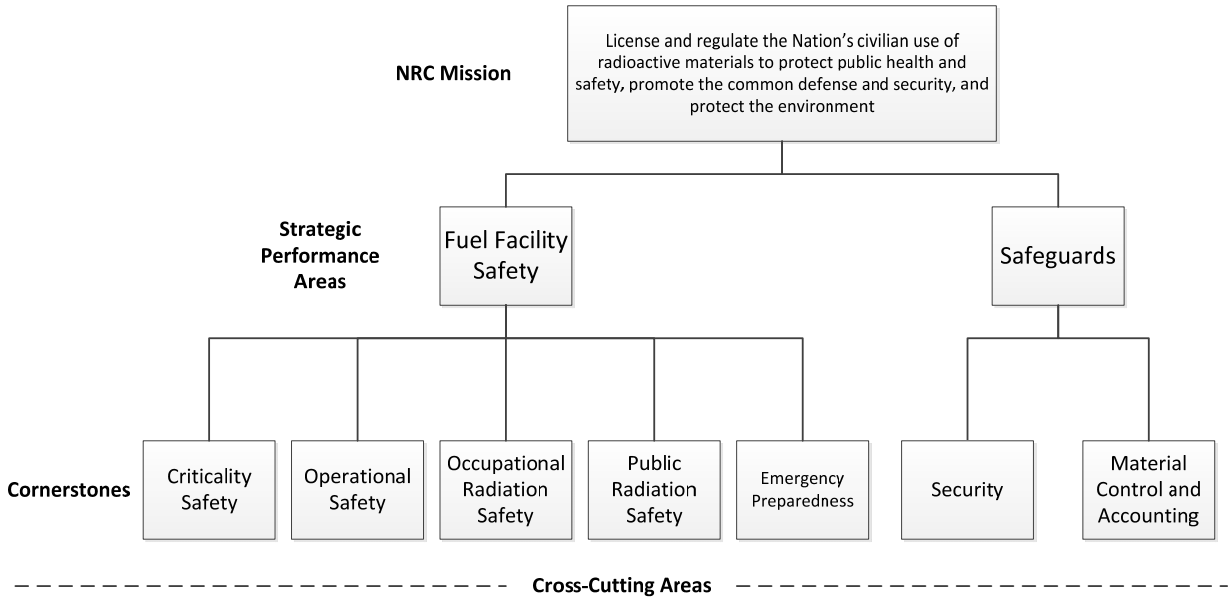


Figure 4. RFCOP Regulatory Framework Using Recommended Cornerstones

The similarities and differences between the staff's recommendation and the operations-based cornerstones can be seen by comparing Figures 2 and 4. The staff's recommendation is similar to the operations-based cornerstones because it includes cornerstones related to Criticality Safety and Emergency Preparedness. The differences are not significant. Specifically, the fire protection inspections would be incorporated into the Operational Safety cornerstone instead of being in the Criticality Safety, Chemical Safety, and Radiation Safety cornerstones. Also, to enhance communication with stakeholders, the staff's recommendation separates the Radiation Safety cornerstone from the operations-based approach into two cornerstones, Occupational Radiation Safety and Public Radiation Safety. Similarly, the staff's recommendation separates

the Security/MC&A cornerstone in the operations-based approach in two cornerstones, Security and MC&A, to enhance communication with stakeholders and for implementation purposes.

The staff developed its recommendation by considering the cornerstone approaches discussed in Sections 3.1 through 3.3 and what is important to meet the NRC's mission. Specifically, the staff considered, from a risk-informed and performance-based perspective, the important aspects of licensee performance that merit regulatory oversight. These important aspects of licensee performance are the cornerstones.

The cornerstones of safety were informed by the appropriate regulatory requirements (i.e., 10 CFR Parts 20, 40, and 70) and NUREG-1520, "Standard Review Plan for the Review of the License Application for a Fuel Cycle Facility" (ADAMS Accession No. ML101390110). NUREG-1520 provides guidance to the staff on reviewing the safety programs that licensees develop in order to comply with regulations for safe operations at fuel cycle facilities. The guidance for reviewing the safety programs is described in Chapters 3, "ISA and ISA Summary;" 4, "Radiation Protection;" 5, "Nuclear Criticality Safety;" 6, "Chemical Process Safety;" 7, "Fire Safety;" 8, "Emergency Management;" 9, "Environmental Protection;" and 11, "Management Measures."

The Criticality Safety cornerstone is related to Chapter 5. The Operational Safety cornerstone covers chemical safety and fire safety; therefore, it is related to Chapters 6 and 7. The Public Radiation Safety and Occupational Radiation Safety cornerstones are related to Chapters 4 and 9. The Emergency Preparedness cornerstone is related to Chapter 8. Finally, Chapters 3 and 11 of NUREG-1520 provide the framework for complying with the requirements of Subpart H to 10 CFR Part 70, "Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material." Therefore, they are related to the cornerstones that have an interface with the ISA Summary and management measures. Table 1 summarizes the relationship between the cornerstones of safety and the identified chapters of NUREG-1520.

Table 1. Relationship between Cornerstones of Safety and NUREG-1520 Chapters

| **Cornerstones** | **NUREG-1520 Chapters** |
|---|---|
| Criticality Safety | 5, "Nuclear Criticality Safety"<br>3, "ISA and ISA Summary"<br>11, "Management Measures" |
| Operational Safety | 6, "Chemical Process Safety<br>7, "Fire Safety"<br>3, "ISA and ISA Summary"<br>11, "Management Measures" |
| Occupational and Public Radiation Safety | 4, "Radiation Protection"<br>9, "Environmental Protection"<br>3, "ISA and ISA Summary"<br>11, "Management Measures" |
| Emergency Preparedness | 8, "Emergency Management" |

The safeguards-related cornerstones were informed by the appropriate regulatory requirements (i.e., 10 CFR Parts 73, 74, and 95) and guidance documents. The cornerstones under the safeguards strategic performance area would be applied commensurate with the type of facility (i.e., Category I, Category II, Category III fuel fabrication facility, and Category III enrichment

facility). Table 2 provides the relationship between the safeguards-related cornerstones and selected guidance documents.

Table 2. Relationship between Safeguards-Related Cornerstones and Guidance Documents

| Cornerstones | Guidance Document |
|---|---|
| Security | Regulator Guide (RG) 5.52, "Standard Format and Content of a Licensee Physical Protection Plan for Strategic Special Nuclear Material at Fixed Sites (Other than Nuclear Power Plants)"<br>RG 5.59, "Standard Format and Content for a Licensee Physical Security Plan for the Protection of Special Nuclear Material of Moderate or Low Strategic Significance" |
| Material Control and Accounting | NUREG-1280, "Standard Format and Content Acceptance Criteria for the [MC&A] Reform Amendment"<br>NUREG-1065, "Acceptable Standard Format and Content for the [FNMC] Plan Required for Low-Enriched Uranium Facilities"<br>NUREG/CR-5734, "Recommendations to the NRC on Acceptable Standard Format and Content for the FNMC Plan Required for Low-Enriched Uranium Enrichment Facilities" |

4.2 Rationale of Staff's Recommendation

The staff recommends this cornerstone approach because adequate implementation of these aspects of licensee performance in a risk-informed and performance-based manner represents adequate safe and secure operations. The recommended cornerstone approach would also provide flexibility to implement effective oversight of licensee activities to such a diverse group of facilities. Also, given that licensees are responsible, with NRC oversight, to comply with regulations for safe and secure operations, the recommended cornerstone approach aligns with licensees' typical method of organizing their safety and security programs and is within the context of fuel facility operation. Therefore, the staff's recommendation would address the Commission's direction in the SRM for SECY-11-0140. Further, as concluded by ACRS in their letter report related to the "Comparison of Integrated Safety Analysis and Probabilistic Risk Assessment for Fuel Cycle Facilities" (ADAMS Accession No. ML110460328), ISAs, in combination with practices current regulations require, are adequate for the protection of the health and safety of workers and the public, and for licensing fuel cycle facilities. The staff's recommendation would continue to use insights from the ISA summaries and the current required regulatory practices to verify licensees adequately implement safety and security programs. For the reasons cited above, the staff determined that their recommendation is the optimal basis for the cornerstones of the RFCOP.

The staff recognized for licensees to comply with regulations for safe operations at fuel cycle facilities, licensees need to prevent accidents, and, in the event an accident occurs, mitigate the consequences. Licensees can prevent accidents (i.e., minimize the occurrence) and mitigate them through the use of controls. The consequence of accidents can be mitigated through appropriate emergency response actions. Therefore, the staff included accident prevention and mitigation as the objectives of the cornerstones and a specific cornerstone on emergency preparedness whose objective is to verify that emergency response actions are adequate. In addition, controls used to prevent or mitigate accident sequences must be available and reliable

to perform their function when needed as implemented by control support programs such as the management measures required by 10 CFR 70.62(d).

To confirm the appropriateness of the staff's recommendation, the staff reviewed the International Atomic Energy Agency's (IAEA) "Guidance for the Application of an Assessment Methodology for Innovative Nuclear Energy Systems" (Section 3.4 of Volume 9 of IAEA-TECDOC-1575, Rev. 1), dated November 2008. The staff found that the cornerstones of safety are consistent with the fundamental safety functions for nuclear fuel cycle facilities of maintaining subcriticality, controlling chemistry, confining radioactive materials and shielding sources of radiation.

4.3 Description of Recommended Cornerstones

The cornerstones define the baseline inspection program under the RFCOP. Each cornerstone has several key attributes. Under each key attribute, there are one or more inspectable areas. For each inspectable area, the staff developed the scope and provided the basis. The staff selected these inspectable areas using a risk-informed and performance-based approach. They are risk-informed because the staff considered insights from the ISAs, operating experience, vulnerability assessments (security), and regulatory requirements.

The objectives of the cornerstones are provided below. Appendices A through G present a more detailed description of each cornerstone, including the key attributes and their associated inspectable areas along with the scope and basis for each inspectable area.

Criticality Safety — The objective of this cornerstone is to protect against the consequences of a nuclear criticality accident, preferably by prevention of the accident. This objective can be met by verifying the licensee evaluates the normal and credible abnormal conditions of processes involving special nuclear material and establishes and maintains robust controls to provide an appropriate margin of safety while the material remains subcritical. This objective can be further met by verifying licensee programs to monitor for a criticality accident in preparation to protect worker and public health and safety should an inadvertent criticality occur.

Operational Safety — The objective of this cornerstone is to verify the availability and reliability of IROFS and other safety controls, such as chemical safety and fire safety controls to protect worker and public health and safety. Meeting this objective includes assessing the identification, operation, and maintenance of IROFS and other safety controls that prevent, limit the frequency of, or mitigate accident sequences that could lead to accidents.

Occupational Radiation Safety — The objective of this cornerstone is to verify adequate protection of worker health and safety from exposure to radiation from radioactive materials used in nuclear fuel processing. Licensees can maintain worker protection by meeting the applicable regulatory limits including "as low as is reasonably achievable" (ALARA).

Public Radiation Safety – The objective of this cornerstone is to verify adequate protection of public health and safety from exposure to radiation from radioactive material used in nuclear fuel processing. Activities that could involve inadvertent exposure to the public include routine gaseous and liquid radioactive effluent discharges, treatment and storage of solid contaminated materials, and routine transport of radioactive materials and wastes. Licensees can maintain public protection by meeting the applicable regulatory limits, including ALARA.

Emergency Preparedness — The objective of this cornerstone is to verify that the licensee is

capable of implementing adequate measures to protect public health and safety in the event of a radiological or chemical emergency (for those chemicals under USNRC jurisdiction).

Security — The objectives of this cornerstone are:

1. To verify that the licensee's safeguards systems and programs for both fixed site and transportation shipments promote the common defense and security by protecting against: (a) acts of radiological sabotage; (b) loss, theft, and diversion of special nuclear material (SNM); and (c) unauthorized disclosure of classified and sensitive unclassified information; and

2. To verify that the licensee's physical protection systems minimize the possibility for unauthorized removal of SNM and facilitate the location recovery of missing SNM.

MC&A — The objectives of this cornerstone are:

1. To verify that the licensee's MC&A program promotes the common defense and security by detecting and protecting against loss, theft, diversion, or misuse of SNM, and facilitating the location and recovery of missing SNM.

2. To verify that the licensee adequately detects unauthorized production and unauthorized levels of enrichment of SNM at enrichment facilities.

## 5.0 **Cross-Cutting Areas**

Figure 4 depicts the concept of cross-cutting areas in relationship to the cornerstones. The staff reviewed the incorporation of cross-cutting areas in the ROP for potential applicability in the RFCOP. In the ROP, the cross-cutting areas are fundamental performance characteristics that extend across more than one cornerstone. These areas are human performance, problem identification and resolution (PI&R), and safety conscious work environment. Each cross-cutting area has several cross-cutting aspects. A cross-cutting aspect is a performance characteristic of an inspection finding that is the most significant causal factor of the performance deficiency as described in IMC 0612, "Power Reactor Inspection Reports" (ADAMS Accession No. ML12244A483). These cross-cutting aspects are listed in IMC 0310, "Aspects within the Cross-Cutting Areas" (ADAMS Accession No. ML13351A028). The staff assigns cross-cutting aspects to inspection findings and evaluates them in accordance with IMC 0305, "Operating Reactor Assessment Program" (ADAMS Accession No. ML13178A032).

After the RFCOP pilot program, the staff will reevaluate the cornerstones, their key attributes and inspectable areas to identify improvements and determine the cross-cutting areas. This assessment may necessitate the revision of the cornerstones, including the re-categorization of some key attributes and inspectable areas as cross-cutting.

The staff anticipates the RFCOP cross-cutting areas will be similar to those of the ROP, but may include areas of licensee performance in several activities related to change management. These areas may include management of facility changes; design of structures, systems, and components (SSCs); selection of human actions appropriate to maintain safety; procurement and testing of components that are appropriate to meet design function, and feedback from monitoring and PI&R processes into design, procurement, and maintenance processes.

## 6.0 **References**

Inspection Manual Chapter (IMC) 0305, “Operating Reactor Assessment Program” (ADAMS Accession No. ML13178A032).

IMC 0310, “Aspects within the Cross-Cutting Areas” (ADAMS Accession No. ML13351A028).

IMC 0612, “Power Reactor Inspection Reports” (ADAMS Accession No. ML12244A483).

“A Comparison of Integrated Safety Analysis and Probabilistic Risk Assessment,” Revision 1, dated February 2011 (ADAMS Accession No. ML110610195).

## 7.0 **RFCOP Cornerstones Working Group Members**

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- Mary Thomas, Region II
- Gregory Chapman, Office of Nuclear Material Safety and Safeguards
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- F. Scot Sullivan, Office of Nuclear Security and Incident Response
- Rebecca Richardson, Office of Nuclear Security and Incident Response
- Glenn Tuttle, Office of Nuclear Material Safety and Safeguards
- Suzanne Ani, Office of Nuclear Material Safety and Safeguards
- James Isom, Office Nuclear Reactor Regulation

## Appendix A: Criticality Safety Cornerstone

### Objective

The objective of this cornerstone is to protect against the consequences of a nuclear criticality accident, preferably by prevention of the accident. This objective can be met by verifying the licensee evaluates the normal and credible abnormal conditions of processes involving special nuclear material and establishes and maintains robust controls to provide an appropriate margin of safety while the material remains subcritical. This objective can be further met by verifying licensee programs to monitor for a criticality accident in preparation to protect worker and public health and safety should an inadvertent criticality occur.

### Key Attributes and Inspectable Areas

Experience from the history of criticality accidents, significant operational events, and enforcement actions demonstrate that having a robust nuclear criticality safety (NCS) program is essential to maintain adequate safe operation of a nuclear fuel cycle facility. Therefore, the staff derived the key attributes from the essential functions the NCS program performs to maintain safety. These functions are described in the NRC's licensing guidance, particularly the main program areas discussed in Chapter 5 of NUREG-1520, "Nuclear Criticality Safety." In addition, the staff gave consideration to those factors identified as root and contributing causes in surveys of lessons learned from historical accident and significant events, grouping those factors which have historically led to the majority of such occurrences under the headings of key attributes. The key attributes thus constitute a holistic and integrated overview of the essential functions of the NCS program which are establishing sufficient controls to maintain subcriticality; providing oversight to maintain those controls, and restoring those controls or otherwise adequately protecting workers and the public from consequences should those controls degrade or fail.

Figure A-1 shows those attributes of licensee performance that affect criticality safety. These key attributes and the inspectable areas are described below.

Attribute 1. Criticality Analysis

Establishing controls and limits in NCS evaluations to prevent criticality.

Inspectable Areas

a. Identifying credible abnormal conditions

**Scope:** Inspection activities in this area include reviewing licensee analyses and calculations to determine whether the licensee identified the most reactive conditions resulting from credible events and process deviations, based on established controls. Inspection activities also include reviewing the licensee's application of criteria for determining which abnormal conditions are considered credible.

**Basis:** This area is inspected because identification of abnormal conditions is an objective of this cornerstone and is part of meeting the performance requirement of 10

CFR 70.61(d). An assessment of criticality events has shown that failure to consider process deviations or failure to consider them credible can lead to accidents and other significant events.

b. Demonstrating subcriticality for normal and credible abnormal conditions

**Scope:** Inspection activities in this area include reviewing licensee analyses and calculations to determine whether the licensee adequately demonstrates subcriticality for the worst credible conditions, provides for sufficient margin of subcriticality as approved in the license, and bases calculations on validated methods.

**Basis:** This area is inspected because maintaining subcriticality under normal and credible abnormal conditions is an objective of this cornerstone and is part of meeting the performance requirement of 10 CFR 70.61(d).

c. Demonstrating compliance with double contingency principle

**Scope:** Inspection activities in this area include reviewing licensee demonstrations of double contingency, including the aspects of independence, concurrence, and unlikelihood. This review necessarily entails the consideration of common-mode failure, provisions for prompt detection and correction, and adherence to the preferred design hierarchy and application of management measures appropriate to the type of control.

**Basis:** This area is inspected because compliance with the double contingency principle is required for those licensees covered by the baseline design criteria in 10 CFR 70.64(a)(9). Furthermore, all existing licenses require compliance with the double contingency principle which is fundamental to the industry standard practice of criticality safety (for example, through ANS-8.1) as the preferred way of maintaining subcriticality under normal and credible abnormal conditions.

d. Specifying controlled parameters, controls, and limits

**Scope:** Inspection activities in this area focus on determining whether controlled parameters, controls, and limits listed in licensee criticality safety evaluations are sufficient to limit parameters to subcritical values. Also, inspection activities include determining whether the specification of the controls will be adequate to meet their intended safety function (e.g., specification of important attributes of engineered controls, identification of all necessary components of control systems, clarity and ready performance of procedures), and whether there is sufficient operating margin in limits and setpoints to provide high confidence that the applicable safety limits will not be exceeded.

**Basis:** This area is inspected because criticality prevention is achieved by establishing controls to limit process parameters to their subcritical values and to maintain subcriticality under normal and credible abnormal conditions.

Attribute 2. Criticality Implementation

Adequate implementation in the field of the controls established in the facility flowdown documents provides an adequate preventative measure against criticality accidents. Flowdown refers to implementing and maintaining limits and controls established in

safety basis documents in all applicable facility procedures. Inspectors normally verify that the safety limits and controls are appropriately implemented in drawings, procedures, etc. The licensee uses controls to establish safety limits on controlled parameters to prevent criticality and to maintain subcriticality under normal and credible abnormal conditions.

Inspectable Areas

a. Incorporation of engineered and administrative controls

**Scope:** Inspection activities in this area include reviewing safety basis documents such as specifications, drawings, diagrams, system descriptions, procedures, postings, and job-specific training to determine whether controls are consistent with the current safety basis as described in criticality safety evaluations. Also, inspection activities include examining facilities and processes to determine whether they are consistent with the approved safety basis.

**Basis:** This area is inspected because engineered controls must be procured, installed, and verified in order to have the specified attributes to perform their intended safety functions. The licensees must also identify these controls in equipment drawings, piping and instrumentation diagrams, and system description documents to adequately maintain them under configuration control and prevent inadvertent changes so as to compromise safety. The licensee must appropriately incorporate administrative controls into procedures, postings/operator aids, and training. The proper implementation of controls is necessary for their availability and reliability in preventing criticality.

b. Establishment of quality assurance and management measures

**Scope:** Inspection activities in this area include reviewing the specified quality assurance and management measures of criticality controls to determine whether they will be sufficient to establish and maintain the controls to an acceptable level of reliability in order to meet the performance requirements and double contingency principle.

**Basis:** This area is inspected because the licensee must maintain controls to be available and reliable to perform their safety functions and prevent criticality at an acceptable level of risk. The licensee must maintain the likelihood of a criticality as highly unlikely and of process deviations as sufficiently unlikely to meet the double contingency principle. Meeting these criteria entails maintenance, surveillance, functional testing, etc., for engineered controls and procedures, postings, audits, and training for administrative controls.

c. Interface with integrated safety analysis (ISA)

**Scope:** Inspection activities include evaluating consistency between criticality analyses and ISA and the appropriate application of the approved ISA methodology to criticality hazards.

**Basis:** This area is inspected because criticality analysis forms a significant portion of the basis for ISA. The criticality controls relied on to maintain subcriticality under normal and credible abnormal conditions must be designated as IROFS consistent with 10 CFR 70.61(e). Consistency between the safety basis as described in the criticality analysis

and the supplemental demonstration of risk in the ISA is necessary to have an accurate understanding and regulatory oversight of the risk of criticality.

Attribute 3. Criticality Operational Oversight

Maintaining controls, once established, through continuous oversight of facility operations facilitates prevention of a criticality.

Inspectable Areas

a. Preventive and corrective maintenance

**Scope:** Inspection activities in this area focus on verifying the licensee maintains controls, as specified, to maintain their availability and reliability in performing their intended safety functions and to restore them to working order when found degraded or after failure. Also, inspection activities include reviewing licensee start-up and post-maintenance verification activities prior to placing new or changed operations in service.

**Basis:** This area is inspected for licensee compliance with 10 CFR 70.62 (d). Once management measures have been established, it is necessary to verify whether the licensee properly performs them. This inspection area is necessary to support the objective of preventing criticality.

b. Functional testing and surveillance

**Scope:** Inspection activities in this area focus on determining whether surveillance is sufficient to comply with the performance requirements and double contingency principle. Inspection activities also include the review of the scope and periodicity of functional testing to determine whether the licensee verifies all aspects of control systems needed to perform their intended safety functions are working properly.

**Basis:** This area is inspected because correct performance of management measures is necessary to support the objective of preventing criticality by establishing and maintaining sufficiently robust controls.

c. Configuration and change control

**Scope:** Inspection activities in this area focus on determining whether the licensee appropriately reviews and approves new operations, change requests, and work packages, including a proper assessment of impacts on criticality safety which includes participation of operations. Inspection activities include permanent plant modifications and, temporary changes, including equipment, process, and procedural modifications. Other inspection activities determine whether the licensee controls and properly maintains facility safety basis documents.

**Basis:** This area is inspected because criticality prevention on an ongoing basis requires verifying the licensee establishes and maintains robust controls throughout the lifetime of the operation.

d. Process monitoring, sampling, and nondestructive assay

**Scope:** Inspection activities in this area include the review of the licensee's oversight of conditions to verify that process deviations with criticality potential are promptly detected and corrected as needed to meet the performance requirements and the double contingency principle. Inspection activities also include the review of operations, procedures, and sampling records to evaluate whether any single failure of administrative controls can result in criticality (such as transferring concentrated solutions from favorable to unfavorable geometry). Other inspection activities include the review of nondestructive assay methods and records to determine whether they are adequate to detect the unwanted accumulation of an unsafe mass of material that could lead to criticality.

**Basis:** This area is inspected because the double contingency principle requires the prompt detection and correction of process deviations such that the likelihood of concurrent failures is low. In potentially inaccessible areas and locations where large accumulations of fissionable material are possible, the licensee must take special care to nondestructively detect such accumulations. In addition, sampling is needed where concentrated solutions may be transferred from favorable to unfavorable geometry. Dual sampling prior to transfers and nondestructive assay has proven problematic, leading to accidents and significant events.

e. Fissile material operator training

**Scope:** Inspection activities in this area include the review of training provided to operators to determine whether they understand controls and hazards in their work areas, factors affecting criticality, potential consequence of criticality, and their responsibilities during an emergency, and plant safety policies such as stop-work authority, condition reporting, and procedural compliance. Inspection activities also include determining whether operators are appropriately trained on job-specific tasks and procedures prior to performing work. Other inspection activities include reviewing refresher training and operator aids for maintaining awareness of criticality hazards and controls and interviewing operators to determine whether they adequately understand the training.

**Basis:** This area is inspected because hands-on operation involving fissionable materials is widespread in fuel facilities, and past experience demonstrates that human error is a significant contributor to the occurrence of accidents and significant events. Training of operators to correctly perform administrative controls and recognize and appropriately respond to criticality hazards is essential to meeting the objective of preventing criticality using robust administrative controls.

Attribute 4. Criticality Programmatic Oversight

Maintaining an effective criticality safety program is essential in adequately preventing criticality accidents on an ongoing basis.

Inspectable Areas

a. Walkthroughs, inspections, and program audits

**Scope:** Inspection activities focus on verifying criticality safety staff walk through and inspect plant areas containing fissionable materials on the specified periodicity. Inspection activities further verify that criticality staff evaluates the scope, breadth, and thoroughness of those walkthroughs and inspections. Inspectors would accompany criticality staff on their inspections whenever possible and independently observe facility operations and assess their compliance with established controls and limits. Inspection activities would also verify criticality staff is familiar with operations, maintains close working relations with operations, and evaluates the results of any external program audits. Inspection activities further determine whether audit findings are appropriately handled.

**Basis:** This area is inspected because the NCS Program, as described in the license application, is the primary program responsible for preventing criticality to an acceptable level. The observation of plant operations for procedural compliance and material condition is of primary importance in preventing a degradation of the facility safety basis that could erode the ability to prevent criticality to an acceptable level.

b. Review of new operations and proposed changes

**Scope:** Inspection activities in this area include evaluating the scope and thoroughness of analyses of new and revised operations and determining whether they are performed in accordance with industry standard practices, program procedures, and license requirements. Inspection activities would also determine whether knowledgeable and qualified individuals perform criticality analyses and whether those analyses are subject to peer-review and management approval.

**Basis:** This area is inspected because criticality analysis for new or revised operations must be performed and reviewed appropriately to continuously prevent criticality.

c. Training and qualification of NCS staff

**Scope:** Inspection activities in this area include the review of the training and qualification of criticality staff to determine whether the licensee is meeting license requirements. This review also helps determine whether criticality staff is knowledgeable in the technical aspects of criticality safety, familiar with facility operations, and cognizant of the regulatory requirements.

**Basis:** This area is inspected because qualified and competent staff is essential to having confidence that the NCS Program is adequate to meet the objective of preventing criticality to an acceptable level. Given the primary importance of the NCS Program to prevent criticality, the staff implementing that program must be appropriately trained and qualified.

Attribute 5. Criticality Problem Identification and Resolution

Responding to deviations and events, thereby restoring adequate preventive measures when they are degraded or compromised, helps provide reasonable assurance that the licensee avoids criticality accidents. In the event of criticality, protecting workers and the public from its consequences by prompt and effective response and recovery is essential in meeting the cornerstone objective.

Inspectable Areas

a. Criticality alarm placement, design, testing, and maintenance

**Scope:** Inspection activities in this area include the review of the design and deployment of new and changed criticality alarm systems, including assessing the basis for detector locations and alarm setpoints, alarm logic, and vulnerability to environmental conditions (e.g., lightning, earthquakes); and on-going inspection of calibration, testing, maintenance, and audibility of the detectors and alarms

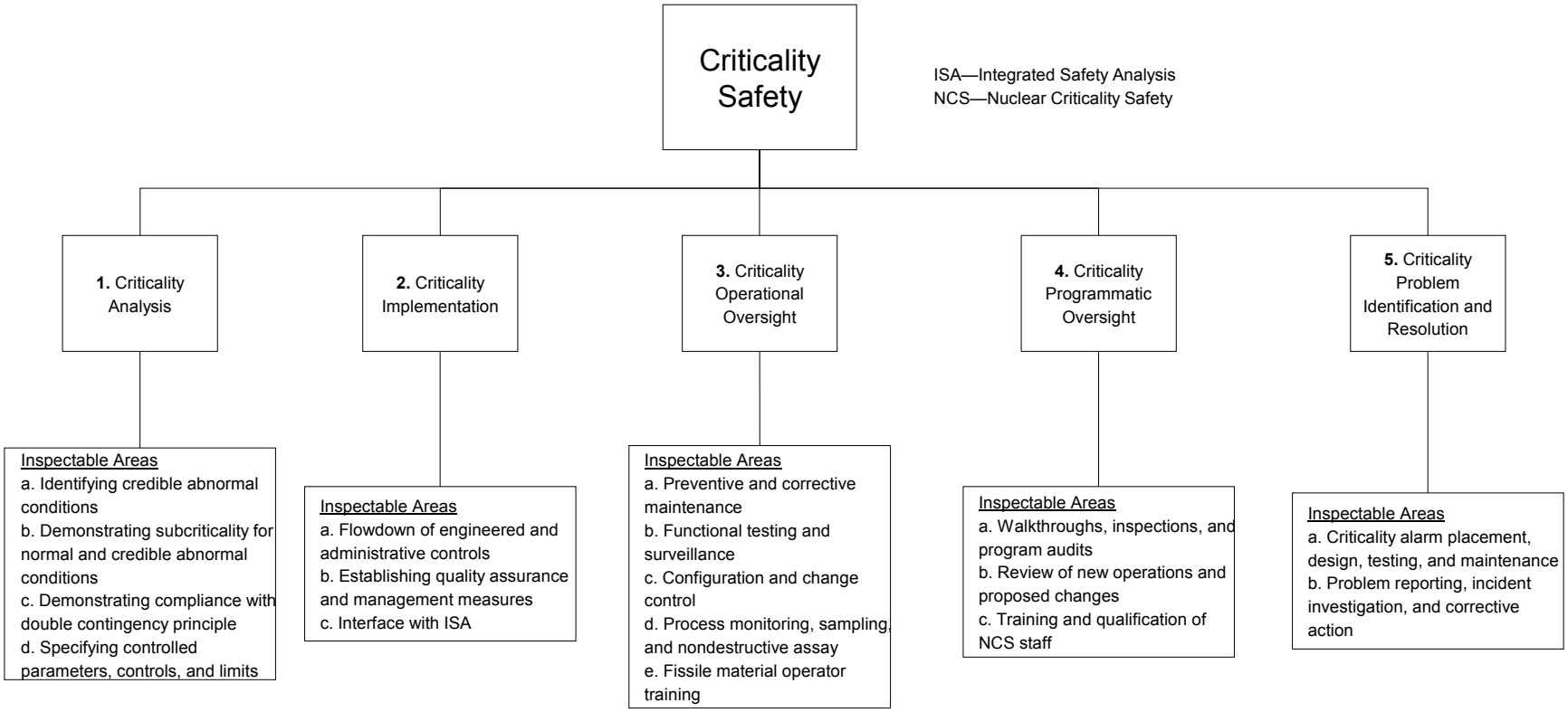
**Basis:** This area is inspected because the prompt detection of criticality is necessary for timely evacuation and the initiation of response and recovery actions. Timely evacuation is necessary to meet the objective of protecting worker health and safety from the consequences of accidental criticality.

b. Problem reporting, incident investigation, and corrective action

**Scope:** Inspection activities in this area focus on determining whether facility operators report defective conditions promptly and adhere to plant safety policies (e.g., stop work and procedural compliance). Inspectors would determine whether the licensee appropriately investigates significant events and performs adequate root cause and extent of condition reviews. Inspectors would also determine whether there is a trend of degrading performance or a preponderance of repeated or similar infractions. Inspection activities would include the evaluation of corrective actions in terms of promptness commensurate with their safety significance, effectiveness in preventing recurrence, and sufficient breadth in scope to address immediate, as-found and potential safety implications. Inspection activities would further assess whether the licensee tracks corrective actions to completion.

**Basis:** This area is inspected because, as recognized by the double contingency principle, deviations will occur. As no single occurrence must lead to an accident, such occurrences afford valuable opportunities to eliminate possible precursors before they can lead to an accident. Prompt and effective restoration of the baseline safety basis is crucial for compliance with the performance requirements and maintenance of the double contingency principle. This area is also inspected to verify the licensee is identifying and correcting problems in accordance with the corrective action program license condition.

Figure A-1. Criticality Safety Cornerstone Key Attributes



## Appendix B: Operational Safety Cornerstone

### Objective

The objective of this cornerstone is to verify the availability and reliability of IROFS and other safety controls, such as chemical safety and fire safety controls to protect worker and public health and safety. Meeting this objective includes assessing the identification, operation, and maintenance of IROFS and other safety controls that prevent, limit the frequency of, or mitigate accident sequences that could lead to accidents.

### Key Attributes and Inspectable Areas

Figure B-1 shows the attributes of licensee performance that affect operational safety. These key attributes and the inspectable areas are described below.

Attribute 1. Operational Design of Structures, Systems, and Components

The licensee's operational design is essential to identifying and implementing the appropriate IROFS and other operational safety controls required to prevent, limit the frequency of, or mitigate accidents. Adequate operational design includes appropriate assumptions regarding accident sequences and their associated hazards and safety controls.

Inspectable Areas

a. Operational Design Development

**Scope:** Inspection activities focus on evaluating credible and non-credible accident sequences as compared to the licensee's safety analyses and associated facility and equipment performance. These safety analyses include the ISA, ISA summary, and other safety analyses, such as process and fire hazards analyses. Inspection activities include an examination of the facility and equipment associated with accident sequences to determine whether the licensee is appropriately identifying IROFS and other safety controls. This examination may include reviewing design basis assumptions as compared to actual conditions, including those assumptions leading to the conclusion that an accident sequence is not credible or IROFS or other safety controls are not needed. Inspection activities further include observation of equipment operation to identify potential failure modes and resultant accident sequence initiators as compared to those analyzed in the ISA or other safety analyses.

**Basis:** This area is inspected to verify that the licensee considers in its safety analyses all potential accident sequences and respective initiators in accordance with 10 CFR 70.62(c) and as required by license condition. Inspection of this area also verifies the licensee considers all equipment failure modes when developing safety analyses in accordance with 10 CFR 70.62(c) and as required by license condition.

b. Operational Design Implementation

**Scope:** Inspection activities focus on assessing whether the results of operational safety analyses consider the effects of licensee activities such as normal and emergency operations and testing. Inspection activities include reviewing the safety analyses associated with risk-significant systems and comparing the results to the as-built conditions. Safety analyses under consideration include the ISA, ISA summary, and other safety analyses, such as process and fire hazards analyses.

**Basis:** This area is inspected to verify that the licensee's safety analyses, as required by license condition, are compatible with the as-built and operated structures, systems, and components designed to meet the performance requirements of 10 CFR 70.61.

Attribute 2. Human Performance and Procedure Quality

Appropriate procedures regarding the use, maintenance and testing of operational safety controls and IROFS facilitate proper functioning of operational safety controls and IROFS. Standard and abnormal operating procedures are essential to the licensee's appropriate implementation of operational safety controls and IROFS, as required by regulations and the license. Inadequate procedures can result in staff errors that contribute to the failure of operational safety controls or IROFS.

Inspectable Areas

a. Human Performance

**Scope:** Inspections activities focus on whether the licensee's ISA or safety analysis appropriately weighs the complexity of actions licensee staff is required to perform, provides adequate guidance in procedures, and appropriately considers, in accident sequence initiator determination, the potential performance deficiencies that might result from inadequate procedures.

**Basis:** This area is inspected to determine whether the licensee considers performance expectations of its staff when developing accident response actions in accordance with 10 CFR 70.22(i)(3)(vii and x) or 40.31(j)(3)(vii and x).

b. Procedure Quality and Use

**Scope:** Inspection activities in this area focus on the flowdown of plant procedures with regard to operational safety controls or IROFS. Inspection activities include observation of plant staff performance during operations and evaluation of any deficient performance to determine whether inadequate procedures are a contributing factor. Inspection activities also include the evaluation of the use of procedures in promoting compliance with regulations and license requirements. In addition, inspectors review selected changes to procedures to verify the procedures provide adequate guidance to plant staff on meeting NRC requirements. Inspections of this area also evaluate whether procedures adequately address various operational aspects, including startup, temporary operation, and shutdown, as required. In addition, inspection of this area verifies that observed deviations from procedures and unforeseen process changes affecting nuclear criticality, chemical, radiological, and fire safety are reported to management, documented, and investigated promptly.

**Basis:** This area is inspected to verify the licensee appropriately incorporates the required actions, as identified in the ISA Summary or safety analyses, in written operating procedures that are readily available to operators. Procedures are one of the defined 10 CFR 70.4 management measures and are required as part of a license application by 10 CFR 70.22(a)(8). For Part 40 licensees, procedures are required by 10 CFR 40.32(c).

Attribute 3. Human Performance and Training

Human performance and training in day-to-day activities, prior to any initiating event, influences the performance of process safety controls and IROFS through the conduct of operational, maintenance, and test activities. Human actions are also important for equipment to respond to initiating events. Human performance, which can involve operational safety controls or IROFS, is critical to reducing the frequency of certain accident sequences and mitigating the resulting consequences. Examples of human actions that are important to the performance of operational safety controls or IROFS would include response to alarms for elevated hydrogen fluoride concentrations in air, uranium hexafluoride ($UF_6$) in air, or the weight of a $UF_6$ cylinder. Human performance during initial training and re-qualification provide an indication of expected staff performance.

Inspectable Areas

a. Human Performance

**Scope:** Inspection activities involve observation of plant staff performance to determine adherence to applicable safety procedures, particularly with regard to the adequacy of precautions taken for radiological, chemical, toxicological, fire protection, and control of nuclear material. Inspection activities include observation of and interviews with operators to evaluate operator knowledge of process conditions, safety limits on controlled parameters and safety controls. This evaluation necessarily includes verifying operator skills in following procedures. Inspection activities also include examining conditions that are abnormal to determine whether operators are performing in accordance with approved procedures, regulatory requirements, or license commitments.

**Basis:** This area is inspected to verify that operators and technicians are adequately implementing safety controls in accordance with 10 CFR 70.22(a)(8) or 40.32(c).

b. Training

**Scope:** Inspection activities in this area focus on the effectiveness of the licensee's program for conducting initial, qualification, and requalification training for plant staff. Inspection activities in this area include the review of operational safety training and observation of plant staff performance during operations. Inspectors evaluate any deficient performance to determine whether inadequate training and qualification are contributing factors.

**Basis:** This area is inspected to verify that training is in compliance with license requirements. Training is listed as one of the 10 CFR 70.4 management measures.

Attribute 4. Performance of Management Measures

Adequate availability and reliability of structures, systems, and components that function as operational safety controls and IROFS are crucial to preventing and mitigating intermediate to high consequence events. Maintenance, surveillance, and fire protection support the availability and reliability of SSCs. In addition, external events such as flooding, cold or hot weather and loss of offsite power influence the risk of loss of operational safety controls or IROFS. Protective systems, such as freeze protection and backup power can reduce the impact of external events on the plant.

Inspectable Areas

a. Maintenance

**Scope:** Inspection activities in this area focus on verifying the licensee is implementing maintenance appropriately to assure adequate performance of operational safety controls or IROFS. Inspection activities include reviewing failure evaluations of selected IROFS to determine causes as required by 10 CFR 70.62(a). Inspectors observe maintenance activities for operational safety controls or IROFS to evaluate work practices, including post-maintenance testing.

**Basis:** This area is inspected to verify that maintenance activities for IROFS and other safety controls are adequate to assure their availability and reliability in performing their safety function and to comply with the performance requirements or appropriate license conditions. Maintenance is one of the 10 CFR 70.4 management measures.

b. Surveillance

**Scope:** Inspection activities focus on verifying the licensee is implementing surveillance to assure adequate performance of operational safety controls or IROFS. Inspection activities include evaluating the licensee's surveillance practices to determine readiness for protecting operational safety controls or IROFS from external factors such as earthquakes, tornados, hurricanes, high winds, high temperatures, cold or hot weather, and other adverse weather-related conditions. Inspection activities also include verifying that operational safety controls or IROFS will perform within the design assumptions. Inspectors review surveillance test results for adequacy in meeting the requirements, observe ongoing testing to evaluate plant staff performance, and evaluate whether test acceptance criteria are in agreement with operational safety controls or IROFS specifications.

**Basis:** This area is inspected to verify the licensee is performing surveillance activities for IROFS and other safety controls to provide reasonable assurance of their availability and reliability and to comply with the performance requirements or appropriate license conditions. Surveillance is a management measure as discussed in NUREG 1520.

c. Fire Protection

**Scope:** Inspection activities focus on evaluating protection against fires within and external to the facility. Inspection activities include a periodic assessment of conditions

related to ignition sources, control of combustible materials, and fire protection systems and equipment, including an in-depth review of fire protection of operational safety controls or IROFS and other fire protection required by the license.

**Basis:** This area is inspected to verify fire protection systems and equipment and administrative controls are available and reliable for the fire accident sequences delineated in safety analyses or the ISA, as required, in part, by 10 CFR 70.62(c)(1)(iv).

d. Flood Protection

**Scope:** Inspection activities in this area focus on a licensee's readiness to protect operational safety controls or IROFS from potential internal and external flooding. Inspection activities include walkdowns of key plant areas to verify licensee implementation of flood protection features; review of procedures including verification of key operator actions credited for coping with flood, and evaluation of compensatory measures during impending conditions of flooding or heavy rains. The inspection also focuses on verifying the consistency of the licensee's flood mitigation plans and equipment with the licensee's ISA or safety analysis.

**Basis:** This area is inspected to verify that the licensee identifies, implements, and maintains flood protection controls that are consistent with protecting the plant from external events as required by 10 CFR 70.62(c)(1)(iv) or the appropriate safety analyses required by license condition.

e. Cold or Hot Weather Protection

**Scope:** Inspection activities focus on a licensee's readiness to protect operational safety controls or IROFS from potential impacts from cold or hot weather. Inspection activities include walkdowns of key plant areas to verify licensee implementation of cold or hot weather protection features; review of procedures including verification of key plant staff actions credited for coping with cold or hot weather, and evaluation of compensatory measures during impending conditions of cold or hot weather. The inspection also focuses on verifying the consistency of the licensee's cold or hot weather protection plans and equipment with the licensee's ISA or safety analysis.

**Basis:** This area is inspected to verify that the licensee identifies, implements, and maintains cold and hot weather protection controls that are consistent with protecting the plant from external events as required by 10 CFR 70.62(c)(1)(iv) or appropriate safety analyses required by license condition.

f. Protection from Other Natural Phenomena and External Events

**Scope:** Inspection activities focus on the licensee's readiness to protect operational safety controls or IROFS from external events and other natural phenomena such as earthquakes, tornadoes, etc. Inspection activities include walkdowns of key plant areas to verify licensee implementation of protection from external hazards, review of procedures including verification of key plant staff actions credited for coping with these events, and evaluation of compensatory measures during impending hazardous external conditions. The inspection also focuses on verifying the consistency of the licensee's external event protection plans and equipment with the licensee's ISA or safety analysis.

**Basis:** This area is inspected to verify that the licensee identifies, implements, and maintains protection controls that are consistent with protecting the plant from external events as required by 10 CFR 70.62(c)(1)(iv) or appropriate safety analyses required by license condition.

g. Offsite and Onsite Power Reliability

**Scope:** Inspection activities focus on a licensee's actions to maintain the reliability of offsite power during adverse weather conditions such as freezing rain or high winds. In addition, inspection activities include reviewing licensee actions to maintain the availability and reliability of onsite backup power such as batteries and emergency diesel generators.

**Basis:** This area is inspected to verify the licensee identifies, implements, and maintains power reliability protection controls that are consistent with protecting the plant from external events as required by 10 CFR 70.62(c)(1)(iv) or appropriate safety analyses required by license condition.

Attribute 5. Configuration Control

Maintaining configuration control of operational safety controls or IROFS is essential to their availability and reliability in preventing, limiting the frequency of or mitigating the consequences of an accident.

Inspectable Areas

a. Permanent Plant Modifications

**Scope:** Inspection activities include the review of design, installation, configuration control, and post-modification testing for risk-significant permanent modifications potentially affecting operational safety controls or IROFS. Inspection activities also include an in-depth review of changes to the initial licensed design, the ISA and ISA summary or safety analysis, management measures, and normal and emergency operating procedures.

**Basis:** This area is inspected to verify that the licensee's evaluations of the modifications meet the requirements of 10 CFR 70.72, "Facility Changes and Change Process," or the appropriate license condition. Furthermore, inspection of this area verifies the licensee has adequately designed and implemented modifications and updated the ISA to include new failure modes and new assumptions.

b. Temporary Plant Modifications

**Scope:** Inspection activities include a review of design, installation, configuration control, and post-modification testing for selected potentially risk-significant temporary modifications that impact operational safety controls or IROFS.

**Basis:** This area is inspected to verify the licensee's evaluations of the modifications meet the requirements of 10 CFR 70.72 or the appropriate license condition. Furthermore, inspection of this area verifies the licensee has adequately designed and

implemented temporary modifications and updated the ISA, as necessary, to include new failure modes and new assumptions.

c. Equipment Alignment

**Scope:** Inspection activities verify that equipment is properly aligned and includes investigation of discrepancies that potentially impact operational safety controls or IROFS. Equipment alignment includes visual observation of actual valve, switch, or breaker positions and system control panels. Inspection activities also include periodic system or control panel walkdowns to verify proper alignment of operational safety controls or IROFS.

**Basis:** This area is inspected to verify that equipment is in the correct alignment for operation to support 10 CFR 70.61(e) or the appropriate license condition. In addition, inspections verify that equipment is left in the correct alignment after a modification has been implemented in accordance with 10 CFR 70.72 or the appropriate license condition.

Attribute 6. Problem Identification and Resolution

A key component of effective incident response is an adequate CAP. An adequate CAP identifies and corrects problems or indications of problems associated with a particular key attribute within a cornerstone that could lead to degraded operational safety controls or IROFS and eventually actual safety significant events. In the context of this cornerstone, the inspectable areas of problem reporting, incident investigation and corrective action are similar to those of criticality safety.

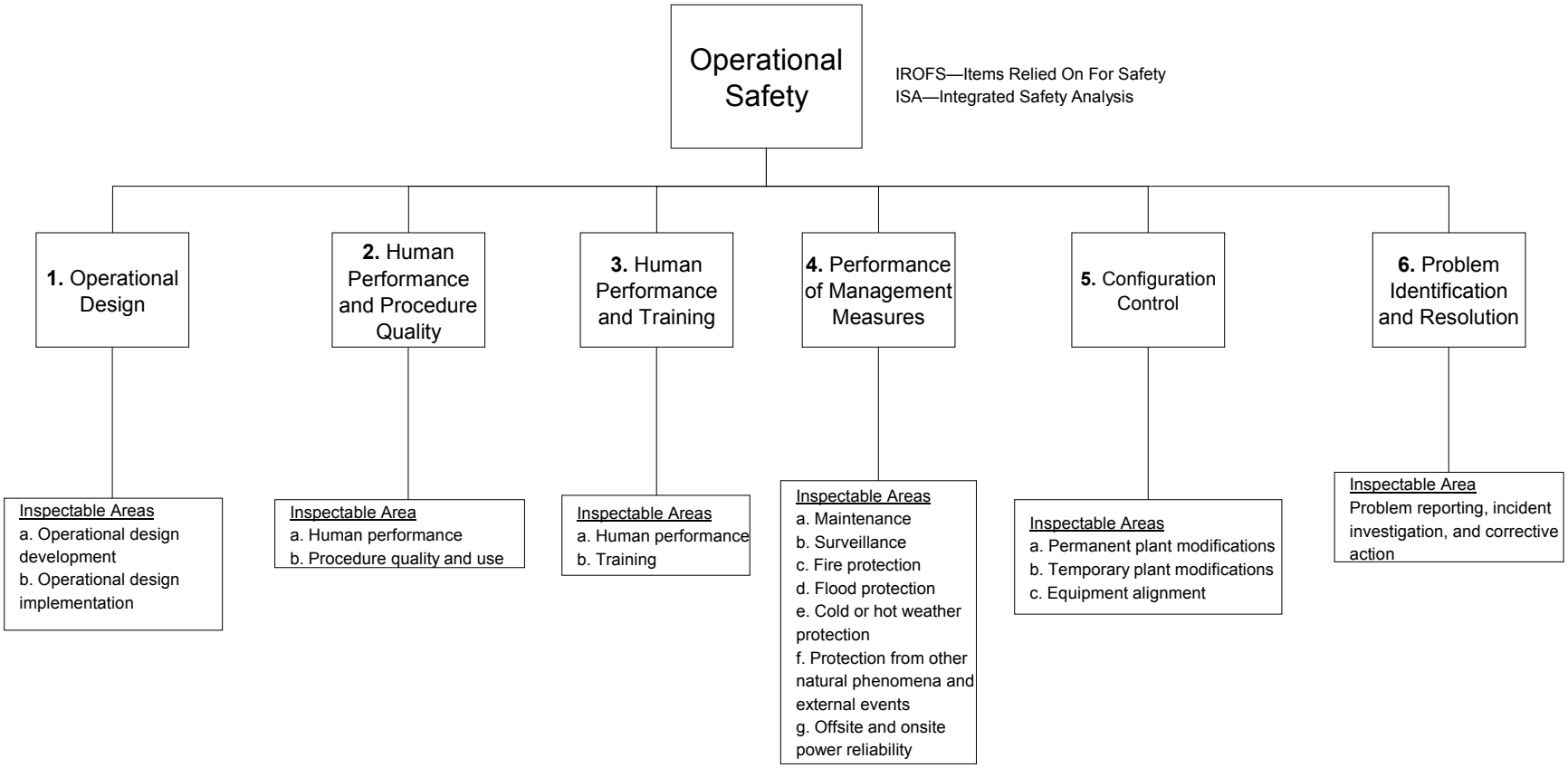
Inspectable Area

Problem reporting, incident investigation and corrective action

**Scope:** Inspection activities in this area focus on determining whether facility operators report and correct defective conditions promptly and adhere to plant safety policies (e.g., stop work and procedural compliance). Inspectors would determine whether the licensee appropriately investigates significant events and performs adequate root cause and extent of condition reviews. Inspectors would also determine whether there is a trend of degrading performance or a preponderance of repeated or similar infractions. Inspection activities would include the evaluation of the corrective action program in terms of promptness commensurate with their safety significance, effectiveness in preventing recurrence, and sufficient breadth in scope to address immediate, as-found and potential safety implications. Inspection activities would further assess whether the licensee' tracks corrective actions to completion.

**Basis:** This area is inspected because deviations will occur. Prompt and effective restoration of the baseline safety basis is crucial for compliance with the performance requirements. Furthermore, this area is inspected to verify the licensee is identifying and correcting problems in accordance with the corrective action program license condition and the management measure requirements under 10 CFR Part 70.

Figure B-1. Operational Safety Cornerstone Key Attributes



## Appendix C: Occupational Radiation Safety Cornerstone

### Objective

The objective of this cornerstone is to verify adequate protection of worker health and safety from exposure to radiation from radioactive materials used in nuclear fuel processing. Licensees can maintain worker protection by meeting the applicable regulatory limits, including "as low as is reasonably achievable" (ALARA).

### Key Attributes and Inspectable Areas

Figure C-1 shows the attributes of licensee performance that affect occupational radiation safety. These key attributes and the inspectable areas are described below.

Attribute 1. Plant Facilities, Equipment, and Instrumentation

Licensees use plant facilities, equipment and instrumentation in assessing radiological exposures to meet regulatory requirements, including limits ALARA.

Inspectable Areas

a. Control of Radiological Work Environments

**Scope:** Inspection activities verify that the licensee implements effective radiation protection (RP) controls to prevent an uncontrolled exposure in an airborne or radiation area that could potentially exceed regulatory limits. RP controls include identification and control of the hazard; administrative controls (radiation work permits (RWPs), planning, procedures, postings); physical barrier integrity or engineered controls (e.g., ropes, locked doors, respiratory protection equipment, ventilated process enclosures and gloveboxes, shielding, and ventilation systems), and radiological surveys and monitoring (e.g., RP technician coverage, personnel alarming dosimeter, or localized contamination monitoring).

**Basis:** This area is inspected to verify the licensee implements and maintains the physical and administrative controls defined in Subparts G, H, I, and J of 10 CFR Part 20; IROFS identified in the facility ISA to prevent or mitigate radiological consequences, and licensee procedures for RWPs, airborne areas, radiation areas, and worker adherence to these controls.

Licensees are required to limit occupational radiological exposure as defined in 10 CFR Part 20 and ALARA to minimize the potential for health effects. Collectively, the radiological controls provide "defense-in-depth" against a significant exposure.

b. Radiation Monitoring Instrumentation

**Scope:** Inspection activities verify that area radiation monitors, and continuous air monitors are reliable, available, and accurate in areas where activities could result in transient radiation areas or airborne areas. Instrumentation to be inspected includes

those used for routine air sampling and analysis; contamination monitoring, and bioassays. If the licensee has designated equipment as IROFS, then inspection activities also verify that appropriate management measures are in place and current for that equipment.

**Basis:** This area is inspected to verify the licensee calibrates and maintains instrumentation, including verifying alarm setpoints, as required by 10 CFR Part 20 and a licensee's procedures. Licensees are required to limit occupational radiological exposure as defined in 10 CFR Part 20 and ALARA to minimize the potential for health effects.

Attribute 2. ALARA Implementation

Licensees implement programs and processes which establish radiological controls and practices so that radiological exposures meet regulatory requirements and are ALARA.

Inspectable Areas

a. ALARA Program Controls

**Scope:** Inspection activities verify that the licensee maintains occupational exposure ALARA by properly planning and controlling radiologically significant work activities. Controls refer to those physical (e.g., locked doors, ropes, shielding, engineering controls) and administrative (e.g., surveys, planning, procedures, training, monitoring) controls that, in the aggregate, serve to mitigate exposure. Inspection activities also verify the licensee establishes reasonable goals for radiologically significant work while considering previous licensee performance and industry experience, and whether the licensee's subsequent performance meets those goals. Emphasis is placed on those licensee activities having a high individual and/or collective dose, performed in an area of higher radiological risk or of concern because of operating experience). Therefore, inspection activities may include observing selected licensee activities to verify the assumptions underlying these goals and the implementation of appropriate controls.

**Basis:** This area is inspected to verify the licensee meets the requirements of Subpart B to 10 CFR Part 20, which requires the licensee institutes a Radiation Protection Program, including procedures and engineering controls, to maintain occupational dose ALARA. As discussed in the Statement of Considerations to the 1991 10 CFR Part 20 rule change (FR Vol. 56, No. 98, page 23367), compliance with this requirement is judged on whether the licensee has incorporated measures to track and, if practical, to reduce exposures, not whether exposures represent an absolute minimum.

Licensees are required to limit occupational radiological exposure as defined in 10 CFR Part 20 and ALARA to minimize the potential for health effects. Effective ALARA planning facilitates the implementation of adequate physical and administrative controls to mitigate exposure during radiologically significant work.

b. ALARA Program Assessments

**Scope:** Inspection activities include a review of licensee audits and assessments of the ALARA program to verify the effectiveness of administrative controls, management oversight, and exposure controls (including source term reduction).

**Basis:** This area is inspected to verify the licensee meets license conditions and the requirements of 10 CFR Part 20.1101, which requires the licensee to review radiation program performance and conduct audits and self-assessments.

Attribute 3. Problem Identification and Resolution

A key component of effective incident response is an adequate CAP. An adequate CAP identifies and corrects problems or indications of problems associated with a particular key attribute within a cornerstone that could lead to degraded occupational safety controls and eventually actual safety significant events.

Inspectable Area

Problem reporting, incident investigation and corrective action

**Scope:** Inspection activities verify that: (1) the licensee's assessments of problems and issues are of sufficient scope to address the key attributes of the cornerstone to which the problem relates; (2) the licensee properly assesses the risk significance of the findings; (3) root cause analyses and corrective actions are timely and adequate to prevent recurrence; (4) the licensee considers applicable inspection findings and industry and NRC generic issues, and (5) the licensee makes required reports to the Commission. Inspection activities include verifying that the CAP is effective in identifying, resolving and preventing risk significant problems and includes a deficiency reporting process; licensee self-assessments, and quality assurance audits.

**Basis:** This area is inspected, in accordance with the CAP license condition, to verify that the licensee effectively assesses performance to identify and correct situations that could impact the cornerstone objective.

Attribute 4. Human Performance and Training

Human performance and training is evaluated to verify the licensee considers human errors and minimizes those activities with exposure potential.

Inspectable Areas

a. Human Performance

**Scope:** Inspection activities include observing radiation worker (including RP technicians) performance to verify awareness and appropriate use of radiological controls (such as properly controlling radioactive material and using respiratory protection equipment) when performing work involving radiological hazards to maintain exposures within regulatory limits and ALARA, and to prevent an unauthorized release of radioactive material to the environment. Inspection activities verify the licensee appropriately corrects radiation worker performance events, prevents their reoccurrence, and performs trending to identify underlying performance issues.

**Basis:** This area is inspected to verify compliance with 10 CFR 19.12, "Instructions to Workers" and license requirements and verify workers understand the radiological hazards associated with nuclear fuel cycle facility operation, effectively identify and

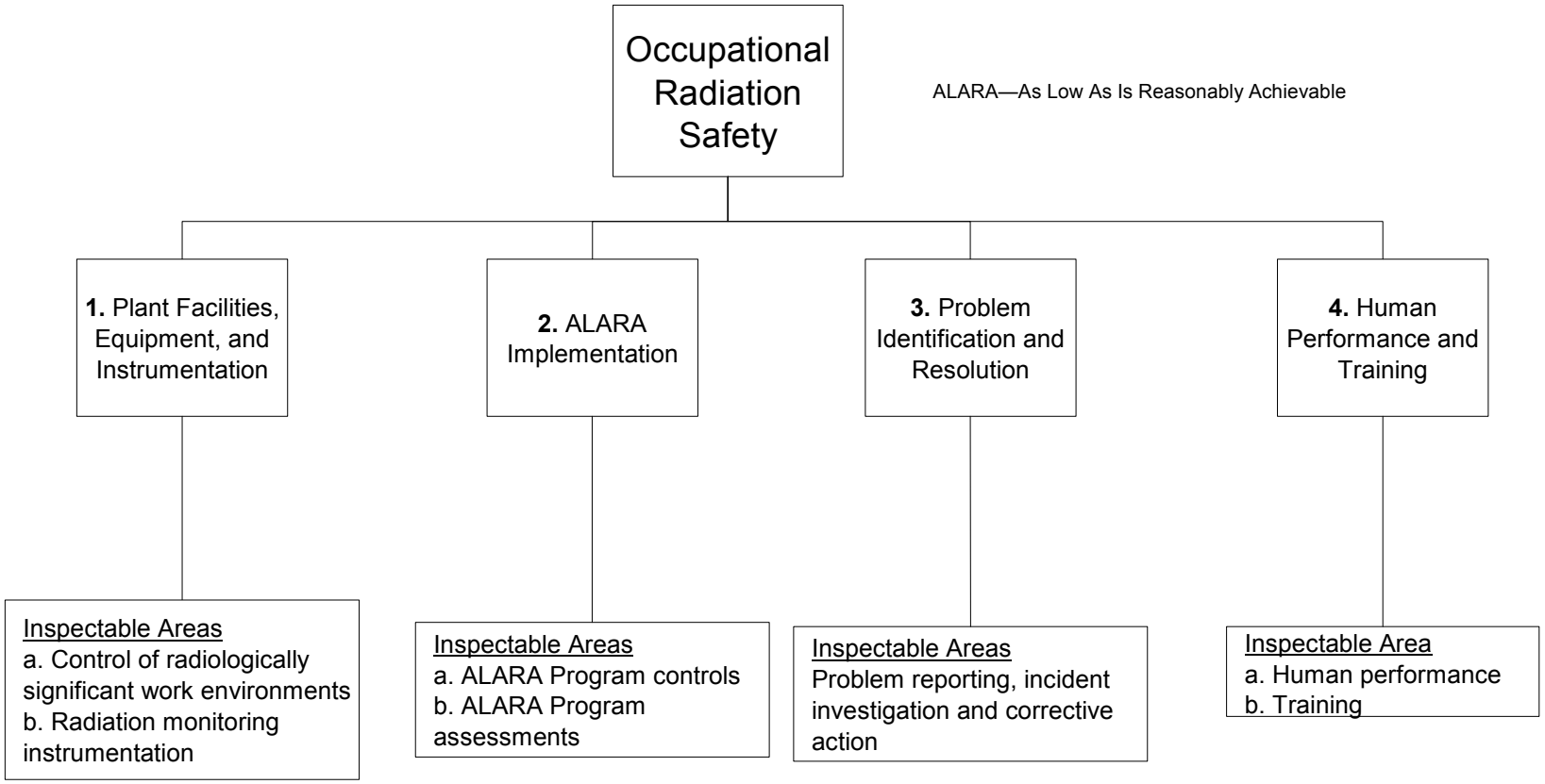
control these hazards, identify and resolve adverse trends or deficiencies, and maintain proper oversight of work.

b. Training

**Scope:** Inspection activities include the review of training records and interviews with plant staff to verify that training is in compliance with license requirements and that employees receive the training at the frequency specified in the license application, if applicable. Other inspection activities may include interviewing plant staff to determine whether there is adequate understanding of radiation protection and its relationship to accidents resulting from licensed activities.

**Basis:** This area is inspected to verify compliance with 10 CFR 19.12, “Instructions to Workers,” license requirements and 10 CFR 70.62(f), if applicable, and 10 CFR 70.4 management measures.

Figure C-1. Occupational Radiation Safety Cornerstone Key Attributes



## Appendix D: Public Radiation Safety Cornerstone

### Objective

The objective of this cornerstone is to verify adequate protection of public health and safety from exposure to radiation from radioactive material used in nuclear fuel processing. Activities that could involve inadvertent exposure to the public include routine gaseous and liquid radioactive effluent discharges, treatment and storage of solid contaminated materials, and routine transport of radioactive materials and wastes. Licensees can maintain public protection by meeting the applicable regulatory limits, including ALARA.

### Key Attributes and Inspectable Areas

Figure D-1 shows the attributes of licensee performance that affect public radiation safety. These key attributes and the inspectable areas are described below.

Attribute 1. Plant Facilities, Equipment, and Instrumentation

The release of effluents and waste is heavily dependent on the process methods to minimize waste, waste treatment methods, and the instruments the licensee uses to assess radioactive materials in the applicable media.

Inspectable Areas

a. Airborne and Liquid Effluent Treatment Systems

**Scope:** Inspection activities focus on verifying the accuracy, reliability, and availability of radiological effluent and meteorological monitors and verifying the licensee controls radiological effluent releases in accordance with license conditions and regulatory limits. Inspection activities verify the licensee maintains airborne and liquid radioactive effluent treatment systems such that radiological releases are appropriately mitigated, monitored and assessed. Inspection of overall system operation (including administrative controls) includes activities such as reviewing licensee problem and resolution assessments, semi-annual radiological release reports, the reported annual dose from airborne releases, and any compiled information evaluating emissions trends for ALARA. Other inspection activities include a walkdown of the airborne and liquid radioactive processing and monitoring systems to observe routine activities assess material condition and verify that previously identified deficiencies are being corrected. Additional areas of review may include calibration of the gaseous and liquid radiological effluent monitors, including any modifications to the system, the calibration and operation of the site meteorological monitoring system, if applicable, and modifications to the radioactive waste treatment system.

**Basis:** This area is inspected to verify the licensee maintains airborne and liquid radioactive effluent processing systems, as required by license commitments. The dose from radioactive effluents is required to be maintained within the limits of 10 CFR Part 20, as well as being ALARA to minimize the potential for health effects. Proper operation of the radioactive effluent treatment system and release point monitors help

establish adequate defense-in-depth against an unmonitored, unanticipated release of radioactivity to the environment.

b. Solid Waste Processing Systems and Storage

**Scope:** Inspection activities focus on assessing the as-built system configuration and operation as compared to the license description and determining whether the licensee has established adequate measures for the proper labeling and handling of solid radioactive waste storage containers. Inspection activities include assessing operational and non-operational equipment for unmonitored release paths, sources of unnecessary personnel exposure, and inadvertent hindrance of operations important to protecting public safety. Other inspection activities include reviewing changes made to solid radioactive waste processing systems to verify the licensee maintains public radiation safety. Inspections will also include an assessment of solid waste storage and handling, including access control, housekeeping, posting and labeling, appropriate separation from other hazardous materials, and environmental control such as protection from weather and fire.

**Basis:** This area is inspected to verify the licensee maintains facilities, equipment, and instrumentation related to solid waste processing systems and storage to comply with licensee conditions, 10 CFR Part 61, and Subparts L and M of 10 CFR 20.

Attribute 2. Radioactive Material Processing, Packaging, Transportation and Monitoring

The licensee establishes programs and processes to comply with regulations and license conditions with regards to radioactive material treatment, processing, transportation, and monitoring.

Inspectable Areas

a. Radioactive Material Processing, Packaging and Transportation

**Scope:** The focus of the inspection is to verify that the licensee conducts radioactive material processing and transportation to maintain radiation exposure to members of the public within regulatory limits. Inspection activities verify the licensee institutes the appropriate controls for the processing and transportation of radioactive material to a licensed disposal facility or other licensed recipient. Inspection activities include reviewing the administrative and physical controls for the processing and transportation of radioactive material. Inspection activities also include independent validation of the transportation program via review and observation of a sample of selected shipping activities and records having risk-significance. Emphasis is also given to the 10 CFR Part 61 waste characterization and stability requirements (III.A.3 and III.C.5 of Appendix G to 10 CFR Part 20). The inspection uses licensee documentation and assessments for the review of lesser shipping activities, administrative controls, worker training and qualifications, and to verify the licensee addresses changes to the NRC transportation requirements.

**Basis:** This area is inspected to verify that the radioactive material processing, packaging and transportation program comply with the requirements of 10 CFR Parts 20 and 71. Radioactive material intended for disposal must also comply with 10 CFR 61.55

- 61.57 waste classification and stability requirements.

b. Radiological Environmental Monitoring Program

**Scope:** Inspection activities verify the Radiological Environmental Monitoring Program (REMP) reasonably measures the effects of radioactive releases to the environment and sufficiently validates the integrity of the airborne and liquid effluent release program. The inspection activities include a review of any radiological environmental monitoring reports and licensee assessments to verify the licensee implements the REMP as required by license commitments and procedures. Emphasis is placed on verifying that environmental sampling is representative of the release pathways and that the licensee appropriately addresses missed samples and/or inoperable sampling/analyses equipment. Inspection activities include walkdowns to observe sampler stations, environmental sampling and analyses techniques, and a review of the calibration and maintenance of the counting room instrumentation. The inspection also considers the quality of procedures, quality assurance results of sample analysis, tracking of samples and other minor administrative processes. Further programmatic assessments include a review of adverse trends or recurrent problems, identified through licensee assessments or the semi-annual effluent reports, and periodic observations of REMP worker and equipment performance.

**Basis:** This area is inspected to verify the licensee implements the REMP consistent with the licensee's commitments and procedures to validate that the effluent release program meets the ALARA principle. The REMP supplements the effluent monitoring program by verifying that the effluent measurements and modeling of effluent pathways appropriately predict the measurable concentrations of radioactive materials and levels of radiation. As such, the REMP helps to provide reasonable assurance that the associated dose from radioactive releases is within regulatory limits. Industry experience has shown that the REMP is often the primary method of assessing the potential risk from unplanned or unmonitored radioactive releases.

Attribute 3. Problem Identification and Resolution

A key component of effective incident response is an adequate CAP. An adequate CAP identifies and corrects problems or indications of problems associated with a particular key attribute within a cornerstone that could lead to degraded public radiation safety controls and eventually actual safety significant events.

<u>Inspectable Area</u>

Problem reporting, incident investigation and corrective action

**Scope:** Inspection activities focus on the licensee's effectiveness in identifying, resolving and preventing risk significant problems. Inspection activities verify that: (1) the licensee's assessments of problems and issues are of sufficient scope to address the key attributes of the cornerstone; (2) the licensee properly assesses the risk significance of the findings; (3) root cause analyses and corrective actions are timely and adequate to prevent recurrence; (4) the licensee considers applicable inspection findings and industry and NRC generic issues, and (5) the licensee makes required reports to the Commission. Inspection activities include verifying that the CAP is effective in identifying, resolving and preventing risk significant problems and includes a deficiency

reporting process; licensee self-assessments, and quality assurance audits.

**Basis:** This area is inspected, in accordance with the CAP license condition, to verify that the licensee effectively assesses performance to identify and correct situations that could impact the cornerstone objective.

Attribute 4. Human Performance and Training

Human performance and training is evaluated to verify the licensee considers human errors and minimizes those activities with exposure potential.

Inspectable Areas

a. Human Performance

**Scope:** Inspection activities include observing radiation worker (including RP technicians) performance to verify awareness and appropriate use of radiological controls when performing work involving radiological hazards to maintain exposures within regulatory limits and ALARA, and to prevent an unauthorized release of radioactive material to the environment. Inspection activities verify the licensee appropriately corrects identified radiation worker performance events, prevents their reoccurrence, and performs trending to identify underlying performance issues. Of special concern are maintenance activities when contract staff, having varying levels of experience, performs radiologically significant work.

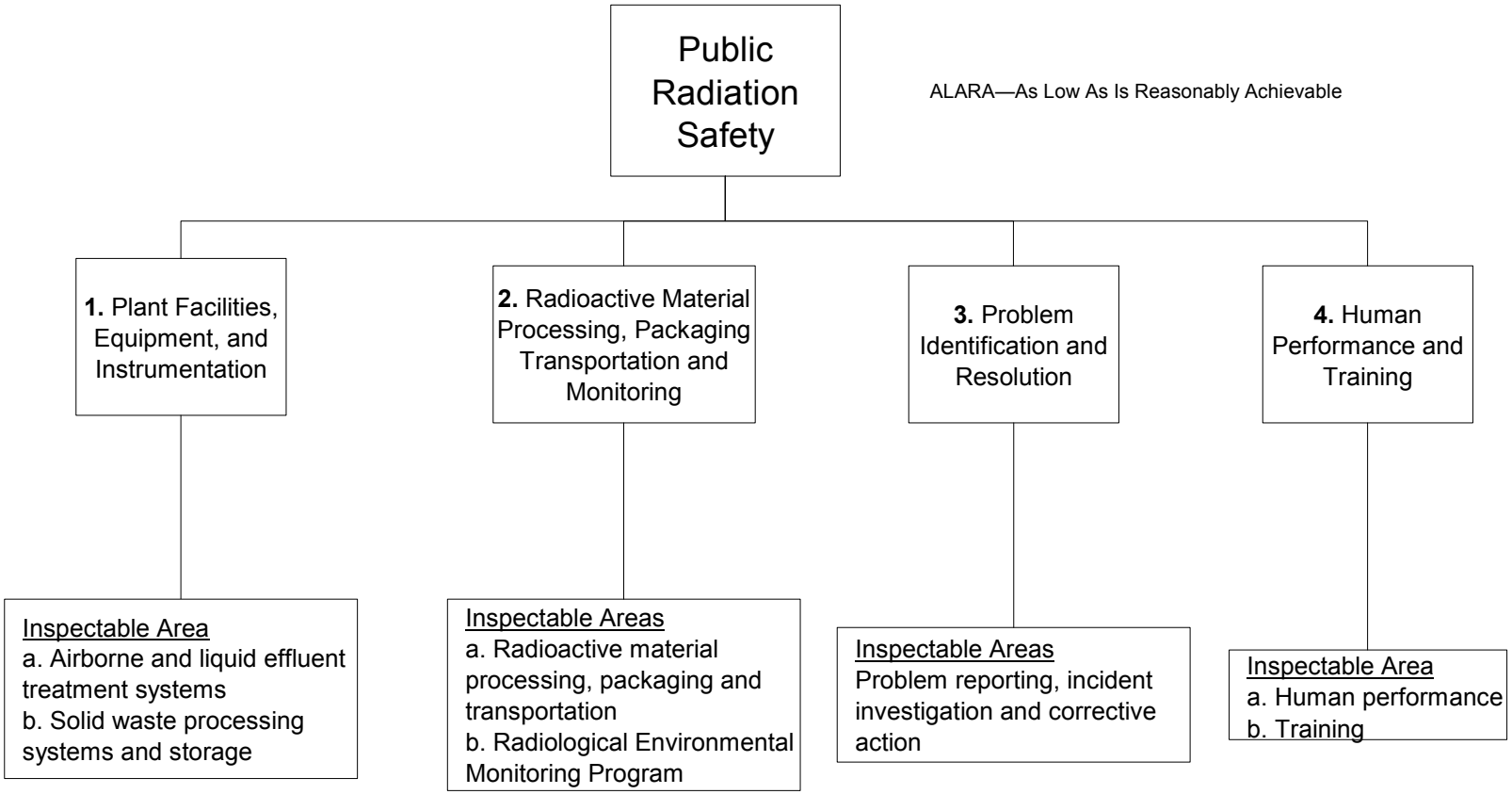
**Basis:** This area is inspected to verify compliance with 10 CFR 19.12, “Instructions to Workers” and license requirements and verify workers understand the radiological hazards associated with nuclear fuel cycle facility operation, effectively identify and control these hazards, identify and resolve adverse trends or deficiencies, and maintain proper oversight of work. The associated risk is the potential for a significant, unplanned release resulting either directly or in part by the failure of a worker to perform a required task as a result of insufficient knowledge.

b. Training

**Scope:** Inspection activities include interviewing plant staff and reviewing training records to determine whether there is adequate understanding of radiation protection and its relationship to radioactive waste operations and accidents resulting from licensed activities; whether personnel certifying and processing radioactive material shipments are adequately trained and qualified, and whether personnel are adequately trained in environmental protection. Other inspection activities may include the review of training records and interviews with plant staff to verify that employees receive training at the frequency specified in the license application, if applicable.

**Basis:** This area is inspected to verify licensee compliance with license conditions, subsection II of Appendix G to 10 CFR Part 20, 10 CFR 70.4 management measures, and 49 CFR 172.204.

Figure D-1. Public Radiation Safety Cornerstone Key Attributes



## Appendix E: Emergency Preparedness Cornerstone

### Objective

The objective of this cornerstone is to verify that the licensee is capable of implementing adequate measures to protect public health and safety in the event of a radiological or chemical emergency (for those chemicals under USNRC jurisdiction).

### Key Attributes and Inspectable Areas

Figure E-1 shows the key attributes of licensee performance that affect emergency preparedness. These key attributes and the inspectable areas are described below.

Attribute 1. Emergency Readiness (Emergency Response Organization (ERO), including Fire Brigade, as applicable)

Implementation of the Commission-approved emergency plan is dependent on the readiness of the ERO to respond to emergencies. The emergency plan and its implementation are required via 10 CFR 40.31(j)(1)(ii) and 40.35(f) and 10 CFR 70.22(i)(1)(ii) and 70.32(i). Per 10 CFR 40.31(j)(3)(vii) and 10 CFR 70.22(i)(3)(vii), the emergency plan must contain a description of the ERO which includes those licensee personnel responsible for responding to an accident and developing, maintaining, and updating the emergency plan. Licensee training programs provide the ERO knowledge base, and the drills provide opportunities to gain proficiency and maintain skills in individual duties and team function in the integrated organization. Licensee assessment of ERO performance during drills and exercises identifies successful performance and areas for improvement. The ability to augment onsite ERO staff facilitates full staffing of the ERO within the timeliness goals of the emergency plan.

Inspectable Areas

a. ERO Drill Participation

**Scope:** Inspection activities focus on the licensee's participating in drills or exercises, developing proficiency, and maintaining skill (including the self-assessment noted below (2.a)). Inspection activities include reviewing the adequacy of drill participation frequency for members of the ERO.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

b. Timely ERO Augmentation

**Scope:** Inspection activities include ERO notification system functionality, ERO response timeliness, and adequacy of the ERO staffing duty roster. Inspection activities also include review of the results of the licensee's testing of the ERO notification system, evaluation of ERO augmentation timeliness during drills, exercises and actual events,

and review of adequacy and qualifications of ERO staff on the duty roster.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

Attribute 2. Emergency Performance (ERO, including Fire Brigade)

The adequacy of the implementation of the emergency plan is dependent on the performance of the ERO in their emergency plan assignments. The technical aspects of these assignments generally align with the expertise of the individual, but also include duties unique to emergency response. The opportunity to demonstrate proficiency is provided in drills, exercises, and actual events that require implementation of the emergency plan. ERO performance during initial and re-qualification drills and exercises provide an indication of expected ERO performance during an actual event.

Inspectable Area

Emergency Performance

**Scope:** Inspection activities focus on:

1) timely and accurate classification of events;
2) timely and accurate notification emergency classification to offsite government authorities;
3) timely and accurate development of Protective Action Recommendations (PARs);
4) timely and accurate notification of PARs to offsite authorities;
5) timely and effective fire brigade performance, as applicable, and
6) ERO performance assessment.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

Attribute 3. Procedure Quality

Appropriate procedures that control preparedness and response facilities, equipment, and actions facilitate adequate emergency preparedness and response. Maintenance and testing procedures are essential to providing adequate capability and functionality of emergency response facilities. Emergency plan implementing procedures are essential for adequate ERO performance in accordance with the emergency plan. Inadequate procedures may result in ERO response errors that lead to the inadequate implementation of the emergency plan.

Inspectable Area

Procedure Quality

**Scope:** Inspection activities focus on the clarity and quality of emergency plan implementing procedures with regard to risk-significant procedures, i.e., those procedures associated with the emergency performance attributes 2.a.1) through 2.a.4)

above, through observation of ERO performance in planned exercises, drills, or inspector walkthroughs.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

Attribute 4. Facility and Equipment Performance

The Emergency Response Plan specifies emergency response facilities and equipment needed to implement licensee emergency response. Licensees are required to maintain these facilities and equipment. Where applicable, licensees are required to maintain operability of the public warning system (PWS).

Inspectable Areas

a. Availability of PWS

**Scope:** Inspection activities focus on verifying that the PWS, if required, is able to perform its design function, as specified in the emergency plan. Inspection activities include reviewing the licensee's testing activities for the PWS.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

b. Availability of Facilities and Equipment

**Scope:** Inspection activities focus on verifying the licensee performs surveillance testing of facilities and equipment to provide adequate reliability and availability in performing intended safety functions. Inspection activities include reviewing surveillance test results for adequacy in meeting the requirements.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

Attribute 5. Offsite Emergency Preparedness Support

State and local government authorities maintain offsite emergency preparedness programs and implement protective actions to protect public health and safety. Where required, there may be a Letter of Agreement between licensee and local authorities to provide support. The Emergency Response Plan, via 10 CFR 40.31(j)(3)(viii) and 40.35(f) and 10 CFR 70.22(i)(3)(viii) and 70.32(i), requires the licensee to supply appropriate information to offsite authorities to allow timely implementation of this support.

Inspectable Area

Offsite Emergency Preparedness Support

**Scope:** Inspection activities focus on information that the licensee provides to offsite support (such as the fire department and medical support), as defined in the emergency plan. Inspection activities include review of the licensee's training and orientation of offsite support groups and, potentially, discussions with offsite support group representatives to determine that the licensee offers and conducts training and orientation, as required by the emergency plan.

**Basis:** This area is inspected to verify the licensee is implementing the program in accordance with the Emergency Response Plan, emergency implementing procedures, license conditions, 10 CFR 40.31(j) and 40.35(f), and 10 CFR 70.22(i) and 70.32(i).

Attribute 6. Problem Identification and Resolution

A key component of effective incident response is an adequate CAP. An adequate CAP identifies and corrects problems or indications of problems associated with a particular key attribute within a cornerstone that could lead to degraded emergency preparedness actions and eventually actual safety significant events.

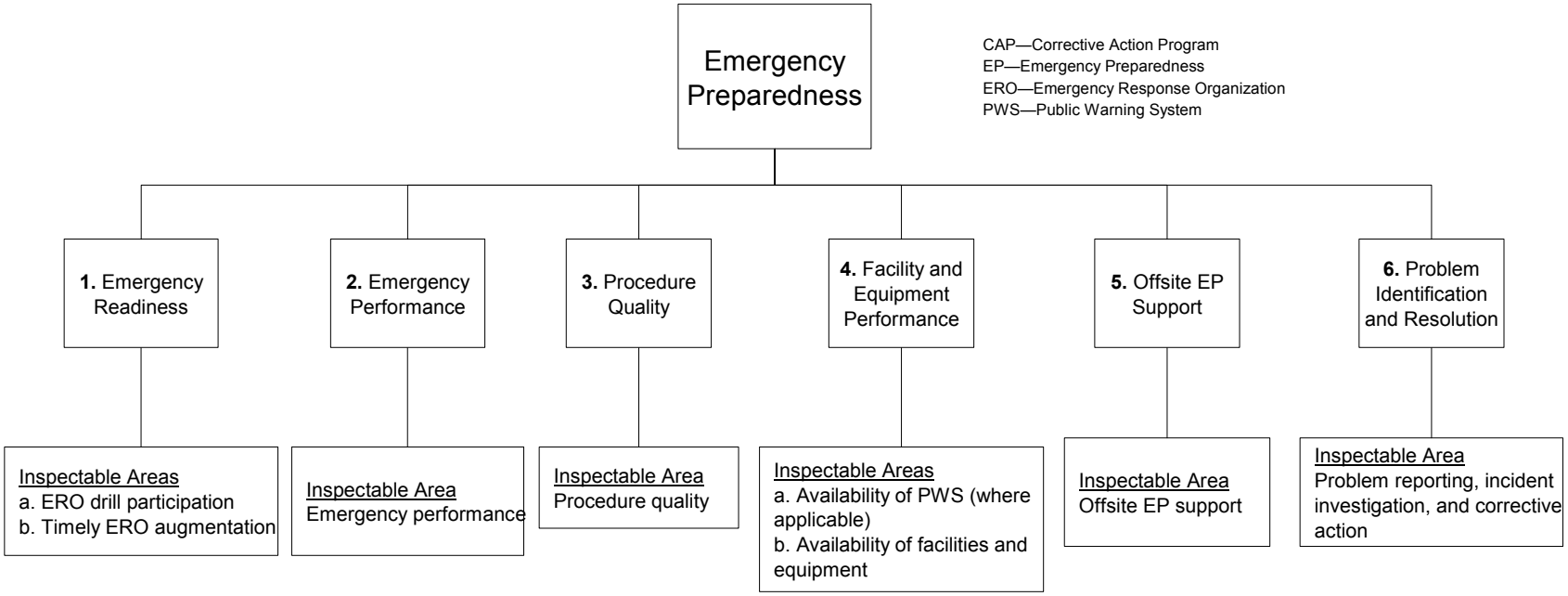
Inspectable Area

Problem reporting, incident investigation and corrective action

**Scope:** Inspection activities verify that: (1) the licensee's assessments of problems and issues are of sufficient scope to address the key attributes of the cornerstone; (2) the licensee properly assesses the risk significance of the findings; (3) root cause analyses and corrective actions are timely and adequate to prevent recurrence; (4) the licensee considers applicable inspection findings and industry and NRC generic issues, and (5) the licensee makes required reports to the Commission. Inspection activities include verifying that the CAP is effective in identifying, resolving and preventing risk significant problems and includes a deficiency reporting process; licensee self-assessments, and quality assurance audits.

**Basis:** This area is inspected, in accordance with the CAP license condition, to verify that the licensee effectively assesses performance to identify and correct situations that could impact the cornerstone objective.

Figure E-1. Emergency Preparedness Cornerstone Key Attributes



## Appendix F: Security Cornerstone

### Objective

The objectives of this cornerstone are:

3. To verify that the licensee's safeguards systems and programs for both fixed site and transportation shipments promote the common defense and security by protecting against: (a) acts of radiological sabotage; (b) loss, theft, and diversion of special nuclear material (SNM); and (c) unauthorized disclosure of classified and sensitive unclassified information; and

4. To verify that the licensee's physical protection systems minimize the possibility for unauthorized removal of SNM and facilitate the location recovery of missing SNM.

### Key Attributes and Inspectable Areas

Figure F-1 shows those attributes of licensee performance that affect security systems. These key attributes and the inspectable areas are described below.

Note: There are various categories of licensees which possess various quantities and types of special nuclear material; as such, the security-related regulatory requirements for each specific class of facility or material license holder will vary. Each licensee shall establish and maintain physical security in accordance with the appropriate regulatory requirements and orders specific to each class of facility or material license. Additionally, controlled areas, as identified below, are those areas that either meet the specifications of a: (1) Protected Area; (2) Material Access Area; (3) Controlled Access Area; (4) Vital Area; or (5) Vault.

Attribute 1. Access Authorization

Access authorization measures will vary based on the type of material that the facility is licensed to possess. This area measures the ability of the licensee to implement its access authorization program in accordance with regulatory requirements. Inspection areas for this key attribute include (1) security plans and procedures; (2) personnel screening; (3) fitness for duty (FFD); and (4) personnel monitoring programs. These key areas provide integral information as to how the licensee grants, monitors, denies, and revokes individuals' unescorted access authorization into controlled areas. The establishment of reliability and trustworthiness for persons granted unescorted access to controlled areas is a major component of protection against the insider threat.

Inspectable Areas

a. Security Plans and Procedures

**Scope:** Inspection activities focus on the review of the facilities' security plans and procedures related to the implementation of the access authorization program.

**Basis:** This area is inspected to verify facility security plans and procedures adequately

describe how the licensee plans to meet regulatory requirements in 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

b. Personnel Screening

**Scope:** Inspection activities focus on the review of the facilities' records to verify that personnel screening requirements have been met.

**Basis:** This area is inspected to verify the licensee maintains an access authorization program, which may include background investigations and psychological assessments for granting individuals unescorted access to controlled areas with the objective of providing reasonable assurance that the individuals are trustworthy and reliable and do not constitute an unreasonable risk to public health and safety including the potential to commit radiological sabotage and effect the loss, theft or diversion of special nuclear material as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

c. Fitness for Duty

**Scope:** Inspection activities focus on the review of the facilities' records to verify that FFD screening requirements have been met.

**Basis:** This area is inspected to verify the licensee maintains an FFD program that provides reasonable assurance that the workforce will perform tasks in a reliable and trustworthy manner and are not under the influence or impaired from any cause as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

d. Personnel Monitoring Programs

**Scope:** Inspection activities focus on the review of licensee personnel monitoring program procedures and interviews to verify compliance with regulatory requirements.

**Basis:** This area is inspected to verify licensees implement behavioral observation to detect indications of behavioral problems that could constitute a threat to public health and safety as required, by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

Attribute 2. Access Control

Access control measures will vary based on the type of material that the facility is licensed to possess. This area measures the ability of the licensee to implement its access control program in accordance with regulatory requirements. Inspection areas for this key attribute include: (1) security plans and procedures; and (2) access control measures (identification and search) for controlled areas. These inspection areas verify that the licensee has effective access controls and equipment in place designed to detect and prevent access by unauthorized individuals and vehicles, and prevent the introduction of contraband (firearms, explosives, incendiary devices, etc.) into controlled areas that could be used to commit radiological sabotage and effect the loss, theft or diversion of special nuclear material. The identification and authorization process provides reasonable assurance that, once personnel have been screened to verify their

trustworthiness, those persons have a need for access and to confirm that only those persons who have been screened and have a need are granted access to the facility and controlled areas. Some of the equipment involved are metal detectors, explosive detectors, x-ray machines, biometric sensors, computers, key-cards, hard keys, and card-readers.

The search function is to prevent the introduction of contraband (firearms, explosives, incendiary devices, etc.) that could be used to commit radiological sabotage and effect the loss, theft or diversion of special nuclear material. The search function for detection of firearms, explosives and incendiary devices on individuals, in packages or vehicles, is accomplished by equipment or a hands-on search. These identification and authorization functions are accomplished during the issuance of badges and through the use of biometrics or card-readers. The licensee must also positively control all points of personnel and vehicle access into controlled areas.

Inspectable Areas

a. Security Plans and Procedures

**Scope:** Inspection activities focus on the review of the facilities security plans and procedures related to the implementation of the access control program.

**Basis:** This area is inspected to verify facility security plans and procedures adequately describe how the licensee plans to meet regulatory requirements in 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

b. Access Control Measures

**Scope:** Inspection activities focus on verifying the licensee implements an access control program that allows access to only those persons who have a need for access and verify that those persons have been properly screened prior to entry into controlled areas.

**Basis:** This area is inspected to verify adequate implementation of the licensee's access control measures in preventing radiological sabotage and loss, theft and diversion of special nuclear material as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

Attribute 3. Physical Protection

Physical protection systems will vary based on the type of material that the facility is licensed to possess. This area measures the functionality of components and training of security force personnel in the site's implementation of its physical protection system in accordance with regulatory requirements. Inspection areas for this key attribute include: (1) security plan and procedures; (2) equipment performance, testing and maintenance; and (3) security training. These key areas verify that the licensee has an effective physical protection system in place designed to protect against radiological sabotage and loss, theft or diversion of special nuclear material. An effective physical protection system depends on having properly trained and qualified security officers who are properly equipped. Additionally, the equipment the physical protection system uses

must be designed, tested, and maintained in order to implement the physical protection system effectively and support the protective strategy.

Inspectable Areas

a. Security Plans and Procedures

**Scope:** Inspection activities focus on the review of facilities' security plans and procedures related to the implementation of the physical protection program.

**Basis:** This area is inspected to verify facility security plans and procedures adequately describe how the licensee plans to meet regulatory requirements in 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

b. Equipment Performance, Testing, and Maintenance

**Scope:** Inspection activities focus on the review of the facilities' critical security system and the performance, testing and maintenance of intruder detection equipment.

**Basis:** This area is inspected to verify the functionality, reliability, and sensitivity of licensee security system equipment as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

c. Security Training

**Scope:** Inspection activities focus on the review of initial training and periodic requalification, including weapons training, as applicable.

**Basis:** This area is inspected to verify licensee security personnel are properly trained, qualified and equipped as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

Attribute 4. Contingency Response Measures

Contingency response measures will vary based on the type of material that the facility is licensed to possess. This area measures the ability of the licensee to protect against radiological sabotage and loss, theft and diversion of special nuclear materials. The implementation of the facility's protective measures includes demonstrating that these measures work, and that the security organization can successfully protect against individuals with malevolent intent. Inspection areas for this key attribute include: (1) security plan and procedures; (2) protective measures evaluation; and (3) security training. These inspection areas verify that the licensee has designed a contingency response plan to protect against radiological sabotage and loss, theft or diversion of special nuclear material. The licensee should be able to demonstrate the ability to respond appropriately and protect against radiological sabotage and loss, theft or diversion of special nuclear material. The ability of the security organization to respond effectively to contingency events is contingent upon: (1) the number of security force personnel; (2) the intrusion detection system's being able to detect; (3) the alarm status being communicated to the alarm station(s); (4) the assessment functions and the training of security personnel; (5) communications on and off site; and (6) proficiency of security response personnel, including handling of and qualification with assigned

weapons, equipment, and the use of proper tactics. Protection against the loss or misuse of special nuclear material (SNM), i.e., enriched uranium or plutonium, is a critical function of a facility's security program.

Inspectable Areas

a. Security Plans and Procedures

**Scope:** Inspection activities focus on the review of facilities' security plans and procedures related to the implementation of the contingency response plan.

**Basis:** This area is inspected to verify facility security plans and procedures adequately describe how the licensee plans to meet regulatory requirements in 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

b. Protective Measures Evaluation

**Scope:** Inspection activities focus on the review of the facilities' conducted drills and exercises to verify that the facility's protective measures remain effective.

**Basis:** This area is inspected to verify the licensee implements effective protective measures in the protection against radiological sabotage, theft and diversion of special nuclear materials, as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

c. Security Training

**Scope:** Inspection activities focus on the review of initial training and periodic requalification, related to contingency response.

**Basis:** This area is inspected to verify security personnel are properly qualified to effectively implement the licensee's security program as required by 10 CFR Part 73, other applicable security related regulations, and applicable Orders.

Attribute 5. Information Security (Safeguards Information (SGI)/Classified/National Security Information (NSI))

Information security programs will vary based on the type of material that the facility is licensed to possess and the type of information at the facility. The scope of this key attribute is verifying the effectiveness of the licensee's information protection system in protecting against the unauthorized disclosure of protected information at licensed facilities. Inspection areas for this key attribute include: (1) security plan and procedures; (2) designation and storage; (3) processing, reproducing and transmitting information; and (4) removal and destruction. These inspection areas verify that the licensee has designed an information protection system that protects against the unauthorized disclosure of protected information. Protection against the unauthorized disclosure of protected information (i.e., safeguards information/classified information/national security information) is a critical function of a facility's security program. The protection of information works in concert with physical protection to complete the Security Cornerstone. The control of information provides for the timely detection of unauthorized disclosure of information. The inspection in this key attribute

of the Security Cornerstone is used to assess the effectiveness of the licensee's program for controlling access, designation, storage, processing, reproduction, transmitting, removal, and destruction of information.

Inspectable Areas

a. Security Plans and Procedures

**Scope:** Inspection activities focus on the review of facilities' security plans and procedures related to the implementation of the information security program.

**Basis:** This area is inspected to verify facility security plans and procedures adequately describe how the licensee plans to meet regulatory requirements in 10 CFR Part 73, Part 95, other security related regulations, and applicable Orders.

b. Designation and Storage

**Scope:** Inspection activities focus on the review of the facilities' information security program to verify that the licensee appropriately designates and stores protected information to prevent unauthorized disclosure.

**Basis:** This area is inspected to verify a licensee's security program provides protection against the unauthorized disclosure of protected information (i.e., safeguards information/classified information/national security information) as required by 10 CFR Part 73, Part 95, other security related regulations and applicable Orders.

c. Processing, Reproducing, and Transmitting

**Scope:** Inspection activities focus on the review of the facilities' information security program to verify that the licensee appropriately processes, reproduces, and transmits protected information to prevent unauthorized disclosure.

**Basis:** This area is inspected to verify a facility's security program provides protection against the unauthorized disclosure of protected information (i.e., safeguards information/classified information/national security information) as required by 10 CFR Part 73, Part 95, other security related regulations and applicable Orders.

d. Removal and Destruction

**Scope:** Inspection activities focus on the review of the facilities' information security program to verify that the licensee appropriately removes and destroys protected information to prevent unauthorized disclosure.

**Basis:** This area is inspected to verify a facility's security program provides protection against the unauthorized disclosure of protected information (i.e., safeguards information/classified information/national security information) as required by 10 CFR Part 73, Part 95, other security related regulations and applicable Orders.

Attribute 6. Problem Identification and Resolution

A key component of effective incident response is an adequate CAP. An adequate CAP

identifies and corrects problems or indications of problems associated with a particular key attribute within a cornerstone that could lead to degraded emergency preparedness actions and eventually actual safety significant events.

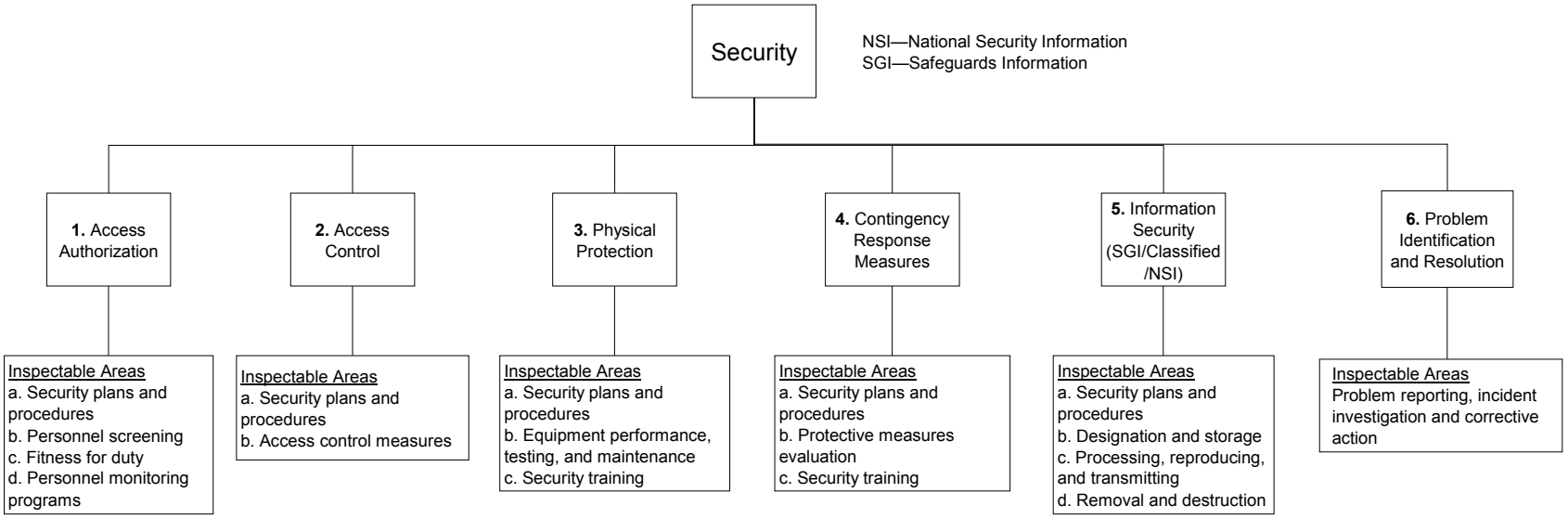
Inspectable Area

Problem reporting, incident investigation and corrective action

**Scope:** Inspection activities verify that: (1) the licensee's assessments of problems and issues are of sufficient scope to address the key attributes of the cornerstone; (2) the licensee properly assesses the risk significance of the findings; (3) root cause analyses and corrective actions are timely and adequate to prevent recurrence; (4) the licensee considers applicable inspection findings and industry and NRC generic issues, and (5) the licensee makes required reports to the Commission. Inspection activities include verifying that the CAP is effective in identifying, resolving and preventing risk significant problems and includes a deficiency reporting process; licensee self-assessments, and quality assurance audits.

**Basis:** This area is inspected, in accordance with the CAP license condition, to verify that the licensee effectively assesses performance to identify and correct situations that could impact the cornerstone objective.

## Figure F-1. Security Cornerstone Key Attributes




Note: Because there are various categories of licensees, the regulatory and license requirements will vary. Therefore, either all or a subset of the inspectable areas will apply, depending on the licensee category.

## Appendix G: Material Control and Accounting Cornerstone

### Objective

This cornerstone has the following objectives:

3. To verify that the licensee's MC&A program promotes the common defense and security by detecting and protecting against loss, theft, diversion, or misuse of SNM, and facilitating the location and recovery of missing SNM.

4. To verify that the licensee adequately detects unauthorized production and unauthorized levels of enrichment of SNM at enrichment facilities.

### Key Attributes and Inspectable Areas

Figure G-1 shows those attributes of licensee performance that affect MC&A systems. These key attributes and the inspectable areas are described below.

Attribute 1. Measurement Systems and Measurement Control

Adequate and appropriate measurement systems and equipment, and the control of those measurement systems, are important to providing reasonable assurance that all quantities of SNM in the accounting records are based on accurate and reliable measurements. These elements of the licensee's MC&A program facilitate detection and protection against loss, theft, diversion, or misuse of SNM.

Inspectable Areas

a. Adequacy of MC&A Measurement Systems

**Scope:** Inspection activities in this area focus on the adequacy of MC&A measurement systems. Inspection activities include review of key measurement points, review of measurement and sampling techniques and equipment, and verification of measurement capability through observation of measurements being performed and samples being taken by licensee staff.

**Basis:** This area is inspected to verify licensees use adequate and appropriate measurement systems as required by 10 CFR 74.31(c)(2), 74.33(c)(2), 74.45(b), and 74.59(d). Licensees are responsible for establishing measurement systems that are tested and evaluated for the specific material being measured. Licensee documentation is expected to describe, at each measurement point, the material type to be measured and the measurement system to be used. Measurement systems are expected to account for the method of sampling, mass or volume determination, chemical or nondestructive assay, and isotopic analyses. Components of each measurement system must include the equipment required, range of application, sensitivity, precautions, and uncertainty estimates.

b. Measurement Control

**Scope:** Inspection activities in this area focus on the licensee's ability to monitor and control measurement systems to meet requirements. Inspection activities include review of control standard handling and usage, review and observation of measurement system calibrations, and review of mixing and sampling studies. The inspection activities include review of various statistical applications including control charts for the implemented measurement systems, review of statistical analysis reports, and review of measurement uncertainty determinations.

**Basis:** Proper system calibrations, standards adequacy and traceability, and use of control and replicate measurements help provide reasonable assurance that licensees are controlling systems to meet program objectives and the regulatory requirements in 10 CFR 74.31(c)(3), 74.33(c)(3), 74.45(c), and 74.59(e).

Attribute 2. Control of Special Nuclear Material

Proper control of SNM is essential to protect against potential loss, theft or diversion. Proper control entails appropriate item identification and item storage, item monitoring activities, periodic physical inventories, and an effective accounting system. For Category I facilities, proper control of strategic SNM also includes process monitoring procedures that facilitate timely detection of the possible abrupt loss of five or more kilograms of strategic SNM. For enrichment facilities, control of SNM includes a program for detection of unauthorized production and enrichment.

Inspectable Areas

a. Item Control and Item Monitoring

**Scope:** Inspection activities in this area focus on the licensee's ability to maintain current knowledge of the identity, SNM content, and location of items. Inspection activities include review of the licensee's periodic item monitoring activities, observation of item monitoring activities, and an item audit of a sample of items on the licensee's inventory to verify current knowledge is maintained.

**Basis:** The licensee's MC&A program maintains a record of all SNM items, regardless of quantity or duration of existence. Item control systems are expected to provide current knowledge of the location, identity, and quantity of all SNM contained in all items that are not excepted from the requirements, as required by 10 CFR 74.31(c)(6), 74.33(c)(6), 74.43(b)(5) and (6), and 74.55. Maintaining current knowledge of items supports the cornerstone objective of detecting and preventing loss, theft, or diversion of SNM.

b. Physical Inventory

**Scope:** Inspection activities in this area include review and observation of the inventory process, from preparation and conduct of the inventory to reconciliation of the inventory. Inspection activities include review of the reported inventory and the statistical analysis the licensee applies to evaluate adequacy of the inventory.

**Basis:** By performing periodic physical inventories of all SNM, as required by 10 CFR 74.31(c)(5), 74.33(c)(4), 74.43(c), and 74.59(f), licensees confirm that a loss or diversion of a significant quantity of SNM has not occurred.

c. Process Monitoring

**Scope:** Inspection activities in this area focus on a Category I licensee's ability to detect an abrupt loss of five formula kilograms of strategic SNM in a timely manner. Inspection activities include a walk-down of the process areas to review material used in the areas, allowable exceptions to process monitoring, and potential substitute materials. Inspection activities include evaluation of process monitoring procedures, audits of process monitoring records, and observation of process monitoring activities. Additional inspection activities include evaluation of quality control tests and review of trend analysis methods the licensee applies for process monitoring.

**Basis:** This area is inspected because process monitoring activities provide early indications of diversion or theft, and a prompt detection system for significant abrupt diversions of five or more kilograms of strategic SNM, as required by 10 CFR 74.53.

d. Detection of Unauthorized Production and Enrichment

**Scope:** Inspection activities in this area include review of an enrichment facility's detection program plans and procedures, process flow diagrams, and diversion scenarios. Inspection activities also include a walk-down of the processing areas to observe licensee unauthorized production and enrichment program activities and a review of records of licensee detection program activities since the last inspection.

**Basis:** This area is inspected because an effective program for detection of unauthorized production and enrichment, as required by 10 CFR 74.33(c)(5), protects against loss, theft, diversion, or misuse of SNM.

e. MC&A Accounting System

**Scope:** Inspection activities in this area include verification that the accounting system maintains current knowledge of SNM items through item inventory audits. Inspection activities involve reviewing the licensee's procedures for recovering from damage to, or tampering with, the accounting system. Inspection activities also verify that access to the MC&A accounting system is limited to authorized individuals and authorized activities by challenging access to the system in the various process areas.

**Basis:** This area is inspected because an effective accounting and recordkeeping system, as required by 10 CFR 74.31(d), 74.33(d), 74.43(d), and 74.59(g), enables the licensee to maintain current knowledge of the SNM it possesses, to reconstruct the SNM inventory in case of computer failure, water or fire damage, or access by unauthorized persons, and to adequately resolve and recover from loss indicators.

Attribute 3. MC&A Program

An effective MC&A program has an organizational structure that separates key MC&A functions from each other in order to provide checks and balances that increase MC&A system reliability and counter the possibility of loss, theft, or diversion, of SNM.

Licensee staff performance of MC&A-related activities can significantly affect the control of special nuclear material. Inadequate performance by staff conducting MC&A activities can result in the loss, theft, or diversion of SNM. Appropriate procedures regarding MC&A-related activities facilitate adequate performance of the licensee's MC&A program. MC&A procedures, if not performed correctly, could result in a failure to achieve the objective of detecting and preventing loss, theft, diversion, or misuse of SNM. An effective recordkeeping system enables the licensee to maintain current knowledge of the SNM it possesses and to adequately detect and prevent loss, theft, or diversion, and recover from loss indicators.

Inspectable Areas

a. MC&A Organization

**Scope:** Inspection activities in this area focus on verifying the MC&A program is designed with adequate checks and balances to counter defeat of the system and to free MC&A management from conflicts of interest with other licensee functions. Inspection activities include review of the licensee's organizational structure as it relates to the MC&A program. Inspectors verify that functional relationships between positions responsible for MC&A functions enact appropriate checks and balances of safeguards responsibilities, and verify that responsibilities and authorities for each position assigned an SNM accounting function are clearly defined in position descriptions.

**Basis:** This area is inspected because an effective MC&A organizational structure, as required by 10 CFR 74.31(c)(1), 74.33(c)(1), 74.43(b)(1)-(4), and 74.59(b), separates key MC&A functions from each other in order to provide checks and balances that increase MC&A system reliability and counter defeat of the system through deceit and falsification. The organizational structure is also meant to free MC&A management from conflicts of interest with other major functions such as production.

b. Staff MC&A Training and Qualification

**Scope:** Inspection activities in this area focus on the effectiveness of the licensee's program for conducting plant staff initial MC&A training and the methods used to determine qualification and requalification. Inspection activities include observation of plant staff performance during conduct of MC&A-related activities and walkthroughs. Inspectors evaluate any deficient performance to determine if it results from deficient training and qualification.

**Basis:** This area is inspected because adequate MC&A staff performance is maintained through training and qualification of licensee personnel. A training and qualification program, as required by 10 CFR 74.31(c)(1), 74.33(c)(1), 74.43(b)(4), and 74.59(c), facilitates adequate preparation of personnel performing MC&A functions to perform their functions correctly with a minimum of errors.

c. MC&A Procedure Quality

**Scope:** Inspection activities in this area focus on the clarity of plant procedures with regard to MC&A-related activities. Inspection activities include observation of plant staff performance during MC&A-related activities and walkthroughs. Inspectors evaluate any deficient performance to determine if it results from inadequate, deficient, or unclear

procedures. Inspection activities also include an evaluation of whether the procedure and activities observed result in compliance with regulations and license requirements. Additional inspection activities include review of selected changes to procedures to determine whether the procedures provide adequate guidance to plant staff to meet NRC requirements.

**Basis:** MC&A procedures are required by 10 CFR 74.31(c)(1), 74.33(c)(1), 74.43(b)(3), and 74.59(b)(2). Appropriate licensee procedures entail coverage of all MC&A functions in a clear and technically correct manner. Measurement system procedures influence the capability of adequately assigning appropriate quantities of SNM to processing units and items. Inventory and item control procedures are essential to preventing the loss, theft, or diversion of material. Alarm and loss indicator response procedures are important to adequately assess the indicators, determine if a loss actually occurred, and recover from said loss. Unclear procedures could result in errors that lead to the failure to control and account for material.

d. Recordkeeping

**Scope:** Inspection activities in this area include review of the licensee's program and controls for maintaining an accurate and reliable MC&A record-keeping system.

**Basis:** This areas is inspected because an effective accounting and recordkeeping system, as required by 10 CFR 74.31(d), 74.33(d), 74.43(d), and 74.59(g), enables the licensee to maintain current knowledge of the SNM it possesses, reconstruct the SNM inventory in case of computer failure, water or fire damage, or access by unauthorized persons, and adequately resolve and recover from loss indicators.

Attribute 4. Problem Identification and Resolution

The licensee's ability to resolve alarms and loss indicators is essential to detecting and protecting against loss, theft, or diversion of SNM. Human error monitoring can adequately minimize the frequency and consequence of human errors that may mask loss, theft, or diversion of SNM. Periodic independent assessments of the overall effectiveness of the MC&A program are essential to performance of the MC&A program in detecting and preventing loss, theft or diversion of SNM. The licensee's CAP is expected to identify and correct problems or indications of problems in the above key attributes that could lead to degraded MC&A components. The CAP should identify early indications of problems before they have actual MC&A impacts.

Inspectable Areas

a. Resolution of Alarms and Loss Indicators

**Scope:** Inspection activities in this area focus on the licensee's ability to adequately resolve abrupt alarm and SNM loss indicators in a timely manner.

**Basis:** This area is inspected because item control discrepancies, significant item or process monitoring indicators, and significant inventory discrepancies, could be indicators of an actual loss, theft, or diversion, of SNM. Prompt investigation and resolution of the indicator or discrepancy is important to determining no loss, theft, or

diversion has occurred, as required in the performance objectives of 10 CFR 74.31(a), 74.33(a), 74.41(a), and 74.51(a).

b. Human Error Monitoring (Category I facilities)

**Scope:** Inspection activities in this area focus on the effectiveness of the licensee's program for controlling the rate of human errors in MC&A information. Inspection activities include observation of plant staff performance, review of job performance aids, review of the methods for automation of MC&A activities, and review of the licensee's human error quality control system for monitoring human errors.

**Basis:** For Category I facilities, due to the nature of the material possessed, MC&A staff performance is particularly critical. The licensee's program for human error monitoring, as required by 10 CFR 74.59(h)(3), helps minimize the frequency and consequence of human errors , and enhances the likelihood of detection of errors when they do occur.

c. Independent Assessment of the MC&A Program

**Scope:** Inspection activities in this area focus on verifying the licensee's independent assessment program adequately assesses the health of the MC&A program through periodic, comprehensive, and independent assessments. Inspection activities include review of the assessment program, review of assessment reports, and verification that assessment findings and recommendations are addressed by licensee management in a timely manner. Inspectors verify that effective corrective actions are taken to address the issues identified.

**Basis:** This area is inspected because periodic independent assessments of the overall effectiveness of the MC&A program, as required by 10 CFR 74.31(c)(8), 74.33(c)(8), 74.43(b)(8), and 74.59(h)(4), are essential to the performance of the MC&A program to meet overall safeguards goals and to identify weaknesses or deficiencies in the program design or performance that may need correcting.

d. Problem reporting, incident investigation and corrective action

**Scope:** Inspection activities verify that: (1) the licensee's assessments of problems and issues are of sufficient scope to address the key attributes of the cornerstone; (2) the licensee properly assesses the risk significance of the findings; (3) root cause analyses and corrective actions are timely and adequate to prevent recurrence; (4) the licensee considers applicable inspection findings and industry and NRC generic issues, and (5) the licensee makes required reports to the Commission. Inspection activities include verifying that the CAP is effective in identifying, resolving and preventing risk significant problems and includes a deficiency reporting process; licensee self-assessments, and quality assurance audits.

**Basis:** This area is inspected to determine whether the licensee is identifying and correcting problems in accordance with the corrective action program license condition.

Figure G-1. Material Control and Accounting Cornerstone Key Attributes