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DRAFT REGULATORY GUIDE

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DRAFT REGULATORY GUIDE DG-3046

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STANDARD FORMAT AND CONTENT FOR LICENSE APPLICATIONS FOR URANIUM HEXAFLUORIDE SOURCE MATERIAL FACILITIES

A. INTRODUCTION

Purpose

This regulatory guide (RG) provides a description of a standard format and content that the U.S. Nuclear Regulatory Commission (NRC) staff considers acceptable for license applications for source material facilities that process significant quantities of uranium hexafluoride and excludes the licensing requirements for enrichment facilities.

Applicability

This RG applies to all applicants and licensees subject to 10 CFR Part 40, which includes the acceptance criteria for licensing and renewal of a source material. This RG can be used as an acceptable method to the NRC staff in preparing license applications to authorize the acquisition, delivery, receipt, possession, production, use, processing, transfer, and storage of source materials consistent with requirements in Title 10 of the *Code of Federal Regulations* (10 CFR), Part 40, “Domestic Licensing of Source Material” (Ref. 1) for a uranium hexafluoride processing facility using 10 CFR Part 70, “Domestic Licensing of Special Nuclear Material” (Ref. 2) requirements.

Applicable Regulations

- 10 CFR Part 40.31, “Applications for Specific Licenses,” identifies the general

This regulatory guide is being issued in draft form to involve the public in the early stages of the development of a regulatory position in this area. It has not received final staff review or approval and does not represent an official NRC final staff position. Public comments are being solicited on this draft guide and its associated regulatory analysis. Comments should be accompanied by appropriate supporting data. Comments may be submitted through the Federal-rulemaking Web site, <http://www.regulations.gov>, by searching for Docket ID **<INSERT: NRC-20YY-XXXX>**. Alternatively, comments may be submitted to the Rules, Announcements, and Directives Branch, Office of Administration, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001. Comments must be submitted by the date indicated in the *Federal Register* notice.

Electronic copies of this draft regulatory guide, previous versions of this guide, and other recently issued guides are available through the NRC’s public Web site under the Regulatory Guides document collection of the NRC Library at <http://www.nrc.gov/reading-rm/doc-collections/reg-guides/>. The draft regulatory guide is also available through the NRC’s Agencywide Documents Access and Management System (ADAMS) at <http://www.nrc.gov/reading-rm/adams.html> under Accession No. **MLxxxxxx**. The regulatory analysis may be found in ADAMS under Accession No. **MLxxxxxx**.

- 10 CFR Part 40.32, “General Requirements for Issuance of Specific Licenses,” specifies how applicants must demonstrate compliance in order for the NRC staff to approve the application.
- 10 CFR Part 70, “Domestic Licensing of Special Nuclear Material,” provides procedures and criteria for the issuance of licenses to receive title to, own, acquire, deliver, receive, possess, use, and transfer special nuclear material.
- 10 CFR Part 70, Subpart H, “Additional Requirements for Certain Licensees Authorized to Possess a Critical Mass of Special Nuclear Material,” provides the requirements for applicants to perform an integrated safety analysis (ISA).

Related Guidance

- NUREG-1513, “Integrated Safety Analysis Guidance Document” (Ref. 4), provides general guidance to NRC fuel cycle licensee/applicants on how to perform an ISA and document the results.
- NUREG-1520, “Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility” (Ref. 5), provides guidance for the review and evaluation of proposed amendments and license-renewal applications for nuclear fuel cycle facilities.
- NUREG-1748, “Environmental Review Guidance for Licensing Actions Associated with NMSS Programs” (Ref. 6), provides guidance for the environmental review of licensing actions.

Purpose of Regulatory Guides

The NRC issues RGs to describe to the public methods that the staff considers acceptable for use in implementing specific parts of the agency’s regulations, to explain techniques that the staff uses in evaluating specific problems or postulated accidents, and to provide guidance to applicants. RGs are not substitutes for regulations, and compliance with them is not required. Methods and solutions that differ from those set forth in RGs will be deemed acceptable if they provide a basis for the findings required for the issuance or continuance of a permit or license by the Commission.

Paperwork Reduction Act

This regulatory guide contains and references information collections covered by 10 CFR Part 40 and 10 CFR Part 70 that are subject to the Paperwork Reduction Act of 1995 (44 U.S.C. 3501 et seq.). These information collections were approved by the Office of Management and Budget (OMB), control numbers 3150-0020 and 3150-0009, respectively.

Public Protection Notification

The NRC may not conduct or sponsor, and a person is not required to respond to, a request for information or an information collection requirement unless the requesting document displays a currently valid OMB control number.

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B. DISCUSSION

Reason for Revision

This revision of the guide (Revision 1) addresses new issues identified since the guide was originally issued in April 1985. These changes include the revised standard format for applications for fuel cycle facilities as modified by the NRC staff to conform with the current format and content requirements for license applications in 10 CFR Part 40. In addition, this RG includes the ISA requirements based on 10 CFR Part 70.

Background

Standard Format and Content

The standard format included in this guide is an approved approach to meet the regulatory requirements contained in 10 CFR Part 40. The information provided in the application should account for NRC regulations and guides, industry codes and standards, and developments in source material facilities that process significant quantities of uranium. The NRC may request additional information in support of an application, if such information is necessary to provide reasonable assurance of the ability of the facility to meet the regulations.

This RG establishes a standard format for the license application to ensure the completeness of an application, assist NRC staff in locating relevant information, and shorten the time needed to review the submittal. Conformance with the standard format is not required. Applications prepared in other formats will be deemed acceptable if they provide an adequate basis for the findings required to approve them. Nonetheless, the use of other formats may increase the time required to review the application because it may be more difficult for the staff to locate the required information to meet the regulations.

Integrated Safety Analysis Applicability

An ISA which is consistent with the regulations in 10 CFR Part 70, Subpart H, is an acceptable approach to demonstrate an adequate safety basis for compliance with 10 CFR 40.32(b) and 40.32(c), “General requirements for issuance of specific licenses.” The requirement for an ISA has been implemented through license conditions or orders for uranium hexafluoride source material facilities. These facilities may implement an ISA to identify accident sequences, evaluate the consequences, mitigate credible accidents with high or intermediate consequence, and establish management measures to ensure mitigation is available and reliable.

Harmonization with International Standards

The International Atomic Energy Agency (IAEA) has established a series of safety guides and standards constituting a high level of safety for protecting people and the environment. IAEA safety guides present international good practices and increasingly reflects best practices to help users striving to achieve high levels of safety. IAEA guidance pertinent to this RG includes, IAEA Safety Guide NS-R-5, “Safety of Nuclear Fuel Cycle Facilities” (Ref. 7) issued in May, 2014, IAEA Safety Guide SSG-5, “Safety of Conversion Facilities and Uranium Enrichment Facilities” (Ref. 8) issued in May 2010, and IAEA Information Circular 225, Rev. 5, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities,” issued in January 2011 (Ref. 9). These documents address

safety requirements applicable to fuel cycle facilities. This RG incorporates similar attributes and is consistent with the basic safety principles provided in IAEA SSG-5 (Ref. 10).

C. STAFF REGULATORY GUIDANCE

This section provides detailed descriptions of the methods, approaches, or data that the staff considers acceptable for meeting the requirements of the regulations cited in the Introduction.

1. GENERAL INFORMATION

1.1 General Format

The license application should be written consistent with the general format described in the sections below.

1.2 The Application

For license renewals, a license application should be filed in proper form not less than 30 days before the expiration of the existing license (see paragraph 40.42(a) of 10 CFR Part 40). However, the NRC suggests that earlier filing is preferable.

Applicants should submit their documents to the NRC in either paper format or electronically, as specified in 10 CFR 40.5, "Communications." The NRC staff performs a preliminary acceptance review to determine whether sufficient information has been provided to conduct a detailed technical and regulatory review. If the application is acceptable, the NRC staff responds with an acceptance letter and initiates the detailed safety review. The NRC staff may request additional information if needed to complete the acceptance review.

1.3 Presentation of Information

The applicant should strive for clear, concise presentation of the information in the license application. Each topic should include the analyses and supporting data with sufficient depth and documentation to permit the NRC to independently evaluate the information and verify the results. Each section should state the conclusions of the licensee's analysis. The application should use tables, line drawings, and photographs wherever they contribute to clarity and brevity. The number of significant figures in numerical data should reflect the accuracy of the data. Descriptive and narrative passages should be brief and concise. For cases in which the application presents test results to support the conclusions, the applicant should describe the procedures, techniques, and equipment used to obtain the test data.

Information contained in previous submittals, statements, or reports filed with the NRC under the license may be incorporated by reference, provided such references are clear and specific. The reference should specify the document title, date, page, and paragraph number of the pertinent information.

1.4 Proprietary Information

Proprietary information should be submitted separately from the public version of the application. It should be accompanied by an affidavit containing the applicant's justifications for withholding the information from public disclosure, as specified in 10 CFR 2.390, "Public Inspections, Exemptions,

Requests for Withholding,” of 10 CFR Part 2, “Rules of Practice for Domestic Licensing Proceedings” (Ref. 10). The NRC staff’s review of the safety analysis should depend as much as possible on nonproprietary information.

1.5 Style and Composition

Abbreviations should be consistent throughout the application and with generally accepted usage. Any abbreviations, symbols, or special terms not in general usage or unique to the plant should be defined when they first appear in the application and should be presented in an Abbreviations and Acronyms section with symbols defined in an Explanation of Symbols section or a separate Glossary.

References used should appear either as footnotes on the page where they are cited or at the end of each chapter.

1.6 Graphical Presentations

Graphical presentations such as drawings, maps, diagrams, sketches, and tables may be used to improve the submittal. All such information should be legible, have defined symbols, and use appropriate scales. These graphical presentations should be located near the text where they are cited.

1.7 Physical Specifications

Paper size: The paper size for text pages should be $8\frac{1}{2} \times 11$ inches. Drawings and graphics should also be on pages measuring $8\frac{1}{2} \times 11$ inches. However, a larger size is acceptable provided that the finished copy when folded does not exceed $8\frac{1}{2} \times 11$ inches.

Page numbering: Pages should be numbered with the digits corresponding to the chapter followed by a hyphen and a sequential number; (e.g., the third page of Chapter 4 should be numbered 4-3). Do not number the entire report sequentially.

Table of Contents: A table of contents and an index of key items should be included in each volume of the license application.

1.8 Procedures for Updating or Revising Pages

When updating a submittal, data and text should be revised by replacing pages. The changed or revised portion on each page should be highlighted by a change-indicator mark consisting of a bold vertical line drawn in the margin opposite the binding margin. The line should be the same length as the portion of text actually changed. All pages submitted to update or revise existing pages or to add pages to the report should show the date of the change and a revision or amendment number. Unless an alternate approach is agreed with NRC staff, change pages should be submitted in complete sections (e.g., chapters), if possible. If individual pages are submitted, a guide page listing the pages to be inserted and the pages to be removed should accompany the revised pages. Where major changes or additions are made, a revised Table of Contents should be provided.

2. STANDARD FORMAT AND CONTENT

The following topics should be addressed by sections in the license application to demonstrate compliance with the general health and safety and common defense and security requirements specified in 10 CFR 40.31 and 10 CFR 40.32.

2.1 General Information

This section should describe the (1) facility and process overview, (2) institutional information, and (3) site description. This section of the application is needed to provide a general understanding of the purpose of the facility and an overview of the design of its processes in compliance with 10 CFR 40.32(a) and 40.32(b).

2.1.1 Facility and Process Overview

The facility and process description should provide an overview of the site layout, process overview, site overview, and descriptive summary of the licensed material. The facility layout should describe each major feature on the site and provide an overview of the interrelationships between the major features. Site drawings of building locations and major process components should be provided.

The process overview should provide a summary, nontechnical narrative description for each activity or process in which the applicant proposes to acquire, deliver, receive, possess, produce, use, process, transfer, or store licensed material. The process steps should be described briefly. The site overview should specify the proximity of the facility buildings to the site boundary and nearby populations based on the most recent census data. Drawings of the overall facility layout should be included. This section should also describe the site's geographical characteristics such as facility structures (e.g., buildings, towers, and tanks), transportation right of ways, etc.

The descriptive summary of the license material should include the name, amount, and specifications (including chemical and physical forms) of the licensed material. The application should identify the elemental name, maximum quantity, and specifications, including the types, amounts, and discharge points of waste materials discharged to the environment. The license application also should include a list of the raw materials, byproducts, wastes, and finished products of the facility.

The facility and process description in the license application should be consistent with the information presented in the other portions of the application (e.g., the ISA Summary, if applicable, and the emergency-management section).

2.1.2 Institutional Information

The institutional information should specify the corporate identity and ownership of the licensed facility. This section should include the identity and physical address of the applicant's facility and corporate headquarters, corporate information sufficient to show the relationship of the applicant's organization to other corporate entities, and the existence and extent of foreign ownership or influence. It should address the applicant's financial qualifications to pursue the activities for which the license is sought. The description should demonstrate the applicant has adequate financial resources to support the safe siting, construction, operation, maintenance, and eventual decommissioning of the proposed facility.

The application should clearly describe each proposed licensed activity in the form of requested authorized uses and the type of license the applicant is requesting. Any specific exemptions and special authorizations should be listed in this section and the regulatory requirements for which the applicant is seeking approval or exemption. This section should also specify the period of time for which the applicant is seeking approval and discuss the justification for this time period (e.g., commitment to ISA requirements in Part 70, Subpart H).

2.1.3 Site Description

This section should include the location of the plant and a description of the geographic, demographic, meteorological, hydrologic, geologic, and seismologic characteristics of the site and the surrounding area. The application should summarize the more detailed site information located in related documents such as the environmental report, emergency plan, and ISA summary.

- **Site Geography:** A description of the site's geography should include information on the state, county, municipality, topographic quadrangle (in eight 7¹/₂-minute quadrants), site boundary, and controlled-area boundary. The local terrain should be discussed, including major nearby highways, nearby bodies of water, and any other significant geographical features within 1.6 kilometers (km) (1 mile (mi) of the site (e.g., ridges, valleys, and specific geologic structures).
- **Demographics:** Information on the demographics for the area surrounding the site should include the latest census results for areas of concern. A description should be provided of the distance and direction to the nearby population centers and nearby public facilities such as schools, hospitals, and parks. The description should also address the distance and direction to nearby industrial areas or facilities that may present potential hazards (including other nearby nuclear facilities). The section should describe any no licensed land uses within the site boundary that may present potential hazards to licensed operations (e.g., residential, industrial, commercial, or agricultural).
- **Meteorology:** Information on the site's local meteorology should address the range of weather events possible for the site and the primary wind directions and average wind speeds. Information should include the annual amount and forms of precipitation, as well as the design-basis values of the maximum precipitation and any related structural loading. The description should summarize the design-basis events for severe types of weather (e.g., lightning, tornado, and hurricane) including the frequency and magnitude.
- **Hydrology:** A description of the site's hydrology should include the characteristics of the water table, nearby rivers, streams, and bodies of water, as appropriate. It should also address groundwater flow direction and velocity for the site, information on impacted aquifers, and design-basis flood events used for accident analysis.
- **Geology:** The description of the site's geology should provide the characteristics of the soil types and bedrock and the design-basis earthquake magnitude and return periods. A map of the site should be included in the application and should be suitable scale to clearly define the boundary of the site and the distance from the significant facility features to the site boundary. The area to be considered is the exclusion area should be clearly delineated if its boundaries are not the same as the boundaries of the plant site. A general location map encompassing at least an 80-km (500-mi) radius should also be provided. Additional maps and site plots should be provided to present details near the plant and to establish orientation of the buildings, streams, ponds, and neighboring structures.

2.1.4 Additional Guidance on General Information

Additional information on developing the General Information section of the application is available in Chapter 1, "General Information," of NUREG-1520.

2.2 Organization and Administration

In accordance with 10 CFR 40.32(b), the application should provide the technical qualifications, including training and experience of the applicant and members of its staff.

2.2.1 Management Structure

The application should commit to identify and functionally describe the specific organizational groups that are responsible for managing the design, construction, operations, and modifications of the facility or licensed activities. The application should provide a clear, unambiguous system for communications and control between management organizations. The application should clearly describe the roles and responsibilities of the different functions engaged in maintain an organizational structure with appropriate administrative policies and procedures.

2.2.2 Health, Safety and Environmental Organization

The application should define a health, safety, and environmental organization (HS&E) with authority over the facility safety activities. The facility management hierarchy should be defined with clear authority provided to the HS&E organization to take appropriate safety actions including shut down operations. The application should address how the management policies ensure the establishment and maintenance of design and operations. It should provide clearly defined effective lines of communication and authority among the organizational units involved in the engineering, HS&E, and operations functions of the facility.

2.2.3 Qualifications of Key Individuals

The applicant should also describe the education levels, the degrees attained, the fields in which the degrees were attained, training, and experience. The description should be provided for management positions commonly titled the facility manager, operations manager, shift supervisor, and managers for various safety and environmental disciplines. Qualification criteria should be described generally, in terms of academic credentials, formal continuing education, and work experience. For example, “bachelor’s degree in nuclear engineering or related scientific or engineering field, with 5 years of experience managing the operations of a nuclear fuel manufacturing facility.”

2.2.4 Additional Guidance on Organization and Administration

Additional information on developing the Organization and Administration section is available in Chapter 2 of NUREG-1520.

2.3 Safety Program

The regulations in 10 CFR Part 40 do not contain ISA requirements. However, because of the significant chemical process hazards present at uranium hexafluoride source material facilities, the application should describe an established facility safety program, such as that described in 10 CFR 70.61, “Performance Requirements” and 10 CFR 70.62, “Safety Program and Integrated Safety Analysis.” Some licensees have been required to perform an ISA through license conditions. Licensees who choose to pursue licensing through this process should commit to all elements in their ISA.

2.3.1 Safety Basis for Uranium Hexafluoride Source Material Facilities

NRC staff have determined that the use of ISA methods, as described in 10 CFR Part 70, Subpart H, and NUREG-1520, is an acceptable way of demonstrating adequate compliance for the safety basis required by 10 CFR 40.32(b) and (c) for uranium hexafluoride source material facilities. Applicants are free to propose alternate accident analysis methods, radiological and chemical consequence and likelihood criteria, safety features, and methods of assuring the availability and reliability of the safety features.

As used in this RG, the terms “performance requirements” and “items relied on for safety (IROFS)” are not intended to suggest that Part 40 licensees are required to comply with the performance requirements found in 10 CFR 70.61 or utilize IROFS as mitigating safety features, only that their use by the uranium hexafluoride source material facility would be found acceptable by NRC staff to meet the requirements of 10 CFR 40.32(b) and 10 CFR Part 40.32(c). Alternate accident consequence and likelihood criteria may be found acceptable if the applicant demonstrates that the proposed equipment and facilities to prevent or mitigate accidents are adequate to protect health and minimize danger to life or property, and that proposed procedures to prevent or mitigate accidents are adequate to protect health and to minimize danger to life or property.

2.3.2 Additional Guidance on ISA

Additional guidance on the development of an ISA is available in the documents provided below.

- NUREG-1513, “Integrated Safety Analysis Guidance Document,” contains guidance applicable to performing an ISA and documenting the results.
- NUREG-1520, Chapter 3, “Integrated Safety Analysis and Integrated Safety Analysis Summary.” Provides specific guidance on the development of an ISA and ISA summary. Although this guidance was developed for facilities licensed under 10 CFR Part 70, Subpart H, the NRC staff is using ISA guidance for uranium hexafluoride processing facilities. It should be noted that every section in NUREG-1520 may not be applicable to these facilities (i.e. criticality).
- NUREG/CR-6410, “Nuclear Fuel Cycle Facility Accident 1 Analysis Handbook” (Ref. 11), provides guidance on acceptable methods for evaluating the chemical and radiological consequences of potential accidents.
- NUREG-1601, “Chemical Process Safety at Fuel Cycle Facilities” (Ref. 12), provides guidance on chemical safety practices acceptable for compliance with the regulations.
- RG 3.74, “Guidance for Fuel Cycle Facility Change Process” (Ref. 13), includes requirements in 10 CFR 70.72 and describes the types of changes for which licensees are to seek prior approval from NRC.
- NUREG-1391, “Chemical Toxicity of Uranium Hexafluoride Compared to Acute Effects of Radiation” (Ref. 14). Provides information for developing design and siting guidelines based on chemical toxicity for enrichment plants using uranium hexafluoride.

2.4 Radiation Protection

In accordance with 10 CFR 40.32(c), the application should describe appropriate equipment, facilities, and procedures to protect health and minimize danger to life and property. Implementation of the following guidance will ensure compliance for the area of radiation protection.

The radiation-protection program should address the occupational radiation-protection measures in 10 CFR Parts 19 (Ref. 15), 20, and 40. Specifically, licensees should develop, document, and implement a radiation-protection program in accordance with 10 CFR 20.1101, "Radiation Protection Programs." Additionally, 10 CFR 20.2102, "Records of Radiation Protection Programs" (Ref. 16), requires licensees to keep records of the radiation-protection program, including a description of the program components, audits, and other aspects of program implementation.

The application should also reference the ISA Summary, if applicable, to identify (1) those facility operations analyzed in the ISA that have radiological consequences, (2) the applicable safety features, and 3) the management measures implemented to prevent or mitigate such radiological risks.

The license application should contain a commitment to establish, maintain, and implement a quality radiation-protection program which addresses the following areas.

2.4.1 As Low As Is Reasonably Achievable (ALARA)

Applicants should describe the ALARA program pertaining to radiation workers and ALARA committee activities. The committee's membership, frequency of meetings, and scope should be stated. The procedures for performing the required audits and inspections of operations and for review of all new activities or changes in existing activities should also be described. RG 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable" (Ref. 17), may be useful in developing an ALARA program. A periodic report summarizing employee exposures and effluent release data should be made to senior management.

As part of the ALARA program, the licensee should investigate and address situations that significantly reduce the effectiveness of health and safety programs. For example, the licensee should analyze data from surveillance and monitoring programs for trends that may indicate an increasing trend in radiation exposures.

2.4.2 Organization and Personnel Qualifications

The application should describe the qualifications for the radiological protection personnel and identify their authority and responsibilities for implementing the radiation protection program functions. These individuals should have clearly defined position responsibilities within the radiation protection program and with other line managers. The level of education, experience, and training for key radiation protection staff should be specified in the application.

2.4.3 Procedures

The application should commit to operate using written radiation-protection procedures and radiation work permits. Procedures should address applicable radiation protection requirements found in 10 CFR Parts 19, 20, and 40, and any other applicable regulations. The applicant should describe a process for procedure generation or modification, authorization, distribution, and training. In addition, procedures should be described for creation of written radiation work permits for activities involving licensed material that are not covered by written radiation protection procedures.

2.4.4 Training

The application should demonstrate that the radiation protection program is implemented by qualified staff that is trained in radiation-protection procedures. The training program should comply with the requirements of 10 CFR Parts 19 and 20. The training program should be provided to all personnel and visitors entering restricted areas that is commensurate with the health risk to which they may be exposed, or provide escorts who have received the appropriate training. The staff should be trained on the health protection problems associated with exposure to radiation, precautions, and procedures to minimize exposure, and the purposes and functions of protective devices employed. The program should include regular refresher training.

2.4.5 Ventilation and Respiratory Protection Programs

The application should demonstrate adequate control of airborne concentrations of radioactive material using ventilation systems, containment systems, and respirators. The ventilation and containment systems should be appropriately sized and positioned to keep airborne concentration below levels specified in 10 CFR Part 20, Appendix B, “Annual Limits on Intake (ALIs) and Derived Air Concentrations (DACs) of Radionuclides for Occupational Exposure; Effluent Concentrations; Concentrations for Release to Sewerage.” The ventilation system should be maintained within design specifications through application of management measures, regular maintenance, and performance testing. The operating criteria and performance testing should be described. A survey and monitoring program should be in place to document radiation levels, concentrations of radioactive material, and occupational exposures at the facility.

The application should also describe the respiratory protection program needed to limit the inhalation of airborne radioactive materials and hazardous chemicals. The applicant should commit to maintain written procedures for fitting and training on the respiratory equipment. Appropriate procedures should be maintained for the respiratory program. RG 8.15, “Acceptable Programs for Respiratory Protection” (Ref. 18), may be used when evaluating programs for protection against airborne radioactive materials.

2.4.6 Radiation Surveys and Monitoring Programs

Describe the radiation surveys and monitoring programs to document the magnitude and extent of radiation levels, concentrations of radioactive materials, and occupational exposures to radiation by workers. The monitoring program should follow written procedures. The program should involve air sampling in areas of the plant identified as potential airborne radioactive areas. The application should address the routine radiation survey program and special surveys for planning and preparing maintenance operations to ensure that occupational exposures are ALARA. The personnel monitoring program for external radiation should be described including the types of personnel monitoring equipment that are used.

The application should also identify the controlled areas established to prevent the spread of contamination. It should include commitments for appropriate step-off pads, change facilities, protective clothing facilities, and personnel monitoring instruments. It should commit to maintain policies for equipment and materials removed from restricted areas to unrestricted areas are not contaminated above the release levels presented in Appendix A, “Acceptable Surface Contamination Levels” to RG 8.24 (Ref. 19).

The application should contain a description of the air-sampling and analysis program used for monitoring the concentrations of radioactivity in working areas and detecting the presence of unsafe concentrations. The description should address the placement, monitoring, and maintenance of the air sampling equipment. It should address the action levels and actions to be taken if these levels are exceeded. It should describe conditions under which air sampling instruments (e.g., work-area samplers, continuous air monitors, lapel air samplers) should be used.

The application should commit to maintain internal procedures on the use of protective clothing, surface contamination surveys, and allowable limits (fixed and removable). The action levels for cleanup should be specified for clean (uncontrolled) areas, intermediate areas (e.g., change rooms), and controlled areas. A corrective action program should be in place for incidents that result in unplanned exposures

The bioassay program to detect and monitor any significant deposition of radioactive material in the body should be described. The description should include the frequency of data collection and an evaluation of the urine bioassay sampling program (routine and special). RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program" (Ref. 20), and RG 8.11, "Applications of Bioassay for Uranium" (Ref. 21), may be used as guidance on such topics as (1) the necessity for bioassay procedures, (2) the bioassay techniques to use and their frequency, (3) selecting participants, (4) actions to be taken based on bioassay results, (5) the particular results that should initiate such action, and (6) diagnostic evaluation.

2.4.7 Posting and Labeling

The posting and labeling program used to comply with 10 CFR 20.1902 and 10 CFR 20.1904 respectively, should be described.

2.4.8 Control of Radiological Risk Resulting from Accidents

Information on the radiation-protection program should be consistent with the ISA summary, if applicable. The applicant should demonstrate that radiological accident sequences identified in the ISA summary, if applicable, are addressed with appropriate items relied on for safety. Accident sequences should be sufficiently described and detailed to allow an understanding of the radiological hazards (e.g., radioactive materials at risk) and the release mechanism. Note: accident sequences considered "not unlikely" in the ISA summary are constricted, under the ALARA requirement in 10 CFR Part 20, to minimize exposure to personnel and the public.

The applicant should ensure that (1) the emergency plan, if one is required, adequately addresses the response to a release of radioactive materials, or (2) the applicant gives a proper justification that precludes the development of an emergency plan.

2.4.9 Reports and Records

Describe the records that will be maintained and their required retention times including for audits, radiation survey results, corrections actions, radiation work permits (RWPs), employee training, personnel exposure and planned special exposures. The application should ensure safety significant events are tracked in the correction action program and reported to the NRC consistent with the reporting requirements. Ensure a program is established for shipping, receiving, and documenting transportation of radioactive materials.

2.4.10 Administrative Control Levels, Including Effluent Control

The application should contain a description of action levels, alarm set points, frequency of measurements, and action to be taken for the following radiation protection monitoring programs:

- occupational exposure (internal and external)
- airborne activity (area and stack or vent monitors)
- liquid activity (effluent monitors)
- surface contamination (work areas, release of equipment or packages, skin contamination)

The application should also contain a description of the sampling method, sampling frequency, analyses, lower limits of detection, instrumentation calibration and testing, method of reporting, and responsibility (by position) for all effluents at their point of discharge. The location of liquid effluent discharge points should be shown and labeled on appropriate site plans. Limits selected for a commitment of action and actions to be taken should be described. The application should contain a description of methods for demonstrating compliance with the Environmental Protection Agency's regulations in 40 CFR Part 190 (Ref. 22), "Environmental Radiation Protection Standards for Nuclear Power Operations" (see paragraph 20.1301(e) of 10 CFR Part 20).

2.4.11 Additional Guidance on Radiation Protection

Additional information in radiation protection is available in Chapter 4, "Radiation Protection," of NUREG-1520.

2.5 Nuclear Criticality Safety

Source-material facilities generally do not have criticality hazards because they do not possess SNM. Under certain circumstances a source-material facility may have a credible accident sequence involving a criticality (e.g., during the receipt and processing of SNM because of an error in shipping or as part of a combined license). For completeness, both the application and the ISA summary (if applicable) should contain a brief description of any potential criticality hazards or a statement indicating that no criticality hazards have been identified.

2.6 Chemical Process Safety

In accordance with 10 CFR 40.32(c), the application should describe appropriate equipment, facilities, and procedures to protect health and minimize danger to life and property. The implementation of an ISA consistent with applicable portions of 10 CFR Part 70, Subpart H, provides an acceptable safety basis for chemical hazards at uranium hexafluoride source material facilities.

NRC staff have determined that the use of ISA methods, as described in 10 CFR Part 70, Subpart H, NUREG-1520, and NUREG-1513, for the application of the radiological and chemical consequence and likelihood criteria contained in the performance requirements of 10 CFR 70.61, designation of items relied on for safety, and establishment of management measures are an acceptable way of demonstrating adequate safety for the uranium hexafluoride source material facility. Applicants are free to propose alternate accident analysis methods, radiological and chemical consequence and

likelihood criteria, safety features, and methods of assuring the availability and reliability of the safety features.

As used in this chapter and elsewhere in this RG, the term “performance requirements” is not intended to suggest that 10 CFR Part 40 licensees are required to comply with the performance requirements found in 10 CFR 70.61, only that their use as accident consequence and likelihood criteria by the uranium hexafluoride source material facility would be found acceptable by NRC staff. Alternate accident consequence and likelihood criteria may be found acceptable if the applicant demonstrates that the proposed equipment and facilities to prevent or mitigate accidents are adequate to protect health and minimize danger to life or property, and that proposed procedures to prevent or mitigate accidents are adequate to protect health and to minimize danger to life or property.

The application should demonstrate adequate protection of the health and safety of workers and the public from the hazardous chemicals¹ in the facility during normal operations and credible accident conditions. The application should consider all exposure pathways. The facility should also protect against conditions that could affect the safety of licensed materials and thus present an increased radiation or chemical risk (e.g., from a chemical exposure that prevents operators from entering and performing their safety functions in an area of the facility where licensed materials are handled). The 2013 memorandum of understanding between the NRC and the Occupational Safety and Health Administration (Ref. 23), details the NRC’s in role chemical safety issues. The NRC does not regulate substances before process addition to licensed material or after process separation from licensed material, unless the substance could potentially impact the safety of licensed materials (e.g., by leaks or human error) or cause an increased radiological risk.

2.6.1 Chemical Process Description

The applicant’s description of the facility design, operations, and items relied on for safety for chemical safety should provide reasonable assurance that they will function as intended and ensure the safe handling of licensed material at the facility. The application should demonstrate that the proposed equipment and facilities are adequate to protect public health and safety and the environment. The application should describe the mechanisms that will allow the applicant to identify and correct potential problems.

The ISA summary supports the safety basis for the chemical process safety evaluation. The ISA summary should include a detailed description of the chemical process hazards and identification of the potential accident sequences. Sufficient detail should be provided to explain the theory of operations.

2.6.2 Chemical Hazard and Accident Sequences

The ISA summary should contain the potential accident sequences caused by process deviations or other events internal to the facility and credible external events, including natural phenomena. Whenever possible, a licensee should use its own experience to supplement the identification of potential chemical hazards.

The ISA summary should identify the inventory and location of hazardous chemicals. The description should include hazardous chemicals produced from licensed materials and chemicals that

¹ Hazardous chemicals produced from licensed materials are substances having licensed material as precursor compounds(s) or substances that physically or chemically interact with licensed materials and that are toxic, explosive, flammable, corrosive, or reactive to the extent that they can endanger life or health if not adequately controlled. (See 10 CFR 70.4.)

could impact the safety of licensed materials. The ISA summary should list the high- and intermediate-consequence events with sufficient description to identify how the event could impact the safety of individuals.

2.6.3 Chemical Accident Likelihood and Consequences

The estimation of event likelihood presented in the ISA summary should be developed consistent with the methods and definitions approved for the ISA. The quantitative standards used to assess the consequences to an individual from acute chemical exposure should be acceptable. Events with high and intermediate consequences should be identified as well as the items relied on for safety proposed to reduce the likelihood or the consequences of the event. The ISA Summary should identify the selected standards and demonstrate they are correctly applied to the worker or the member of the public.

The applicant should identify and use appropriate techniques and assumptions in estimating the concentration of released hazardous chemicals. The dispersion models used to evaluate worker or public health and safety should be appropriate for the process and physical settings, and should consider all exposure pathways. The models used should provide conservative estimates of the consequences. The quantitative standards used to assess the unmitigated and mitigated consequences should include acute chemical exposure to licensed material, chemicals produced from licensed materials, or chemicals in contact with licensed materials that are onsite or expected to be onsite.

The ISA summary should demonstrate that the mitigated consequences meet the performance requirements in 10 CFR 70.61(b) and 10 CFR 70.61(c). The definition of unlikely, highly unlikely, and credible should be included in the application.

2.6.4 Development of Chemical Process Items Relied on for Safety

Development of chemical process safety features should ensure adequate protections against all unmitigated sequences identified in the accident analysis. The proposed controls for chemical safety should provide reasonable assurance that they will function as intended and assure the safe handling of licensed material at the facility.

The applicant should provide a list of the chemical process safety controls that are necessary to meet the performance requirements committed to in the application. The applicant should identify safety controls for any unmitigated hazardous chemical accident sequences that could lead to consequences that exceed these performance requirements. The safety controls should mitigate the consequence or make them sufficiently unlikely in order to meet the performance requirements. The applicant should describe the safety controls in sufficient detail to permit an understanding of their safety functions.

2.6.5 Chemical Process Management Measures

The application should describe the management measures that the licensee will take to provide reasonable assurances that the chemical safety controls are available and reliable to perform their function. The description should include the procedures put in place to ensure engineered and administrative controls are correctly implemented. The applicant should provide commitments to retain records for chemical-process safety compliance and reporting commitments for chemical releases. In addition, the applicant should commit to refer any unacceptable performance deficiency to those responsible for the facility's corrective action function.

Management measures may be graded, commensurate with the safety significance of the safety controls to which they are applied. If the applicant has applied a graded approach to safety, the

application should establish that the grading of management measures and classification of safety controls is appropriate and sufficient to protect against chemical process risks.

2.6.6 Additional Guidance on Chemical Safety

Additional information regarding developing and implementing a chemical process safety is available in Chapter 6, “Chemical Process Safety,” of NUREG-1520.

2.7 Fire Safety

In accordance with 10 CFR 40.32(c), the application should describe appropriate equipment, facilities, and procedures for fire safety used to protect health and minimize danger to life and property. Implementation of the following guidance will ensure the regulatory requirements are met.

In addition, facilities subject to the ISA requirements should comply with 10 CFR 70.62(a). This requires an applicant to develop, implement, and maintain a safety program that will reasonably protect public health and safety and the environment from the fire and explosive hazards associated with processing, handling, and storing licensed materials during normal operations, anticipated operational occurrences, and credible accidents. The fire protection program should address these process-specific risks and general fire prevention, protection, and management issues.

The application and the ISA summary should demonstrate a commitment to control and mitigate fire hazards. Information on fire safety should be risk informed, address procedures for maintaining an acceptable level of fire safety, and demonstrate that the applicant is prepared to react quickly and safely to extinguish fires. An applicant may use a graded approach to define fire safety, but it should provide sufficient documentation and commitments to ensure that it will adequately protect workers, the public, and the environment from fire events.

NRC staff have determined that the use of ISA methods, as described in 10 CFR Part 70, Subpart H and NUREG-1520, for the application of the radiological and chemical consequence and likelihood criteria contained in the performance requirements of 10 CFR 70.61, designation of items relied on for safety, and establishment of management measures are an acceptable way of demonstrating adequate safety for the uranium hexafluoride source material facility. Applicants are free to propose alternate accident analysis methods, to propose alternate radiological and chemical consequence and likelihood criteria, to propose alternate safety features, and to propose alternate methods of assuring the availability and reliability of the safety features.

As used in this chapter and elsewhere in this RG, the term “performance requirements” is not intended to suggest that 10 CFR Part 40 licensees are required to comply with the performance requirements found in 10 CFR 70.61, only that their use as accident consequence and likelihood criteria by the uranium hexafluoride source material facility would be found acceptable by NRC staff. Alternate accident consequence and likelihood criteria may be found acceptable if the applicant demonstrates that the proposed equipment and facilities to prevent or mitigate accidents are adequate to protect health and minimize danger to life or property, and that proposed procedures to prevent or mitigate accidents are adequate to protect health and to minimize danger to life or property.

2.7.1 Fire Safety Management Measures

The application should reflect a commitment to ensure that the safety controls are available and reliable and that the facility maintains fire safety awareness among employees, controls transient ignition sources and combustibles, and maintains a readiness to extinguish the fire or limit its consequences. The

application should provide for senior-level management oversight of the fire safety program with input from the facility safety committee or fire safety review committee.

The fire safety management measures should be consistent with the National Fire Protection Association (NFPA) 801: “Standard for Fire Protection for Facilities Handling Radioactive Materials” 2014 Edition (Ref. 24) including (1) fire prevention, (2) inspection, testing, and maintenance of fire safety systems, (3) emergency response organization qualifications, drills, and training, and (4) pre-fire plans. Information on the fire safety management measures should contain sufficient detail to identify their relationship to and functions in, normal operations, anticipated (off-normal) events, and accident safety (mitigating features).

2.7.2 Fire Hazards Analysis

A licensee should conduct an fire hazards analysis (FHA) for each facility or part thereof that, if totally consumed by fire, could release special nuclear material (SNM) in quantity and form that could cause at least an intermediate consequence, as defined in 10 CFR 70.61. The FHA should develop bounding credible fire scenarios for each fire area containing significant fire loading and then assess the consequences of an unmitigated fire. The FHA should include a description, by fire area, of the fuel loading, fire scenarios, methods of consequence analysis, and potential consequences, as well as a description of the mitigative or preventive controls or both. The FHA should also contain an inventory of safety controls that are susceptible to fire damage from credible fires within each fire area.

The FHA is used to identify possible fire initiators and accident sequences leading to radiological consequences or toxic chemical consequences resulting from interaction with SNM. In developing accident sequences that will be reported in the ISA summary, the ISA team will consider the FHA results and assign likelihoods to the various events in the accident sequences. With respect to fire safety, the ISA summary should identify the credible fire hazards (e.g., from the FHA) for each process fire and if it provides details as to how the applicant considered and addressed (i.e., the management measures and safety controls) each fire hazard for each process accident sequence whose consequence could exceed the performance requirements in 10 CFR 70.61. Thus, the FHA is a fundamental tool for evaluating fire hazards as input to the ISA evaluation.

Elements of facility design may affect fire safety including building construction, fire area determination, electrical installation, life safety, ventilation, drainage, and lightning protection. The application should document the fire safety considerations used in the general design of the facility.

In addition to standard industrial fire safety concerns, the application should also address nuclear safety that includes water exclusion areas, environmental protection from large quantities of contaminated fire water, and physical security impacts on egress.

Many hazardous chemicals and processes used by fuel cycle facilities contribute to the fire hazards. For items that threaten licensed material, the application should identify the hazardous chemicals, processes, and design standards used to ensure fire safety.

2.7.3 Safety Controls and the Associated Management Measures

Fire-initiated release scenarios should be identified in the ISA summary to demonstrate compliance with 10 CFR 70.61. The ISA summary should provide sufficient detail to understand the fire hazard and potential consequence and likelihood of the accident sequences. Controls should be identified to mitigate or prevent the scenario and be identified as safety controls or as defense-in-depth measures. For those controls that are mitigative safety controls, reliability and associated management measures

should be indicated. The applicant should identify fire protection safety controls suitable to prevent or mitigate potential accidents. If the applicant takes a graded approach to safety in accordance with 10 CFR 70.62(a), the reviewer should establish that the classification of safety controls and grading of the associated management measures are appropriate and sufficient to protect against fire-related risks.

The NRC staff should also review those management measures that ensure the availability and reliability of such safety controls when they are required to perform safety functions. The ISA summary should demonstrate that the proposed management measures ensure that safety controls are available and reliable when required to ensure the reliable operation of engineered and administrative controls.

2.7.4 Fire Protection and Emergency Response

The application should document the fire protection systems and fire emergency response organizations provided for licensed facilities. If needed, the facility should have an onsite fire emergency response team. If offsite fire departments are needed for facility fire safety, periodic training should be conducted. A memorandum of understanding between the applicant and the fire departments is recommended to define the required protection.

2.7.5 Requirements for New Facilities or New Processes at Existing Facilities

The application or ISA summary or both should address the BDC as required under 10 CFR 70.64 for new facilities or new processes at existing. The application should briefly describe how the ISA was performed for the new process, including its use and relationship to the performance requirements in 10 CFR 70.61, the BDC, and a defense-in-depth strategy for higher risk accident sequences. The ISA summary should describe how the applicant applied 10 CFR 70.64(a)(3) in establishing the design principles, features, and control systems of the new process.

2.7.6 Additional Guidance on Fire Safety

Additional information regarding developing and implementing a fire-safety program is available in the following Standard Review Plan for fuel cycle facilities:

- Chapter 7, “Fire Safety,” of NUREG-1520
- NFPA 801: “Standard for Fire Protection for Facilities Handling Radioactive Materials” 2014 edition

2.8 Emergency Management

Regulations in 10 CFR 40.31(j) require an application that contains uranium hexafluoride in excess of 50 kilograms (kg) (110 pounds (lb)) in a single container or a total of 1,000 kg (2,200 lb) total must contain either an emergency plan or an evaluation showing that the maximum dose to a member of the public due to a release would not exceed that from 2 milligrams (mg) of soluble uranium (see 10 CFR 40.31(j)(1)(ii)).

If an evaluation is submitted, it may use one or more of the factors listed in 10 CFR 40.31(j)(2). If an emergency plan is required, it must meet the content requirements in 10 CFR 40.31(j)(3).

2.8.1 Additional Guidance on Emergency Management:

Additional information on developing an emergency plan is available in the following documents:

- NFPA 801, “Standard for Fire Protection for Facilities Handling Radioactive Materials”
- RG 3.67, Revision 1, “Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities” (Ref. 25)

2.9 Environmental Protection

To address the requirements in 10 CFR 40.32(c) to protect health and minimize danger to life and property, applicants should describe an environmental safety program that is adequate to protect the environment and public health and safety. This information is separate from the requirements in 10 CFR 40.31(f) which requires submission of an environmental report pursuant to subpart A, “National Environmental Policy Act—Regulations Implementing Section 102” of 10 CFR Part 51, “Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions” (Ref. 26).

The environmental safety program differs from the environmental report in that it (a) is part of the license application, (b) addresses the control and monitoring of effluents, and (c) should demonstrate compliance with 10 CFR 40.32(c). Information in the environmental safety program should be consistent with information in the environmental report. The environmental safety program should address the control and monitoring of gaseous and liquid effluents and the management of solid waste. It should also provide for the monitoring of the facility environment, including ambient air, surface water, ground water, soils, and vegetation that can be affected by facility effluents.

If the application includes an ISA summary, the environmental program should be applied to high or intermediate consequences that could affect an individual outside the controlled area or that could result in a 24-hour averaged release of radioactive material outside the restricted area in concentrations exceeding 5,000 times the values in Table 2, “Effluent Concentrations,” in Appendix B to 10 CFR Part 20.

The environmental protection program should focus on that part of the plant used to control and assess the levels of radioactive and non-radioactive releases (gaseous, liquid, and solid) to the environment. The environmental program may rely heavily on the radiation protection program to maintain public doses ALARA in accordance with 10 CFR 20.1101. This includes the use of effluent controls (e.g., procedures, engineering controls, and process controls) to maintain public doses ALARA. The environmental protection program also focuses on the applicant’s waste minimization practices to comply with 10 CFR 20.1406, “Minimization of Contamination.” The reporting procedures should comply with the requirements of 10 CFR 40.65, as described further in RG 4.16, “Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants” (Ref. 27).

The environmental safety review of the ISA summary should examine the identified potential accident sequences that result in radiological and non-radiological releases to the environment, the safety controls that the applicant specifies to reduce the environmental risk of those accidents, and the associated management measures that provide reasonable assurance that the safety controls will perform their designated safety functions. The ISA summary should specify that offsite impacts of accidents have been considered in the evaluation and provide an assessment of those impacts, if any. This information can be used to support the environmental review.

Thus, environmental protection (e.g. the environmental safety program) encompasses three main components, as necessary: (1) effluent and environmental controls and monitoring; (2) the ISA Summary and related ISA documentation, if applicable; and (3) management measures in the license application, if

applicable. The applicant should ensure that environmental protections is addressed in each section of the application including facility and process description, ISA documentation, radiation safety, chemical processes, fire safety, and configuration management.

2.9.1 Additional Guidance on Environmental Protection:

Additional information regarding preparing the environmental protection program, is available in Chapter 9, “Environmental Protection,” of NUREG-1520.

2.10 Decommissioning

The applicant should submit sufficient information to demonstrate decommissioning of the facility safely and in accordance with the requirements in 10 CFR Part 40.36. The applicant should discuss its conceptual approach for meeting the decommissioning requirements in Subpart E, “Radiological Criteria for License Termination,” of 10 CFR Part 20. The applicant should discuss its plans for minimizing contamination. In addition, the applicant should submit a decommissioning funding plan (DFP) in accordance with 10 CFR 40.31(i).

If required, the DFP should demonstrate that the applicant or licensee has considered decommissioning activities that may be needed in the future, performed a credible site-specific cost estimate for those activities, and presented the NRC with financial assurance to cover the cost of those activities in the future. Therefore, the DFP should contain the following:

- an overview of the proposed decommissioning activities
- the methods used to determine the cost estimate
- the financial assurance mechanism

This overview should contain sufficient detail to demonstrate that the decommissioning cost estimate is reasonably accurate.

The application should discuss plans for meeting the decommissioning recordkeeping requirements in 10 CFR 40.36(f). Under the regulations, a licensee must keep records important for decommissioning. These should include records of spills or unusual occurrences involving the spread of contamination, as-built drawings and modifications to structures and equipment in restricted areas, a list of areas designated or formerly designated as restricted areas, and records pertaining to the financial assurance requirements.

If required by 10 CFR 40.36(a), the licensee must also submit, for NRC approval, a decommissioning plan (DP) before beginning its decommissioning actions. The DP should detail the specific decommissioning activities that the licensee will perform and describe the radiation-protection procedures that the licensee will use to protect workers, the public, and the environment during decommissioning.

This information should demonstrate the appropriateness of the decommissioning activities and commit to procedures that protect the health and safety of workers, the public, and the environment. The applicant should update the cost estimate originally presented in the DFP to undertake the facility decommissioning.

In addition to commitments in the DP, both the environmental protection measures and radiation-protection program should contain commitments to minimize waste associated with decommissioning and the management of radiological effluents. The DP should address the decommissioning program and steps, management and organization, health and safety, radiological decommissioning criteria, waste management, security and nuclear-material control, recordkeeping, the decontamination process, and the minimization of contamination. It should also provide information on the decommissioning costs and financial assurance (i.e., the decommissioning cost information should be consistent with the recommendations in NUREG-1757, “Consolidated Decommissioning Guidance” (Ref. 28), issued September 2006).

2.10.1 Additional Guidance on Decommissioning:

Additional information regarding preparing the decommissioning program, the applicant is available in Chapter 10, Decommissioning,” of NUREG-1520

2.11 Management Measures

Management measures are activities performed by a licensee, generally on a continuing basis, to provide reasonable assurance that the safety controls will perform their intended safety function when needed to prevent accidents or mitigate the consequences of accidents to an acceptable level. The purpose of management measures is to provide reasonable assurance of compliance with 10 CFR 70.61, “Performance Measures.” Reasonable assurance is established by considering factors such as necessary maintenance, operating limits, common-cause failures, and the likelihood and consequences of failure or degradation of the safety controls and the measures. As defined in 10 CFR 70.4, “Definitions,” management measures include the following:

- **Configuration management** that provides oversight and control of design information, safety information, and records of modifications (both temporary and permanent) that might affect the ability of items relied on for safety to perform their functions when needed.
- **Maintenance** of safety controls, including corrective maintenance, preventative maintenance, surveillance, monitoring, and functional testing.
- **Training and qualification programs** that provide reasonable assurance that personnel who perform activities relied on for safety understand, recognize the importance of, and are qualified to perform these activities in a manner that adequately protects public health and safety and the environment.
- **Procedures**
- **Audit and Assessments**
- **Incident investigations** for abnormal events, including appropriate corrective actions and lessons learned.
- **Records management** of training, dosimetry, and effluents records, as well as records of classified information and records concerning facility safety controls and their failures.
- **Other quality assurance (QA) elements**

2.11.1 Applicability of Management Measures

According to 10 CFR 70.62(d), if applicable, each applicant should establish management measures to ensure that safety controls will be designed, implemented, and maintained in such a way as to be available and reliable to perform their intended functions when needed to comply with the performance requirements of 10 CFR 70.61. The degree to which management measures are applied may be a function of the item's importance in meeting the performance requirements. If a management measure is applied in a "graded" approach to various safety controls of differing importance, the applicant should describe the variations.

NRC staff have determined that the use of ISA methods, as described in 10 CFR Part 70, Subpart H and NUREG-1520, for the application of the radiological and chemical consequence and likelihood criteria contained in the performance requirements of 10 CFR 70.61, designation of items relied on for safety, and establishment of management measures are an acceptable way of demonstrating adequate safety for the uranium hexafluoride source material facility. Applicants are free to propose alternate accident analysis methods, to propose alternate radiological and chemical consequence and likelihood criteria, to propose alternate safety features, and to propose alternate methods of assuring the availability and reliability of the safety features.

As used in this chapter and elsewhere in this RG, the term "performance requirements" is not intended to suggest that 10 CFR Part 40 licensees are required to comply with the performance requirements found in 10 CFR 70.61, only that their use as accident consequence and likelihood criteria by the uranium hexafluoride source material facility would be found acceptable by NRC staff. Alternate accident consequence and likelihood criteria may be found acceptable if the applicant demonstrates that the proposed equipment and facilities to prevent or mitigate accidents are adequate to protect health and minimize danger to life or property, and that proposed procedures to prevent or mitigate accidents are adequate to protect health and to minimize danger to life or property.

Specific guidance on the development of management measures is available in Chapter 11, "Management Measures," of NUREG-1520, see references below. Although this guidance was developed for facilities licensed under 10 CFR Part 70, Subpart H, the management measures guidance can be used for uranium hexafluoride processing facilities.

2.11.2 Additional Guidance on Management Measures

In preparing the management measures, the applicant may obtain additional information from Chapter 11, Management Measures," of NUREG-1520.

2.12 Material Control and Accounting

Source material facilities are not subject to the requirements in 10 CFR Part 74 (Ref. 29) and therefore are not required to develop a Fundamental Nuclear Material Control Plan (FNMC) unless the facility also processes special nuclear material in addition to the source material. The MC&A requirements that apply to source material facilities are limited to reporting requirements in 10 CFR 40.64, "Reports." The facility should address how it will track and report foreign obligated source material. The primary reporting requirements contained in 10 CFR 40.64(a) are further described in NUREG/BR-0006, "Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M)" (Ref. 30), and Nuclear Materials Management and Safeguards System (NMMSS) Report D-24, "Personal Computer Data Input for Nuclear Regulatory Commission Licensees" (Ref. 31), for receipts, transfers, and inventory adjustments of the licensed source materials. Additional reporting

requirements for the material status reports associated with the annual inventory of source material are contained in 10 CFR 40.64(b) and further described NUREG/BR-0007, “Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C)” (Ref. 32).

The U.S. Government relies on industry to track and report to the NMMSS the quantity and location of foreign obligated source and special nuclear material. Even if the material is shipped to a disposal site for burial, it should be reported to NMMSS as shipped and buried. There is no automatic removal of the foreign obligation from the material. Rather, once material is identified as foreign obligated, the quantity of material remains foreign obligated and NMMSS is used to track the quantity and location of the materials.

Note: Source materials processed at enrichment facilities may be subject to an Agreement for Peaceful Nuclear Cooperation and as a result, most or all of the depleted uranium that is produced at enrichment plants will be foreign obligated, even if the natural uranium feed to the plants is not foreign obligated. In addition, foreign obligated natural uranium feed in an enrichment plant results in the corresponding depleted uranium being foreign obligated.

2.12.1 Additional Guidance on Material Control and Accounting:

Additional information regarding developing material control and accounting reporting requirements is available in NUREG/BR-0096, “Instructions and Guidance for Completing Physical Inventory Summary Reports” (Ref. 33).

2.13 Physical Protection

As specified in 10 CFR 40.32, “General Requirements for Issuance of Specific Licenses,” an applicant must demonstrate that issuance of the license is not inimical to the common defense and security. Although 10 CFR Part 40 does not contain specific requirements for a security plan, the Commission has implemented security requirements by order and voluntarily by license condition for facilities that process large quantities of uranium hexafluoride source materials. The physical security requirements should be completed in accordance with 10 CFR 73.67, “Licensee Fixed Site and In-Transit Requirements for the Physical Protection of Special Nuclear Material of Moderate and Low Strategic Significance” (Ref. 34) for a Category III fuel cycle facility.

The NRC has issued security orders to certain source material fuel cycle facilities primarily because of the chemical security concerns at these facilities. After issuing these orders, the NRC established an internal Security Framework Assessment to analyze the effectiveness of the security measures and to provide input to applicants if more security measures are needed. On a case-by-case basis, the NRC staff has provided example orders to new applicants to review and assess the scale of the projected hazards onsite, and the corresponding level of physical protection required. During development of security plan, licensees should interact with the NRC security staff early in the application process to inform the NRC of the proposed project and seek NRC feedback on the level of security information required.

2.13.1 Additional Guidance on Physical Protection:

Additional information relevant to physical protection is available in the following documentation.

- IAEA Information Circular 225, Rev. 5, “Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities,” issued in January 2011

- NUREG/BR-0252, “User’s Guide to Physical Protection Documents Published by the NRC” (Ref. 36)
- 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” (Ref. 37)

In addition to the physical security requirements, 10 CFR 40.31(m) requires the application provide for the protection of safeguards information against unauthorized disclosure. The safeguards information should be protected in accordance with 10 CFR 73.21, 73.22, and 73.23.

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D. IMPLEMENTATION

The purpose of this section is to provide information on how applicants and licensees² may use this guide and information regarding the NRC's plans for using this RG. In addition, it describes how the NRC staff complies with the Backfit Rule in 10 CFR Part 72.62 (Ref. 38).

Use by Applicants and Licensees

Applicants and licensees may voluntarily³ use the guidance in this document to demonstrate compliance with the underlying NRC regulations. Methods or solutions that differ from those described in this RG may be deemed acceptable if they provide sufficient basis and information for the NRC staff to verify that the proposed alternative demonstrates compliance with the appropriate NRC regulations. Current licensees may continue to use guidance the NRC found acceptable for complying with the identified regulations as long as their current licensing basis remains unchanged. The acceptable guidance may be a previous version of this RG.

Licensees may use the information in this RG for actions which do not require NRC review and approval such as changes to a facility design under 10 CFR Part 72.48. Licensees may use the information in this RG or applicable parts to resolve regulatory or inspection issues.

Use by NRC Staff

The NRC staff does not intend or approve any imposition or backfitting of the guidance in this RG. The NRC staff does not expect any existing licensee to use or commit to using the guidance in this RG, unless the licensee makes a change to its licensing basis. The NRC staff does not expect or plan to request that licensees voluntarily adopt this RG to resolve a generic regulatory issue. The NRC staff does not expect or plan to initiate NRC regulatory action that would require using this RG. Examples of such unplanned NRC regulatory actions include issuance of an order requiring the use of the RG, generic communication, or promulgation of a rule requiring the use of this RG without further backfit consideration.

During regulatory discussions on plant-specific operational issues, the staff may discuss with licensees various actions consistent with staff positions in this RG, as one acceptable means of meeting the underlying NRC regulatory requirement. Such discussions would not ordinarily be considered backfitting even if prior versions of this RG are part of the licensing basis of the facility. However, unless this RG is part of the licensing basis for a facility, the staff may not represent to the licensee that the licensee's failure to comply with the positions in this RG constitutes a violation.

² In this section, "licensees" refers to: (1) holders of special nuclear material licenses under 10 CFR Part 70, (2) holders of licenses for independent spent fuel storage installations or monitored retrievable storage installations or certificates of compliance for spent fuel storage cask designs under 10 CFR Part 72, and (3) holders of certificates of compliance or approvals of a compliance plan for gaseous diffusion plants under 10 CFR Part 76. In this section, the term "applicants," refers to applicants for: (1) special nuclear material licenses under 10 CFR Part 70, (2) licenses for independent spent fuel storage installations or monitored retrievable storage installations or certificates of compliance for spent fuel storage cask designs under 10 CFR Part 72, and (3) certificates of compliance or approvals of a compliance plan for gaseous diffusion plants under 10 CFR Part 76.

³ In this section, "voluntary" and "voluntarily" mean that the licensee is seeking the action of its own accord, without the force of a legally binding requirement or an NRC representation of further licensing or enforcement action.

If an existing licensee voluntarily seeks a license amendment or change and (1) the NRC staff's consideration of the request involves a regulatory issue directly relevant to this new or revised RG, and (2) the specific subject matter of this RG is an essential consideration in the staff's determination of the acceptability of the licensee's request, then the staff may request that the licensee either follow the guidance in this RG or provide an equivalent alternative process that demonstrates compliance with the underlying NRC regulatory requirements. This is not considered backfitting as defined in 10 CFR Part 72.62(a).

Additionally, an existing applicant may be required to adhere to new rules, orders, or guidance if 10 CFR Part 72.62(c) applies.

If a licensee believes that the NRC is either using this RG or requesting or requiring the licensee to implement the methods or processes in this RG in a manner inconsistent with the discussion in this Implementation section, then the licensee may file a backfit appeal with the NRC in accordance with the guidance in NRC Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection" (Ref. 39) and NUREG-1409, "Backfitting Guidelines" (Ref. 40).

REFERENCES ⁴

1. *U.S. Code of Federal Regulations* (CFR), Title 10, "Energy," 10 CFR Part 40, (10 CFR Part 40) "Domestic Licensing of Source Material," U.S. Nuclear Regulatory Commission, Washington, DC.
2. 10 CFR Part 70, "Domestic Licensing of Special Nuclear Material." U.S. Nuclear Regulatory Commission, Washington, DC.
3. SECY-07-0146, "Regulatory Options for Licensing New Uranium Conversion and Depleted Uranium Deconversion Facilities," U.S. Nuclear Regulatory Commission, Washington, DC.
4. NUREG-1513, "Integrated Safety Analysis Guidance Document," U.S. Nuclear Regulatory Commission, Washington, DC.
5. NUREG-1520, "Standard Review Plan for the Review of a License Application for a Fuel Cycle Facility," U.S. Nuclear Regulatory Commission, Washington, DC.
6. NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs," U.S. Nuclear Regulatory Commission, Washington, DC.
7. International Atomic Energy Agency (IAEA) Safety Guide No. NS-R-5, "Safety of Nuclear Fuel Cycle Facilities," issued in 2008.
8. IAEA Safety Guide No. SSG-5, "Safety of Conversion Facilities and Uranium Enrichment Facilities," issued in 2010.
9. IAEA Information Circular 225, Rev. 5, "Nuclear Security Recommendations on Physical Protection of Nuclear Material and Nuclear Facilities." IAEA, Vienna, Austria, January 2011.
10. IAEA Safety Guide No. SSG-15, "Storage of Spent Nuclear Fuel," issued in 2012.

⁴ Publicly available NRC published documents are available electronically through the Electronic Reading Room on the NRC's public Web site at <http://www.nrc.gov/reading-rm/doc-collections/>. The documents can also be viewed online or printed for a fee in the NRC's Public Document Room (PDR) at 11555 Rockville Pike, Rockville, MD; the mailing address is USNRC PDR, Washington, DC 20555; telephone 301-415-4737 or 800-397-4209; fax 301-415-3548; and e-mail pdresource@nrc.gov.

11. 10 CFR Part 2, "Rules of Practice for Domestic Licensing Proceedings," U.S. Nuclear Regulatory Commission, Washington, DC.
12. NUREG/CR-6410, "Nuclear Fuel Cycle Facility Accident 1 Analysis Handbook," (Science Applications International Corporation, 1998).
13. NUREG-1601, "Chemical Process Safety at Fuel Cycle Facilities," U.S. Nuclear Regulatory Commission, Washington, DC.
14. RG 3.74, "Guidance for Fuel Cycle Facility Change Process," U.S. Nuclear Regulatory Commission, Washington, DC.
15. NUREG-1391, "Chemical Toxicity of Uranium Hexafluoride Compared to Acute Effects of Radiation," U.S. Nuclear Regulatory Commission, Washington, DC.

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16. 10 CFR Part 19, "Notices, Instructions and Reports to Workers: Inspection and Investigation," U.S. Nuclear Regulatory Commission, Washington, DC.
17. 10 CFR Part 20, "Standards for Protections against Radiation," U.S. Nuclear Regulatory Commission, Washington, DC.
18. RG 8.10, "Operating Philosophy for Maintaining Occupational Radiation Exposures as Low as Is Reasonably Achievable," U.S. Nuclear Regulatory Commission, Washington, DC.
19. RG 8.15, "Acceptable Programs for Respiratory Protection," U.S. Nuclear Regulatory Commission, Washington, DC.
20. RG 8.24 "Health Physics Surveys During Enriched Uranium-235 Processing and Fuel Fabrication" U.S. Nuclear Regulatory Commission, Washington, DC.
21. RG 8.9, "Acceptable Concepts, Models, Equations, and Assumptions for a Bioassay Program," U.S. Nuclear Regulatory Commission, Washington, DC.
22. RG 8.11, "Applications of Bioassay for Uranium," U.S. Nuclear Regulatory Commission, Washington, DC.
23. *U.S. Code of Federal Regulations* (CFR), Title 40, "Protection of Environment," 40 CFR Part 190, (40 CFR Part 190) "Environmental Radiation Protection Standards for Nuclear Power Operations," U.S. Environmental Protection Agency, Washington, DC.
24. "Memorandum of Understanding Between the U.S. Nuclear Regulatory Commission and the Occupational Safety and Health Administration," 2013.
25. NFPA 801, "Standard for Fire Protection for Facilities Handling Radioactive Materials," National Fire Protection Association, Quincy, MA, 2014.
26. RG 3.67, "Standard Format and Content for Emergency Plans for Fuel Cycle and Materials Facilities," U.S. Nuclear Regulatory Commission, Washington, DC.
27. 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," U.S. Nuclear Regulatory Commission, Washington, DC.
28. RG 4.16, "Monitoring and Reporting Radioactivity in Releases of Radioactive Materials in Liquid and Gaseous Effluents from Nuclear Fuel Processing and Fabrication Plants and Uranium Hexafluoride Production Plants," U.S. Nuclear Regulatory Commission, Washington, DC.
29. NUREG-1757, "Consolidated Decommissioning Guidance," U.S. Nuclear Regulatory Commission, Washington, DC.
30. 10 CFR Part 74, "Material Control and Accounting of Special Nuclear Material," U.S. Nuclear Regulatory Commission, Washington, DC.
31. NUREG/BR-0006, "Instructions for Completing Nuclear Material Transaction Reports (DOE/NRC Forms 741 and 740M)," U.S. Nuclear Regulatory Commission, Washington, DC.
32. Nuclear Materials Management and Safeguards System (NMMSS) Report D-24, "Personal Computer Data Input for Nuclear Regulatory Commission Licensees," U.S. Nuclear Regulatory Commission, Washington, DC.

33. NUREG/BR-0007, "Instructions for the Preparation and Distribution of Material Status Reports (DOE/NRC Forms 742 and 742C)," U.S. Nuclear Regulatory Commission, Washington, DC.
34. NUREG/BR-0096, "Instructions and Guidance for Completing Physical Inventory Summary Reports," U.S. Nuclear Regulatory Commission, Washington, DC.
35. 10 CFR 73.67, "Licensee Fixed Site and In-Transit Requirements for the Physical Protection of Special Nuclear Material of Moderate and Low Strategic Significance," U.S. Nuclear Regulatory Commission, Washington, DC.
36. NUREG/BR-0252, "User's Guide to Physical Protection Documents Published by the NRC," U.S. Nuclear Regulatory Commission, Washington, DC.
37. 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," U.S. Nuclear Regulatory Commission, Washington, DC.
38. 10 CFR Part 72, "Licensing Requirements for the Independent Storage of Spent Nuclear Fuel, High-Level Radioactive Waste, and Reactor-Related Greater than Class C Waste," U.S. Nuclear Regulatory Commission, Washington, DC.
39. NRC Management Directive 8.4, "Management of Facility-Specific Backfitting and Information Collection," U.S. Nuclear Regulatory Commission, Washington, DC.
40. NUREG-1409, "Backfitting Guidelines," U.S. Nuclear Regulatory Commission, Washington, DC.