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## 9.0 ENVIRONMENTAL PROTECTION

### 9.1 PURPOSE OF REVIEW

The purpose of this review is to determine whether the applicant's proposed environmental protection measures are adequate to protect public health and the environment and comply with the regulatory requirements imposed by the Commission in 10 CFR Parts 20, 51, and 70. In addition, the staff will determine if the applicant has submitted an environmental report that is adequate for staff use in preparation of an Environmental Assessment (EA) and Finding of No Significant Impact (FONSI), or an Environmental Impact Statement (EIS), pursuant to Part 51.

Staff should coordinate the preparation of an EA and FONSI, or EIS, with the Environmental Review Team in the Division of Waste Management. Staff coordination is described in Section 9.6.2 of this chapter.

### 9.2 RESPONSIBILITY FOR REVIEW

Primary: Environmental Engineer/Scientist

Secondary: Licensing Project Manager

Supporting: Fuel Cycle Facility Inspector  
Radiation Safety Reviewer  
ISA Lead Reviewer

### 9.3 AREAS OF REVIEW

There are two distinct components of the application that require an environmental review. These are: (1) the environmental report; and (2) the description of environmental protection measures. The review of environmental protection measures includes a review of the applicant's ISA. The following subsections identify the areas of review for each of these components. Greater detail on each component is provided in Section 9.4, which specifies the review acceptance criteria.

#### 9.3.1 Environmental Report

The regulatory requirements for the environmental report are contained in Part 51. These regulations were promulgated by the Commission to implement the National Environmental Policy Act (NEPA) of 1969, which requires an assessment of the environmental impacts for all major Federal actions. The NRC staff conducts an independent assessment for all licensing actions that may have a significant effect on the environment, based on the information provided by the applicant in the environmental report. This assessment is documented in an

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EA or EIS. The Commission has determined that actions listed in 10 CFR 51.22(c) have insignificant environmental impacts and are categorically excluded from the requirement for an EA and an environmental report. However, the applicant may be required to submit information to the NRC to justify the applicability of the categorical exclusion. In accordance with 10 CFR 51.21, the Commission may, in special circumstances, prepare an EA on an action covered by a categorical exclusion.

The areas of review for the environmental report correspond to the content specified in 10 CFR 51.45:

- Date of Application;
- Environmental Considerations;
  - Description of the proposed action;
  - Purpose of the proposed action;
  - Description of the affected environment;
  - Discussion of considerations (including environmental impacts and alternatives to the proposed action);
- Analysis;
- Status of Compliance; and
- Adverse Information.

The environmental report may include, reference, or supplement information submitted to the NRC for prior licensing actions.

## 9.3.2 Environmental Protection Measures

The regulatory requirements for environmental protection are contained in Parts 20, 51, and 70. The NRC staff environmental review is focused on that part of the applicant's plant-wide safety program that is established to control and assess the level of radioactive and nonradioactive releases (gaseous, liquid, and solid) to the environment. Therefore, the effluent control portion of the applicant's radiation protection program, as well as effluent and monitoring practices, are reviewed.

To receive authorization to possess a critical quantity of SNM, as defined in 10 CFR 70.4, an applicant must also perform an ISA and an ISA Summary in accordance with Subpart H of 10 CFR Part 70. Guidance on the ISA is covered in Chapter 3 of this SRP. The environmental safety review of the ISA Summary will include a review of the identified potential accident sequences that result in radiological and nonradiological releases to the environment; the IROFS that are specified by the applicant to reduce the risk of those accidents; and the associated management measures that provide reasonable assurance that the IROFS will perform their designated safety functions.

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Thus, environmental protection includes three main components: (1) the radiation protection program; (2) effluent and environmental monitoring; and (3) the ISA Summary and other ISA documentation, as necessary. The areas of review include:

## 9.3.2.1 Radiation Protection

- ALARA goals for effluent control;
- Effluent controls to maintain public doses ALARA;
- ALARA reviews and reports to management; and
- Waste-minimization practices and for new operations, design plans for waste-minimization.

## 9.3.2.2 Effluent and Environmental Monitoring

- In-place filter-testing procedures for air-cleaning systems;
- Known or expected concentrations of radionuclides in effluents;
- Physical and chemical characteristics of radionuclides in discharges;
- Discharge locations;
- Environmental media to be monitored and the sample locations;
- Sampling collection and analysis procedures, including the minimum detectable concentrations of radionuclides;
- Action levels and actions to be taken when the levels are exceeded;
- Permits, including air discharge and National Pollutant Discharge and Elimination System permits;
- Leak-detection systems for ponds, lagoons, and tanks;
- Pathways analysis methods to estimate public doses;
- Recording and reporting procedures; and
- Solid waste handling and disposal programs.

## 9.3.2.3 ISA Summary

- Accident sequences (and associated facility processes) which, if unmitigated, result in releases to the environment;
- Likelihood and environmental consequences of these accident sequences;
- Controls relied on to reduce the unmitigated risk from "high" risk to an acceptable level; and
- Availability and reliability of controls.

## 9.4 ACCEPTANCE CRITERIA

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Acceptance criteria for the environmental report and for the environmental protection measures are described in Sections 9.4.1 and 9.4.2, respectively.

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## 9.4.1 Regulatory Requirements

- 1) 10 CFR Part 20, specifically the effluent control and treatment measures necessary to meet the dose limits and dose constraints for members of the public specified in Subparts B, D, and F; the survey requirements specified in Subpart F; the waste disposal requirements in Subpart K; the records requirements of Subpart L; and the reporting requirements of Subpart M.
- 2) Part 51, specifically the applicant must establish effluent and environmental monitoring systems to provide the information required by 10 CFR 51.60(a).
- 3) Part 51, specifically the applicant must submit an environmental report, as required by 10 CFR 51.60(b), or support a categorical exclusion as described in 10 CFR 51.22(c).
- 4) Part 70, specifically the applicant must demonstrate that proposed facilities and equipment, including measuring and monitoring instruments and devices for the disposal of radioactive effluents and wastes, are adequate to protect public health and the environment as specified in 10 CFR 70.22(a)(7).
- 5) Part 70, specifically the applicant for a facility as described in 10 CFR 70.4, must submit a safety assessment of the design basis of the principal structure, systems, and components of the plant, including provisions for protection against natural phenomena, as specified in 10 CFR 70.22(f).
- 6) Part 70, specifically an application for a facility must contain an ISA Summary that includes a list of the IROFS established by the applicant and other elements, as described in 10 CFR 70.65(b).
- 7) 10 CFR 70.59 outlines the radiological effluent monitoring reporting requirements for a 10 CFR Part 70 licensee.

## 9.4.2 Regulatory Guidance

The regulatory guidance for environmental protection is contained in:

- (1) NRC Regulatory Guide 4.5, "Measurements of Radionuclides in the Environment Sampling and Analysis of Plutonium in Soil."
  - (2) NRC Regulatory Guide 4.15, "Quality Assurance for Radionuclide Monitoring Programs (Normal Operations) - Effluent Streams and the Environment."
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- (3) NRC Regulatory Guide 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."
- (4) NRC Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other than Power Reactors."
- (5) NRC Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities."
- (6) NRC Information Notice 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewerage Under the Revised 10 CFR Part 20," January 28, 1994.
- (7) NRC Information Notice 94-23, "Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program," March 1994.
- (8) ANSI N13.1-1982, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities."
- (9) ANSI N42.18-1980, "Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactive Effluents."
- (10) NCRP Report No. 123, "Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground," January 1996.
- (11) Draft Environmental Standard Review Plan, 2000.

## **9.4.3 Regulatory Acceptance Criteria**

### **9.4.3.1 Environmental Report (or Categorical Exclusion Information)**

An environmental report is required for actions listed in 10 CFR 51.60(b). The acceptance criteria for the environmental report are discussed in Section 9.4.3.1.1.

An environmental report is not required for licensing actions that meet the requirements for a categorical exclusion, as defined in 10 CFR 51.22(c). However, if pursuant to 10 CFR 51.23(c)(11), the action involves an amendment to licenses for fuel cycle plants, radioactive waste disposal sites, and other materials licenses identified in 10 CFR 51.60(b)(1), for changes in process operations or equipment, the applicant must justify that the action will not result in significant effects on the environment. The acceptance criteria for this categorical exclusion are given in Section 9.4.3.1.2.

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#### **9.4.3.1.1 Environmental Report**

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## (1) Date of Application

The date of an application for a license to possess and use SNM for processing and fuel fabrication, scrap recovery, conversion of uranium hexafluoride, or for the conduct of any other activity, that the NRC has determined pursuant to 10 CFR 51 Subpart A will significantly affect the quality of the environment, is acceptable if the application is submitted at least 9 months before construction begins, as required by 10 CFR 70.21(f). However, an EIS is generally estimated to take 2 years to complete.

## (2) Environmental Considerations

An adequate environmental report addresses the requirements of 10 CFR 51.45(b), as described below.

### 1. Description of the proposed action

The description of the proposed action includes a brief summary of the significant characteristics of the proposed facility, including the major site features and the major plant design and operating parameters. The description includes a complete discussion about how SNM will be processed at the facility. If future construction is proposed, the description includes a proposed project schedule showing the dates for initiation of site preparation, plant construction, and operation.

### B. Purpose of the proposed action

The statement of purpose demonstrates a need for the proposed project. This demonstration provides at least the following information: (a) the quantities of SNM used for domestic benefit; (b) a projection of national and foreign requirements for the services; and (c) alternative sources of supply for the proposed facility's services. If delay of the proposed project would have effects on the Nation's energy program, or on the applicant's business (such as loss of contracts, jobs, or future business), these effects are discussed.

### C. Description of the affected environment

The description of the affected environment includes:

- i. Site location (including longitude and latitude) and facility layout;
- ii. Regional demography and land use;
- iii. Socioeconomic information, including low-income and minority populations within a 50 mile radius;

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- iv. Regional historic, archaeological, architectural, scenic, cultural, and natural landmarks;
- v. Local meteorology and air quality;
- vi. Local surface water and groundwater hydrology;
- vii. Regional geology and seismology; and
- viii. Local terrestrial and aquatic ecology.

To the extent possible, this information is current, and affects observations and measurements made over a period of years, especially for conditions that are expected to vary seasonally (e.g., precipitations, wind speed and direction, and groundwater levels).

## D. Discussion of considerations

The reviewer should find the discussion of considerations acceptable if it includes:

### i. Impact of the proposed action on the environment

- Effects of site preparation and construction on land use and water use;
- Effects of plant operation on the human population (including consideration of occupational and public radiation exposure) and important biota;
- Any irreversible commitments of resources because of site preparation and plant construction and operation, such as destruction of wildlife habitat, removal of land from agricultural use, and diversion of electrical power;
- Plans and policies regarding decommissioning and dismantling at the end of the plant's useful life;
- Environmental effects of the transportation of radioactive materials to and from the site;
- Environmental effects of accidents;
- Impacts on air and water quality; and
- Impacts on cultural and historic resources.

This section of the environmental report discusses the impacts on the environment in proportion to their significance, and considers the cumulative impacts of the proposed action. In addition, accident analyses provided in the report are consistent with the applicant's ISA.

### ii. Adverse environmental effects

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The information submitted describes any adverse environmental effects that cannot be avoided should the proposal be implemented. This description is presented in quantitative terms to the maximum extent possible. This discussion makes clear which of these effects are unavoidable and subject to later amelioration and which

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are unavoidable and irreversible. The description includes specific measures that the applicant could take or plan to take to mitigate adverse effects.

## iii. Alternatives to the proposed action

The discussion of alternatives to the proposed action is sufficiently complete to aid the NRC in developing and exploring, pursuant to Section 102(2)(E) of the NEPA, "appropriate alternatives to recommended courses of action in any proposal which involves unresolved conflicts concerning alternative uses of available resources." To the extent practicable, the environmental impacts of the proposal and the alternatives are presented in comparative form.

The discussion of alternatives includes siting alternatives and design alternatives. Comparable levels of information on each site need not be presented as long as the applicant presents sufficient information to facilitate a fair and reasonable comparison. The following factors are considered when comparing alternative sites:

- Physical characteristics of the area, including demographic, geological, hydrological, meteorological, and seismological conditions of the site and surrounding area;
- Location of power sources and transmission lines;
- Location of the major product market;
- Location of raw materials, components, and sources of supply;
- Availability of air, rail, roads, and water for transport of raw materials and supplies, finished products, and solid wastes;
- Commitment of natural resources for site preparation and plant construction, including but not limited to the destruction or diminution of wildlife habitats, flora, woodlands, and marshlands;
- Commitment of capital for site preparation and plant construction;
- Cost of operation, including consideration of labor supply, prevailing wage rates, and other recurring or nonrecurring costs;
- Availability of municipal services and facilities or, conversely, the cost of providing services such as water and sewage treatment;
- Requirements for relocating homes and families; and
- Existing and projected land use and economic status of the community (e.g., urban, industrial, stable).

## iv. Relationship between short-term uses and long-term productivity

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The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity is discussed. Short-term uses are considered to be those that occur during the active life of the facility. Long-



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term productivity represents the use of the environment beyond decommissioning of the facility.

v. Irreversible and irretrievable commitments of resources

Any irreversible environmental commitments and irretrievable material resources that would be involved in the proposed action are discussed.

### **3. Analysis of Environmental Effects of Proposed Action and Alternatives**

An adequate environmental report analyzes the environmental effects of the proposed action and alternatives. In accordance with 10 CFR 51.45(c), the analysis considers and balances the environmental effects of the proposed action and the alternatives available for reducing or avoiding adverse environmental effects, as well as the environmental, economic, social, and other benefits of the proposed action.

This analysis quantifies, to the fullest extent practicable, the various factors considered. If the application involves renewal or amendment of a current license, environmental impacts are quantified using environmental monitoring data collected by the licensee. To the extent that there are important qualitative considerations or factors that cannot be quantified, the analysis discusses those considerations and factors in qualitative terms. The analysis contains sufficient data to aid the staff in its development of an independent analysis.

### **4. Status of Compliance**

As required by 10 CFR 51.45(d), the applicant should list all Federal permits, licenses, approvals, and other entitlements, that must be obtained in connection with the proposed action. The list is acceptable if it is complete and current as of the application date.

In addition, 10 CFR 51.45(d) requires that the environmental report include a discussion of the status of compliance with applicable environmental quality standards and requirements including, but not limited to, applicable zoning and land-use regulations, and thermal and other water pollution limitations or requirements that have been imposed by Federal, State, regional, and local agencies having responsibility for environmental protection. The discussion is acceptable if it includes a discussion of whether each alternative will comply with such applicable environmental quality standards and requirements. The discussion includes, but is not limited to, the following Federal laws:

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- The National Historic Preservation Act of 1966;

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- The Fish and Wildlife Coordination Act of 1966;
- The Wild and Scenic Rivers Act of 1968;
- The Endangered Species Act Amendments of 1978; and
- The Coastal Zone Management and Improvement Act of 1990.

## 5. Adverse Information

In accordance with 10 CFR 51.45(e), the preceding discussions and analyses are acceptable if they include information that is adverse to the proposed actions, as well as information supporting the proposed action.

### 9.4.3.1.2 Categorical Exclusion

An environmental report is not required for actions, identified in 10 CFR 51.60(b)(1), that involve an amendment to licenses for fuel cycle plants, radioactive waste disposal sites, and other materials licenses, which are not expected to result in significant environmental impacts. However, when amendments involve changes in process operations or equipment as defined in 10 CFR 51.22(c)(11), the applicant needs to justify that the changes will not result in significant environmental effects.

The information provided by the applicant to justify the categorical exclusion determination is acceptable if it demonstrates the following, as specified in 10 CFR 51.22(c)(11):

- There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite;
- There is no significant increase in individual or cumulative occupational radiation exposure;
- There is no significant construction impact; and
- There is no significant increase in the potential for or consequences from radiological accidents.

### 9.4.3.2 Environmental Protection Measures

An applicant's proposed actions for environmental protection are acceptable if they provide for qualified and trained staff, effluent control, and effluent and environmental monitoring, in accordance with NRC requirements. Using the acceptance criteria provided in Chapter 11 of this SRP, the NRC staff will review the training and qualifications for plant personnel associated with environmental protection, as described in the license application. This will include the training and qualification of managers, supervisors, technical staff, operators, technicians, and maintenance personnel whose levels of knowledge are important to maintain protection of public health and the environment. Managers and staff will be expected to have levels of education and experience commensurate with the responsibilities of their positions.

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## 9.4.3.2.1 Radiation Safety

In accordance with 10 CFR 20.1101, each licensee must implement a radiation protection program, which is discussed in detail in Chapter 4.0 of this SRP. The environmental review of the radiation protection program focuses on the applicant's methods to maintain *public* doses ALARA in accordance with 10 CFR 20.1101. NRC guidance on compliance with these regulations can be found in Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities," July 1993.

Specifically, 10 CFR 20.1101(d) requires the applicant to establish a constraint on air emissions of radioactive material to the environment, excluding radon-222 and its decay products, such that the individual member of the public likely to receive the highest dose will not be expected to receive a TEDE in excess of 0.1 mSv (10 mrem) per year from these emissions. The applicant must have procedures to report, when this dose constraint is exceeded, to the NRC, in accordance with 10 CFR 20.2203, and take prompt appropriate corrective action to ensure against recurrence. NRC guidance on compliance with this regulation can be found in Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees Other Than Power Reactors," December 1996.

The environmental review of the radiation protection program also focuses on the applicant's waste minimization practices. Applicants for new licenses are required to comply with 10 CFR 20.1406, which states that the applicant must describe how facility design procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, facilitate eventual decommissioning, and minimize, to the extent practicable, the generation of radioactive waste. Applicants requesting amendment or renewal of existing licenses must minimize and control waste generation during operations as part of the radiation protection program, in accordance with 20.1101 [62 FR 39082].

Guidance for waste minimization programs can be found in NRC Information Notice No. 94-23: "Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program," March 25, 1994. More information on compliance with the decommissioning aspects of the waste minimization regulations can be found in Chapter 10.0 of this SRP.

The proposed radiation protection program is acceptable if it satisfies the following criteria:

1. Radiological (ALARA) Goals for Effluent Control
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ALARA goals are set at a modest fraction (10 to 20 percent) of the values in Appendix B, Table 2, Columns 1 and 2 and Table 3 and the external exposure limit in 10 CFR 20.1302(b)(2)(ii), or the dose limit for members of the public, if the applicant proposes to demonstrate compliance with 10 CFR 20.1301, through a calculation of the total effective dose equivalent (TEDE) to the individual likely to receive the highest dose.

An applicant's constraint approach is acceptable if it is consistent with guidance found in Regulatory Guide 4.20, and the applicant's description of the constraint approach provides sufficient detail to demonstrate specific application of the guidance to proposed routine operations and non-routine operations, including anticipated events.

## 2. Effluent Controls to Maintain Public Doses ALARA

The applicant describes and commits to using effluent controls (e.g., procedures, engineering controls, and process controls) to maintain public doses ALARA. Common control practices include filtration, encapsulation, adsorption, containment, recycling, leakage reduction, and the storage of materials for radioactive decay. Practices for large, diffuse sources such as contaminated soils or surfaces include covers, wetting during operations, and the application of stabilizers. The applicant demonstrates a commitment to reducing unnecessary exposure to members of the public and releases to the environment.

Engineering options that do not result in a substantial reduction in collective dose and require unreasonable costs are not required. Reasonableness can be based on a qualitative or quantitative cost/benefit analysis. Quantitative analyses may use a \$2000 per person-cSv (man-rem) value, as discussed in NUREG-1530, "Reassessment of the NRC's Dollar per Person-Rem Conversion Factor Policy."

## 3. ALARA Reviews and Reports to Management

The applicant commits to annual review of the content and implementation of the radiation protection program, which includes the ALARA effluent control program. This review includes analysis of trends in release concentrations, environmental monitoring data, and radionuclide usage; determines whether operational changes are needed to achieve the ALARA effluent goals; and evaluates all designs for system installations or modifications. The applicant also includes a commitment to report the results to senior management, along with recommendations for changes in facilities or procedures that are necessary to achieve ALARA goals.

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## 4. Waste minimization

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To comply with 10 CFR 20.1406, applications for new licenses are acceptable if they contain a description of how facility design procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment, and minimize, to the extent practicable, the generation of radioactive waste. Waste-minimizations programs proposed by applicants for both new and existing licenses are acceptable if the programs include:

- Top management support;
- Methods to characterize waste generation, including types and amounts, and waste management costs, including costs of regulatory compliance, paperwork, transportation, treatment, storage, disposal, etc.;
- Periodic waste minimization assessments to identify waste minimization opportunities and solicit employee or external recommendations;
- Provisions for technology transfer to seek and exchange technical information on waste minimization; and
- Methods for implementation and evaluation of waste minimization recommendations.

## 9.4.3.2.2 Effluent and Environmental Controls and Monitoring

### A. Effluent Monitoring

The reviewer should find that the applicant's effluent monitoring is acceptable if it meets the following criteria:

1. The known or expected concentrations of radioactive materials in airborne and liquid effluents are below the limits in 10 CFR Part 20, Appendix B, Table 2, or below site-specific limits established in accordance with 10 CFR 20.1302(c), and are ALARA.

If, in accordance with 10 CFR 20.1302(c), the applicant proposes to adjust the effluent concentrations in Appendix B to 10 CFR Part 20, to take into account the actual physical and chemical characteristics of the effluents, the applicant provides information related to aerosol-size distributions, solubility, density, radioactive-decay equilibrium, and chemical form. This information is complete and accurate for the radioactive materials, to justify the derivation and application of the alternative concentration limits.

2. If the licensee proposes to demonstrate compliance with 10 CFR 20.1301 through a calculation of the TEDE to the individual likely to receive the highest dose in accordance with 10 CFR 20.1302(b)(1), calculation of the TEDE by pathway analyses uses appropriate models and codes and assumptions that accurately represent the facility, the site, and the surrounding area; assumptions are reasonable; input data are

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accurate; all applicable pathways are considered; and the results are interpreted correctly.

NCRP Report No. 123, "Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground," January 1996, provides acceptable methods for calculating the dose from radioactive effluents. Computer codes are acceptable tools for pathway analyses if the applicant is able to demonstrate that the code has undergone validation and verification to demonstrate the validity of estimates developed using the code for established input sets. Dose-conversion factors used in the pathway analyses are acceptable if they are based on the methodology described in ICRP 30, "Limits for Intakes of Radionuclides by Workers" as reflected in Federal Guidance Report 11. Such methods are acceptable for determining the dose to the maximally exposed individual during normal facility operations and anticipated events.

3. All liquid and airborne effluent discharge locations are identified and monitored. Monitoring locations are identified, and for those effluent discharge points that have input from two or more contributing sources within the facility, sampling each contributing source is considered necessary for effective process and effluent control.
4. Airborne effluents from all routine operations, and non-routine operations, as well as anticipated events associated with the plant, including effluents from areas not used for processing SNM such as laboratories, experimental areas, storage areas, and fuel element assembly areas, are continuously sampled.

Effluents are sampled unless the applicant has established, by periodic sampling or other means, that radioactivity in the effluent is insignificant and will remain so. In such cases, the effluent is sampled at least quarterly to confirm that effluents are not significant. For the purposes of this SRP, an effluent is significant if the concentration averaged over a calendar quarter is equal to 10 percent or more of the appropriate concentration listed in Table 2 of Appendix B to 10 CFR Part 20.

5. The sample collection and analysis methods and frequencies are appropriate for the effluent medium and the radionuclide(s) being sampled. Sampling methods ensure that representative samples are obtained by use of appropriate sampling equipment and sample collection and storage procedures. For liquid effluents, representative samples are taken at each release point for the determination of concentrations and quantities of radionuclides released to an unrestricted area, including discharges to sewage systems. For continuous releases, samples are continuously collected at each release point. For batch releases, a representative sample of each batch is collected. If periodic sampling is used in lieu of continual sampling, the applicant shows that the samples are representative of actual releases. Monitoring instruments are calibrated at least annually, or more frequently if suggested by the manufacturer.
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6. Radionuclide specific analyses are performed on selected composited samples unless either:
  1. The gross alpha and gross beta activities are so low that individual radionuclides could not be present in concentrations greater than 10 percent of the concentrations specified in Table 2 or 3 of Appendix B to 10 CFR Part 20, or
  2. The radionuclide composition of the sample is known through operational data, such as the composition of the feed material.

Monitoring reports in which estimates of quantities of individual radionuclides are based on methods other than direct measurement include an explanation and justification of how the results were obtained.

Examples of cases in which operational data may not be adequate for the determination of radionuclide concentration are: (1) plants processing uranium in which extraction, ammonium diuranate precipitation, ion exchange, or other separation processes could result in concentration of thorium isotopes (principally Th-234); (2) plants in which uranium of varying enrichments is processed; and (3) plants processing plutonium in which significant variation in the Pu-238/Pu-239 ratio among batches and the continuous in-growth of Am-241 would preclude the use of feed material data to determine the radionuclide composition of effluents.

Radionuclide analyses are performed more frequently than usual under three circumstances: (1) at the beginning of the monitoring program until a predictable and consistent radionuclide composition in effluents is established; (2) whenever there is a significant unexplained increase in gross radioactivity in effluents; or (3) whenever a process change or other circumstance might cause a significant variation in the radionuclide composition.

7. The minimum detectable concentration (MDC) for sample analyses is not more than 5 percent of the concentration limits listed in Table 2 of Appendix B to 10 CFR Part 20. If the actual concentrations of radionuclides in samples are known to be higher than 5 percent of the 10 CFR Part 20 limits, the analysis methods need only be adequate to measure the actual concentration. However, in such cases, the MDC is low enough to accommodate fluctuations in the concentrations of the effluent and the uncertainty of the MDC.
8. The laboratory quality control (QC) procedures are adequate to support the validity of the analytical results. These QC procedures include the use of established standards such as those provided by the National Institute of Standards and Technology (NIST), as well as standard analytical procedures, such as those established by the National Environmental Laboratory Accreditation Conference.

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9. The proposed action levels and actions to be taken if the action levels are exceeded are appropriate. The action levels are incremental, such that each increasing action level results in a more aggressive action to assure and control effluents. A slightly higher than normal concentration of a radionuclide in effluent triggers an investigation into the cause of the increase. An action level is specified that will result in the shutdown of an operation if this level is exceeded. These action levels are selected based on the likelihood that a measured increase in concentration could indicate potential violation of the effluent limits.
10. The descriptions of applicable Federal and/or State standards for discharges and any permits issued by local, State, or Federal governments for gaseous and liquid effluents are complete and accurate.
11. The systems for the detection of leakage from ponds, lagoons, and tanks are adequate to detect and assure against any unplanned releases to groundwater, surface water, or soil.
12. Releases to sewer systems are controlled and maintained to meet the requirements of 10 CFR 20.2003, including (i) the material is water soluble; (ii) known or expected discharges meet the effluent limits of 10 CFR Part 20 Appendix B, Table 3; and (iii) the known or expected total quantity of radioactive material released into the sewer system in a year does not exceed 5 Ci (185 GBq) of  $^3\text{H}$ , 1 Ci (37 GBq) of  $^{14}\text{C}$ , and 1 Ci (37 GBq) of all other radioactive materials combined. Solubility is determined in accordance with the procedure described in NRC Information Notice 94-07.
13. Reporting procedures comply with the requirements of 10 CFR 70.59 and the guidance specified in Regulatory Guide 4.16. Reports of the concentrations of principal radionuclides released to unrestricted areas in liquid and gaseous effluents are provided and include the MDC for the analysis and the error for each data point.
14. The applicant's procedures and facilities for solid and liquid waste handling, storage, and monitoring result in safe storage of the material and timely disposition.

## **B. Environmental Monitoring**

The scope of the applicant's environmental monitoring is acceptable if it is commensurate with the scope of activities at the facility and the expected impacts from operations as identified in the environmental report and meets the following criteria:

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1. Background and baseline concentrations of radionuclides in environmental media have been established through sampling and analysis.



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2. Monitoring includes sampling and analyses for monitoring of air, surface water, groundwater, soil, sediments, and vegetation, as appropriate.
3. The description of monitoring identifies adequate and appropriate sampling locations and frequencies for each environmental medium, the frequency of sampling, and the analyses to be performed on each medium.
4. Monitoring procedures employ acceptable analytical methods and instrumentation to be used. The applicant commits to a program of instrument maintenance and calibration appropriate to the instrumentation. If the applicant proposes to use its own analytical laboratory for the analysis of environmental samples, the applicant commits to provide third-party verification of the laboratory's methods such as may be obtained by participation in a round-robin measurement program.
5. Appropriate action levels and actions to be taken if the levels are exceeded are specified for each environmental medium and radionuclide.

Action levels are selected based on a pathway analysis that demonstrates that below those concentrations, doses to the public will be below the limits in 10 CFR Part 20, Subpart B, and are ALARA. The action levels specify the concentrations at which an investigation would be performed and levels at which process operations would be shut down.

6. MDCs are specified for sample analyses, and are at least as low as those selected for effluent monitoring in air and water. MDCs for sediment, soil, and vegetation are selected based on the action levels, to ensure that sampling and analytical methods are sensitive and reliable enough to support application of the action levels.
7. Data analysis methods and criteria to be used for evaluating and reporting the environmental sampling results are appropriate and will indicate when an action level is being approached in time to take corrective actions.
8. The description of the status of all licenses, permits, and other approvals of plant operations required by Federal, State, and local authorities is complete and accurate.
9. Environmental monitoring is adequate to assess impacts to the environment from potential radioactive and nonradioactive releases, as identified in high and medium risk accident sequences in the ISA.

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## 9.4.2.3 Integrated Safety Analysis

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In accordance with 10 CFR 70.60, applicants requesting a critical mass of SNM are required to perform an ISA. The applicant's treatment of environmental protection in the ISA is acceptable if it fulfills the following criteria:

- The ISA provides a complete list of accident sequences that result in radiological and nonradiological releases to the environment;
- The ISA provides a reasonable estimate for the likelihood and consequences of each accident sequence identified;
- Adequate controls are identified for each accident sequence of environmental significance. The controls (engineering or administrative) will prevent or mitigate "high" risk sequences to an acceptable level. (Definitions of risk categories are given in Chapter 3 of this SRP.) Controls provide the indicated level of protection;
- Adequate levels of assurance are afforded to the controls to ensure that IROFS will satisfactorily perform their safety functions. This may be accomplished through configuration management, training, and maintenance activities; and
- The ISA uses acceptable methods for estimating environmental effects from accident sequences.

## 9.5 REVIEW PROCEDURES

The staff will review the environmental report and the environmental protection measures to verify that each meets the acceptance criteria in Section 9.4. If the applicant has not provided sufficient information to make these determinations, then a request for additional information (RAI) should be made in coordination with the facility project manager. The format for an RAI is specified in Chapter 4 of the Fuel Cycle Licensing Branch "Materials Licensing Procedures Manual." Additional review procedures are provided in Sections 9.5.1 to 9.5.3.

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## 9.5.1 Environmental Report

Review of the environmental report or information presented to support a categorical exclusion includes review of occupational exposure information. This review should be coordinated with the radiation safety reviewer to assess the adequacy of the information provided by the applicant.

## 9.5.2 Environmental Protection

For renewal and amendment applications, an environmental specialist review of environmental protection will include coordination with the fuel cycle facility inspector responsible for environmental protection. Any comments or concerns that the inspector identifies will be addressed and resolved, and the SER (described in Section 9.6.1) for the licensing action will contain a statement indicating if the inspection staff has any objections to approval of the proposed licensing action. In addition, the review of applications will include review of inspection reports and semi-annual effluent reports submitted in accordance with 10 CFR 70.59, to assure licensee performance in environmental protection.

As part of the environmental protection review, the environmental specialist will review the ISA Summary. All accident sequences identified in the ISA Summary that can have significant environmental consequences will be reviewed to determine that the list of potential accidents is complete and properly identified. This review will be coordinated with the ISA reviewer. Detailed review will only be conducted of the accident sequences which, when left unmitigated, are rated as "high risk" by the applicant, as well as approximately 10 percent of the "medium" risk sequences, and a smaller number of the "low" risk sequences. However, additional "medium" and "low" risk sequences may be evaluated based on the results of the initial review.

Evaluation of the ISA Summary requires coordination with other technical reviewers. The environmental review of the controls will be coordinated with the reviewers for the specific assurance functions, such as training and maintenance.

Finally, review of the ISA may require examination of detailed supporting documents that have not been submitted for the public record and are instead located at the facility. The reviewer should decide, as a result of these reviews, what supporting documents need to be forwarded to the NRC for inclusion in the public record of the application. As a general rule, material that directly supports a licensing decision of reasonable assurance of safety should be a matter of public record. Whether the material is placed in the public record or only available at the facility, the reviewer will clearly cite in the SER what materials were examined, and what descriptions and commitments were considered and relied on, or the basis for the staff's safety decision.

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## 9.6 EVALUATION FINDINGS

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## 9.6.1 Introduction

Documentation of the evaluation findings for the environmental protection review is contained in two types of products. An SER documents the technical review of the application including, the review of the environmental protection program and the ISA Summary. The EA or EIS documents the staff's independent assessment of the environmental impacts of the proposed action.

The staff reviewers will verify that the information submitted by the applicant is in accordance with Parts 20, 51, and 70, and that this information is consistent with the guidance in this SRP as it applies to environmental protection. In the input to the SER, the primary reviewer documents the bases for determining the adequacy of the application with respect to environmental protection, and should recommend additional license conditions in areas where the license application is not adequate. The primary reviewer also describes the applicant's approach to ensuring the quality and reliability of the controls required for environmental protection.

Often, environmental protection is reviewed and evaluated in conjunction with the environmental report, and the environmental protection function is summarized in the EA or EIS. However, the EA or EIS does not become part of the license. Issues identified during the review should be discussed briefly in the SER, and any recommended license conditions based on the analysis in the EA or EIS should be added to the license.

If an EA and EIS were prepared for the licensing action, the date the documents were issued should be reported in the environmental safety section of the SER. If the EA resulted in a FONSI, the FONSI's publication date in the Federal Register should be included in the SER. If an EIS is prepared, the SER would include the Federal Register publication date for the Record of Decision. When applicable, the SER also documents the determination that an action meets a categorical exclusion.

## 9.6.2 NEPA Documentation and Coordination

Before taking a licensing action, including issuance, renewal, or amendment, the appropriate NRC Branch Chief will determine whether the proposed action qualifies for a categorical exclusion under 10 CFR 51.22, or whether an EA should be prepared, or whether conditions warrant staff going directly to an EIS, and then initiate the appropriate coordination with the Division of Waste Management.

1. An EIS will be prepared if the action meets the criteria in 10 CFR 51.20. An EA is not necessary if it is determined that an EIS will be prepared. The NRC Branch Chief should initiate coordination with the Division of Waste Management to prepare the EIS.
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2. An EA will be prepared if the action meets the criteria in 10 CFR 51.21. If the EA results in a FONSI, no further environmental review is necessary unless significant new information comes to light or the licensee changes its plan. Review of the EAs by the Environmental Review Team is required and the EA should be sent to the team for review prior to its finalization. If the EA does not result in a FONSI, then an EIS must be prepared.
3. A categorical exclusion will suffice if the action meets the criteria for categorical exclusions as defined in 10 CFR 51.22(c). (An action that qualifies for a categorical exclusion is usually identified at the start of the licensing review, and an environmental report is not required.) No coordination with the Division of Waste Management is required.

Requirements for the preparation of an EIS, EA, or FONSI are described in detail in Part 51. Documents prepared in accordance with NEPA will follow pertinent NMSS procedures, including consultation with States (Policy & Procedures Letter 1-48), evaluation of environmental justice (Policy & Procedures Letter 1-50 Revision 2), and Chapter 6 of the NRC Division of Fuel Cycle Safety and Safeguards, Fuel Cycle Licensing Branch Manual. Sections 9.6.2.1 and 9.6.2.2 contain an overview of the regulatory requirements for an EA, FONSI, EIS and Record of Decision specified in Part 51. However, this discussion is not intended to be all-inclusive.

## 9.6.2.1 Environmental Assessment (EA)

The staff will prepare an EA using information contained in the license application and a separate submittal, the environmental report submitted by the licensee, in accordance with 10 CFR 51.45. The EA that is prepared identifies the proposed action and includes the following, in accordance with 10 CFR 51.30:

1. A brief discussion of:
    - a. The need for the proposed action
    - b. Alternatives to the proposed action as required by Section 102(2)(E) of the NEPA
    - c. The environmental impacts of the proposed action and alternatives, as appropriate
    - d. As required for special case EAs, as defined by NMSS Policy and Procedures letter 1-50, Revision 2, September 7, 1999, disproportionately high and adverse human health or environmental effects on low-income and minority populations
  2. A list of agencies and persons consulted and identification of sources used. During preparation of an EA, the staff will consult with affected States, the Fish and Wildlife Service, State Historic Preservation Officer, and Tribal Officer (as necessary), on
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- environmental issues and will document such contacts in the EA. This documentation

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will include the following information identified in NMSS Policy and Procedures Letter 1-48, January 1995:

- a. The name of each State, agency (including contacted individual's name), or person consulted
- b. Date of consultation(s)
- c. Purpose for the consultation
- d. Brief summary of the views or comments expressed by the consulted party and the staff's resolution
- e. Reference to publicly available documents containing additional information, if applicable

Much of the information used to prepare the EA is provided by the applicant in the environmental report. However, the staff will perform independent analyses of the environmental impacts of the proposed action and will discuss the conclusions of these analyses in the EA. The EA should focus on the impacts of the proposed action and should be no more than 15 pages, unless more are necessary to explain any complicated environmental issues associated with the proposed action.

On completion, the EA should be forwarded to the Environmental Review Team for review. The Environmental Review Team reviews the EA to ensure consistency among all EAs prepared by NMSS. When the Environmental Review Team completes its review, the appropriate NRC Branch Chief will determine whether to prepare an EIS or a FONSI on the proposed action. As discussed in Section 9.6.2.2 and provided in 10 CFR 51.33, a determination to prepare a draft FONSI may be made. As provided in 10 CFR 51.25, an EA is not necessary if it is determined that an EIS will be prepared.

## 9.6.2.2 FONSI

When the staff makes a final finding that there are no significant environmental impacts from the proposed action, a final FONSI will be published in the Federal Register. The Commission will not take the proposed action, including license issuance, renewal, or amendment, until after the FONSI has been published. Requirements for the preparation of a FONSI for materials licensing actions are contained in 10 CFR 51.32 to 51.35. A FONSI will include the following:

1. Identification of the proposed action
2. Statement that the Commission has determined not to prepare an EIS for the proposed action
3. Brief presentation of the reasons why the proposed action will not have a significant impact on the quality of the human environment
4. The EA or a summary of the EA
5. A note of any other related environmental documents

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6. A statement that the finding and any related environmental documents are available for public inspection and where the documents may be inspected.

NRC may make a determination to prepare and issue a draft FONSI for public review and comment before making a final determination on whether to prepare an EIS or a final FONSI on the proposed action. A draft FONSI may be prepared if a FONSI appears warranted, but the proposed action is similar to one that normally requires an EIS, or is without precedent.

The draft FONSI will be identified as a "draft" and will contain the information specified above for a final FONSI. The draft FONSI will be accompanied by or will include a request for comments on the proposed action and the draft findings within 30 days, or a longer period, as may be specified in the notice of the draft findings. This draft FONSI will be published in the Federal Register, distributed as provided in 10 CFR 51.74(a), and made available in accordance with 10 CFR 51.123.

When a draft FONSI is issued, a final determination to prepare an EIS or final FONSI will not be made until the last day of the public comment period has expired.

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## 9.6.2.3 EIS

When the appropriate NRC Branch Chief determines that an EIS will be prepared for the licensing action the NRC Branch Chief should initiate coordination with the Environmental Review Team. The Environmental Review Team will prepare the EIS. The project manager should coordinate with Environmental Review Team to: 1) ensure that there is consistency between the environmental review and the preparation of the EIS; and 2) ensure that the results of the NEPA analysis are appropriately incorporated into the SER and license.

## 9.6.3 Sample Safety Evaluation Report

The following language would be appropriate for a licensing action that required an EIS in accordance with 10 CFR 51.20.

*The applicant has committed to adequate environmental protection measures, including: (1) environmental and effluent monitoring; and (2) effluent controls to maintain public doses ALARA as part of the radiation protection program. The NRC staff concludes, with reasonable assurance that the applicant's conformance to the application and license conditions is adequate to protect public health and the environment and comply with the regulatory requirements imposed by the Commission in Parts 20, 51, and 70. The bases for these conclusions are:*

*[State the bases for the conclusion, including any recommended license conditions.]*

*The NRC staff prepared an environmental impact statement (EIS) [publication date] for this licensing action as required by 10 CFR 51.20. Based on the EIS, the NRC stated in its Record of Decision [publication date in the Federal Register] that the preferred option was [state preferred option here].*

## 9.7 REFERENCES

American National Standards Institute, N13.1-1982, "Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities."

American National Standards Institute, N42.18-1980, "Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactive Effluents."

National Council on Radiation Protection and Measurements, NCRP Reports No. 123 I & II, "Screening Models for Releases of Radionuclides to Atmosphere, Surface Water, and Ground," January 1996.

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U.S. Nuclear Regulatory Commission Information Notice No. 94-23: "Guidance to Hazardous, Radioactive and Mixed Waste Generators on the Elements of a Waste Minimization Program," March 25, 1994.

U.S. Nuclear Regulatory Commission Information Notice 94-07, "Solubility Criteria for Liquid Effluent Releases to Sanitary Sewerage Under the Revised 10 CFR Part 20," January 28, 1994.

U.S. Nuclear Regulatory Commission, NMSS/FCSS/Fuel Cycle Licensing Branch, Rev. 5, "Materials Licensing Procedures Manual," September 1996.

U.S. Nuclear Regulatory Commission, Regulatory Guide 4.15, Rev. 2, "Quality Assurance for Radiological Monitoring Programs (Normal Operations)–Effluent Streams and the Environment," February 1979.

U.S. Nuclear Regulatory Commission, Regulatory Guide 4.16, Rev. 2, "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," December 1985.

U.S. Nuclear Regulatory Commission, Regulatory Guide 4.20, "Constraint on Releases of Airborne Radioactive Materials to the Environment for Licensees other Than Power Reactors," December 1996.

U.S. Nuclear Regulatory Commission, Regulatory Guide 8.37, "ALARA Levels for Effluents from Materials Facilities", July 1993.