
STANDARD REVIEW PLAN

for *In Situ* Leach Uranium Extraction
License Applications

**U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Division of Fuel Cycle Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001**



STANDARD REVIEW PLAN

for *In Situ* Leach Uranium Extraction
License Applications

Manuscript Completed:
Date Published:

Office of Nuclear Material Safety and Safeguards
Division of Fuel Cycle Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

AVAILABILITY NOTICE

ABSTRACT

A U.S. Nuclear Regulatory Commission source and byproduct materials license is required to recover uranium by *in situ* leach extraction techniques, under the provisions of Title 10 U.S. Code of Federal Regulations, Part 40 (10 CFR Part 40), "Domestic Licensing of Source Material." An applicant for a research and development or commercial-scale license, or for the renewal or amendment of an existing license, is required to provide detailed information on the facilities, equipment, and procedures used and an environmental report that discusses the effects of proposed operations on the health and safety of the public and on the environment.

The standard review plan is prepared for the guidance of staff reviewers, in the Office of Nuclear Material Safety and Safeguards, in performing safety and environmental reviews of applications to develop and operate uranium *in situ* leach facilities. It provides guidance for new license applications, renewals, and amendments. The principal purpose of the standard review plan is to assure the quality and uniformity of staff reviews and to present a well-defined base from which to evaluate changes in the scope and requirements of a review.

The standard review plan is written to cover a variety of site conditions and facility designs. Each section is written to provide a description of the areas of review, review procedures, acceptance criteria, and evaluation findings. However, for a given application, the staff reviewers may select and emphasize particular aspects of each standard review plan section, as appropriate for the application.

CONTENTS

Section	Page
ABSTRACT	iii
FIGURES	xv
TABLES	xv
INTRODUCTION	xvii
1.0 PROPOSED ACTIVITIES	1-1
1.1 Areas of Review	1-1
1.2 Review Procedures	1-1
1.3 Acceptance Criteria	1-2
1.4 Evaluation Findings	1-2
1.5 Reference	1-3
2.0 SITE CHARACTERIZATION	2-1
2.1 Site Location and Layout	2-1
2.1.1 Areas of Review	2-1
2.1.2 Review Procedures	2-1
2.1.3 Acceptance Criteria	2-2
2.1.4 Evaluation Findings	2-3
2.1.5 References	2-3
2.2 Uses of Adjacent Lands and Waters	2-3
2.2.1 Areas of Review	2-3
2.2.2 Review Procedures	2-4
2.2.3 Acceptance Criteria	2-4
2.2.4 Evaluation Findings	2-6
2.2.5 Reference	2-7
2.3 Population Distribution	2-7
2.3.1 Areas of Review	2-7
2.3.2 Review Procedures	2-7
2.3.3 Acceptance Criteria	2-8
2.3.4 Evaluation Findings	2-8
2.3.5 References	2-9
2.4 Historic, Scenic, and Cultural Resources	2-9
2.4.1 Areas of Review	2-9
2.4.2 Review Procedures	2-10
2.4.3 Acceptance Criteria	2-10
2.4.4 Evaluation Findings	2-11
2.4.5 References	2-12
2.5 Meteorology	2-13
2.5.1 Areas of Review	2-13
2.5.2 Review Procedures	2-13
2.5.3 Acceptance Criteria	2-14

CONTENTS (continued)

Section	Page
2.5.4	Evaluation Findings 2-15
2.5.5	References 2-16
2.6	Geology and Seismology 2-16
2.6.1	Areas of Review 2-16
2.6.2	Review Procedures 2-17
2.6.3	Acceptance Criteria 2-17
2.6.4	Evaluation Findings 2-19
2.6.5	Reference 2-20
2.7	Hydrology 2-20
2.7.1	Areas of Review 2-20
2.7.2	Review Procedures 2-21
2.7.3	Acceptance Criteria 2-22
2.7.4	Evaluation Findings 2-26
2.7.5	References 2-27
2.8	Ecology 2-28
2.8.1	Areas of Review 2-28
2.8.2	Review Procedures 2-29
2.8.3	Acceptance Criteria 2-29
2.8.4	Evaluation Findings 2-31
2.8.5	Reference 2-31
2.9	Background Radiological Characteristics 2-31
2.9.1	Areas of Review 2-31
2.9.2	Review Procedures 2-32
2.9.3	Acceptance Criteria 2-32
2.9.4	Evaluation Findings 2-32
2.9.5	References 2-34
2.10	Background Non-Radiological Characteristics 2-34
2.10.1	Areas of Review 2-34
2.10.2	Review Procedures 2-34
2.10.3	Acceptance Criteria 2-34
2.10.4	Evaluation Findings 2-35
2.10.5	References 2-35
3.0	DESCRIPTION OF PROPOSED FACILITY 3-1
3.1	<i>In Situ</i> Leaching Process and Equipment 3-1
3.1.1	Areas of Review 3-1
3.1.2	Review Procedures 3-1
3.1.3	Acceptance Criteria 3-3
3.1.4	Evaluation Findings 3-7
3.1.5	References 3-78

CONTENTS (continued)

Section	Page
3.2	Recovery Plant, Satellite Processing Facilities, Well Fields, and Chemical Storage Facilities—Equipment Used and Materials Processed 3-8
3.2.1	Areas of Review 3-8
3.2.2	Review Procedures 3-9
3.2.3	Acceptance Criteria 3-9
3.2.4	Evaluation Findings 3-10
3.2.5	Reference 3-10
3.3	Instrumentation and Control 3-11
3.3.1	Areas of Review 3-11
3.3.2	Review Procedures 3-11
3.3.3	Acceptance Criteria 3-11
3.3.4	Evaluation Findings 3-12
3.3.5	References 3-13
4.0	EFFLUENT CONTROL SYSTEMS 4-1
4.1	Gaseous and Airborne Particulates 4-1
4.1.1	Areas of Review 4-1
4.1.2	Review Procedures 4-1
4.1.3	Acceptance Criteria 4-1
4.1.4	Evaluation Findings 4-2
4.1.5	Reference 4-3
4.2	Liquids and Solids 4-3
4.2.1	Areas of Review 4-3
4.2.2	Review Procedures 4-3
4.2.3	Acceptance Criteria 4-4
4.2.4	Evaluation Findings 4-9
4.2.5	References 4-12
4.3	Contaminated Equipment 4-12
5.0	OPERATIONS 5-1
5.1	Corporate Organization and Administrative Procedures 5-1
5.1.1	Areas of Review 5-1
5.1.2	Review Procedures 5-1
5.1.3	Acceptance Criteria 5-1
5.1.4	Evaluation Findings 5-2
5.1.5	References 5-3
5.2	Management Control Program 5-3
5.2.1	Areas of Review 5-3
5.2.2	Review Procedures 5-4
5.2.3	Acceptance Criteria 5-4
5.2.4	Evaluation Findings 5-8
5.2.5	Reference 5-9

CONTENTS (continued)

Section	Page
5.3	Management Audit and Inspection Program 5-9
5.3.1	Areas of Review 5-9
5.3.2	Review Procedures 5-9
5.3.3	Acceptance Criteria 5-10
5.3.4	Evaluation Findings 5-10
5.3.5	References 5-11
5.4	Qualifications for Personnel Conducting the Radiation Safety Program 5-11
5.4.1	Areas of Review 5-11
5.4.2	Review Procedures 5-11
5.4.3	Acceptance Criteria 5-11
5.4.4	Evaluation Findings 5-12
5.4.5	Reference 5-12
5.5	Radiation Safety Training 5-12
5.5.1	Areas of Review 5-12
5.5.2	Review Procedures 5-12
5.5.3	Acceptance Criteria 5-13
5.5.4	Evaluation Findings 5-13
5.5.5	References 5-14
5.6	Security 5-14
5.6.1	Areas of Review 5-14
5.6.2	Review Procedures 5-14
5.6.3	Acceptance Criteria 5-14
5.6.4	Evaluation Findings 5-14
5.6.5	References 5-15
5.7	Radiation Safety Controls and Monitoring 5-15
5.7.1	Effluent Control Techniques 5-15
5.7.1.1	Areas of Review 5-15
5.7.1.2	Review Procedures 5-16
5.7.1.3	Acceptance Criteria 5-16
5.7.1.4	Evaluation Findings 5-18
5.7.1.5	References 5-19
5.7.2	External Radiation Exposure Monitoring Program 5-19
5.7.2.1	Areas of Review 5-19
5.7.2.2	Review Procedures 5-19
5.7.2.3	Acceptance Criteria 5-20
5.7.2.4	Evaluation Findings 5-21
5.7.2.5	References 5-21
5.7.3	Airborne Radiation Monitoring Program 5-22
5.7.3.1	Areas of Review 5-22
5.7.3.2	Review Procedures 5-22
5.7.3.3	Acceptance Criteria 5-23
5.7.3.4	Evaluation Findings 5-23
5.7.3.5	References 5-24

CONTENTS (continued)

Section	Page
5.7.4	Exposure Calculations 5-25
5.7.4.1	Areas of Review 5-25
5.7.4.2	Review Procedures 5-25
5.7.4.3	Acceptance Criteria 5-25
5.7.4.4	Evaluation Findings 5-26
5.7.4.5	References 5-27
5.7.5	Bioassay Program 5-27
5.7.5.1	Areas of Review 5-27
5.7.5.2	Review Procedures 5-27
5.7.5.3	Acceptance Criteria 5-28
5.7.5.4	Evaluation Findings 5-29
5.7.5.5	References 5-29
5.7.6	Contamination Control Program 5-29
5.7.6.1	Areas of Review 5-29
5.7.6.2	Review Procedures 5-30
5.7.6.3	Acceptance Criteria 5-30
5.7.6.4	Evaluation Findings 5-33
5.7.6.5	References 5-34
5.7.7	Airborne Effluent and Environmental Monitoring Program 5-34
5.7.7.1	Areas of Review 5-34
5.7.7.2	Review Procedures 5-34
5.7.7.3	Acceptance Criteria 5-35
5.7.7.4	Evaluation Findings 5-36
5.7.7.5	References 5-36
5.7.8	Ground-Water and Surface-Water Monitoring Programs 5-36
5.7.8.1	Areas of Review 5-36
5.7.8.2	Review Procedures 5-37
5.7.8.3	Acceptance Criteria 5-38
5.7.8.4	Evaluation Findings 5-45
5.7.8.5	References 5-46
5.7.9	Quality Assurance 5-47
5.7.9.1	Areas of Review 5-47
5.7.9.2	Review Procedures 5-47
5.7.9.3	Acceptance Criteria 5-47
5.7.9.4	Evaluation Findings 5-48
5.7.9.5	References 5-49
6.0	GROUND-WATER QUALITY RESTORATION, SURFACE RECLAMATION, AND FACILITY DECOMMISSIONING 6-1
6.1	PLANS AND SCHEDULES FOR GROUND-WATER QUALITY RESTORATION 6-1
6.1.1	Areas of Review 6-1
6.1.2	Review Procedures 6-2

CONTENTS (continued)

Section	Page
6.1.3	Acceptance Criteria 6-4
6.1.4	Evaluation Findings 6-11
6.1.5	References 6-13
6.2	Plans and Schedules for Decommissioning Disturbed Lands and Affected Structures 6-13
6.2.1	Areas of Review 6-13
6.2.2	Review Procedures 6-13
6.2.3	Acceptance Criteria 6-14
6.2.4	Evaluation Findings 6-15
6.2.5	Reference 6-16
6.3	Procedures for Removing and Disposing of Structures and Equipment 6-17
6.3.1	Areas of Review 6-17
6.3.2	Review Procedures 6-17
6.3.3	Acceptance Criteria 6-17
6.3.4	Evaluation Findings 6-18
6.3.5	References 6-19
6.4	Procedures for Conducting Post-Reclamation and Decommissioning Radiological Surveys 6-19
6.4.1	Areas of Review 6-19
6.4.2	Review Procedures 6-19
6.4.3	Acceptance Criteria 6-20
6.4.4	Evaluation Findings 6-21
6.4.5	Reference 6-21
6.5	Financial Assessment for Ground-water Restoration, Decommissioning, Reclamation, Waste Disposal, and Associated Monitoring 6-22
6.5.1	Areas of Review 6-22
6.5.2	Review Procedures 6-22
6.5.3	Acceptance Criteria 6-22
6.5.4	Evaluation Findings 6-24
6.5.5	References 6-25
7.0	ENVIRONMENTAL EFFECTS 7-1
7.1	Site Preparation and Construction 7-1
7.1.1	Areas of Review 7-1
7.1.2	Review Procedures 7-1
7.1.3	Acceptance Criteria 7-2
7.1.4	Evaluation Findings 7-3
7.1.5	References 7-4
7.2	Effects of Operations 7-4
7.2.1	Areas of Review 7-4
7.2.2	Review Procedures 7-4

CONTENTS (continued)

Section	Page
7.2.3	Acceptance Criteria 7-5
7.2.4	Evaluation Findings 7-5
7.2.5	Reference 7-6
7.3	Radiological Effects 7-6
7.3.1	Exposure Pathways 7-6
7.3.1.1	Exposures from Water Pathways 7-6
7.3.1.1.1	Areas of Review 7-6
7.3.1.1.2	Review Procedures 7-7
7.3.1.1.3	Acceptance Criteria 7-7
7.3.1.1.4	Evaluation Findings 7-8
7.3.1.1.5	References 7-8
7.3.1.2	Exposures from Airway Pathways 7-9
7.3.1.2.1	Areas of Review 7-9
7.3.1.2.2	Review Procedures 7-9
7.3.1.2.3	Acceptance Criteria 7-10
7.3.1.2.4	Evaluation Findings 7-11
7.3.1.2.5	References 7-11
7.3.1.3	Exposures from External Radiation 7-12
7.3.1.3.1	Areas of Review 7-12
7.3.1.3.2	Review Procedures 7-12
7.3.1.3.3	Acceptance Criteria 7-12
7.3.1.3.4	Evaluation Findings 7-13
7.3.1.3.5	References 7-13
7.3.1.4	Total Human Exposures 7-13
7.3.1.4.1	Areas of Review 7-13
7.3.1.4.2	Review Procedures 7-14
7.3.1.4.3	Acceptance Criteria 7-14
7.3.1.4.4	Evaluation Findings 7-15
7.3.1.4.5	Reference 7-15
7.3.1.5	Exposures to Flora and Fauna 7-15
7.3.1.5.1	Areas of Review 7-15
7.3.1.5.2	Review Procedures 7-15
7.3.1.5.3	Acceptance Criteria 7-16
7.3.1.5.4	Evaluation Findings 7-16
7.3.1.5.5	References 7-17
7.4	Non-Radiological Effects 7-17
7.4.1	Areas of Review 7-17
7.4.2	Review Procedures 7-17
7.4.3	Acceptance Criteria 7-18
7.4.4	Evaluation Findings 7-18
7.4.5	References 7-18
7.5	Effects of Accidents 7-18
7.5.1	Areas of Review 7-18
7.5.2	Review Procedures 7-19

CONTENTS (continued)

Section	Page
7.5.3	Acceptance Criteria 7-20
7.5.4	Evaluation Findings 7-20
7.5.5	References 7-21
7.6	Economic and Social Effects of Construction and Operation 7-21
7.6.1	Benefits 7-21
7.6.1.1	Areas of Review 5-21
7.6.1.2	Review Procedures 5-22
7.6.1.3	Acceptance Criteria 5-22
7.6.1.4	Evaluation Findings 5-23
7.6.1.5	Reference 5-23
7.6.2	Socioeconomic Costs 7-24
7.6.2.1	Areas of Review 5-24
7.6.2.2	Review Procedures 5-24
7.6.2.3	Acceptance Criteria 5-25
7.6.2.4	Evaluation Findings 5-25
7.6.2.5	Reference 5-26
8.0	ALTERNATIVES TO PROPOSED ACTION 8-1
8.1	Areas of Review 8-1
8.2	Review Procedures 8-1
8.3	Acceptance Criteria 8-2
8.4	Evaluation Findings 8-3
8.5	References 8-3
9.0	COST-BENEFIT ANALYSIS 9-1
9.1	Areas of Review 9-1
9.2	Review Procedures 9-1
9.3	Acceptance Criteria 9-2
9.4	Evaluation Findings 9-4
9.5	Reference 9-5
10.0	ENVIRONMENTAL APPROVALS AND CONSULTATIONS 10-1
10.1	Areas of Review 10-1
10.2	Review Procedures 10-1
10.3	Acceptance Criteria 10-2
10.4	Evaluation Findings 10-2
10.5	References 10-3

CONTENTS (continued)

Section		Page
APPENDIXES		
A	—	GUIDANCE FOR REVIEWING HISTORICAL ASPECTS OF SITE PERFORMANCE FOR LICENSE RENEWALS AND AMENDMENTS
B	—	RELATIONSHIP OF 10 CFR PART 40, APPENDIX A REQUIREMENTS TO STANDARD REVIEW PLAN SECTIONS
C	—	RECOMMENDED OUTLINE FOR SITE-SPECIFIC <i>IN SITU</i> LEACH FACILITY RECLAMATION AND STABILIZATION COST ESTIMATES
D	—	MILDOS-AREA: AN UPDATE WITH INCORPORATION OF <i>IN SITU</i> LEACH URANIUM RECOVERY TECHNOLOGY
E	—	GUIDANCE TO THE U.S. NUCLEAR REGULATORY COMMISSION STAFF ON THE RADIUM BENCHMARK DOSE APPROACH

FIGURES

Figure		Page
1	Licensing Process for 10 CFR Part 40 Licenses	xviii
2	Schematic of NRC Licensing and Inspection Process and Applicability to Different License Documents	xxiv

TABLES

Table		Page
1	Identification of Sections Applicable to a Technical Evaluation Report or an Environmental Assessment	xxi
2.7.3-1	Typical Baseline Water Quality Indicators to Be Determined During Pre-operational Data Collection	2-25
2.9.3-1	Standard Format for Water Quality Data Submittal to the Nuclear Regulatory Commission for Uranium Recovery Facilities	2-33
4.2.3-1	Non-NRC Permits That May Be Required to Support Liquid Effluent Disposal at Uranium <i>in Situ</i> Leach Facilities	4-10
5.7.6.3-1	Acceptable Surface Contamination Levels	5-32

INTRODUCTION

A U.S. Nuclear Regulatory Commission (NRC) source and byproduct material license is required under the provisions of Title 10 of the U.S. Code of Federal Regulations, Part 40 (10 CFR Part 40), Domestic Licensing of Source Material, to recover uranium by *in situ* leach techniques. The licensing process for Part 40 licenses is pictured in Figure 1. NRC authority to regulate *in situ* leach facilities comes from the Atomic Energy Act of 1954, as amended, and the Uranium Mill Tailings Radiation Control Act of 1978, as amended. Specific requirements for *in situ* leach facilities are taken from 10 CFR Part 40, Appendix A criteria. The specific sections in this standard review plan that address these criteria are shown in Appendix B of the review plan. Although the National Environmental Policy Act of 1969 does not provide NRC with any additional authority, it does reinforce NRC authority found in the organic statutes by obligating NRC to evaluate both radiological and nonradiological environmental impacts for NRC-licensed sites. Also the National Environmental Policy Act, as interpreted by the courts, requires NRC to mitigate environmental impacts resulting from Agency actions, to the extent possible, through its licensing. Therefore, NRC can also condition commitments made by applicants to mitigate such environmental impacts.

An applicant for a new operating license, or for the renewal or amendment of an existing license, is required to provide detailed information on the facilities, equipment, and procedures to be used and to submit an environmental report that discusses the effect of proposed operations on public health and safety and the impact on the environment as required by 10 CFR 51.45, 51.60, and 51.66. This information is used by NRC staff to determine whether the proposed activities will be protective of public health and safety and will be environmentally acceptable. General provisions for issuance, amendment, transfer, and renewal of licenses are described in 10 CFR Part 2, Subpart A. General guidance for filing an application and for producing an environmental report is provided in 10 CFR 40.31, Application for Specific Licenses, and in 10 CFR Part 51, Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions, respectively.

The purpose of this standard review plan is to provide the NRC staff in the Office of Nuclear Material Safety and Safeguards with specific guidance on the review of applications for *in situ* leach facilities. The standard review plan complements Regulatory Guide 3.46, Standard Format and Content of License Applications, Including Environmental Reports for *In Situ* Uranium Solution Mining (NRC, 1982) which is guidance to applicants and licensees on an acceptable format and contents for a license application. Sections of this standard review plan are keyed to sections in Regulatory Guide 3.46 (NRC, 1982). Applicants should use Regulatory Guide 3.46 (NRC, 1982) as guidance in preparing their applications. Information in this standard review plan will be used by the Office of Nuclear Material Safety and Safeguards staff in the review of applications for new facilities, renewals, and amendments.

Throughout the remainder of this standard review plan, “application” is synonymous with license application, renewal, or amendment. The principal purpose of the standard review plan is to ensure a consistent quality and uniformity in NRC staff reviews. Each section in this standard review plan provides guidance on what is to be reviewed, the basis for the review, how the staff

review is to be accomplished, what the staff will find acceptable in a demonstration of compliance with the regulations, and the conclusions that are sought regarding the applicable sections in Title 10 of the U.S. Code of Federal Regulations. In general, *in situ* leach

Introduction

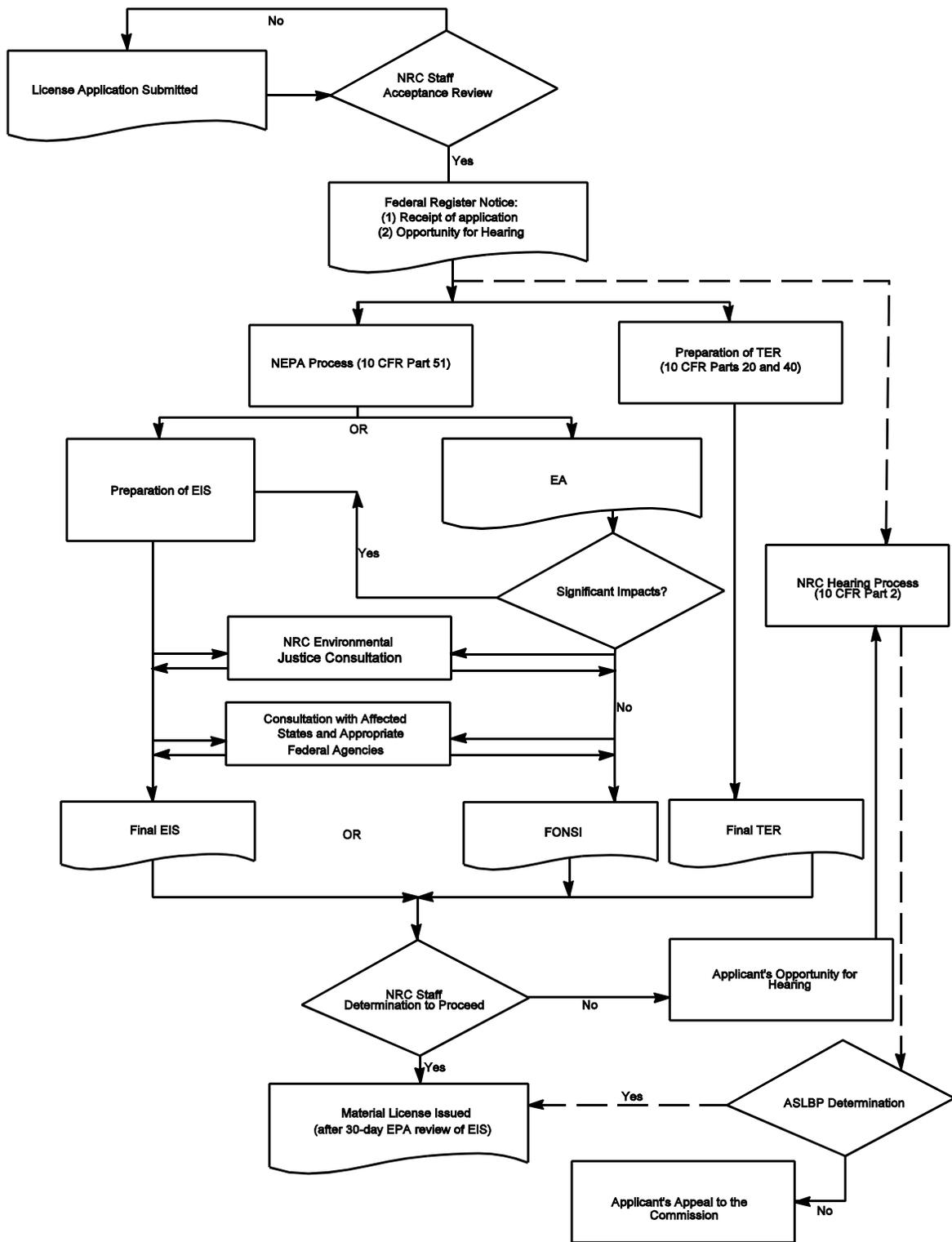


Figure 1. Licensing Process for 10 CFR Part 40 Licenses

operations are much more environmentally benign than conventional mining and milling and pose lower risk of occupational harm. Still, the NRC staff must determine if operations will be conducted in an environmentally acceptable manner and in compliance with applicable regulations. The detailed review procedures and acceptance criteria are intended to assist the Office of Nuclear Material Safety and Safeguards staff in making the necessary findings in an effective and efficient manner. General information regarding procedures for environmental reviews for licensing actions and guidance for the preparation of environmental assessments is available in NUREG–1748, “Environmental Review Guidance for Licensing Actions Associated with NMSS Programs” (NRC, 2001).

This standard review plan is intended to cover only those aspects of the NRC regulatory mission related to the licensing of an *in situ* leach facility. As such, the standard review plan helps focus the staff review on determining if a facility can be constructed and operated in compliance with the applicable NRC regulations. The standard review plan is also intended to make information about regulatory matters widely available and to improve communications and understanding of the staff review process by interested members of the public and the uranium recovery industry.

For amendments, the focus of the review should be on the changes proposed in the amendment (see Appendix A for guidance for reviewing historical aspects of site performance). Reviewers should not review other previously accepted actions if they are not part of the amendment unless the review of the amendment package identifies problems with other aspects of facility operation.

For renewals, the licensee need only submit information containing changes from the currently accepted license. As for amendments, the staff reviews should focus on those aspects of facility operation that are different from what is in the current license. The licensee need not resubmit a complete application covering all aspects of facility operation. Reviewers should analyze the inspection history and operation of the site to see if any major problems have been identified over the course of the license term and should review changes to operations from those currently found acceptable (see Appendix A). If the changes are found to be acceptable, then the license is acceptable for renewal.

For license amendments and renewals, the operating history of the facility is often a valuable source of information concerning the adequacy of site characterization, the acceptability of radiation protection and monitoring programs, the success of and adherence to operating procedures and training programs, and other data that may influence the staff’s determination of compliance. Appendix A to the standard review plan provides guidance for review of these historical aspects of facility performance.

The products that will be prepared by the staff to document the review will be a technical evaluation report, and an environmental assessment with a finding of no significant impact to meet requirements under the National Environmental Policy Act. Preparation of an environmental assessment is required under the provisions of 10 CFR 51.20 unless (i) the staff finds, based on the environmental assessment, that NRC needs to prepare an environmental impact statement; (ii) an environmental impact statement is needed by another federal agency also involved in the action as a cooperating agency; (iii) an environmental impact statement

Introduction

would be needed because of controversy at the site, or (iv) the action is categorically excluded from the necessity to prepare an environmental assessment by 10 CFR 51.22. Different sections of this standard review plan refer either to a technical evaluation report, an environmental assessment, or both. Table 1 identifies which sections apply to a technical evaluation report and which to an environmental assessment. Details on the NRC National Environmental Policy Act process are contained in NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs" (NRC, 2001).

It is important to note that the acceptance criteria laid out in this standard review plan are for the guidance of NRC staff responsible for the review of applications to operate *in situ* leach facilities. Review plans are not substitutes for the Commission's regulations, and compliance with a particular standard review plan is not required. This standard review plan provides descriptions of methodologies that have been found acceptable for demonstrating regulatory compliance. Methods and solutions different from those set out in the standard review plan will be acceptable if they provide a basis for the findings requisite to the issuance or continuance of a license by NRC.

General Review Procedure

A licensing review is not intended to be a detailed evaluation of all aspects of facility operations. Specific information about implementation of the program outlined in an application is obtained through NRC review of procedures and operations done as part of the inspection function. A definition of the differences between licensing reviews and inspections is provided in Figure 2.

The general licensing process is outlined in the flow diagram provided in Figure 1. An *in situ* leach source and byproduct material application may be denied or rejected under specific instances during the review process. Beginning construction of process facilities, well fields, or other substantial actions that would adversely affect the environment of the site, before the staff has concluded that the appropriate action is to issue the proposed license, is grounds for denial of the application [10 CFR 40.32(e)]. The applicant's failure to demonstrate compliance with requirements [10 CFR 40.31(h)], or refusal or failure to supply information requested by the staff to complete the review (10 CFR 2.108) is also grounds for denial of the application.

Changes to existing licensed activities and conditions require the issuance of an appropriate license amendment. An application for such an amendment should describe the proposed changes in detail and should discuss the likely consequences of any environmental and health and safety impacts. Amendment requests should be reviewed using the appropriate sections of this document for guidance. Appendix A to this standard review plan provides guidance for examining the historical aspects of facility operations that may be useful for conducting such amendment reviews.

In conducting these evaluations, the reviewer shall consider the technical evaluations conducted by a state or another federal agency with authorities overlapping those of the NRC. Ground-water compliance and protection reviews are the primary technical areas impacted by overlapping authorities. The desired outcome is to identify any areas where duplicative NRC reviews may be reduced or eliminated. The NRC staff must make the necessary evaluations of compliance with applicable regulations for licensing the facility. However, the reviewer may, as

Table 1. Identification of Sections Applicable to a Technical Evaluation Report or an Environmental Assessment			
Section	Title	Applicable to Technical Evaluation Report	Applicable to Environmental Assessment
1.0	PROPOSED ACTIVITIES	X	X
2.0	SITE CHARACTERIZATION	X	X
2.1	Site Location and Layout	X	X
2.2	Uses of Adjacent Lands and Waters	X	X
2.3	Population Distribution	X	X
2.4	Historic, Scenic, and Cultural resources		X
2.5	Meteorology	X	X
2.6	Geology and Seismology	X	X
2.7	Hydrology	X	X
2.8	Ecology	X	X
2.9	Background Radiological Characteristics	X	X
2.10	Background Non-Radiological Characteristics	X	X
3.0	DESCRIPTION OF PROPOSED FACILITY	X	X
3.1	In Situ Leaching Process and Equipment	X	X
3.2	Recovery Plant Equipment	X	X
3.3	Instrumentation and Control	X	X
4.0	EFFLUENT CONTROL SYSTEMS	X	X
4.1	Gaseous and Airborne Particulates	X	X
4.2	Liquids and Solids	X	X
4.3	Contaminated Equipment	X	X
5.0	OPERATIONS	X	
5.1	Corporate Organization and Administrative Procedures	X	
Table 1. Identification of Sections Applicable to a Technical Evaluation Report or an Environmental Assessment (continued)			

Introduction

Section	Title	Applicable to Technical Evaluation Report	Applicable to Environmental Assessment
5.2	Management Control Program	X	
5.3	Management Audit, Inspection, and Record-keeping Program	X	
5.3.1	Management Audit, and Internal Inspection Program	X	
5.3.2	Recordkeeping and Record Retention	X	
5.4	Qualifications for Personnel	X	
5.5	Radiation Safety Training	X	
5.6	Security	X	X
5.7	Radiation Safety Controls and Monitoring	X	
5.7.1	Effluent Control Techniques	X	
5.7.2	External Radiation Exposure Monitoring Program	X	
5.7.3	Airborne Radiation Monitoring Program	X	
5.7.4	Exposure Calculations	X	
5.7.5	Bioassay Program	X	
5.7.6	Contamination Control Program	X	X
5.7.7	Airborne Effluent and Environmental Monitoring Program	X	X
5.7.8	Ground-Water and Surface-Water Monitoring Programs	X	X
5.7.9	Quality Assurance	X	X
6.0	GROUND-WATER QUALITY RESTORATION, SURFACE RECLAMATION, AND PLANT DECOMMISSIONING	X	X
6.1	Plans and Schedules for Ground-Water Quality Restoration		X
6.2	Plans and Schedules for Reclaiming Disturbed Lands		X
6.3	Procedures for Removing and Disposing of Structures and Equipment	X	X

Table 1. Identification of Sections Applicable to a Technical Evaluation Report or an Environmental Assessment (continued)

Section	Title	Applicable to Technical Evaluation Report	Applicable to Environmental Assessment
6.4	Procedures for Conducting Post-Reclamation and Decommissioning Radiological Surveys	X	X
6.5	Financial Assessment for Ground-Water Restoration, Decommissioning, Reclamation, Waste Disposal, and Monitoring	X	X
7.0	ENVIRONMENTAL EFFECTS		X
7.1	Site Preparation and Construction		X
7.2	Effects of Operations	X	X
7.3	Radiological Effects	X	X
7.3.1	Exposure Pathways	X	X
7.3.1.1	Exposures from Water Pathways	X	X
7.3.1.2	Exposures from Air Pathways	X	X
7.3.1.3	Exposures from External Radiation	X	X
7.3.1.4	Total Human Exposures	X	X
7.3.1.5	Exposures to Flora and Fauna	X	X
7.4	Non-Radiological Effects		X
7.5	Effects of Accidents	X	X
7.6	Economic and Social Effects of Construction and Operation		X
7.6.1	Benefits		X
7.6.2	Socioeconomic Costs		X
8.0	ALTERNATIVES TO PROPOSED ACTION		X
9.0	COST-BENEFIT ANALYSIS		X
10.0	ENVIRONMENTAL APPROVALS AND CONSULTATIONS		X

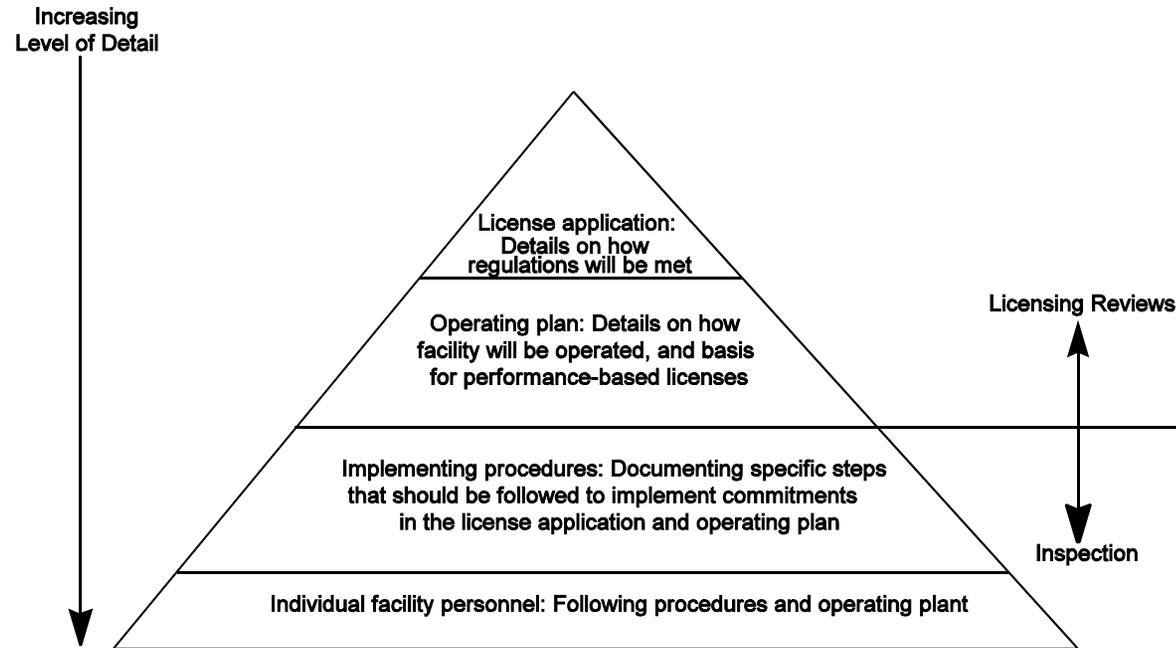


Figure 2. Schematic of NRC Licensing and Inspection Process and Applicability to Different License Documents

appropriate, rely on the applicant's responses to inquiries made by a state or another federal agency to support the NRC evaluation of compliance. The reviewer should make every effort to coordinate the NRC technical review with the state or other federal agency with overlapping authority to avoid unnecessary duplication of effort.

The steps of the application review are described in the following paragraphs.

Acceptance (Administrative) Review Objectives

The staff should conduct an acceptance review of the application, which is an administrative review, to determine the completeness of the information submitted. This review requires a comparison of the submitted information to the information identified in the Standard Format and Content of License Applications, Including Environmental Reports (NRC, 1982). The application will be considered complete for docketing if the information provided is complete, reflects an adequate reconnaissance and physical examination of the regional and site conditions, and provides appropriate analyses and design information to demonstrate that the applicable acceptance criteria will be met. Details for review of the environmental report are also contained in NUREG-1748 (NRC, 2001, Section 6). The staff should complete the acceptance review and transmit the results to the applicant within 30 days of the receipt of the application, along with a projected schedule for the remainder of the review as described in Section 1.1 of the standard review plan. In this transmittal, the staff should identify any additional information needed to make the application complete. Detailed technical questions, although not required, can be included if they are identified during the acceptance review. If the content of the application is acceptable for docketing, the staff should be able to make a finding that the applicable requirements in 10 CFR 40.31 have been met.

Detailed Review Objectives

Following completion of the acceptance review, the staff should conduct a detailed technical review of the application. The results of this review and the basis for acceptance or denial of the requested licensing action are documented by NRC in a technical evaluation report and either an environmental assessment (10 CFR 51.30) if there is a finding of no significant impact, or an environmental impact statement (10 CFR 50.31) if the review indicates that the licensed activity would have a significant impact on the health and safety of the public or on the environment. The detailed review should evaluate the environmental, economic, and technical evidence provided by the applicant to support the ability of the proposed facility to meet applicable regulatory requirements. Details on the NRC National Environmental Policy Act process are contained in NUREG-1748 (NRC, 2001).

Standard Review Plan Organization

The standard review plan is written to address a variety of site conditions and facility designs. Each section provides the complete review procedure and acceptance criteria for all the areas of review pertinent to that section. For any given application, the staff reviewer may select and emphasize particular aspects of each standard review plan section as appropriate for the

Introduction

application. Because of this, the staff may not carry out in detail all of the review steps listed in each standard review plan section in the review of every application.

Areas of Review Subsection

This subsection describes the scope of the review (i.e., what is being reviewed). It contains a brief description of the specific technical information and analyses in the application that should be reviewed by each technical reviewer.

Review Procedures Subsection

This subsection discusses the appropriate review technique. It is generally a step-by-step procedure that the reviewer uses to determine whether the acceptance criteria have been met.

Acceptance Criteria Subsection

This subsection delineates criteria that can be applied by the reviewer to determine the acceptability of the applicant compliance demonstration. Because the criteria are based on detailed technical approaches for determining compliance with applicable regulations, they do not routinely reference specific regulations. To include such reference would simply restate the requirements, and would not provide guidance on what is an acceptable method of compliance. The technical bases for these criteria have been derived from 10 CFR Parts 40 and 20, NRC regulatory guides, general design criteria, codes and standards, branch technical positions, standard testing methods (e.g., American Society for Testing and Materials standards), technical papers, and other similar sources. These sources typically include solutions and approaches previously determined to be acceptable by the staff for making compliance determinations for the specific area of review. These acceptance criteria have been defined so that staff reviewers can use consistent and well-documented approaches for review of all applications. Flexibility is provided to enable licensees to achieve the type of operation desired at their facilities. Applicants may take approaches to demonstrating compliance that are different from the acceptance criteria in this standard review plan as long as the staff can make the requisite decisions concerning environmental acceptability and compliance with applicable regulations. However, applicants should recognize that, as is the case for regulatory guides, substantial staff time and effort have gone into the development of these procedures and criteria, and a corresponding amount of time and effort may be required to review and accept new or different solutions and approaches. Thus, applicants proposing solutions and approaches to safety problems or safety-related design issues other than those described in this standard review plan may experience longer review times and NRC requests for more extensive supporting information. The staff is willing to consider proposals for other solutions and approaches on a generic basis, apart from a specific application, to avoid the impact of the additional review time for individual cases.

Evaluation Findings Subsection

This subsection presents general conclusions and findings of the staff that result from review of each area of the application as well as an identification of the applicable regulatory

requirements. Conclusions and findings for a specific application and review area are dependent on the site and type of licensing action being considered. For each standard review plan section, a conclusion is included in the technical evaluation report or the environmental assessment/environmental impact statement in which results of the review are published. These documents contain a description of the review; the basis for the staff findings, including aspects of the review selected or emphasized; where the facility design or the applicant programs deviate from the criteria stated in the standard review plan; and the evaluation findings.

References Subsection

This subsection lists any applicable references.

Standard Review Plan Updates

This standard review plan will be revised and updated periodically as the need arises to clarify the content or correct errors and to incorporate modifications approved by NRC management. Corresponding changes to the Standard Format and Content of License Applications, Including Environmental Reports (NRC, 1982) will be made as required.

References

NRC. NUREG-1748, "Environmental Review Guidance for Licensing Actions Associated with NMSS Programs." Washington, DC: NRC. 2001.

———. Regulatory Guide 3.46, "Standard Format and Content of License Applications, Including Environmental Reports, for *In Situ* Uranium Solution Mining." Washington, DC: NRC, Office of Standards Development. 1982.

1.0 PROPOSED ACTIVITIES

1.1 Areas of Review

The reviewer should examine the summary of the proposed activities for which a license is requested to gain a basic understanding of those proposed activities and the likely consequences of any safety or environmental impact. The staff should review the corporate entities involved; the location of the proposed activities; land ownership; ore-body locations and estimated uranium (U_3O_8) content; proposed solution extraction method and recovery processes; operating plans, design throughput and anticipated annual U_3O_8 production; radiation safety protection estimated schedules for construction, startup, and duration of operations; plans for project waste management and disposal; source and byproduct material transportation plans; plans for ground-water quality restoration, decommissioning, and land reclamation; and surety arrangements covering eventual facility decommissioning, ground-water quality restoration, and site reclamation.

1.2 Review Procedures

The reviewer should determine whether the application provides a sufficiently comprehensive summary of the nature of the facilities, equipment, and procedures to be used in the proposed *in situ* leach activity including the name and location. Reviewers should keep in mind that the development and initial licensing of an *in situ* leach facility is not based on comprehensive information. This is because *in situ* leach facilities obtain enough information to generally locate the ore body and to understand the natural systems involved. More detailed information is developed as each area is brought into production. Therefore, reviewers should verify that sufficient information is presented to reach only the conclusion necessary for initial licensing. However, reviewers should not expect that information needed to fully describe each aspect of a full operation will be available in the initial application. For license renewals and amendment applications, Appendix A to this standard review plan provides guidance for examining facility operations and the approach that should be used in evaluating amendments and renewal applications.

Applications for licenses authorizing commercial-scale operations should rely on results from research and development operations or other operational experience that can be used as a basis to support the proposed processes, operating plans (including plans for ground-water quality restoration), and assessment of the likely consequences of any environmental impact. This does not mean that the applicant needs to develop a research and development facility in order to license a full-scale production plant. Rather it is intended to allow the applicant to rely on available data from research and development facilities, other sites currently operated by the applicant, or sites with similar designs or natural features operated by other licensees. In performing the evaluation, the reviewer should use the data available from these other sources to assess how the proposed site compares with already licensed sites.

Proposed Activities

1.3 Acceptance Criteria

The proposed activities are acceptable if they meet the following criteria:

- (1) The application summary of proposed activities includes descriptions of the following items that are sufficient to provide a basic understanding of the proposed activities and the likely consequences of any health, safety, and environmental impact. The content of the introduction is outlined in the “Standard Format and Content of License Applications, Including Environmental Reports, for *In Situ* Uranium Solution Mining” [U.S. Nuclear Regulatory Commission (NRC), 1982].
 - (a) Corporate entities involved
 - (b) Location of the proposed facilities by county and state, including the facility name
 - (c) Land ownership
 - (d) Ore-body locations and estimated U₃O₈ content
 - (e) Proposed solution extraction method and recovery process
 - (f) Operating plans, design throughput, and annual U₃O₈ production
 - (g) Estimated schedules for construction, startup, and duration of operations
 - (h) Plans for project waste management and disposal
 - (i) Plans for ground-water quality restoration, decommissioning, and land reclamation
 - (j) Surety arrangements covering eventual facility decommissioning, ground-water quality restoration, and site reclamation
 - (k) For license renewals, a summary of proposed changes, a record of amendments since the last license issuance, and documentation of inspection results
- (2) Applications for commercial-scale operations include results from research and development operations or previous operating experience as a basis for the proposed processes, operating plans, ground-water quality restoration, and assessment of the likely consequences of any environmental impact.

1.4 Evaluation Findings

If the staff review, as described in this section, results in the acceptance of the summary of the proposed activities, the following conclusions may be presented in the technical evaluation report and in the environmental assessment.

The NRC has completed its review of the summary of the proposed activities at the _____ *in situ* leach facility. This review included an evaluation of the methods that will be used to evaluate the proposed activities using the review procedures in standard review plan Section 1.2 and the acceptance criteria outlined in standard review plan Section 1.3.

The applicant has acceptably described the proposed activities at the _____ *in situ* leach facility including (i) corporate entities involved; (ii) location of the proposed facility; (iii) land ownership; (iv) ore-body locations and estimated U₃O₈ content; (v) proposed solution extraction method and recovery process; (vi) operating plans, design throughput, and annual U₃O₈ production; (vii) schedules for construction, startup, and duration of operations; (viii) waste management and disposal plans; and (ix) ground-water quality restoration, decommissioning, and land reclamation plans; (x) surety arrangements covering facility decommissioning, ground-water quality restoration, and site reclamation. For license renewals, the applicant has provided a summary of proposed changes, a record of amendments since the last license issuance, and documentation of inspection results. Applicants for commercial-scale operations have included results from research and development operations or previous operating experience.

Based on the information provided in the application and the detailed review conducted of the summary of the proposed activities at the _____ *in situ* leach facility, the staff concludes that the summary of the proposed activities is acceptable and is in compliance with 10 CFR 40.32, which describes the general requirements for the issuance of a specific license. The summary of proposed activities is acceptable and is in compliance with 10 CFR 51.45, which requires a description of the proposed action sufficient to allow the staff to evaluate the impacts on the affected environment.

1.5 Reference

NRC. Regulatory Guide 3.46, "Standard Format and Content of License Applications, Including Environmental Reports, for *In Situ* Uranium Solution Mining." Washington, DC: NRC, Office of Standards Development. 1982.