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CENTER FOR NUCLEAR WASTE REGULATORY ANALYSES QUALITY ASSURANCE SURVEILLANCE REPORT

PROJECT NO.: 20-3101 REPORT NO.: C-89-007 PAGE 1 OF 8

SURVEILLANCE SCOPE: Selection of Regulatory Topics for Program Architecture, 10CFR60 Subparts A, C, D, F, G, H.

REFERENCE DOCUMENTS: TOP-001-04, Rev. 0; A. Whiting memo 7/11/89 to Element Managers

STARTING DATE: 7/19/89 ENDING DATE: 7/19/89

QA REPRESENTATIVE: B. E. MABRITO

PERSONS CONDUCTING TEST/EXAM/ACTIVITY: A. Chowdhury, J. Hageman, P. Nair, J. Russell, A. Whiting

SATISFACTORY FINDINGS: Selection of Regulatory Topics Meeting was called to order at 9:10 A.M. 7/19/89 by WSEAT Element Manager A. Whiting. Directions provided to Element Managers, including TOP-001-04 Rev. 0 and Part 60 dated November 30, 1988. The group identified Regulatory Requirements in Subparts A, C, D, F, G, H and I (a reserved subpart) if they existed. Results of meeting are attached. Meeting ended at 2:30 pm 7/19/89.

UNSATISFACTORY FINDINGS: NONE

NONCONFORMANCE REPORT NO.: N/A

ATTACHMENTS: MEETING ATTENDANCE LIST, July 11, 1989 memo, Meeting Product.

RECOMMENDATIONS / ACTIONS: No Recommendations. No Actions.

APPROVED: *B. E. Mabrigo*
CENTER DIRECTOR OF QUALITY ASSURANCE
DATE: 7/19/89

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ORIGINATOR
PRINCIPAL ENGINEER A. Whiting
ELEMENT MANAGERS
J. Latz / W. Patrick

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BSM

Section	INCLUSION OR EXCLUSION Inclusion Basis	* Exceptions
60.1	5.7-4	
60.2	5.7-1*	60.2 - "Aff. Indian Tribe" Finding by Sec. of Interior <u>RR 3000</u>
60.3(a)	RR 3001	License Issuance - DOE
60.3(b)	RR 3002	Construction Authorization - DOE
60.4 *	RR 3003	Communications + Records.
60.5	5.7-1,3	
60.6	RR 3004	Grant Exemptions - NRC
60.7	(RR 3001)	supports 60.3(a) a related is 60.18(e)

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SEM

10CFR60 Section	Exclusion Basis or RR#	Notes
60.8	5.7-3	
60.9(a)(e)	RR 3005	Prohibited Discrimination ^{60.9(b)(c)(d) are at least} Related
60.10*	RR 3006	Completeness + Accuracy - Notes. This may be associated or be Related to other RRs in B.
60.61*	RR 3007	Provision of Information - NRC
60.62*	RR 3008	Site Review - NRC
60.63(a)	5.7-3,4	
60.63(b)	5.7-3,4	
60.63(e-f)	RR 3009	Proposal Review - NRC
60.64	RR 3010	Notice to States - NRC
60.65	RR 3011	Representation - Others

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MEETING Product
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10CFR 60 Section	Exclusion Basis or RR#	Notes:
60.71, 72	RR 3012	Records + Reports - DOE, 60.71(a) is Basis 60.71(b) + 72(a) Support 60.71(a) + 60.72(b) Support = 60.72(a).
60.73*	RR 3013	Reports of Deficiencies - DOE
60.74*	RR 3014	Tests - DOE - Subpart F is strongly related, but only related
60.75*	RR 3015	Inspection Rights - DOE
60.140* 141* 142* 143*	RR 3016	Performance Confirmation Program - DOE. 60.140 appears to be the Basis + 141, 142, + 143 support 140
60.150	5.7-1	Definitions
60.151	5.7-1 -4	Definition & General Discussion
60.152	RR 3017	QA Implementation Support Appendix B of 10CFR 50

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10CFR60 Section	Exclusion Basis or RR#	Notes:
60.160	RR 3018	General Requirements
60.161	RR 3019	Training & Certification
60.162	RR 3020	Physical Requirements
Subpart I	—	Emergency Planning (Reserved) FEMA Regulations Related.

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MEMORANDUM

July 11, 1989

To: A. Chowdhury
J. Hageman
P. Nair
J. Russell

From: A. Whiting

Subject: Initiation of Activities Under TOP-001-04

This memorandum initiates activities under TOP-001-04 "Selection of Regulatory Topics for Program Architecture Analysis".

Scope of Regulatory Topic Selection

In accordance with section 5.1 of the subject TOP, Regulatory Topics will be selected for the following portions of 10CFR60. Note that such Topics have already been identified for Subparts B and E of this regulation. Furthermore, Subpart I, Emergency Planning Criteria, has not yet been prepared and, thus, cannot be analyzed at this time.

Subpart Title

A	General Provisions
C	Participation by State Governments and Affected Indian Tribes
D	Records, Reports, Tests, and Inspections
F	Performance Confirmation Program
G	Quality Assurance
H	Training and Certification of Personnel

Analysts for Regulatory Topic Selection

In accordance with Section 5.2 of the subject TOP, the following individuals are named as analysts for purposes of Regulatory Topic Selection. These individuals are named to serve for the entire Regulatory Topic Selection process. Substitution is not allowed for unless specifically approved by the undersigned and documented in writing.

A. Chowdhury	Element Manager, Repository Design, Construction, and Operations.
J. Hageman	Element Manager, Special Projects and Analytical Investigations, including Transportation.
P. Nair	Element Manager, Engineered Barrier Systems.
J. Russell	Element Manager, Geologic Setting.
S. Spector	Senior Regulatory Analyst

Additional Guidance

1. The named members are charged to read and become familiar with the subject TOP, in its entirety; paying particular attention to the Criteria provided in Section 4, the preparations required in Section 5.3, the additional guidance provided in Section 5.4, and the rules for exclusion provided in Section 5.7.
2. The provisions of Section 5.6 of the procedure will not be invoked at this time. Action on this portion of the procedure is specifically deferred until such time as the noted "functional analysis" has been completed. Note: The current Format and Content Guide development activity may produce a surrogate for the functional analysis.
3. The Program Architecture Review Committee(s) assigned to review the products of the analyses that follow the selection of these Regulatory Topics will be charged to provide the comparison with the functional analysis, in accordance with Section 5.6 of TOP-001-04.
4. By copy of this memorandum, the Director of Quality Assurance is requested to provide the documentation and surveillance required in accordance with Sections 5.2, 6, and 7 of this procedure.
5. Because the Director of Systems Engineering and Integration is also serving as the WSE&I Element Manager, concurrence in these actions is provided by the Center Technical Director, as indicated below.

Approved:

Allen R. Whiting, Director
Systems Engineering and Integration

Concurrence:

Wesley C. Patrick
Technical Director

cc: J. Latz
R. Adler
B. Mabrito
R. Johnson
H. Garcia
T. Romine

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Section	INCLUSION OR EXCLUSION Inclusion Basis	* Exceptions
60.1	5.7-4	
60.2	5.7-1*	60.2 - "Aff. Indian Tribe" Finding by Sec. of Interior <u>RR 3000</u>
60.3(a)	RR 3001	License Issuance - DOE
60.3(b)	RR 3002	Construction Authorization - DOE
60.4 *	RR 3003	Communications + Records.
60.5	5.7-1,3	
60.6	RR 3004	Grant Exemptions - NRC
60.7	(RR 3001)	supports 60.3(a) a related is 60.18(e)

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10CFR60 Section	Exclusion Basis or RR#	Notes
60.8	5.7-3	
60.9(a)(e)	RR 3005	Prohibited Discrimination ^{60.9(b)(c)(d) are at least} Related
60.10*	RR 3006	Completeness + Accuracy - Note: This may be associated or be Related to other RRs in B.
60.61*	RR 3007	Provision of Information - NRC
60.62*	RR 3008	Site Review - NRC
60.63(a)	5.7-3,4	
60.63(b)	5.7-3,4	
60.63(e-f)	RR 3009	Proposal Review - NRC
60.64	RR 3010	Notice to States - NRC
60.65	RR 3011	Representation - Others

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10CFR 60 Section	Exclusion Basis or RR#
60.71, 72	RR 3012
60.73*	RR 3013
60.74*	RR 3014
60.75*	RR 3015
60.140* 141* 142* 143*	RR 3016
60.150	5.7-1
60.151	5.7-1 -4
60.152	RR 3017

Notes:

Records + Reports - DOE, 60.71(a) is Basis
60.71(b) + 72(a) Support 60.71(a) + 60.72(b)
Supports 60.72(a).

Reports of Deficiencies - DOE

Tests - DOE - Subpart F is strongly related, but only related.

Inspection Rights - DOE

Performance Confirmation Program - DOE.

60.140 appears to be the Basis + 141, 142, + 143 support 140

Definitions

Definition & General Discussion

QA Implementation Support Appendix B of 10CFR 50

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Meeting Product
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BEM

OCFR 60 Section	Exclusion Basis or RR#	Notes:
50.160	RR 3018	General Requirements
50.161	RR 3019	Training & Certification
50.162	RR 3020	Physical Requirements
Subpart I	—	Emergency Planning (Reserved) FEMA Regulations Related.

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Title **TOP-001-04 SELECTION OF REGULATORY TOPICS
FOR PROGRAM ARCHITECTURE ANALYSIS**

EFFECTIVITY AND APPROVAL

Revision 0 of this procedure became effective on June 30, 1989. This procedure consists of the pages and changes listed below.

<u>Page No.</u>	<u>Change</u>	<u>Date Effective</u>
A11	0	6/30/89

Supersedes Procedure No. **None**

Approvals

Written By <i>Wesley Roberts</i>	Date <i>6/30/89</i>	Technical Review <i>Freda Jain</i>	Date <i>6/30/89</i>
Quality Assurance <i>Samuel Malins</i>	Date <i>6/30/89</i>	Cognizant Director <i>Allen R. Whiting</i>	Date <i>6/30/89</i>

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**TOP-001-04 SELECTION OF REGULATORY TOPICS
FOR PROGRAM ARCHITECTURE ANALYSIS**

1. PURPOSE AND SCOPE

The purposes of this procedure are to (a) document the method previously used to select the Regulatory Topics for 10CFR60 Subparts B and E and (b) provide consistent guidance for the selection of additional Regulatory Topics associated with 10CFR60 and other primary regulations that are subject to Program Architecture analysis.

Regulatory Topics for Subparts B and E of 10CFR60 were selected several months ago to support an acceleration in the development of the Program Architecture. Although a decision was made to conduct the initial selection without strict procedural control, it is now appropriate to implement such controls for future selections of Regulatory Topics. Since the process used in the initial selection was effective, it is documented here and is used as the basis for subsequent selections.

2. DEFINITIONS

2.1 REGULATORY TOPIC

The Regulatory Topic is an assigned word or phrase that uniquely identifies the subject of the Regulatory Requirement. Such Regulatory Topics are based on the Primary Statute or Regulation, and are assigned by means of implementing this procedure.

2.2 REGULATORY REQUIREMENT

A Regulatory Requirement is a statement of a requirement pertaining to the NWSA Nuclear Waste Management System, as quoted from one or more statutes, regulations, or other sources which have the force of law. Each such quotation, which is called a Regulatory Text, is an element of a source at or above the lowest level to which an alphanumeric identifier has been assigned. See TOP-001-02 for expanded, current definition of Regulatory Requirement.

2.3 PRIMARY STATUTE OR REGULATION

Primary Federal statutes and regulations are those for which

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the NRC has direct regulatory authority for implementation and enforcement. Examples include 10CFR60, 10CFR71, and 10CFR72. Note that most items falling into the "Primary" category are regulations; there are relatively few cases where the NRC has not developed regulations to implement its statutory authorized responsibilities. From an analytical perspective, the Primary Regulations and Statutes are those used to derive both the Regulatory Topics, and the Regulatory Requirements that are the foundation of the Program Architecture development process.

2.4 INCORPORATED BY REFERENCE STATUTE OR REGULATION

The pertinent parts of statutes and regulations that are incorporated by reference (IBR) are treated as an integral part of the base Primary Federal Statute or Regulation. To be considered as "incorporated by reference", the statute or regulation must (a) be directly cited by number in a Primary Statute or Regulation, (b) be cited as part of the "Authority" for a Primary Statute or Regulation, and/or (c) be clearly referred to in a Primary Statute or Regulation. Examples include pertinent portions of 10CFR20, 10CFR51, and 40CFR191 that are IBR into 10CFR60, and portions of 49CFR173-178 that are IBR into 10CFR71. Note that items incorporated by reference are typically regulations, rather than statutes. With regard to analyses, any regulation incorporated by reference into a Primary Regulation is treated as an integral part of that Primary Regulation for purposes of analysis; the portion of the regulation becomes part of the Regulatory Requirement that is analyzed.

2.5 STATUTORY AUTHORIZATION

Statutes that authorize the NRC to conduct the various parts of its regulatory mission fall under this definition. Examples include the NWPA, NWPA, and the Atomic Energy Act. Statutes may be used in the analyses in three different ways. First, these Federal statutes may contain the specific requirements which must be complied with by the affected agency. In this case, the pertinent part of the statute would be treated as part of the Primary Statute or Regulation. Second, they may provide the basis for evaluation of the consistency and completeness of the regulation with its respective authorizing legislation. Third, statutes are compared with one another and with pertinent regulations to evaluate potential Institutional and/or Regulatory Uncertainties. In the latter two cases, the authorizing legislation is treated as a Related Statute for purposes of Program

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Architecture analysis, i.e. it is not embodied in part or in whole in a Primary Statute or Regulation and such things as Regulatory Elements of Proof are not developed for it.

2.6 RELATED STATUTES AND REGULATIONS

Statutes and regulations that relate topically to the Primary or IBR items, that are used by the NRC to regulate other nuclear facilities with similar functions, or that are used by other agencies to guide or regulate either high-level nuclear waste facilities or other nuclear facilities are included in this category. Examples include 10CFR72 in the context of 10CFR60, and vice versa.

2.7 OTHER

Other definitions are as contained in TOP-001 "Program Architecture Development and Maintenance," TOP-001-01 "Guidance to the Program Architecture Review Committee, Review and Revision of WSE&I Major Milestone No. 12," TOP-001-02, "Program Architecture Relational Database Work Instruction," and TOP-001-03 "Submission and Verification of Program Architecture Database Entries."

3. RESPONSIBILITY

3.1 The WSE&I Element Manager is delegated responsibility for implementation of the activities described in this procedure.

3.2 All other responsibilities regarding this procedure are as described in TOP-001, Section 3.

4. CRITERIA

The following criteria apply to the selection of Regulatory Topics for subsequent Program Architecture analysis.

4.1 The principal subject matter for a Regulatory Topic must be found in a Primary Statute or Regulation, and shall clearly and concisely convey the essence of the underlying Regulatory Requirement. Incorporated by Reference statutes and/or regulations may be used to add greater specificity to the Regulatory Topic, as appropriate.

4.2 The subject matter of Related Statutes or Regulations shall not be used as the basis for Regulatory Topics.

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4.3 Each Regulatory Topic shall embody a complete Regulatory Requirement. That is, the cited portion of the statute or regulation taken by itself shall comprise a distinct requirement which will require an independent proof of compliance.

4.4 Each Regulatory Topic shall contain a single Regulatory Requirement. That is, it should not group two or more requirements unless such requirements exist at a level below the lowest designated subdivision of the statute or regulation that is being analyzed. (See Section 2.2, definitions of Regulatory Requirement and Regulatory Text.)

4.5 Each Regulatory Topic shall be unique. That is, it should not duplicate an existing Topic.

5. PROCEDURE

5.1 The WSE&I Element Manager may elect to implement this procedure on the whole of a Primary Statute or Regulation, or for an appropriate subdivision of such Statute or Regulation. Such decision to select Regulatory Topics for a subdivision of a Primary Statute or Regulation shall be documented by the WSE&I Element Manager.

Note: Historically, Regulatory Topics were selected for Subparts B and E of 10CFR60 to support an accelerated development of the Program Architecture. The remaining Subparts of 10CFR60 and all other Primary Regulations will be analyzed using this procedure to select a unique set of Regulatory Topics.

5.2 The WSE&I Element Manager, with the concurrence of the Director of Systems Engineering and Integration, shall identify a team of analysts who will work together to select the Regulatory Topics for the identified Primary Statute or Regulation or subdivision thereof. The team shall include members from the senior technical staff, regulatory analyst, and legal staff (if such legal expertise is not present in the regulatory analyst). Identification of the team and statements of their qualifications (by means of Professional Data Sheets or the equivalent) shall be documented.

5.3 Team members shall study the Primary Statute or Regulation or subdivision thereof and appropriate supporting documentation such as the Statements of Consideration, NUREG-0804 (applicable to 10CFR60, only), Statutory Authorizations, etc. to become familiar with the

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statute or regulation, as well as the legislative and regulatory intent associated with it.

5.4 Using the criteria given in Section 4 of this procedure, an initial list of Regulatory Topics shall be developed comprising each distinct requirement that is present in the regulation. The process of identifying distinct requirements and naming of specific Regulatory Topics may be assisted by considering the following factors.

- A. A section or paragraph of the statute or regulation may call out a specific program requirement or technical criteria, and examination of that section may show that it contains only one distinct requirement. In this case, the section or paragraph identifies the Regulatory Topic. Furthermore, the title of that section or some modification thereto can be used to name the Regulatory Topic.

For example, 10CFR60.21 "Content of application" produced the Regulatory Topic "License Application and Content."

- B. A section or paragraph of the statute or regulation may appear to call out a specific requirement but examination of that section may show that it contains several distinct Regulatory Requirements that are logically interrelated. In this case, the content of the section or paragraph must be further divided to identify each of the several unique Regulatory Requirements (but never lower than the lowest level of alphanumeric identifier used in the regulation). The names selected for the Regulatory Topics may be developed from a combination of the title of the section of the regulation and the topical material contained in the pertinent text of the regulation.

For example, 10CFR60.122(c) "Potentially adverse conditions" produced 24 Regulatory Topics of the form "Adverse Condition - Flooding of the Underground Facility," "Adverse Condition - Evidence of Drilling," etc.

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C. A section or paragraph of the regulation may call out a specific requirement but examination of that section may show that it contains several distinct Regulatory Requirements that are not logically interrelated. In this case, the content of the section or paragraph must be further divided to identify each of the several unique Regulatory Requirements (but never lower than the lowest level of alphanumeric identifier used in the regulation). Furthermore, the names selected for the Regulatory Topics must be developed from the topical material contained in the pertinent text of the regulation.

For example 10CFR60.113 "Performance of particular barriers after permanent closure" produced the three Regulatory Topics "Containment Performance of the Engineered Barrier System to be Substantially Complete after Permanent Closure," "Release of Radionuclides from the Engineered Barrier System to be a Gradual Process over Long Times after Permanent Closure," and "Geologic Repository Located so Pre-waste-emplacment Groundwater Travel Time is at Least 1000 Years,"

Following tentative identification under Step 5.4, each Regulatory Topic shall be evaluated according to Steps 5.5 through 5.8 of this procedure to determine whether it has been correctly identified.

5.5 Each Regulatory Topic shall be carefully evaluated to ensure that it (a) clearly and concisely conveys the essence of the underlying Regulatory Requirement, (b) embodies a complete Regulatory Requirement (i.e. the cited portion of the regulation taken by itself comprises a distinct requirement), and (c) does not group two or more distinct Regulatory Requirements. Each Regulatory Topic shall be checked against the then current list of such Topics to ensure that it does not duplicate an existing Topic.

5.6 The set of Regulatory Topics shall be compared with the results of a functional analysis of the system that is subject to the regulation from which the Regulatory Topics were developed (e.g., 10CFR60 for the repository "system") to determine the inter-relationships among the hierarchy of the specific Regulatory Requirements. This comparison should include "rolling up" or consolidating the individual requirements to successively higher

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levels until, at the highest level, the requirements for the entire system are identified. The functional analysis may be performed independently of this procedure and be used here as the basis for comparison.

5.7 The Primary Regulation or subdivision thereof that is being analyzed shall be compared with the set of Regulatory Topics to ensure that each portion of the text is included in one or more Regulatory Topics. The following portions of regulations should not be included in Regulatory Topics (See TOP-001-02, Section 8.3 for detailed criteria).

- 1 - Definitions of terms and concepts (e.g. 10CFR60 and 10CFR60.102).
- 2 - Guidance regarding application for exceptions *OR EXEMPTIONS.*
- 3 - Guidance related to procedural matters, provided such matters are not specifically called out as requirements within the regulation. NOTE: Procedural matters which do convey a regulatory requirement (e.g. 10CFR60.33) shall have appropriate Regulatory Topics developed for them.
- 4 - General discussions without regulatory requirement (e.g. 10CFR60.101)

5.8 The Regulatory Topics resulting from use of this procedure are subject to subsequent review by a Program Architecture Review Committee (PARC), in accordance with TOP-001-03 "Submission and Verification of Program Architecture Database Entries." Any changes recommended by a PARC are subject to approval at or above the level of the Director of Systems Engineering and Integration.

6. RECORDS

Records shall be developed and maintained in accordance with Sections 4.A.4.3 through 4.A.4.6 and 4.A.4.8 of TOP-001, and the general provisions of Chapters 5, 6, and 17 of the Center Quality Assurance Manual (CQAM). Appropriate records shall also be maintained of Quality Assurance surveillance, reviews, and/or audits performed on the activities conducted under this procedure.

7. QUALITY ASSURANCE

This procedure has been developed and shall be controlled in accordance with Chapters 5 and 6 of the CQAM.

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Other Quality Assurance requirements for this procedure shall be implemented in accordance with the provisions of Sections 4.A.4.7 and 4.A.4.8 of TOP-001 and the general provisions of the CQAM. Either electronic or hard-copy objective evidence is acceptable for independent verification of the acceptability of activities performed in accordance with this procedure.

UNITED STATES NUCLEAR REGULATORY COMMISSION
RULES and REGULATIONS

TITLE 10, CHAPTER 1, CODE OF FEDERAL REGULATIONS - ENERGY

60.1

60.2

**PART
60**

**DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES
IN GEOLOGIC REPOSITORIES;
LICENSING PROCEDURES**

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**PART 60—DISPOSAL OF HIGH-LEVEL
RADIOACTIVE WASTES IN GEO-
LOGIC REPOSITORIES**

Subpart A—General Provisions

Sec.

- 60.1 Purpose and scope.
- 60.2 Definitions.
- 60.3 License required.
- 60.4 Communications.
- 60.5 Interpretations.
- 60.6 Exemptions.
- 60.7 License not required for certain preliminary activities.
- 60.8 Reporting, recordkeeping, and application requirements; OMB approval not required.
- 60.9 Employment protection.
- 60.10 Completeness and accuracy of information.

Subpart B—Licenses

PREAPPLICATION REVIEW

- 60.15 Site characterization.
- 60.16 Site characterization plan required.
- 60.17 Contents of site characterization plan.
- 60.18 Review of site characterization activities.

LICENSE APPLICATIONS

- 60.21 Content of application.
- 60.22 Filing and distribution of application.
- 60.23 Elimination of repetition.
- 60.24 Updating of application and environmental report.

CONSTRUCTION AUTHORIZATION

- 60.31 Construction authorization.
- 60.32 Conditions of construction authorization.
- 60.33 Amendment of construction authorization.

LICENSE ISSUANCE AND AMENDMENT

- 60.41 Standards for issuance of a license.
- 60.42 Conditions of license.
- 60.43 License specification.
- 60.44 Changes, tests, and experiments.
- 60.45 Amendment of license.
- 60.46 Particular activities requiring license amendment.

PERMANENT CLOSURE

- 60.51 License amendment for permanent closure.
- 60.52 Termination of license.

**Subpart C—Participation by State
Governments and Affected Indian Tribes**

- 60.61 Provision of information.
- 60.62 Site review.
- 60.63 Participation in license reviews.
- 60.64 Notice to States.
- 60.65 Representation.

**Subpart D—Records, Reports, Tests, and
Inspections**

- 60.71 Records and reports
- 60.72 Construction records.
- 60.73 Reports of deficiencies.
- 60.74 Tests.
- 60.75 Inspections.

Subpart E—Technical Criteria

- 60.101 Purpose and nature of findings.
- 60.102 Concepts.

PERFORMANCE OBJECTIVES

- 60.111 Performance of the geologic repository operations area through permanent closure.
- 60.112 Overall system performance objective for the geologic repository after permanent closure.
- 60.113 Performance of particular barriers after permanent closure.

LAND OWNERSHIP AND CONTROL

- 60.121 Requirements for ownership and control interests in land.

SITING CRITERIA

- 60.122 Siting criteria.

**DESIGN CRITERIA FOR THE GEOLOGICAL
REPOSITORY OPERATIONS AREA**

- 60.130 Scope of design criteria for the geologic repository operations area.
- 60.131 General design criteria for the geologic repository operations area.
- 60.132 Additional design criteria for surface facilities in the geologic repository operations area.
- 60.133 Additional design criteria for the underground facility.
- 60.134 Design of seals for shafts and boreholes.

DESIGN CRITERIA FOR THE WASTE PACKAGE

- 60.135 Criteria for the waste package and its components.

PERFORMANCE CONFIRMATION REQUIREMENTS

- 60.137 General requirements for performance confirmation.

Subpart F—Performance Confirmation Program

- 60.140 General requirements.
- 60.141 Confirmation of geotechnical and design parameters.
- 60.142 Design testing.
- 60.143 Monitoring and testing waste packages.

Subpart G—Quality Assurance

- 60.150 Scope.
- 60.151 Applicability.
- 60.152 Implementation.

**Subpart H—Training and Certification of
Personnel**

- 60.160 General requirements.
- 60.161 Training and certification program.
- 60.162 Physical requirements.

**Subpart I—Emergency Planning Criteria
[Reserved]**

Authority: Secs. 51, 53, 82, 83, 85, 81, 161, 182, 183 68 Stat. 929, 930, 932, 933, 935, 948, 953, 954, as amended (42 U.S.C. 2071, 2073, 2092, 2093, 2095, 2111, 2201, 2232, 2233); secs. 202, 206, 88 Stat. 1244, 1246, (42 U.S.C. 5842, 5846); secs. 10 and 14, Pub. L. 95-601, 92 Stat. 2951 (42 U.S.C. 2021a and 5851); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332); sec. 121, Pub. L. 97-425, 96 Stat. 2228 (42 U.S.C. 10141).

For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273); §§ 60.10, 60.71 to 60.75 are issued under sec. 1610, 68 Stat. 950, as amended (42 U.S.C. 2201)(o).

Subpart A—General Provisions

§ 60.1 Purpose and scope.

This part prescribes rules governing the licensing of the U.S. Department of Energy to receive and possess source, special nuclear, and byproduct material at a geologic repository operations area sited, constructed, or operated in accordance with the Nuclear Waste Policy Act of 1982. This part does not apply to any activity licensed under another part of this chapter.

§ 60.2 Definitions.

As used in this part—
"Accessible environment" means: (1) The atmosphere, (2) the land surface, (3) surface water, (4) oceans, and (5) the portion of the lithosphere that is outside the controlled area.

"Affected Indian Tribe" means any Indian Tribe (1) within whose reservation boundaries a repository for high-level radioactive waste or spent fuel is proposed to be located; or (2) whose Federally defined possessory or usage rights to other lands outside of the reservation's boundaries arising out of Congressionally ratified treaties or other Federal law may be substantially and adversely affected by the locating of such a facility; *Provided*, That the Secretary of the Interior finds, upon the petition of the appropriate governmental officials of the Tribe, that such effects are both substantial and adverse to the Tribe.

"Anticipated processes and events" means those natural processes and events that are reasonably likely to occur during the period the intended performance objective must be achieved. To the extent reasonable in the light of the geologic record, it shall be assumed that those processes operating in the geologic setting during the Quaternary Period continue to operate but with the perturbations caused by the presence of emplaced radioactive waste superimposed thereon.

"Barrier" means any material or structure that prevents or substantially delays movement of water or radionuclides.

"Candidate area" means a geologic and hydrologic system within which a geologic repository may be located.

"Commencement of construction" means clearing of land, surface or subsurface excavation, or other substantial action that would adversely affect the environment of a site, but does not include changes desirable for the temporary use of the land for public recreational uses, site characterization activities, other preconstruction monitoring and investigation necessary to establish background information related to the suitability of a site or to the protection of environmental values, or procurement or manufacture of components of the geologic repository operations area.

"Commission" means the Nuclear Regulatory Commission or its duly authorized representatives.

"Containment" means the confinement of radioactive waste within a designated boundary.

"Controlled area" means a surface location, to be marked by suitable monuments, extending horizontally no more than 10 kilometers in any direction from the outer boundary of the underground facility, and the underlying subsurface, which area has been committed to use as a geologic repository and from which incompatible activities would be restricted following permanent closure.

"Director" means the Director of the Nuclear Regulatory Commission's Office of Nuclear Material Safety and Safeguards.

"Disposal" means the isolation of radioactive wastes from the accessible environment.

"Disturbed zone" means that portion of the controlled area the physical or chemical properties of which have changed as a result of underground facility construction or as a result of heat generated by the emplaced radioactive wastes such that the resultant change of properties may have

a significant effect on the performance of the geologic repository.

"DOE" means the U.S. Department of Energy or its duly authorized representatives.

"Engineered barrier system" means the waste packages and the underground facility.

"Geologic repository" means a system which is intended to be used for, or may be used for, the disposal of radioactive wastes in excavated geologic media. A geologic repository includes: (1) The geologic repository operations area, and (2) the portion of the geologic setting that provides isolation of the radioactive waste.

"Geologic repository operations area" means a high-level radioactive waste facility that is part of a geologic repository, including both surface and subsurface areas, where waste handling activities are conducted.

"Geologic setting" means the geologic, hydrologic, and geochemical systems of the region in which a geologic repository operations area is or may be located.

"Groundwater" means all water which occurs below the land surface.

"High-level radioactive waste" or "HLW" means: (1) Irradiated reactor fuel, (2) liquid wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles, or equivalent, in a facility for reprocessing irradiated reactor fuel, and (3) solids into which such liquid wastes have been converted.

"HLW facility" means a facility subject to the licensing and related regulatory authority of the Commission pursuant to Sections 202(3) and 202(4) of the Energy Reorganization Act of 1974 (88 Stat 1244).¹

"Host rock" means the geologic medium in which the waste is emplaced.

"Important to safety," with reference to structures, systems, and components means those engineered structures, systems, and components essential to the prevention or mitigation of an accident that could result in a radiation dose to the whole body, or any organ, of 0.5 rem or greater at or beyond the nearest boundary of the unrestricted area at any time until the completion of permanent closure.

"Isolation" means inhibiting the transport of radioactive material so that

¹ These are DOE facilities used primarily for the receipt and storage of high-level radioactive wastes resulting from activities licensed under such Act (the Atomic Energy Act) and "Retrievable Surface Storage Facilities and other facilities authorized for the express purpose of subsequent long-term storage of high-level radioactive wastes generated by [DOE], which are not used for, or are part of, research and development activities."

amounts and concentrations of this material entering the accessible environment will be kept within prescribed limits.

"Permanent closure" means final backfilling of the underground facility and the sealing of shafts and boreholes.

"Performance confirmation" means the program of tests, experiments, and analyses which is conducted to evaluate the accuracy and adequacy of the information used to determine with reasonable assurance that the performance objectives for the period after permanent closure will be met.

"Public Document Room" means the place at 2120 L Street N.W., Washington, D.C., at which records of the Commission will ordinarily be made available for public inspection and any other place, the location of which has been published in the Federal Register, at which public records of the Commission pertaining to a particular geologic repository are made available for public inspection.

"Radioactive waste" or "waste" means HLW and other radioactive materials other than HLW that are received for emplacement in a geologic repository.

"Restricted area" means any area access to which is controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials. "Restricted area" shall not include any areas used as residential quarters, although a separate room or rooms in a residential building may be set apart as a restricted area.

"Retrieval" means the act of intentionally removing radioactive waste from the underground location at which the waste had been previously emplaced for disposal.

"Saturated zone" means that part of the earth's crust beneath the regional water table in which all voids, large and small, are ideally filled with water under pressure greater than atmospheric.

"Site" means the location of the controlled area.

"Site characterization" means the program of exploration and research, both in the laboratory and in the field, undertaken to establish the geologic conditions and the ranges of those parameters of a particular site relevant to the procedures under this part. Site characterization includes borings, surface excavations, excavation of exploratory shafts, limited subsurface lateral excavations and borings, and in situ testing at depth needed to determine the suitability of the site for a geologic repository, but does not include preliminary borings and geophysical testing needed to decide whether site characterization should be undertaken.

"Unanticipated processes and events" means those processes and events affecting the geologic setting that are

judged not to be reasonably likely to occur during the period the intended performance objective must be achieved, but which are nevertheless sufficiently credible to warrant consideration. Unanticipated processes and events may be either natural processes or events or processes and events initiated by human activities other than those activities licensed under this part. Processes and events initiated by human activities may only be found to be sufficiently credible to warrant consideration if it is assumed that: (1) The monuments provided for by this part are sufficiently permanent to serve their intended purpose; (2) the value to future generations of potential resources within the site can be assessed adequately under the applicable provisions of this part; (3) an understanding of the nature of radioactivity, and an appreciation of its hazards, have been retained in some functioning institutions; (4) institutions are able to assess risk and to take remedial action at a level of social organization and technological competence equivalent to, or superior to, that which was applied in initiating the processes or events concerned; and (5) relevant records are preserved, and remain accessible, for several hundred years after permanent closure.

"Underground facility" means the underground structure, including openings and backfill materials, but excluding shafts, boreholes, and their seals.

"Unrestricted area" means any area, access to which is not controlled by the licensee for purposes of protection of individuals from exposure to radiation and radioactive materials, and any area used for residential quarters.

"Unsaturated zone" means the zone between the land surface and the regional water table. Generally, fluid pressure in this zone is less than atmospheric pressure, and some of the voids may contain air or other gases at atmospheric pressure. Beneath flooded areas or in perched water bodies the fluid pressure locally may be greater than atmospheric.

"Waste form" means the radioactive waste materials and any encapsulating or stabilizing matrix.

"Waste package" means the waste form and any containers, shielding, packing and other absorbent materials immediately surrounding an individual waste container.

"Water table" means that surface in a groundwater body at which the water pressure is atmospheric.

§ 60.3 License required.

(a) DOE shall not receive or possess source, special nuclear, or byproduct material at a geologic repository operations area except as authorized by

a license issued by the Commission pursuant to this part.

(b) DOE shall not commence construction of a geologic repository operations area unless it has filed an application with the Commission and has obtained construction authorization as provided in this part. Failure to comply with this requirement shall be grounds for denial of a license.

§ 60.4 Communications and records.

(a) Except where otherwise specified, all communications and reports concerning the regulations in this part and applications filed under them should be addressed to the Director of Nuclear Material Safety and Safeguards, U.S. Nuclear Regulatory Commission, Washington, DC 20555. Communications reports, and applications may be delivered in person at the Commission's offices at 2120 L Street NW., Washington DC, or 11555 Rockville Pike, Rockville, Maryland.

(b) Each record required by this part must be legible throughout the retention period specified by each Commission regulation. The record may be the original or a reproduced copy or a microform provided that the copy or microform is authenticated by authorized personnel and that the microform is capable of producing a clear copy throughout the required retention period. The record may also be stored in electronic media with the capability for producing legible, accurate, and complete records during the required retention period. Records such as letters, drawings, specifications, must include all pertinent information such as stamps, initials, and signatures. The licensee shall maintain adequate safeguards against tampering with and loss of records.

§ 60.5 Interpretations.

Except as specifically authorized by the Commission, in writing, no interpretation of the meaning of the regulations in this part by any officer or employee of the Commission other than a written interpretation by the General Counsel will be considered binding upon the Commission.

§ 60.6 Exemptions.

The Commission may, upon application by DOE, any interested person, or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law, will not endanger life or property or the common defense and security, and are otherwise in the public interest.

§ 60.7 License not required for certain preliminary activities.

The requirement for a license set forth in § 60.3(a) of this part is not applicable to the extent that DOE receives and possesses source, special nuclear, and

byproduct material at a geologic repository:

(a) For purposes of site characterization; or

(b) For use, during site characterization or construction, as components of radiographic, radiation monitoring, or similar equipment or instrumentation.

§ 60.8 Reporting, recordkeeping, and application requirements: OMB approval not required.

The information collection requirements contained in this part affect fewer than ten persons. Therefore, under section 3506(c)(5) of the Paperwork Reduction Act of 1980 (Pub. L. 96-511), OMB clearance is not required for these information collection requirements.

§ 60.9 Employee protection.

(a) Discrimination by a Commission licensee, an applicant for a Commission license, or a contractor or subcontractor of a Commission licensee or applicant against an employee for engaging in certain protected activities is prohibited. Discrimination includes discharge and other actions that relate to compensation, terms, conditions, and privileges of employment. The protected activities are established in section 210 of the Energy Reorganization Act of 1974, as amended, and in general are related to the administration or enforcement of a requirement imposed under the Atomic Energy Act or the Energy Reorganization Act.

(1) The protected activities include but are not limited to—

(i) Providing the Commission information about possible violations of requirements imposed under either of the above statutes;

(ii) Requesting the Commission to institute action against his or her employer for the administration or enforcement of these requirements; or

(iii) Testifying in any Commission proceeding.

(2) These activities are protected even if no formal proceeding is actually initiated as a result of the employee assistance or participation.

(3) This section has no application to any employee alleging discrimination prohibited by this section who, acting without direction from his or her employer (or the employer's agent), deliberately causes a violation of any requirement of the Energy Reorganization Act of 1974, as amended, or the Atomic Energy Act of 1954, as amended.

(b) Any employee who believes that he or she has been discharged or otherwise discriminated against by any person for engaging in the protected activities specified in paragraph (a)(1) of this section may seek a remedy for the discharge or discrimination through an

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administrative proceeding in the Department of Labor. The administrative proceeding must be initiated within 30 days after an alleged violation occurs by filing a complaint alleging the violation with the Department of Labor, Employment Standards Administration, Wage and Hour Division. The Department of Labor may order reinstatement, back pay, and compensatory damages.

(c) A violation of paragraph (a) of this section by a Commission licensee, an applicant for a Commission license, or a contractor or subcontractor of a Commission licensee or applicant may be grounds for—

(1) Denial, revocation, or suspension of the license.

(2) Imposition of a civil penalty on the licensee or applicant.

(3) Other enforcement action.

(d) Actions taken by an employer, or others, which adversely affect an employee may be predicated upon nondiscriminatory grounds. The prohibition applies when the adverse action occurs because the employee has engaged in protected activities. An employee's engagement in protected activities does not automatically render him or her immune from discharge or discipline for legitimate reasons or from adverse action dictated by nonprohibited considerations.

(e) Each licensee and each applicant shall post Form NRC-3, "Notice to Employees," on its premises. Posting must be at locations sufficient to permit employees protected by this section to observe a copy on the way to or from their place of work. Premises must be posted not later than 30 days after an application is docketed and remain posted while the application is pending before the Commission, during the term of the license, and for 30 days following license termination.

Note.—Copies of Form NRC-3 may be obtained by writing to the Regional Administrator of the appropriate U.S. Nuclear Regulatory Commission Regional Office listed in Appendix D, Part 20 of this chapter.

violates this paragraph only if the applicant or licensee fails to notify the Commission of information that the applicant or licensee has identified as having a significant implication for public health and safety or common defense and security. Notification shall be provided to the Administrator of the appropriate Regional Office within two working days of identifying the information. This requirement is not applicable to information which is already required to be provided to the Commission by other reporting or updating requirements.

§ 60.10 Completeness and accuracy of information.

(a) Information provided to the Commission by an applicant for a license or by a licensee or information required by statute or by the Commission's regulations, orders, or license conditions to be maintained by the applicant or the licensee shall be complete and accurate in all material respects.

(b) Each applicant or licensee shall notify the Commission of information identified by the applicant or licensee as having for the regulated activity a significant implication for public health and safety or common defense and security. An applicant or licensee

§ 60.11 [Removed]

Subpart B—Licenses

Preapplication Review

§ 60.15 Site characterization.

(a) Prior to submittal of an application for a license to be issued under this part DOE shall conduct a program of site characterization with respect to the site to be described in such application.

(b) Unless the Commission determines with respect to the site described in the application that it is not necessary, site characterization shall include a program of in situ exploration and testing at the depths that wastes would be emplaced.

(c) As provided by Sec. 113 of the Nuclear Waste Policy Act (42 U.S.C. 10133), DOE is also required to conduct a program of site characterization, including in situ testing at depth, with respect to alternate sites.

(d) The program of site characterization shall be conducted in accordance with the following:

(1) Investigations to obtain the required information shall be conducted in such a manner as to limit adverse effects on the long-term performance of the geologic repository to the extent practical.

(2) The number of exploratory boreholes and shafts shall be limited to the extent practical consistent with obtaining the information needed for site characterization.

(3) To the extent practical, exploratory boreholes and shafts in the geologic repository operations area shall be located where shafts are planned for underground facility construction and operation or where large unexcavated pillars are planned.

(4) Subsurface exploratory drilling, excavation, and in situ testing before and during construction shall be planned and coordinated with geologic repository operations area design and construction.

§ 60.16 Site characterization plan required.

Before proceeding to sink shafts at any area which has been approved by the President for site characterization, DOE shall submit to the Director, for review and comment, a site characterization plan for such area.

DOE shall defer the sinking of such shafts until such time as there has been an opportunity for Commission comments thereon to have been solicited and considered by DOE.

§ 60.17 Contents of site characterization plan.

The site characterization plan shall contain—

(a) A general plan for site characterization activities to be conducted at the area to be characterized, which general plan shall include:

(1) A description of such area, including information on quality assurance programs that have been applied to the collection, recording, and retention of information used in preparing such description.

(2) A description of such site characterization activities, including the following—

(i) The extent of planned excavations;

(ii) Plans for any onsite testing with radioactive material, including radioactive tracers, or nonradioactive material;

(iii) Plans for any investigation activities that may affect the capability of such area to isolate high-level radioactive waste;

(iv) Plans to control any adverse impacts from such site characterization activities that are important to safety or that are important to waste isolation; and

(v) Plans to apply quality assurance to data collection, recording, and retention.

(3) Plans for the decontamination and decommissioning of such area, and for the mitigation of any significant adverse environmental impacts caused by site characterization activities, if such area is determined unsuitable for application for a construction authorization for a geologic repository operations area;

(4) Criteria, developed pursuant to section 112(a) of the Nuclear Waste Policy Act of 1982, to be used to determine the suitability of such area for the location of a geologic repository; and

(5) Any other information which the Commission, by rule or order, requires.

(b) A description of the possible waste form or waste package for the high-level radioactive waste to be emplaced in such geologic repository, a description (to the extent practicable) of the relationship between such waste form or waste package and the host rock at such area, and a description of the activities being conducted by DOE with

respect to such possible waste form or waste package or their relationship; and

(c) A conceptual design for the geologic repository operations area that takes into account likely site-specific requirements.

§ 60.18 Review of site characterization activities.²

(a) The Director shall cause to be published in the Federal Register a notice that a site characterization plan has been received from DOE and that a staff review of such plan has begun. The notice shall identify the area to be characterized and the NRC staff members to be consulted for further information.

(b) The Director shall make a copy of the site characterization plan available at the Public Document Room. The Director shall also transmit copies of the published notice of receipt to the Governor and legislature of the State in which the area to be characterized is located and to the governing body of any affected Indian Tribe. The Director shall provide an opportunity, with respect to any area to be characterized, for the State in which such area is located and for affected Indian Tribes to present their views on the site characterization plan and their suggestions with respect to comments thereon which may be made by NRC. In addition, the Director shall make NRC staff available to consult with States and affected Indian Tribes as provided in Subpart C of this part.

(c) The Director shall review the site characterization plan and prepare a site characterization analysis with respect to such plan. In the preparation of such site characterization analysis, the Director may invite and consider the views of interested persons on DOE's site characterization plan and may review and consider comments made in connection with public hearings held by DOE.

(d) The Director shall provide to DOE the site characterization analysis together with such additional comments as may be warranted. These comments shall include either a statement that the Director has no objection to the DOE's site characterization program, if such a statement is appropriate, or specific objections with respect to DOE's program for characterization of the area concerned. In addition, the Director may make specific recommendations

² In addition to the review of site characterization activities specified in this section, the Commission contemplates an ongoing review of other information on site investigation and site characterization, in order to allow early identification of potential licensing issues for timely resolution. This activity will include, for example, a review of the environmental assessments prepared by DOE at the time of site nomination, and review of issues related to long lead time exploratory shaft planning and procurement actions by DOE prior to issuance of site characterization plans.

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pertinent to DOE's site characterization program.

(e) If DOE's planned site characterization activities include onsite testing with radioactive material, including radioactive tracers, the Director's comments shall include a determination regarding whether or not the Commission concurs that the proposed use of such radioactive material is necessary to provide data for the preparation of the environmental reports required by law and for an application to be submitted under § 60.22 of this part.

(f) The Director shall publish in the Federal Register a notice of availability of the site characterization analysis and a request for public comment. A reasonable period, not less than 90 days, shall be allowed for comment. Copies of the site characterization analysis and of the comments received shall be made available at the Public Document Room.

(g) During the conduct of site characterization activities, DOE shall report not less than once every six months to the Commission on the nature and extent of such activities and the information that has been developed, and on the progress of waste form and waste package research and development. The semiannual reports shall include the results of site characterization studies, the identification of new issues, plans for additional studies to resolve new issues, elimination of planned studies no longer necessary, identification of decision points reached and modifications to schedules where appropriate. DOE shall also report its progress in developing the design of a geologic repository operations area appropriate for the area being characterized, noting when key design parameters or features which depend upon the results of site characterization will be established. Other topics related to site characterization shall also be covered if requested by the Director.

(h) During the conduct of site characterization activities, NRC staff shall be permitted to visit and inspect the locations at which such activities are carried out and to observe excavations, borings, and in situ tests as they are done.

(i) The Director may comment at any time in writing to DOE, expressing current views on any aspect of site characterization. In particular, such comments shall be made whenever the Director, upon review of comments invited on the site characterization analysis or upon review of DOE's semiannual reports, determines that there are substantial new grounds for

making recommendations or stating objections to DOE's site characterization program. The Director shall invite public comment on any comments which the Director makes to DOE upon review of the DOE semiannual reports or on any other comments which the Director makes to DOE on site characterization.

(j) The Director shall transmit copies of the site characterization analysis and all comments to DOE made by the Director under this section to the Governor and legislature of the State in which the area to be characterized is located and to the governing body of any affected Indian Tribe. When transmitting the site characterization analysis under this paragraph, the Director shall invite the addressees to review and comment thereon.

(k) All correspondence between DOE and the NRC under this section, including the reports described in paragraph (g), shall be placed in the Public Document Room.

(l) The activities described in paragraphs (a) through (k) of this section constitute informal conference between a prospective applicant and the staff, as described in § 2.101(a)(1) of this chapter, and are not part of a proceeding under the Atomic Energy Act of 1954, as amended. Accordingly, neither the issuance of a site characterization analysis nor any other comments of the Director made under this section constitutes a commitment to issue any authorization or license or in any way affect the authority of the Commission, the Atomic Safety and Licensing Appeal Board, Atomic Safety and Licensing Boards, other presiding officers, or the Director, in any such proceeding.

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the location of the geologic repository operations area, the general character of the proposed activities, and the basis for the exercise of licensing authority by the Commission.

(2) Proposed schedules for construction, receipt of waste, and emplacement of wastes at the proposed geologic repository operations area.

(3) A certification that DOE will provide at the geologic repository operations area such safeguards as it requires at comparable surface facilities (of DOE) to promote the common defense and security.

(4) A description of the physical security plan for protection against radiological sabotage. Since the radiation hazards associated with high-level wastes make them inherently unattractive as a target for theft or diversion, no detailed information need be submitted on protection against theft or diversion.

(5) A description of site characterization work actually conducted by DOE at all sites considered in the application and, as appropriate, explanations of why such work differed from the description of the site characterization program described in the Site Characterization Report for each site.

(c) The Safety Analysis Report shall include:

(1) A description and assessment of the site at which the proposed geologic repository operations area is to be located with appropriate attention to those features of the site that might affect geologic repository operations area design and performance. The description of the site shall identify the location of the geologic repository operations area with respect to the boundary of the accessible environment.

(i) The description of the site shall also include the following information regarding subsurface conditions. This description shall, in all cases, include such information with respect to the controlled area. In addition, where subsurface conditions outside the controlled area may affect isolation within the controlled area, the description shall include such information with respect to subsurface conditions outside the controlled area to the extent such information is relevant and material. The detailed information referred to in this paragraph shall include—

(A) The orientation, distribution, aperture in-filling and origin of fractures, discontinuities, and heterogeneities;

(B) The presence and characteristics of other potential pathways such as solution features, breccia pipes, or other potentially permeable features;

(C) The geomechanical properties and conditions, including pore pressure and

ambient stress conditions;

(D) The hydrogeologic properties and conditions;

(E) The geochemical properties; and

(F) The anticipated response of the geomechanical, hydrogeologic, and geochemical systems to the maximum design thermal loading, given the pattern of fractures and other discontinuities and the heat transfer properties of the rock mass and groundwater.

(ii) The assessment shall contain—

(A) An analysis of the geology, geophysics, hydrogeology, geochemistry, climatology, and meteorology of the site.

(B) Analyses to determine the degree to which each of the favorable and potentially adverse conditions, if present, has been characterized, and the extent to which it contributes to or detracts from isolation. For the purpose of determining the presence of the potentially adverse conditions, investigations shall extend from the surface to a depth sufficient to determine critical pathways for radionuclide migration from the underground facility to the accessible environment. Potentially adverse conditions shall be investigated outside of the controlled area if they affect isolation within the controlled area.

(C) An evaluation of the performance of the proposed geologic repository for the period after permanent closure, assuming anticipated processes and events, giving the rates and quantities of releases of radionuclides to the accessible environment as a function of time; and a similar evaluation which assumes the occurrence of unanticipated processes and events.

(D) The effectiveness of engineered and natural barriers, including barriers that may not be themselves a part of the geologic repository operations area, against the release of radioactive material to the environment. The analysis shall also include a comparative evaluation of alternatives to the major design features that are important to waste isolation, with particular attention to the alternatives that would provide longer radionuclide containment and isolation.

(E) An analysis of the performance of the major design structures, systems, and components, both surface and subsurface, to identify those that are important to safety. For the purposes of this analysis, it shall be assumed that operations at the geologic repository operations area will be carried out at the maximum capacity and rate of receipt of radioactive waste stated in the application.

(F) An explanation of measures used to support the models used to perform the assessments required in paragraphs (A) through (D). Analyses and models

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License Applications

§ 60.21 Content of application.

(a) An application shall consist of general information and a Safety Analysis Report. An environmental report shall be prepared in accordance with Part 51 of this chapter and shall accompany the application. Any Restricted Data or National Security Information shall be separated from unclassified information.

(b) The general information shall include:

(1) A general description of the proposed geologic repository identifying

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that will be used to predict future conditions and changes in the geologic setting shall be supported by using an appropriate combination of such methods as field tests, in situ tests, laboratory tests which are representative of field conditions, monitoring data, and natural analog studies.

(2) A description and discussion of the design, both surface and subsurface, of the geologic repository operations area including: (i) the principal design criteria and their relationship to any general performance objectives promulgated by the Commission, (ii) the design bases and the relation of the design bases to the principal design criteria, (iii) information relative to materials of construction (including geologic media, general arrangement, and approximate dimensions), and (iv) codes and standards that DOE proposes to apply to the design and construction of the geologic repository operations area.

(3) A description and analysis of the design and performance requirements for structures, systems, and components of the geologic repository which are important to safety. This analysis shall consider—(i) The margins of safety under normal conditions and under conditions that may result from anticipated operational occurrences, including those of natural origin; and (ii) the adequacy of structures, systems, and components provided for the prevention of accidents and mitigation of the consequences of accidents, including those caused by natural phenomena.

(4) A description of the quality assurance program to be applied to the structures, systems, and components important to safety and to the engineered and natural barriers important to waste isolation.

(5) A description of the kind, amount, and specifications of the radioactive material proposed to be received and possessed at the geologic repository operations area.

(6) An identification and justification for the selection of those variables, conditions, or other items which are determined to be probable subjects of license specifications. Special attention shall be given to those items that may significantly influence the final design.

(7) A description of the program for control and monitoring of radioactive effluents and occupational radiation exposures to maintain such effluents and exposures in accordance with the requirements of Part 20 of this chapter.

(8) A description of the controls that the applicant will apply to restrict access and to regulate land use at the site and adjacent areas, including a conceptual design of monuments which would be used to identify the controlled area after permanent closure.

(9) Plans for coping with radiological emergencies at any time prior to permanent closure and decontamination or dismantlement of surface facilities.

(10) A description of the nuclear material control and accounting program.

(11) A description of design considerations that are intended to facilitate permanent closure and decontamination or dismantlement of surface facilities.

(12) A description of plans for retrieval and alternate storage of the radioactive wastes should the geologic repository prove to be unsuitable for disposal of radioactive wastes.

(13) An identification and evaluation of the natural resources of the geologic setting, including estimates as to undiscovered deposits, the exploitation of which could affect the ability of the geologic repository to isolate radioactive wastes. Undiscovered deposits of resources characteristic of the area shall be estimated by reasonable inference based on geological and geophysical evidence. This evaluation of resources, including undiscovered deposits, shall be conducted for the site and for areas of similar size that are representative of and are within the geologic setting. For natural resources with current markets the resources shall be assessed, with estimates provided of both gross and net value. The estimate of net value shall take into account current development, extraction and marketing costs. For natural resources without current markets, but which would be marketable given credible projected changes in economic or technological factors, the resources shall be described by physical factors such as tonnage or other amount, grade, and quality.

(14) An identification of those structures, systems, and components of the geologic repository, both surface and subsurface, which require research and development to confirm the adequacy of design. For structures, systems, and components important to safety and for the engineered and natural barriers important to waste isolation, DOE shall provide a detailed description of the programs designed to resolve safety questions, including a schedule indicating when these questions would be resolved.

(15) The following information concerning activities at the geologic repository operations area:

(i) The organizational structure of DOE as it pertains to construction and operation of the geologic repository operations area including a description of any delegations of authority and assignments of responsibilities, whether in the form of regulations,

administrative directives, contract provisions, or otherwise.

(ii) Identification of key positions which are assigned responsibility for safety at and operation of the geologic repository operations area.

(iii) Personnel qualifications and training requirements.

(iv) Plans for startup activities and startup testing.

(v) Plans for conduct of normal activities, including maintenance, surveillance, and periodic testing of structures, systems, and components of the geologic repository operation area.

(vi) Plans for permanent closure and plans for the decontamination or dismantlement of surface facilities.

(vii) Plans for any uses of the geologic repository operations area for purposes other than disposal of radioactive wastes, with an analysis of the effects, if any, that such uses may have upon the operation of the structures, systems, and components important to safety and the engineered and natural barriers important to waste isolation.

§ 60.22 Filing and distribution of application.

(a) An application for a license to receive and possess source, special nuclear, or byproduct material at a geologic repository operations area at a site which has been characterized, and an accompanying environmental report, and any amendments thereto, shall be filed in triplicate with the Director and shall be signed by the Secretary of Energy or the Secretary's authorized representative.

(b) Each portion of such application and environmental report and any amendments shall be accompanied by 30 additional copies. Another 120 copies shall be retained by DOE for distribution in accordance with written instructions from the Director or the Director's designee.

(c) DOE shall, upon notification of the appointment of an Atomic Safety and Licensing Board, update the application and environmental report, eliminating all superseded information, and serve them as directed by the Board. In addition, at that time DOE shall serve one such copy on the Atomic Safety and Licensing Appeal Panel. Any subsequent amendments to the application or environmental report shall be served in the same manner.

(d) At the time of filing of an application and environmental report, and any amendments thereto, one copy shall be made available in an appropriate location near the proposed geologic repository operations area (which shall be a public document room, if one has been established) for inspection by the public and updated as amendments to the application or

environmental report are made. An updated copy shall be produced at any public hearing on the application for use by any parties to the proceedings.

(e) The DOE shall certify that the updated copies of the application and environmental report, as referred to in paragraphs (c) and (d), contain the current contents of such documents submitted in accordance with the requirements of this part.

§ 60.23 Elimination of repetition.

In its application, environmental report, or Site Characterization Report, the DOE may incorporate by reference information contained in previous applications, statements, or reports filed with the Commission: PROVIDED, that such references are clear and specific and that copies of the information so incorporated are available in the public document room located near the site of the proposed geologic repository.

§ 60.24 Updating of application and environmental report.

(a) The application and environmental report shall be as complete as possible in the light of information that is reasonably available at the time of docketing.

(b) The DOE shall update its application in a timely manner so as to permit the Commission to review, prior to issuance of a license:

(1) Additional geologic, geophysical, geochemical, hydrologic, meteorologic and other data obtained during construction.

(2) Conformance of construction of structures, systems, and components with the design.

(3) Results of research programs carried out to confirm the adequacy of designs.

(4) Other information bearing on the Commission's issuance of a license that was not available at the time a construction authorization was issued.

(c) The DOE shall update its environmental report in a timely manner so as to permit the Commission to review, prior to issuance of a license, the environmental impacts of any substantial changes in the activities proposed to be carried out or any significant new information regarding the environmental impacts of activities previously proposed.

Construction Authorization

§ 60.31 Construction authorization.

Upon review and consideration of an application and environmental report submitted under this part, the Commission may authorize construction if it determines:

(a) Safety. That there is reasonable assurance that the types and amounts of radioactive materials described in the application can be received, possessed,

and disposed of in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public. In arriving at this determination, the Commission shall consider whether:

(1) DOE has described the proposed geologic repository including but not limited to: (i) The geologic, geophysical, geochemical and hydrologic characteristics of the site; (ii) the kinds and quantities of radioactive waste to be received, possessed, stored, and disposed of in the geologic repository operations area; (iii) the principal architectural and engineering criteria for the design of the geologic repository operations area; (iv) construction procedures which may affect the capability of the geologic repository to serve its intended function; and (v) features or components incorporated in the design for the protection of the health and safety of the public.

(2) The site and design comply with the performance objectives and criteria contained in Subpart E of this part.

(3) The DOE's quality assurance program complies with the requirements of Subpart G of this part.

(4) The DOE's personnel training program complies with the criteria contained in Subpart H of this part.

(5) The DOE's emergency plan complies with the criteria contained in Subpart I of this part.

(6) The DOE's proposed operating procedures to protect health and to minimize danger to life or property are adequate.

(b) Common defense and security. That there is reasonable assurance that the activities proposed in the application will not be inimical to the common defense and security. A DOE certification that it will provide at the geologic repository operations area such safeguards as it requires at comparable DOE surface facilities to promote the common defense and security will constitute a rebuttable presumption of noninimicality to the common defense and security.

(c) Environmental. That, after weighing the environmental, economic, technical and other benefits against environmental costs and considering available alternatives, the action called for is issuance of the construction authorization, with any appropriate conditions to protect environmental values.

§ 60.32 Conditions of construction authorization.

(a) A construction authorization shall include such conditions as the

Commission finds to be necessary to protect the health and safety of the public, the common defense and security, or environmental values.

(b) The Commission will incorporate in the construction authorization provisions requiring DOE to furnish periodic or special reports regarding: (1) Progress of construction, (2) any data about the site obtained during construction which are not within the predicted limits upon which the facility design was based, (3) any deficiencies in design and construction which, if uncorrected, could adversely affect safety at any future time, and (4) results of research and development programs being conducted to resolve safety questions.

(c) The construction authorization will include restrictions on subsequent changes to the features of the geologic repository and the procedures authorized. The restrictions that may be imposed under this paragraph can include measures to prevent adverse effects on the geologic setting as well as measures related to the design and construction of the geologic repository operations area. These restrictions will fall into three categories of descending importance to public health and safety as follows: (1) Those features and procedures which may not be changed without: (i) 60 days prior notice to the Commission (ii) 30 days notice of opportunity for a prior hearing, and (iii) prior Commission approval; (2) those features and procedures which may not be changed without (i) 60 days prior notice to the Commission, and (ii) prior Commission approval; and (3) those features and procedures which may not be changed without 60 days notice to the Commission. Features and procedures falling in paragraph (c)(3) of this section may not be changed without prior Commission approval if the Commission, after having received the required notice, so orders.

(d) A construction authorization shall be subject to the limitation that a license to receive and possess source, special nuclear, or byproduct material at the geologic repository operations area shall not be issued by the Commission until (1) the DOE has updated its application as specified in § 60.24, and (2) the Commission has made the findings stated in § 60.41.

§ 60.33 Amendment of construction authorization.

(a) An application for amendment of a construction authorization shall be filed with the Commission fully describing any changes desired and following as far as applicable the format prescribed in § 60.21.

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(b) In determining whether an amendment of a construction authorization will be approved, the Commission will be guided by the considerations which govern the issuance of the initial construction authorization, to the extent applicable.

License Issuance and Amendment

§ 60.41 Standards for issuance of a license.

A license to receive and possess source, special nuclear, or byproduct material at a geologic repository operations area may be issued by the Commission upon finding that:

(a) Construction of the geologic repository operations area has been substantially completed in conformity with the application as amended, the provisions of the Atomic Energy Act, and the rules and regulations of the Commission. Construction may be deemed to be substantially complete for the purposes of this paragraph if the construction of (1) surface and interconnecting structures, systems, and components, and (2) any underground storage space required for initial operation are substantially complete.

(b) The activities to be conducted at the geologic repository operations area will be in conformity with the application as amended, the provisions of the Atomic Energy Act and the Energy Reorganization Act, and the rules and regulations of the Commission.

(c) The issuance of the license will not be inimical to the common defense and security and will not constitute an unreasonable risk to the health and safety of the public. A DOE certification that it will provide at the geologic repository operations area such safeguards as it requires at comparable DOE facilities to promote the common defense and security, will constitute a rebuttable presumption of non-inimicality to the common defense and security.

(d) All applicable requirements of Part 51 have been satisfied.

§ 60.42 Conditions of license.

(a) A license issued pursuant to this part shall include such conditions, including license specifications, as the Commission finds to be necessary to protect the health and safety of the

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public, the common defense and security, and environmental values.

(b) Whether stated therein or not, the following shall be deemed conditions in every license issued:

(1) The license shall be subject to revocation, suspension, modification, or amendment for cause as provided by the Atomic Energy Act and the Commission's regulations.

(2) The DOE shall at any time while the license is in effect, upon written request of the Commission, submit written statements to enable the Commission to determine whether or not the license should be modified, suspended or revoked.

(3) The license shall be subject to the provisions of the Atomic Energy Act now or hereafter in effect and to all rules, regulations, and orders of the Commission. The terms and conditions of the license shall be subject to amendment, revision, or modification, by reason of amendments to or by reason of rules, regulations, and orders issued in accordance with the terms of the Atomic Energy Act.

(c) Each license shall be deemed to contain the provisions set forth in Section 183 b-d, inclusive, of the Atomic Energy Act, whether or not these provisions are expressly set forth in the license.

§ 60.43 License specifications.

(a) A license issued under this part shall include license conditions derived from the analyses and evaluations included in the application, including amendments made before a license is issued, together with such additional conditions as the Commission finds appropriate.

(b) License conditions shall include items in the following categories—

(1) Restrictions as to the physical and chemical form and radioisotopic content of radioactive waste.

(2) Restrictions as to size, shape, and materials and methods of construction of radioactive waste packaging.

(3) Restrictions as to the amount of waste permitted per unit volume of storage space considering the physical characteristics of both the waste and the host rock.

(4) Requirements relating to test, calibration, or inspection to assure that the foregoing restrictions are observed.

(5) Controls to be applied to restricted access and to avoid disturbance to the controlled area and to areas outside the controlled area where conditions may affect isolation within the controlled area.

(6) Administrative controls, which are the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure that activities at the facility are conducted in a safe manner and in conformity with the other license specifications.

§ 60.44 Changes, tests, and experiments.

(a)(1) Following authorization to receive and possess source, special nuclear, or byproduct material at a geologic repository operations area, the DOE may (i) make changes in the geologic repository operations area as described in the application, (ii) make changes in the procedures as described in the application, and (iii) conduct tests or experiments not described in the application, without prior Commission approval, provided the change, test, or experiment involves neither a change in the license conditions incorporated in the license nor an unreviewed safety question.

(2) A proposed change, test, or experiment shall be deemed to involve an unreviewed safety question if (i) the likelihood of occurrence or the consequences of an accident or malfunction of equipment important to safety previously evaluated in the application is increased, (ii) the possibility of an accident or malfunction of a different type than any previously evaluated in the application is created, or (iii) the margin of safety as defined in the basis for any license condition is reduced.

(b) The DOE shall maintain records of changes in the geologic repository operations area and of changes in procedures made pursuant to this section, to the extent that such changes constitute changes in the geologic repository operations area or procedures as described in the application. Records of tests and experiments carried out pursuant to paragraph (a) of this section shall also be maintained. These records shall include a written safety evaluation which provides the basis for the determination that the change, test, or experiment does not involve an unreviewed safety question. The DOE shall prepare annually, or at such shorter intervals as may be specified in the license, a report containing a brief description of such changes, tests, and experiments, including a summary of the safety evaluation of each. The DOE shall furnish the report to the appropriate NRC Regional Office shown

in Appendix D of Part 20 of this chapter with a copy to the Director, Office of Nuclear Material Safety and Safeguards U.S. Nuclear Regulatory Commission, Washington, D.C. 20555. Any report submitted pursuant to this paragraph shall be made a part of the public record of the licensing proceedings.

§ 60.45 Amendment of license.

(a) An application for amendment of a license may be filed with the Commission fully describing the changes desired and following as far as applicable the format prescribed for license applications.

(b) In determining whether an amendment of a license will be approved, the Commission will be guided by the considerations that govern the issuance of the initial license, to the extent applicable.

§ 60.46 Particular activities requiring license amendment.

(a) Unless expressly authorized in the license, an amendment of the license shall be required with respect to any of the following activities—

- (1) Any action which would make emplaced high-level radioactive waste irretrievable or which would substantially increase the difficulty of retrieving such emplaced waste.
- (2) Dismantling of structures.

(3) Removal or reduction of controls applied to restrict access to or avoid disturbance of the controlled area and to areas outside the controlled area where conditions may affect isolation within the controlled area.

(4) Destruction or disposal of records required to be maintained under the provisions of this part.

(5) Any substantial change to the design or operating procedures from that specified in the license.

(6) Permanent closure.

(7) Any other activity involving an unreviewed safety question.

(b) An application for such an amendment shall be filed, and shall be reviewed, in accordance with the provisions of § 60.45.

Permanent Closure § 60.51 License amendment for permanent closure.

(a) DOE shall submit an application to amend the license prior to permanent closure. The application shall consist of an update of the license application and environmental report submitted under §§ 60.21 and 60.22, including:

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--(1) A description of the program for post-permanent closure monitoring of the geologic repository.

(2) A detailed description of the measures to be employed—such as land use controls, construction of monuments, and preservation of records—to regulate or prevent activities that could impair the long-term isolation of emplaced waste within the geologic repository and to assure that relevant information will be preserved for the use of future generations. As a minimum, such measures shall include—

(i) Identification of the controlled area and geologic repository operations area by monuments that have been designed, fabricated, and emplaced to be as permanent as is practicable; and

(ii) Placement of records in the archives and land record systems of local State, and Federal government agencies, and archives elsewhere in the world, that would be likely to be consulted by potential human intruders—such records to identify the location of the geologic repository operations area, including the underground facility, boreholes and shafts, and the boundaries of the controlled area, and the nature and hazard of the waste.

(3) Geologic, geophysical, geochemical, hydrologic, and other site data that are obtained during the operational period pertinent to the long-term isolation of emplaced radioactive wastes.

(4) The results of tests, experiments, and any other analyses relating to backfill of excavated areas, shaft sealing, waste interaction with the host rock, and any other tests, experiments, or analyses pertinent to the long-term isolation of emplaced wastes within the geologic repository.

(5) Any substantial revision of plans for permanent closure.

(6) Other information bearing upon permanent closure that was not available at the time a license was issued.

(b) DOE shall update its environmental report in a timely manner so as to permit the Commission to review, prior to issuance of an amendment, substantial changes in the permanent closure activities proposed to be carried out or significant new information regarding the environmental impacts of such permanent closure.

§ 60.52 Termination of license.

(a) Following permanent closure and the decontamination or dismantlement of surface facilities, DOE may apply for an amendment to terminate the license.

(b) Such application shall be filed, and will be reviewed, in accordance with the provisions of § 60.45 and this section.

(c) A license shall be terminated only

when the Commission finds with respect to the geologic repository:

(1) That the final disposition of radioactive wastes has been made in conformance with the DOE's plan, as amended and approved as part of the license.

(2) That the final state of the geologic repository operations area conforms to DOE's plans for permanent closure and DOE's plans for the decontamination or dismantlement of surface facilities, as amended and approved as part of the license.

(3) That the termination of the license is authorized by law, including Sections 57, 62, and 81 of the Atomic Energy Act, as amended.

Subpart C—Participation by State Governments and Affected Indian Tribes

§ 60.61 Provision of information.

(a) The Director shall provide to the Governor and legislature of any State in which a geologic repository operations area is or may be located, and to the governing body of any affected Indian Tribe, timely and complete information regarding determinations or plans made by the Commission with respect to the site characterization, siting, development, design, licensing, construction, operation, regulation, permanent closure, or decontamination and dismantlement of surface facilities, of such geologic repository operations area.

(b) For purposes of this section, a geologic repository operations area shall be considered to be one which "may be located" in a State if the location thereof in such State has been described in a site characterization plan submitted to the Commission under this part.

(c) Notwithstanding paragraph (a) of this section, the Director is not required to distribute any document to any entity if, with respect to such document, that entity or its counsel is included on a service list prepared pursuant to Part 2 of this chapter.

(d) Copies of all communications by the Director under this section shall be placed in the Public Document Room, and copies thereof shall be furnished to DOE.

§ 60.62 Site review.

(a) Whenever an area has been approved by the President for site characterization, and upon request of a State or an affected Indian Tribe, the Director shall make NRC staff available to consult with representatives of such States and Tribes.

(b) Requests for consultation shall be made in writing to the Director.

(c) Consultation under this section may include:

(1) Keeping the parties informed of the

Director's views on the progress of site characterization.

(2) Review of applicable NRC regulations, licensing procedures, schedules, and opportunities for State and Tribe participation in the Commission's regulatory activities.

(3) Cooperation in development of proposals for State and Tribe participation in license reviews.

§ 60.63 Participation in license reviews.

(a) State and local governments and affected Indian Tribes may participate in license reviews as provided in Subpart G of Part 2 of this chapter. A State in which a repository for high-level radioactive waste is proposed to be located and any affected Indian Tribe shall have an unquestionable legal right to participate as a party in such proceedings.

(b) In addition, whenever an area has been approved by the President for site characterization, a State or an affected Indian Tribe may submit to the Director a proposal to facilitate its participation in the review of a site characterization plan and/or license application. The proposal may be submitted at any time and shall contain a description and schedule of how the State or affected Indian Tribe wishes to participate in the review, or what services or activities the State or affected Indian Tribe wishes NRC to carry out, and how the services or activities proposed to be carried out by NRC would contribute to such participation. The proposal may include educational or information services (seminars, public meetings) or other actions on the part of NRC, such as establishing additional public document rooms or employment or exchange of State personnel under the Intergovernmental Personnel Act.

(c) The Director shall arrange for a meeting between the representatives of the State or affected Indian Tribe and the NRC staff to discuss any proposal submitted under paragraph (b) of this section, with a view to identifying any modifications that may contribute to the effective participation by such State or Tribe.

(d) Subject to the availability of funds, the Director shall approve all or any part of a proposal, as it may be modified through the meeting described above, if it is determined that:

(1) The proposed activities are suitable in light of the type and magnitude of impacts which the State or affected Indian Tribe may bear;

(2) The proposed activities:

(i) Will enhance communications between NRC and the State or affected Indian Tribe;

(ii) Will make a productive and timely contribution to the review; and

(iii) Are authorized by law.

(e) The Director will advise the State

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or affected Indian Tribe whether its proposal has been accepted or denied, and if all or any part of proposal is denied, the Director shall state the reason for the denial.

(f) Proposals submitted under this section, and responses thereto, shall be made available at the Public Document Room.

§ 60.64 Notice to States.

If the Governor and legislature of a State have jointly designated on their behalf a single person or entity to receive notice and information from the Commission under this part, the Commission will provide such notice and information to the jointly designated person or entity instead of the Governor and legislature separately.

§ 60.65 Representation.

Any person who acts under this subpart as a representative for a State (or for the Governor or legislature thereof) or for an affected Indian Tribe shall include in the request or other submission, or at the request of the Commission, a statement of the basis of his or her authority to act in such representative capacity.

Subpart D—Records, Reports, Tests, and Inspections

§ 60.71 Records and reports.

(a) DOE shall maintain such records and make such reports in connection with the licensed activity as may be required by the conditions of the license or by rules, regulations, and orders of the Commission as authorized by the Atomic Energy Act and the Energy Reorganization Act.

(b) Records of the receipt, handling, and disposition of radioactive waste at a geologic repository operations area shall contain sufficient information to provide a complete history of the movement of the waste from the shipper through all phases of storage and disposal. DOE shall retain these records in a manner that ensures their useability for future generations in accordance with § 60.51(a)(2).

§ 60.72 Construction records.

(a) DOE shall maintain records of construction of the geologic repository operations area in a manner that ensures their useability for future generations in accordance with § 60.51(a)(2).

(b) The records required under paragraph (a) shall include at least the following—

(1) Surveys of the underground facility excavations, shafts, and boreholes referenced to readily identifiable surface features or monuments;

(2) A description of the materials encountered;

(3) Geologic maps and geologic cross sections;

(4) Locations and amount of seepage;

(5) Details of equipment, methods, progress, and sequence of work;

(6) Construction problems;

(7) Anomalous conditions encountered;

(8) Instrument locations, readings, and analysis;

(9) Location and description of structural support systems;

(10) Location and description of dewatering systems; and

(11) Details, methods of emplacement, and location of seals used.

§ 60.73 Reports of deficiencies.

DOE shall promptly notify the Commission of each deficiency found in the characteristics of the site, and design and construction of the geologic repository operations area which, were it to remain uncorrected, could: (a) Be a substantial safety hazard, (b) represent a significant deviation from the design criteria and design bases stated in the application, or (c) represent a deviation from the conditions stated in the terms of a construction authorization or the license, including license specifications. The notification shall be in the form of a written report, copies of which shall be sent to the Director and to the appropriate Nuclear Regulatory Commission Regional Office listed in Appendix D of Part 20 of this chapter.

§ 60.74 Tests.

(a) DOE shall perform, or permit the Commission to perform, such tests as the Commission deems appropriate or necessary for the administration of the regulations in this part. These may include tests of: (1) Radioactive waste, (2) the geologic repository including its structures, systems, and components, (3) radiation detection and monitoring instruments, and (4) other equipment and devices used in connection with the receipt, handling, or storage of radioactive waste.

(b) The tests required under this section shall include a performance confirmation program carried out in accordance with Subpart F of this part.

§ 60.75 Inspections.

(a) DOE shall allow the Commission to inspect the premises of the geologic repository operations area and adjacent areas to which DOE has rights of access.

(b) DOE shall make available to the Commission for inspection, upon reasonable notice, records kept by DOE pertaining to activities under this part.

(c)(1) DOE shall upon requests by the Director, Office of Nuclear Material Safety and Safeguards

provide rent-free office space for the exclusive use of the Commission inspection personnel. Heat, air-conditioning, light, electrical outlets and janitorial services shall be furnished by DOE. The office shall be convenient to and have full access to the facility and shall provide the inspector both visual and acoustic privacy.

(2) The space provided shall be adequate to accommodate a full-time inspector, a part-time secretary and transient NRC personnel and will be generally commensurate with other office facilities at the geologic repository operations area. A space of 250 square feet either within the geologic repository operations area's office complex or in an office trailer or other onsite space at the geologic repository operations area is suggested as a guide. For locations at which activities are carried out under licenses issued under other parts of this chapter, additional space may be requested to accommodate additional full-time inspectors. The Office space that is provided shall be subject to the approval of the Director, Office of Nuclear Material Safety and Safeguards. All furniture, supplies and communication equipment will be furnished by the Commission.

(3) DOE shall afford any NRC resident inspector assigned to that location, or other NRC inspectors identified by the Regional Administrator as likely to inspect the facility, immediate unfettered access, equivalent to access provided regular employees, following proper identification and compliance with applicable access control measures for security, radiological protection and personal safety.

Subpart E—Technical Criteria

§ 60.101 Purpose and nature of findings.

(a)(1) Subpart B of this part prescribes the standards for issuance of a license to receive and possess source, special nuclear, or byproduct material at a geologic repository operations area. In particular, § 60.41(c) requires a finding that the issuance of a license will not constitute an unreasonable risk to the health and safety of the public. The purpose of this subpart is to set out performance objectives and site and design criteria which, if satisfied, will support such a finding of no unreasonable risk.

(2) While these performance objectives and criteria are generally stated in unqualified terms, it is not expected that complete assurance that they will be met can be presented. A

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reasonable assurance, on the basis of the record before the Commission, that the objectives and criteria will be met is the general standard that is required. For § 60.112, and other portions of this subpart that impose objectives and criteria for repository performance over long times into the future, there will inevitably be greater uncertainties. Proof of the future performance of engineered barrier systems and the geologic setting over time periods of many hundreds or many thousands of years is not to be had in the ordinary sense of the word. For such long-term objectives and criteria, what is required is reasonable assurance, making allowance for the time period, hazards, and uncertainties involved, that the outcome will be in conformance with those objectives and criteria. Demonstration of compliance with such objectives and criteria will involve the use of data from accelerated tests and predictive models that are supported by such measures as field and laboratory tests, monitoring data and natural analog studies.

(b) Subpart B of this part also lists findings that must be made in support of an authorization to construct a geologic repository operations area. In particular, § 60.31(a) requires a finding that there is reasonable assurance that the types and amounts of radioactive materials described in the application can be received, possessed, and disposed of in a geologic repository operations area of the design proposed without unreasonable risk to the health and safety of the public. As stated in that paragraph, in arriving at this determination, the Commission will consider whether the site and design comply with the criteria contained in this subpart. Once again, while the criteria may be written in unqualified terms, the demonstration of compliance may take uncertainties and gaps in knowledge into account, provided that the Commission can make the specified finding of reasonable assurance as specified in paragraph (a) of this section.

§ 60.102 Concepts.

This section provides a functional overview of Subpart E. In the event of any inconsistency with definitions found in § 60.2, those definitions shall prevail.

(a) *The HLW facility.* NRC exercises licensing and related regulatory authority over those facilities described in section 202 (3) and (4) of the Energy Reorganization Act of 1974. Any of these facilities is designated a *HLW facility*.

(b) *The geologic repository operations area.* (1) This part deals with the exercise of authority with respect to a particular class of HLW facility—namely a *geologic repository operations area*.

(2) *A geologic repository operations area* consists of those surface and subsurface areas that are part of a geologic repository where radioactive waste handling activities are conducted. The underground structure, including openings and backfill materials, but excluding shafts, boreholes, and their seals, is designated the *underground facility*.

(3) The exercise of Commission authority requires that the geologic repository operations area be used for storage (which includes disposal) of high-level radioactive wastes (HLW).

(4) HLW includes irradiated reactor fuel as well as reprocessing wastes. However, if DOE proposes to use the geologic repository operations area for storage of radioactive waste other than HLW, the storage of this radioactive waste is subject to the requirements of this part.

(c) *Areas related to isolation.* Although the activities subject to regulation under this part are those to be carried out at the geologic repository operations area, the licensing process also considers characteristics of adjacent areas that are defined in other ways. There is to be an area surrounding the underground facility referred to above, which is designated the *controlled area*, within which DOE is to exercise specified controls to prevent adverse human actions following permanent closure. The location of the controlled area is the *site*. The *accessible environment* is the atmosphere, land surface, surface water, oceans, and the portion of the lithosphere that is outside the controlled area. There is an area, designated the *geologic setting*, which includes the geologic, hydrologic, and geochemical systems of the region in which a geologic repository operations area is or may be located. The geologic repository operations area plus the portion of the geologic setting that provides isolation of the radioactive waste make up the *geologic repository*.

(d) *Stages in the licensing process.* There are several stages in the licensing process. The *site characterization* stage, though begun before submission of a license application, may result in consequences requiring evaluation in the license review. The *construction stage* would follow, after issuance of a construction authorization. A *period of operations* follows the issuance of a license by the Commission. The period of operations includes the time during which *emplacement* of wastes occurs; any subsequent period before permanent closure during which the emplaced wastes are *retrievable*; and *permanent closure*, which includes sealing of shafts. Permanent closure represents the end of active human

intervention with respect to the engineered barrier system.

(e) *Isolation of waste.* (1) During the first several hundred years following permanent closure of a geologic repository, when radiation and thermal levels are high and the uncertainties in assessing repository performance are

large, special emphasis is placed upon the ability to contain the wastes by waste packages within an *engineered barrier system*. This is known as the *containment period*. The *engineered barrier system* includes the waste packages and the underground facility. A *waste package* is composed of the waste form and any containers, shielding, packing, and absorbent materials immediately surrounding an individual waste container. The *underground facility* means the underground structure, including openings and backfill materials, but excluding shafts, boreholes, and their seals.

(2) Following the containment period special emphasis is placed upon the ability to achieve isolation of the wastes by virtue of the characteristics of the geologic repository. The engineered barrier system works to control the release of radioactive material to the geologic setting and the geologic setting works to control the release of radioactive material to the accessible environment. *Isolation* means inhibiting the transport of radioactive material so that amounts and concentrations of the materials entering the accessible environment will be kept within prescribed limits.

Performance Objectives

§ 60.111 Performance of the geologic repository operations area through permanent closure.

(a) *Protection against radiation exposures and releases of radioactive material.* The geologic repository operations area shall be designed so that until permanent closure has been completed, radiation exposures and radiation levels, and releases of radioactive materials to unrestricted areas, will at all times be maintained within the limits specified in Part 20 of this chapter and such generally applicable environmental standards for radioactivity as may have been established by the Environmental Protection Agency.

(b) *Retrievability of waste.* (1) The geologic repository operations area shall be designed to preserve the option of waste retrieval throughout the period during which wastes are being emplaced and, thereafter, until the completion of a performance confirmation program and Commission review of the information obtained from such a program. To

satisfy this objective, the geologic repository operations area shall be designed so that any or all of the emplaced waste could be retrieved on a reasonable schedule starting at any time up to 50 years after waste emplacement operations are initiated, unless a different time period is approved or specified by the Commission. This different time period may be established on a case-by-case basis consistent with the emplacement schedule and the planned performance confirmation program.

(2) This requirement shall not preclude decisions by the Commission to allow backfilling part or all of, or permanent closure of, the geologic repository operations area prior to the end of the period of design for retrievability.

(3) For purposes of this paragraph, a reasonable schedule for retrieval is one that would permit retrieval in about the same time as that devoted to construction of the geologic repository operations area and the emplacement of wastes.

§ 60.112 Overall system performance objective for the geologic repository after permanent closure.

The geologic setting shall be selected and the engineered barrier system and the shafts, boreholes and their seals shall be designed to assure that releases of radioactive materials to the accessible environment following permanent closure conform to such generally applicable environmental standards for radioactivity as may have been established by the Environmental Protection Agency with respect to both anticipated processes and events and unanticipated processes and events.

§ 60.113 Performance of particular barriers after permanent closure.

(a) *General provisions.* (1) *Engineered barrier system.* (i) The engineered barrier system shall be designed so that assuming anticipated processes and events: (A) Containment of HLW will be substantially complete during the period when radiation and thermal conditions in the engineered barrier system are dominated by fission product decay; and (B) any release of radionuclides from the engineered barrier system shall be a gradual process which results in small fractional releases to the geologic setting over long times. For disposal in the saturated zone, both the partial and complete filling with groundwater of available void spaces in the underground facility shall be appropriately considered and analysed among the anticipated processes and events in designing the engineered barrier system.

(ii) In satisfying the preceding requirement, the engineered barrier

system shall be designed, assuming anticipated processes and events, so that:

(A) Containment of HLW within the waste packages will be substantially complete for a period to be determined by the Commission taking into account the factors specified in § 60.113(b) provided, that such period shall be not less than 300 years nor more than 1,000 years after permanent closure of the geologic repository; and

(B) The release rate of any radionuclide from the engineered barrier system following the containment period shall not exceed one part in 100,000 per year of the inventory of that radionuclide calculated to be present at 1,000 years following permanent closure, or such other fraction of the inventory as may be approved or specified by the Commission; provided, that this requirement does not apply to any radionuclide which is released at a rate less than 0.1% of the calculated total release rate limit. The calculated total release rate limit shall be taken to be one part in 100,000 per year of the inventory of radioactive waste, originally emplaced in the underground facility, that remains after 1,000 years of radioactive decay.

(2) *Geologic setting.* The geologic repository shall be located so that pre-waste-emplacement groundwater travel time along the fastest path of likely radionuclide travel from the disturbed zone to the accessible environment shall be at least 1,000 years or such other travel time as may be approved or specified by the Commission.

(b) On a case-by-case basis, the Commission may approve or specify some other radionuclide release rate, designed containment period or pre-waste-emplacement groundwater travel time, provided that the overall system performance objective, as it relates to anticipated processes and events, is satisfied. Among the factors that the Commission may take into account are—

(1) Any generally applicable environmental standard for radioactivity established by the Environmental Protection Agency;

(2) The age and nature of the waste, and the design of the underground facility, particularly as these factors bear upon the time during which the thermal pulse is dominated by the decay heat from the fission products;

(3) The geochemical characteristics of the host rock, surrounding strata and groundwater; and

(4) Particular sources of uncertainty in predicting the performance of the geologic repository.

(c) Additional requirements may be found to be necessary to satisfy the overall system performance objective as

it relates to unanticipated processes and events.

Land Ownership and Control

§ 60.121 Requirements for ownership and control of interests in land.

(a) *Ownership of land.* (1) Both the geologic repository operations area and the controlled area shall be located in and on lands that are either acquired lands under the jurisdiction and control of DOE, or lands permanently withdrawn and reserved for its use.

(2) These lands shall be held free and clear of all encumbrances, if significant, such as: (i) Rights arising under the general mining laws; (ii) easements for right-of-way; and (iii) all other rights arising under lease, rights of entry, deed, patent, mortgage, appropriation, prescription, or otherwise.

(b) *Additional controls.* Appropriate controls shall be established outside of the controlled area. DOE shall exercise any jurisdiction and control over surface and subsurface estates necessary to prevent adverse human actions that could significantly reduce the geologic repository's ability to achieve isolation. The rights of DOE may take the form of appropriate possessory interests, servitudes, or withdrawals from location or patent under the general mining laws.

(c) *Water rights.* (1) DOE shall also have obtained such water rights as may be needed to accomplish the purpose of the geologic repository operations area.

(2) Water rights are included in the additional controls to be established under paragraph (b) of this section.

Siting Criteria

§ 60.122 Siting criteria.

(a)(1) A geologic setting shall exhibit an appropriate combination of the conditions specified in paragraph (b) of this section so that, together with the engineered barriers system, the favorable conditions present are sufficient to provide reasonable assurance that the performance objectives relating to isolation of the waste will be met.

(2) If any of the potentially adverse conditions specified in paragraph (c) of this section is present, it may compromise the ability of the geologic repository to meet the performance objectives relating to isolation of the waste. In order to show that a potentially adverse condition does not so compromise the performance of the geologic repository the following must be demonstrated:

(i) The potentially adverse human activity or natural condition has been adequately investigated, including the

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extent to which the condition may be present and still be undetected taking into account the degree of resolution achieved by the investigations; and

(ii) The effect of the potentially adverse human activity or natural condition on the site has been adequately evaluated using analyses which are sensitive to the potentially adverse human activity or natural condition and assumptions which are not likely to underestimate its effect; and

(iii)(A) The potentially adverse human activity or natural condition is shown by analysis pursuant to paragraph (a)(2)(ii) of this section not to affect significantly the ability of the geologic repository to meet the performance objectives relating to isolation of the waste, or

(B) The effect of the potentially adverse human activity or natural condition is compensated by the presence of a combination of the favorable characteristics so that the performance objectives relating to isolation of the waste are met, or

(C) The potentially adverse human activity or natural condition can be remedied.

(b) *Favorable conditions.* (1) The nature and rates of tectonic, hydrogeologic, geochemical, and geomorphic processes (or any of such processes) operating within the geologic setting during the Quaternary Period, when projected, would not affect or would favorably affect the ability of the geologic repository to isolate the waste.

(2) For disposal in the saturated zone, hydrogeologic conditions that provide—

- (i) A host rock with low horizontal and vertical permeability;
- (ii) Downward or dominantly horizontal hydraulic gradient in the host rock and immediately surrounding hydrogeologic units; and

(iii) Low vertical permeability and low hydraulic gradient between the host rock and the surrounding hydrogeologic units.

(3) Geochemical conditions that—(i) Promote precipitation or sorption of radionuclides; (ii) Inhibit the formation of particulates, colloids, and inorganic and organic complexes that increase the mobility of radionuclides; or (iii) Inhibit the transport of radionuclides by particulates, colloids, and complexes.

(4) Mineral assemblages that, when subjected to anticipated thermal loading, will remain unaltered or alter to mineral assemblages having equal or increased capacity to inhibit radionuclide migration.

(5) Conditions that permit the emplacement of waste at a minimum depth of 300 meters from the ground surface. (The ground surface shall be deemed to be the elevation of the lowest

point on the surface above the disturbed zone.)

(6) A low population density within the geologic setting and a controlled area that is remote from population centers.

(7) Pre-waste-emplacement groundwater travel time along the fastest path of likely radionuclide travel from the disturbed zone to the accessible environment that substantially exceeds 1,000 years.

(8) For disposal in the unsaturated zone, hydrogeologic conditions that provide—

(i) Low moisture flux in the host rock and in the overlying and underlying hydrogeologic units;

(ii) A water table sufficiently below the underground facility such that fully saturated voids contiguous with the water table do not encounter the underground facility;

(iii) A laterally extensive low-permeability hydrogeologic unit above the host rock that would inhibit the downward movement of water or divert downward moving water to a location beyond the limits of the underground facility;

(iv) A host rock that provides for free drainage; or

(v) A climatic regime in which the average annual historic precipitation is a small percentage of the average annual potential evapotranspiration.

(c) *Potentially adverse conditions.* The following conditions are potentially adverse conditions if they are characteristic of the controlled area or may affect isolation within the controlled area.

(1) Potential for flooding of the underground facility, whether resulting from the occupancy and modification of floodplains or from the failure of existing or planned man-made surface water impoundments.

(2) Potential for foreseeable human activity to adversely affect the groundwater flow system, such as groundwater withdrawal, extensive irrigation, subsurface injection of fluids, underground pumped storage, military activity or construction of large scale surface water impoundments.

(3) Potential for natural phenomena such as landslides, subsidence, or volcanic activity of such a magnitude that large-scale surface water impoundments could be created that could change the regional groundwater flow system and thereby adversely affect the performance of the geologic repository.

(4) Structural deformation, such as uplift, subsidence, folding, or faulting that may adversely affect the regional groundwater flow system.

(5) Potential for changes in hydrologic conditions that would affect the migration of radionuclides to the

accessible environment, such as changes in hydraulic gradient, average interstitial velocity, storage coefficient, hydraulic conductivity, natural recharge, potentiometric levels, and discharge points.

(6) Potential for changes in hydrologic conditions resulting from reasonably foreseeable climatic changes.

(7) Groundwater conditions in the host rock, including chemical composition, high ionic strength or ranges of Eh-pH, that could increase the solubility or chemical reactivity of the engineered barrier system.

(8) Geochemical processes that would reduce sorption of radionuclides, result in degradation of the rock strength, or adversely affect the performance of the engineered barrier system.

(9) Groundwater conditions in the host rock that are not reducing.

(10) Evidence of dissolution such as breccia pipes, dissolution cavities, or brine pockets.

(11) Structural deformation such as uplift, subsidence, folding, and faulting during the Quaternary Period.

(12) Earthquakes which have occurred historically that if they were to be repeated could affect the site significantly.

(13) Indications, based on correlations of earthquakes with tectonic processes and features, that either the frequency of occurrence or magnitude of earthquakes may increase.

(14) More frequent occurrence of earthquakes or earthquakes of higher magnitude than is typical of the area in which the geologic setting is located.

(15) Evidence of igneous activity since the start of the Quaternary Period.

(16) Evidence of extreme erosion during the Quaternary Period.

(17) The presence of naturally occurring materials, whether identified or undiscovered, within the site, in such form that:

(i) Economic extraction is currently feasible or potentially feasible during the foreseeable future; or

(ii) Such materials have greater gross value or net value than the average for other areas of similar size that are representative of and located within the geologic setting.

(18) Evidence of subsurface mining for resources within the site.

(19) Evidence of drilling for any purpose within the site.

(20) Rock or groundwater conditions that would require complex engineering measures in the design and construction of the underground facility or in the sealing of boreholes and shafts.

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(21) Geomechanical properties that do not permit design of underground opening that will remain stable through permanent closure.

(22) Potential for the water table to rise sufficiently so as to cause saturation of an underground facility located in the unsaturated zone.

(23) Potential for existing or future perched water bodies that may saturate portions of the underground facility or provide a faster flow path from an underground facility located in the unsaturated zone to the accessible environment.

(24) Potential for the movement of radionuclides in a gaseous state through air-filled pore spaces of an unsaturated geologic medium to the accessible environment.

Design Criteria for the Geologic Repository Operations Area

§ 60.130 Scope of design criteria for the geologic repository operations area.

Sections 60.131 through 60.134 specify minimum criteria for the design of the geologic repository operations area. These design criteria are not intended to be exhaustive, however. Omissions in §§ 60.131 through 60.134 do not relieve DOE from any obligation to provide such safety features in a specific facility needed to achieve the performance objectives. All design bases must be consistent with the results of site characterization activities.

§ 60.131 General design criteria for the geologic repository operations area.

(a) *Radiological protection.* The geologic repository operations area shall be designed to maintain radiation doses, levels, and concentrations of radioactive material in air in restricted areas within the limits specified in Part 20 of this chapter. Design shall include—

- (1) Means to limit concentrations of radioactive material in air;
- (2) Means to limit the time required to perform work in the vicinity of radioactive materials, including, as appropriate, designing equipment for ease of repair and replacement and providing adequate space for ease of operation;
- (3) Suitable shielding;
- (4) Means to monitor and control the dispersal of radioactive contamination;
- (5) Means to control access to high radiation areas or airborne radioactivity areas; and
- (6) A radiation alarm system to warn of significant increases in radiation levels, concentrations of radioactive material in air, and of increased radioactivity released in effluents. The alarm system shall be designed with provisions for calibration and for testing its operability.

(b) *Structures, systems, and components important to safety.* (1)

Protection against natural phenomena and environmental conditions.

The structures, systems, and components important to safety shall be designed so that natural phenomena and environmental conditions anticipated at the geologic repository operations area will not interfere with necessary safety functions.

(2) *Protection against dynamic effects of equipment failure and similar events.*

The structures, systems, and components important to safety shall be designed to withstand dynamic effects such as missile impacts, that could result from equipment failure, and similar events and conditions that could lead to loss of their safety functions.

(3) *Protection against fires and explosions.* (i) The structures, systems, and components important to safety shall be designed to perform their safety functions during and after credible fires or explosions in the geologic repository operations area.

(ii) To the extent practicable, the geologic repository operations area shall be designed to incorporate the use of noncombustible and heat resistant materials.

(iii) The geologic repository operations area shall be designed to include explosion and fire detection alarm systems and appropriate suppression systems with sufficient capacity and capability to reduce the adverse effects of fires and explosions on structures, systems, and components important to safety.

(iv) The geologic repository operations area shall be designed to include means to protect systems, structures, and components important to safety against the adverse effects of either the operation or failure of the fire suppression systems.

(4) *Emergency capability.* (i) The structures, systems, and components important to safety shall be designed to maintain control of radioactive waste and radioactive effluents, and permit prompt termination of operations and evacuation of personnel during an emergency.

(ii) The geologic repository operations area shall be designed to include onsite facilities and services that ensure a safe and timely response to emergency conditions and that facilitate the use of available offsite services (such as fire, police, medical and ambulance service) that may aid in recovery from emergencies.

(5) *Utility services.* (i) Each utility service system that is important to safety shall be designed so that essential safety functions can be performed under both normal and accident conditions.

(ii) The utility services important to safety shall include redundant systems to the extent necessary to maintain, with adequate capacity, the ability to perform their safety functions.

(iii) Provisions shall be made so that, if there is a loss of the primary electric power source or circuit, reliable and timely emergency power can be provided to instruments, utility service systems, and operating systems, including alarm systems, important to safety.

(6) *Inspection, testing, and maintenance.* The structures, systems, and components important to safety shall be designed to permit periodic inspection, testing, and maintenance, as necessary, to ensure their continued functioning and readiness.

(7) *Criticality control.* All systems for processing, transporting, handling, storage, retrieval, emplacement, and isolation of radioactive waste shall be designed to ensure that a nuclear criticality accident is not possible unless at least two unlikely, independent, and concurrent or sequential changes have occurred in the conditions essential to nuclear criticality safety. Each system shall be designed for criticality safety under normal and accident conditions. The calculated effective multiplication factor (k_{eff}) must be sufficiently below unity to show at least a 5% margin, after allowance for the bias in the method of calculation and the uncertainty in the experiments used to validate the method of calculation.

(8) *Instrumentation and control systems.* The design shall include provisions for instrumentation and control systems to monitor and control the behavior of systems important to safety over anticipated ranges for normal operation and for accident conditions.

(9) *Compliance with mining regulations.* To the extent that DOE is not subject to the Federal Mine Safety and Health Act of 1977, as to the construction and operation of the geologic repository operations area, the design of the geologic repository operations area shall nevertheless include such provisions for worker protection as may be necessary to provide reasonable assurance that all structures, systems, and components important to safety can perform their intended functions. Any deviation from relevant design requirements in 30 CFR, Chapter I, Subchapters D, E, and N will give rise to a rebuttable presumption that this requirement has not been met.

(10) *Shaft conveyances used in radioactive waste handling.* (i) Hoists important to safety shall be designed to preclude cage free fall.

(ii) Hoists important to safety shall be designed with a reliable cage location system.

(iii) Loading and unloading systems for hoists important to safety shall be designed with a reliable system of interlocks that will fail safely upon malfunction.

(iv) Hoists important to safety shall be

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designed to include two independent indicators to indicate when waste packages are in place and ready for transfer.

§ 60.132 Additional design criteria for surface facilities in the geologic repository operations area.

(a) *Facilities for receipt and retrieval of waste.* Surface facilities in the geologic repository operations area shall be designed to allow safe handling and storage of wastes at the geologic repository operations area, whether these wastes are on the surface before emplacement or as a result of retrieval from the underground facility.

(b) *Surface facility ventilation.* Surface facility ventilation systems supporting waste transfer, inspection, decontamination, processing, or packaging shall be designed to provide protection against radiation exposures and offsite releases as provided in § 60.111(a).

(c) *Radiation control and monitoring.* (1) *Effluent control.* The surface facilities shall be designed to control the release of radioactive materials in effluents during normal operations so as to meet the performance objections of § 60.111(a).

(2) *Effluent monitoring.* The effluent monitoring systems shall be designed to measure the amount and concentration of radionuclides in any effluent with sufficient precision to determine whether releases conform to the design requirement for effluent control. The monitoring systems shall be designed to include alarms that can be periodically tested.

(d) *Waste treatment.* Radioactive waste treatment facilities shall be designed to process any radioactive wastes generated at the geologic repository operations area into a form suitable to permit safe disposal at the geologic repository operations area or to permit safe transportation and conversion to a form suitable for disposal at an alternative site in accordance with any regulations that are applicable.

(e) *Consideration of decommissioning.* The surface facility shall be designed to facilitate decontamination or dismantlement to the same extent as would be required, under other parts of this chapter, with respect to equivalent activities licensed thereunder.

§ 60.133 Additional design criteria for the underground facility.

(a) *General criteria for the underground facility.* (1) The orientation, geometry, layout, and depth of the underground facility, and the design of any engineered barriers that are part of the underground facility shall contribute to the containment and isolation of radionuclides.

(2) The underground facility shall be designed so that the effects of credible

disruptive events during the period of operations, such as flooding, fires and explosions, will not spread through the facility.

(b) *Flexibility of design.* The underground facility shall be designed with sufficient flexibility to allow adjustments where necessary to accommodate specific site conditions identified through in situ monitoring, testing, or excavation.

(c) *Retrieval of waste.* The underground facility shall be designed to permit retrieval of waste in accordance with the performance objectives of § 60.111.

(d) *Control of water and gas.* The design of the underground facility shall provide for control of water or gas intrusion.

(e) *Underground openings.* (1) Openings in the underground facility shall be designed so that operations can be carried out safely and the retrievability option maintained.

(2) Openings in the underground facility shall be designed to reduce the potential for deleterious rock movement or fracturing of overlying or surrounding rock.

(f) *Rock excavation.* The design of the underground facility shall incorporate excavation methods that will limit the potential for creating a preferential pathway for groundwater to contact the waste packages or radionuclide migration to the accessible environment.

(g) *Underground facility ventilation.* The ventilation system shall be designed to—(1) Control the transport of radioactive particulates and gases within and releases from the underground facility in accordance with the performance objectives of § 60.111(a).

(2) Assure continued function during normal operations and under accident conditions; and

(3) Separate the ventilation of excavation and waste emplacement areas.

(h) *Engineered barriers.* Engineered barriers shall be designed to assist the geologic setting in meeting the performance objectives for the period following permanent closure.

(i) *Thermal loads.* The underground facility shall be designed so that the performance objectives will be met taking into account the predicted thermal and thermomechanical response of the host rock, and surrounding strata, groundwater system.

§ 60.134 Design of seals for shafts and boreholes.

(a) *General design criterion.* Seals for shafts and boreholes shall be designed so that following permanent closure they do not become pathways that compromise the geologic repository's ability to meet the performance

objectives or the period following permanent closure.

(b) *Selection of materials and placement methods.* Materials and placement methods for seals shall be selected to reduce, to the extent practicable:

- (1) The potential for creating a preferential pathway for groundwater to contact the waste packages or (2) for radionuclide migration through existing pathways.

Design Criteria for the Waste Package

§ 60.135 Criteria for the waste package and its components.

(a) *High-level-waste package design in general.* (1) Packages for HLW shall be designed so that the in situ chemical, physical, and nuclear properties of the waste package and its interactions with the emplacement environment do not compromise the function of the waste packages or the performance of the underground facility or the geologic setting.

(2) The design shall include but not be limited to consideration of the following factors: solubility, oxidation/reduction reactions, corrosion, hydriding, gas generation, thermal effects, mechanical strength, mechanical stress, radiolysis, radiation damage, radionuclide retardation, leaching, fire and explosion hazards, thermal loads, and synergistic interactions.

(b) *Specific criteria for HLW package design.* (1) *Explosive, pyrophoric, and chemically reactive materials.* The waste package shall not contain explosive or pyrophoric materials or chemically reactive materials in an amount that could compromise the ability of the underground facility to contribute to waste isolation or the ability of the geologic repository to satisfy the performance objectives.

(2) *Free liquids.* The waste package shall not contain free liquids in an amount that could compromise the ability of the waste packages to achieve the performance objectives relating to containment of HLW (because of chemical interactions or formation of pressurized vapor) or result in spillage and spread of contamination in the event of waste package perforation during the period through permanent closure.

(3) *Handling.* Waste packages shall be designed to maintain waste containment during transportation, emplacement, and retrieval.

(4) *Unique identification.* A label or other means of identification shall be provided for each waste package. The identification shall not impair the integrity of the waste package and shall be applied in such a way that the information shall be legible at least to the end of the period of retrievability.

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Each waste package identification shall be consistent with the waste package's permanent written records.

(c) *Waste form criteria for HLW.* High-level radioactive waste that is emplaced in the underground facility shall be designed to meet the following criteria:

(1) *Solidification.* All such radioactive wastes shall be in solid form and placed in sealed containers.

(2) *Consolidation.* Particulate waste forms shall be consolidated (for example, by incorporation into an encapsulating matrix) to limit the availability and generation of particulates.

(3) *Combustibles.* All combustible radioactive wastes shall be reduced to a noncombustible form unless it can be demonstrated that a fire involving the waste packages containing combustibles will not compromise the integrity of other waste packages, adversely affect any structures, systems, or components important to safety, or compromise the ability of the underground facility to contribute to waste isolation.

(d) *Design criteria for other radioactive wastes.* Design criteria for waste types other than HLW will be addressed on an individual basis if and when they are proposed for disposal in a geologic repository.

Performance Confirmation Requirements

§ 60.137 General requirements for performance confirmation.

The geologic repository operations area shall be designed so as to permit implementation of a performance confirmation program that meets the requirements of Subpart F of this part.

Subpart F—Performance Confirmation Program

§ 60.140 General requirements.

(a) The performance confirmation program shall provide data which indicates, where practicable, whether—

(1) Actual subsurface conditions encountered and changes in those conditions during construction and waste emplacement operations are within the limits assumed in the licensing review; and

(2) Natural and engineered systems and components required for repository operation, or which are designed or assumed to operate as barriers after permanent closure, are functioning as intended and anticipated.

(b) The program shall have been started during site characterization and it will continue until permanent closure.

(c) The program shall include in situ monitoring, laboratory and field testing, and in situ experiments, as may be appropriate to accomplish the objective as stated above.

(d) The program shall be implemented so that:

(1) It does not adversely affect the ability of the natural and engineered elements of the geologic repository to meet the performance objectives.

(2) It provides baseline information and analysis of that information on those parameters and natural processes pertaining to the geologic setting that may be changed by site

characterization, construction, and operational activities.

(3) It monitors and analyzes changes from the baseline condition of parameters that could affect the performance of a geologic repository.

(4) It provides an established plan for feedback and analysis of data, and implementation of appropriate action.

§ 60.141 Confirmation of geotechnical and design parameters.

(a) During repository construction and operation, a continuing program of surveillance, measurement, testing, and geologic mapping shall be conducted to ensure that geotechnical and design parameters are confirmed and to ensure that appropriate action is taken to inform the Commission of changes needed in design to accommodate actual field conditions encountered.

(b) Subsurface conditions shall be monitored and evaluated against design assumptions.

(c) As a minimum, measurements shall be made of rock deformations and displacement, changes in rock stress and strain, rate and location of water inflow into subsurface areas, changes in groundwater conditions, rock pore water pressures including those along fractures and joints, and the thermal and thermomechanical response of the rock mass as a result of development and operations of the geologic repository.

(d) These measurements and observations shall be compared with the original design bases and assumptions. If significant differences exist between the measurements and observations and the original design bases and assumptions, the need for modifications to the design or in construction methods shall be determined and these differences and the recommended changes reported to the Commission.

(e) In situ monitoring of the thermomechanical response of the underground facility shall be conducted until permanent closure to ensure that the performance of the natural and engineering features are within design limits.

§ 60.142 Design testing.

(a) During the early or developmental stages of construction, a program for in situ testing of such features as borehole and shaft seals, backfill, and the thermal interaction effects of the waste packages, backfill, rock, and

groundwater shall be conducted.

(b) The testing shall be initiated as early as is practicable.

(c) A backfill test section shall be constructed to test the effectiveness of backfill placement and compaction procedures against design requirements before permanent backfill placement is begun.

(d) Test sections shall be established to test the effectiveness of borehole and shaft seals before full-scale operation proceeds to seal boreholes and shafts.

§ 60.143 Monitoring and testing waste packages.

(a) A program shall be established at the geologic repository operations area for monitoring the condition of the waste packages. Waste packages chosen for the program shall be representative of those to be emplaced in the underground facility.

(b) Consistent with safe operation at the geologic repository operations area, the environment of the waste packages selected for the waste package monitoring program shall be representative of the environment in which the wastes are to be emplaced.

(c) The waste package monitoring program shall include laboratory experiments which focus on the internal condition of the waste packages. To the extent practical, the environment experienced by the emplaced waste packages within the underground facility during the waste package monitoring program shall be duplicated in the laboratory experiments.

(d) The waste package monitoring program shall continue as long as practical up to the time of permanent closure.

Subpart G—Quality Assurance

§ 60.150 Scope.

As used in this part, "quality assurance" comprises all those planned and systematic actions necessary to provide adequate confidence that the geologic repository and its subsystems or components will perform satisfactorily in service. Quality assurance includes quality control, which comprises those quality assurance actions related to the physical characteristics of a material, structure, component, or system which provide a means to control the quality of the material, structure, component, or system to predetermined requirements.

§ 60.151 Applicability.

The quality assurance program applies to all systems, structures and components important to safety, to design and characterization of barriers important to waste isolation and to activities related thereto. These activities include: site characterization,

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facility and equipment construction, facility operation, performance confirmation, permanent closure, and decontamination and dismantling of surface facilities.

§ 60.152 Implementation.

DOE shall implement a quality assurance program based on the criteria of Appendix B of 10 CFR Part 50 as applicable, and appropriately supplemented by additional criteria as required by § 60.151.

Subpart H—Training and Certification of Personnel

§ 60.160 General requirements.

Operations of systems and components that have been identified as important to safety in the Safety Analysis Report and in the license shall be performed only by trained and certified personnel or by personnel under the direct visual supervision of an individual with training and certification in such operation. Supervisory personnel who direct operations that are important to safety must also be certified in such operations.

§ 60.161 Training and certification program.

DOE shall establish a program for training, proficiency testing, certification and requalification of operating and supervisory personnel.

§ 60.162 Physical requirements.

The physical condition and the general health of personnel certified for operations that are important to safety shall not be such as might cause operational errors that could endanger the public health and safety. Any condition which might cause impaired judgment or motor coordination must be considered in the selection of personnel for activities that are important to safety. These conditions need not categorically disqualify a person, so long as appropriate provisions are made to accommodate such conditions.

Subpart I—Emergency Planning Criteria [Reserved]

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follow the procedures set out in paragraph (a) of this section.

PART 60—DISPOSAL OF HIGH-LEVEL RADIOACTIVE WASTES IN GEOLOGIC REPOSITORIES

11. The authority citation for Part 60 is revised to read as follows:

Authority: Secs. 51, 53, 62, 63, 65, 81, 161, 182, 183, 68 Stat. 929, 930, 932, 933, 935, 948, 953, 954, as amended (42 U.S.C. 2071, 2073, 2092, 2093, 2095, 2111, 2201, 2232, 2233); sec. 202, 206, 68 Stat. 1244, 1246 (42 U.S.C. 5842, 5846); sec. 10 and 14, Pub. L. 95-601, 92 Stat. 2951 (42 U.S.C. 2021a and 5851); sec. 102, Pub. L. 91-190, 83 Stat. 853 (42 U.S.C. 4332); sec. 114, 121, Pub. L. 97-425, 96 Stat. 2213, 2228, as amended (42 U.S.C. 10134, 10141).

For the purposes of sec. 223, 68 Stat. 958, as amended (42 U.S.C. 2273), §§ 60.10, 60.71 to 60.75 are issued under sec. 181c, 68 Stat. 950, as amended (42 U.S.C. 2201(o)).

§ 60.15 [Amended]

12. In § 60.15, paragraph (c) is removed and paragraph (d) is redesignated as paragraph (c).

13. In § 60.21, paragraph (a) is revised to read as follows:

§ 60.21 Content of application.

(a) An application shall consist of general information and a Safety Analysis Report. An environmental impact statement shall be prepared in accordance with the Nuclear Waste Policy Act of 1982, as amended, and shall accompany the application. Any Restricted Data or National Security Information shall be separated from unclassified information.

14. Section 60.22 is revised to read as follows:

§ 60.22 Filing and distribution of application.

(a) An application for a license to receive and possess source, special nuclear, or byproduct material at a geologic repository operations area at a site which has been characterized, and any amendments thereto, and an accompanying environmental impact statement and any supplements, shall be signed by the Secretary of Energy or the Secretary's authorized representative and shall be filed in triplicate with the Director.

(b) Each portion of such application and any amendments, and each environmental impact statement and any supplements, shall be accompanied by 30 additional copies. Another 120 copies shall be retained by DOE for distribution in accordance with written instructions from the Director or the Director's designee.

(c) DOE shall, upon notification of the appointment of an Atomic Safety and Licensing Board, update the application, eliminating all superseded information, and supplement the environmental impact statement if necessary, and serve the updated application and environmental impact statement (as it may have been supplemented) as directed by the Board. At that time DOE shall also serve one such copy of the application and environmental impact statement on the Atomic Safety and Licensing Appeal Panel. Any subsequent amendments to the application or supplements to the environmental impact statement shall be served in the same manner.

(d) At the time of filing of an application and any amendments thereto, one copy shall be made available in an appropriate location near the proposed geologic repository operations area (which shall be a public document room, if one has been established) for inspection by the public and updated as amendments to the application are made. The environmental impact statement and any supplements thereto shall be made available in the same manner. An updated copy of the application, and the environmental impact statement and supplements, shall be produced at any public hearing held by the Commission on the application, for use by any party to the proceeding.

(e) The DOE shall certify that the updated copies of the application, and the environmental impact statement as it may have been supplemented, as referred to in paragraphs (c) and (d) of this section, contain the current contents of such documents submitted in accordance with the requirements of this part.

15. In § 60.24, the section heading and paragraphs (a) and (c) are revised to read as follows:

§ 60.24 Updating of application and environmental impact statement.

(a) The application shall be as complete as possible in the light of information that is reasonably available at the time of docketing.

(c) The DOE shall supplement its environmental impact statement in a timely manner so as to take into account the environmental impacts of any substantial changes in its proposed actions or any significant new circumstances or information relevant to environmental concerns and bearing on the proposed action or its impacts.

16. In § 60.31, the introductory paragraph is revised to read as follows:

§ 60.31 Construction authorization.

Upon review and consideration of an application and environmental impact statement submitted under this part, the Commission may authorize construction if it determines:

17. In § 60.51, the introductory portion of paragraph (a), and paragraph (b), are revised to read as follows:

§ 60.51 License amendment for permanent closure.

(a) DOE shall submit an application to amend the license prior to permanent closure. The submission shall consist of an update of the license application submitted under §§ 60.21 and 60.22, including:

(b) If necessary, so as to take into account the environmental impact of any substantial changes in the permanent closure activities proposed to be carried out or any significant new information regarding the environmental impacts of such closure, DOE shall also supplement its environmental impact statement and submit such statement, as supplemented, with the application for license amendment.

Dated at Rockville, Maryland this 28th day of June 1989.

For the Nuclear Regulatory Commission,

Samuel J. Chilk,

Secretary of the Commission.

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PENSION BENEFIT GUARANTY CORPORATION

29 CFR Parts 2610 and 2622

Late Premium Payments and Employer Liability Underpayments and Overpayments; Change in Interest Rate

AGENCY: Pension Benefit Guaranty Corporation.

ACTION: Final rule; correction.

SUMMARY: This document corrects the most recent amendments to Appendix A to Part 2610 and Appendix A to Part 2622, the interest rates on late premium payments and underpayments or overpayments of employer liability, respectively. Those amendments, which appeared at 54 FR 13520 (April 4, 1989), set forth the interest rates effective as of April 1, 1989. This correction removes the ending date for the effective period of those rates, which will remain in effect until changed.

EFFECTIVE DATE: June 30, 1989.