SITE-SPECIFIC INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI) LICENSE RENEWAL

I. PHILOSOPHY

Operation of an ISFSI during a renewal period must maintain the following safety criteria to minimize dose to the public and to avoid release of radioactive material: subcriticality, shielding, confinement, and heat transfer, and structural integrity. The renewal application and review process is intended to establish and confirm that the ISFSI and its components can, with reasonable assurance, operate in a safe manner and meet applicable regulatory requirements for an additional 20 years. Thus, there needs to be a basis to enable the staff to make a finding that the effects of aging on dry cask storage systems, structures, components, and support activities are understood and will be managed such that the ISFSI can be operated during the renewal period without undue risk to the health and safety of the public. The license renewal is not an exercise in re-licensing and does not provide an opportunity to impose requirements that are beyond those that were met by the design when it was initially licensed by the Nuclear Regulatory Commission (NRC). Therefore, the current licensing basis for the ISFSI will be carried forward through the renewal period.

II. ITEMS FOR EVALUATION IN RENEWAL APPLICATIONS

The licensee should consider at a minimum the following items in the preparation of an application: (1) the intended functions of the pertinent systems, structures, and components (SSCs) of the ISFSI; (2) degradation mechanisms and effects (aging) for specific SSCs; (3) existing maintenance and monitoring programs and proposed modifications thereto; (4) changes in environmental factors and conditions for the ISFSI; (5) realized and predicted changes in site-specific characteristics; (6) operational experience at this ISFSI and at others with similar or identical cask designs; (7) applicable reported or non-reported ISFSI or cask events; and (8) realized and projected decreases in thermal loading and source term for loaded casks.

III. CONTENTS OF APPLICATION FOR SITE SPECIFIC LICENSE RENEWAL

A. Section 72.42 of 10 CFR Part 72 lists the requirements that a licensee must meet for renewal of an ISFSI license. A licensee should file an application for renewal in accordance with the applicable provisions of Subpart B, “License Application, Form, and Contents,” at least 2 years prior to the expiration of the existing license. Information contained in previous applications, statements, or reports filed with the Commission under the license may be incorporated by reference provided that such references are clear and specific.

B. The application should include the following general information as listed in 10 CFR 72.22: (1) full name and address of licensee, (2) description of business or occupation of licensee if it has changed from the original application, and (3) information sufficient to demonstrate to the Commission the financial qualifications of the licensee to carry out the activities for which the license renewal is sought.

C. The application should include or reference the technical information required by 10 CFR 72.24 applicable to the renewal period. It should not be a repetition of the entire original application, but should focus on (1) any maintenance or surveillance programs that will be used to manage known or expected component material and functional degradation for the renewal period as discussed below in Section V., and (2) time limited aging (TLA) analyses updates for any components supporting or performing safety functions with functional life spans less than 40 years as justified in the original licensing basis as discussed in Section VI. below.

D. The application should also include technical specification (TS) changes or additions that are necessary to manage the effects of aging during the period of extended operation and should comply with the applicable requirements of 10 CFR 72.44. It should also include a summary statement of the bases and the justification for the changes or additions. Amendments may need to be processed based on required license or TS changes.

E. The licensee should also specify any changes in its organizational technical qualifications, including training and experience as required by 10 CFR 72.28.

F. The licensee must also include financial assurance and record keeping for decommissioning in accordance with 10 CFR 72.30.

G. Finally, the licensee should identify any changes to the Emergency Plan (10 CFR 72.32) or Environmental Report (10 CFR 72.34) as a supplement to the current ones.

IV. INITIAL SCREENING PROCESS

The SSCs that comprise an ISFSI that uses dry storage casks will typically fall into one or more of the categories listed below and thus are within the scope of license renewal. The categories of SSCs are those that are:

- Important to safety (ITS) to ensure that safety functions are met for: (1) criticality, (2) shielding, (3) confinement, (4) heat transfer, and (5) structural integrity.

- Relied upon to demonstrate compliance with regulatory functions. Examples include: (1) fuel retrievability, (2) protection of fuel from gross degradation, (3) special nuclear material accountability, (4) confinement monitoring, (5) specific requirements imposed in the facility license, and (6) decommissioning.

- Classified as not important to safety, but whose failure prevents a safety function from being fulfilled or whose failure as a support SSC prevents a safety function from being fulfilled.

Additional guidance describing SSCs that should be included within the scope of license renewal is provided in NUREG/CR-6407, “Classification of Transportation Packaging and Dry Spent Fuel Storage System Components According to Importance to Safety,” February 1996. Section 3, Pages 4-6, defines the classification categories and Section 6, Pages 34-45, discusses the classification of storage components.

An SSC may be eliminated from the scope of license renewal provided it does not fall into any of the above categories and the licensee has determined it may be excluded from the renewal scope based on plant-specific experience with the design(s), industry wide operating experience (if appropriate), and/or existing engineering evaluations. Also, the staff has determined that SSCs which perform ISFSI support functions are generally not within the scope of license renewal. The following support SSCs may be eliminated provided they are inspected and maintained in accordance with a quality assurance program and the application includes a certification that provisions have been made to ensure that these SSCs will be available to perform their intended support functions for the duration of the renewal period:

(1) Equipment associated with cask loading and unloading such as (a) welding and sealing equipment; (b) lifting rigs, slings, etc.; (c) vacuum drying equipment; (d) transporter devices; (e) portable radiation survey equipment; and (f) other tools, fittings, hoses, gauges, etc., associated with cask loading and unloading.

(2) SSCs associated with physical protection of the ISFSI pursuant to 10 CFR Part 72 Subpart H.

(3) SSCs associated with the ISFSI Emergency Plan pursuant to 10 CFR 72.32.

(4) Miscellaneous hardware that does not support or perform any safety function.

The application should provide documentation of the initial screening process that includes:

- a description of the screening process and rationale for the elimination of SSCs from the renewal scope
- a listing of the SSCs that are included within the scope of license renewal, their primary function, and safety classification or basis for inclusion in the renewal scope
- a list of the sources of information used (see list below)
- any discussion needed to clarify the process, SSC designations, or sources of information used

The appendix to this document] includes a sample of SSC listings for an approved cask design that includes information that will facilitate screening for aging issues discussed in the following section and that would be included in a typical application for renewal.

LIST OF POTENTIAL INFORMATION SOURCES:

SAR/FSAR/UFSAR
Technical Specifications
Operating Procedures
Regulatory Compliance Reports including Safety Evaluation Reports
Design Basis Documents
System/Facility Drawings
Quality Assurance Plan or Program

Docketed Correspondence
Operating Experience Reports
10 CFR 72.48 Approvals
Vendor Information

V. SECONDARY SCREENING OF SSCS FOR AGING ISSUES-AGING MANAGEMENT REVIEW

The purpose of this screening is to identify a **subset** of the SSCs (discussed in Section IV above) that need to be addressed because of material or functional degradation existing or developing during the renewal period. Such SSCs must be addressed by evaluation, monitoring, or periodic replacement programs that will be maintained or established for the renewal period. This screening will provide the basis for the technical information that must be provided in the application.

The licensee should identify known aging effects and mechanisms for SSCs within the scope of the license renewal. The following table lists aging mechanisms and effects and is an excerpt from a table in Appendix C to NUREG-1557,"Summary of Technical Information and Agreements from Nuclear Management and Resources Council Industry Reports Addressing License Renewal" (Oct. 1996).

AGING MECHANISMS AND EFFECTS

Aging Mechanism	*Aging Effects*
SSCs in Outside Environment	
Concrete Structures	
1. Freeze-Thaw	Scaling, cracking, and spalling
2. Leaching of CalciumHydroxide	Increase in porosity and permeability
3. Aggressive Chemical Attack	Increase in porosity and permeability, cracking, and spalling
4. Reaction with Aggregates	Expansion and cracking
5. Elevated Temperature	Loss of strength and modulus
6. Irradiation of Concrete	Loss of strength and modulus
7. Creep	Deformation
8. Shrinkage	Cracking
9. Corrosion	Loss of material
10. Abrasion and Cavitation	Loss of material
11. Restrain, Shrinkage, Creep and Aggressive Environment	Cracking
12. Concrete Interaction with Aluminum	Loss of strength
13. Cathodic Protection Current	Cathodic protection effect on bond strength
Structural Steel and Stainless Steel	
1. Corrosion, Local or Atmospheric	Loss of material
2. Elevated Temperature	Loss of strength and modulus
3. Irradiation	Loss of fracture toughness
4. Stress Corrosion Cracking	Crack initiation and growth
Reinforcing Steel (Rebar)	
1. Corrosion of Embedded Steel	Cracking, spalling, loss of bond and material
2. Elevated Temperature	Loss of strength and modulus
3. Irradiation	Loss of strength and modulus
Miscellaneous	
1. Settlement	Cracking, distortion, increase in component stress level
2. Strain Aging (of Carbon Steel)	Loss of fracture toughness
3. Loss of Prestress	Reduction in design margin
4. Corrosion of Steel Piles	Loss of material
5. Corrosion of Tendons	Loss of material
Cask Internals	
1. Corrosion, Boric Acid Corrosion	Loss of material
2. Creep	Change in dimension
3. Erosion/Corrosion	Wall thinning
4. Stress Corrosion Cracking (includes intergranular, transgranular, and irradiation assisted)	Crack initiation and growth
5. Neutron Irradiation Embrittlement	Loss of fracture toughness
6. Stress Relaxation	Loss of preload
7. Thermal Embrittlement	Loss of fracture toughness
8. Wear	Attrition

Of the mechanisms and effects listed, the staff believes that the most likely effects that could be seen after the fuel has been confined in an inert environment for dry storage are as follows:

Creep of fuel cladding,
Stress corrosion cracking (SCC) of stainless steel (SS) canister welds,
Radiation damage, such as embrittlement,
Corrosion of exposed metal surfaces to the environment, including unprotected carbon Steel and exposed rebar,.
Freeze/thaw conditions at sites with extreme temperatures,
Wearing of components like O-rings that have a specific service life,
Electro-chemical corrosion, and
Thermally induced degradation

(This list is not be necessarily comprehensive for each renewal application.)

For those aging effects identified as applicable during the renewal period, the licensee should identify any existing or new aging management programs that will be maintained throughout the renewal period. Also, the licensee should justify that monitoring or surveillance programs will be effective for the entire renewal period.

Examples are:

For SCC of SS canister welds, corrosion, and concrete weathering, the application should include a description of the inspection and maintenance programs that will be conducted, their frequency, and how they will identify and correct any adverse effects from these aging mechanisms to avoid any undesirable affects on the safe operation of the ISFSI.

For degradation of canister closure O-ring seals, the application should include a description of the surveillance program used to continually monitor the performance of this component, as well as any associated maintenance program.

Attributes of an Effective Aging Management Program **(This Section to Be Developed)**

VI. SCREENING FOR TIME LIMITED AGING (TLA)

TLA analyses provides the analytical, experience based, or testing to justify a specified performance life for SSCs. The licensee should review TLA analyses for SSC's with predetermined life spans and provide a justification and basis for augmenting any SSC life spans that are less than 40 years. TLA technical information provided in the submittal should be based on the following discussion.

It is intended that TLA analyses for license renewal be based on the current operating term of the ISFSI. The licensee must identify ISFSI-specific TLA analyses by applying the six criteria described below. These criteria must be satisfied in any order to conclude that a calculation or analysis is a TLA analysis is suitable for including in the application for license renewal.

(1) The TLA analyses must already be contained or incorporated by reference in the current licensing basis (CLB) for the ISFSI. Plant-specific documentation contained or

incorporated by reference in the CLB include SARs, SERs, Technical Specifications, fire protection plan/hazards analyses, correspondence to and from the NRC, QA plan, and topical reports included as reference to the SAR. Calculations and analyses that are not in the CLB or not incorporated by reference are not TLA analyses.

(2) The TLA analyses must contain SSC's within the scope of license renewal as defined in Section IV above.

(3) The TLA analyses must consider the effects of aging of materials as discussed in Section V above.

(4) The TLA analyses must involve time-limited assumptions defined by the current operating term, for example 20 years. The defined operating term should be explicit in the analyses. Simply asserting that the SSC is designed for a service life or ISFSI life is not sufficient. The assertions must be supported by a calculation, analyses, or testing that explicitly include a time limit.

(5) The TLA analyses must be pertinent to a specific safety determination that exists in the CLB. Such analyses would have initially provided the basis for the licensee's initial safety determination, and without the analyses, the licensee may have reached a different safety conclusion.

(6) The TLA analyses must provide conclusions or a basis for conclusions regarding the capability of the SSC to perform its intended function. Analyses that do not affect the intended function(s) of the SSCs are not considered TLA analyses.

Once identified, the licensee should evaluate the ISFSI-specific TLA analyses using one of three different approaches described below.

(1) Verify that the existing TLA analyses are applicable through the renewal period

Existing TLA analyses are typically based on the current operating term of 20 years. However, the licensee may take credit for or reference more recent performance data or analyses that is available from vendors or other sources that can demonstrate existing analyses remains valid for the period of extended operation and that no additional analyses are required.

The following may be used as an acceptable approach for verifying that existing CLB TLA analyses remain valid. The TLA analyses for renewal should describe the objective(s) of the analyses, conditions and assumptions used in the analyses, acceptance criteria, relevant aging effect(s), and intended function(s) of the SSCs. It should also demonstrate that (1) the conditions and assumptions used in the analyses already address the relevant aging effect(s) for the period of extended operation, and (2) acceptance criteria are maintained to provide reasonable assurance that the intended safety function(s) is maintained.

(2) Justify projection of existing TLA analyses to the end of the renewal period

The current TLA analyses may not be valid for the period of extended operation, however, it may be possible to revise the existing analyses by re-evaluating conservative conditions and assumptions. Examples include consideration of decreased exposure and loading (radiation and thermal) over the renewal period, the alteration of an overly conservative assumption in the original analyses, the use of new or refined analytical techniques, and/or providing new analyses using a 40 year life. The TLA analyses may then be shown to be valid for the period of extended operation.

(3) Verify that the TLA analyses are addressed by existing or new aging management program(s)

SSCs associated with the TLA analyses issue should be identified. The TLA analyses for renewal should describe: (1) the objectives of the analyses, (2) the conditions, and assumptions used, (3) acceptance criteria, (4) pertinent aging effect(s), (5) intended function(s) of the SSCs, and (6) existing or additional aging management programs that will be implemented during the renewal period to address the potential aging effects.. Attributes of what comprises an adequate and comprehensive aging management program is described in Section V above.

GUIDANCE ON WHAT AND IF AGING MANAGEMENT PROGRAMS NEED TO BE ADDED TO TS- (**To be developed)**

VII. REFERENCES

Draft Regulatory Guide DG-1047
Regulatory Guide 3.50
10 CFR Part 72

APPENDIX

The following is an example of ISFSI cask components and materials completed for the TN-68 Cask as reflected in the cask Safety Analysis Report. Other data sheets will be added for additional cask designs in a future revision of this document. Such data sheets should be updated as part of an application for ISFSI license renewal and used for screening SSCs for being included in the scope of renewal.