72-2

VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

10 CFR 72.42

April 29, 2002

Dr. Donald A. Cool, Director
Division of Industrial and Medical Nuclear Safety
Office of Nuclear Material Safety and Safeguards
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Serial No. 02-116
NL&OS/MAE R1"
Docket No. 72-2
License No. SNM-2501

Gentlemen:

VIRGINIA ELECTRIC AND POWER COMPANY
SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION (ISFSI)
LICENSE RENEWAL APPLICATION

Pursuant to 10 CFR 72.42(b) and (c), Virginia Electric and Power Company (Dominion) hereby submits an application for the renewal of the Surry ISFSI License. The current license expires on July 31, 2006. Based on the expected duration of the Surry Power Station Operating Licenses and the estimated time needed to remove all storage casks from the site, Dominion is requesting a license renewal period of 40 years. An exemption request to support the license renewal period is provided as Attachment 1. The application for the renewal of the Surry ISFSI License (Attachment 2) was prepared in accordance with applicable provisions of 10 CFR 72, Subpart B, and the Preliminary NRC Staff Guidance For 10 CFR Part 72 License Renewal.

Pursuant to 10 CFR 72.16(c), 15 copies of each portion of the application are provided, in addition to the signed original. Additionally, another 125 copies are being retained for potential future distribution in accordance with regulation. As discussed in our October 9, 2001 letter (Serial No. 01-625), both the 15 copies included with this submittal and the 125 copies retained by us are provided on compact disk (CD) medium rather than hard-copy paper. It should be noted that the CD copies also contain the Surry ISFSI Final Safety Analysis Report as reference, as well as a file containing a description of the CD content and helpful hints for using Adobe Acrobat®.

If you have any questions or concerns regarding this submittal, please contact us.

Very truly yours,

David A. Christian
Senior Vice President – Nuclear Operations and Chief Nuclear Officer

Original and 15 Copies

NMSS01 Public

Attachments:

1. Request for Exemption from 10 CFR 72.42(a) ISFSI License Renewal Period
2. Application For Renewed Site-Specific License

Commitments contained in this letter:

1. Applicable recommendations and/or results from the EPRI Dry Cask Storage Characterization Project will be incorporated into the FSAR (Section C1.0, Appendix C.)
2. Any revisions to aging management activities resulting from this project will be incorporated into future FSAR updates per the requirements of 10 CFR 72.70 (Section C1.0, Appendix C.)

cc: (CD-ROM copy only)

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Mr. Terry Lewis, County Administrator
P.O. Box 65
Surry, VA 23883

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by David A. Christian who is Senior Vice President and Chief Nuclear Officer of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that Company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 29th day of April, 2002.

My Commission Expires: March 31, 2004.

Notary Public

(SEAL)

Attachment 1

**Request for Exemption from 10 CFR 72.42(a)
ISFSI License Renewal Period**

Exemption Request

In accordance with the provisions of 10 CFR 72.7, "Specific exemptions," Virginia Electric and Power Company (Dominion) requests an exemption from certain requirements of 10 CFR 72.42, "Duration of License; Renewal." Specifically, we request exemption from the Independent Spent Fuel Storage Installation (ISFSI) license renewal period in 10 CFR 72.42(a) which the NRC has interpreted in a November 7, 2000 letter to be 20 years. Dominion is requesting a license renewal period of 40 years.

The spent fuel pool at Surry Power Station is at full usable storage capacity. Operation of the two Surry units is now dependent on the continued ability of the Surry ISFSI to store spent fuel. Spent fuel storage at the Surry ISFSI is and will continue to be necessary since the Department of Energy (DOE) has not begun (and is not soon to be able) to take spent nuclear fuel as it was required to do under the provisions of the Nuclear Waste Policy Act. Therefore, the license renewal period for the Surry ISFSI must consider future operation of the power station to avoid unnecessary redundancy in license renewal activity. Absent approval of an extended period for license renewal, Dominion will be required to request a second license renewal application for the Surry ISFSI over the course of plant operations. This would be an unnecessary diversion of Dominion as well as NRC resources.

This request for an exemption is based on the need for a longer license renewal period and is supported by a technical justification that demonstrates the ability of the ISFSI to safely perform its intended function for a 40 year license renewal period.

The Need For 40 Year License Renewal Period

The current operating licenses for Surry Power Station Units 1 and 2 expire May 25, 2012 and January 29, 2013, respectively. Dominion applied for a 20 year renewal of the Surry Power Station Operating Licenses on May 29, 2001. Assuming that the station license renewal is granted, the renewed operating licenses would expire May 25, 2032 and January 29, 2033 for Units 1 and 2, respectively.

The current Surry ISFSI License expires on July 31, 2006. A license renewal of only 20 years would expire on July 31, 2026, which is approximately 6 ½ years before the last station operating license is expected to expire. During that time, Dominion anticipates that the ISFSI will be required for spent fuel storage in concert with the station's spent fuel pool. In addition, it is assumed that the station's spent fuel pool will be emptied prior to all fuel being removed from the ISFSI. Therefore, the ISFSI License will need to be retained until the last fuel assembly is shipped offsite to a permanent storage facility.

Based on the assumptions that the DOE will begin taking spent fuel in 2010 and that Dominion's allocation rate previously identified by the DOE does not change, spent fuel shipments for the current operating license would be completed in 2036. Further, assuming that the Surry Operating Licenses are renewed, the spent fuel shipments would not be completed until 2046. Independent of plant license renewal, an ISFSI license renewal period of 20 years (which would only allow ISFSI storage until 2026) is inadequate. Dominion is requesting a renewal period of 40 years, which would allow the ISFSI to continue to store spent fuel until 2046.

Technical Justification

The technical justification that the ISFSI will be able to fulfill its safety functions over a license renewal period of 40 years is provided in the Application for Renewed Site-Specific License (ISFSI LRA), which is included as Attachment 2. The ISFSI LRA includes the applicable provisions of Part 72, Subpart B, as required by 10 CFR 72.42(b). The systems, structures, and components (SSCs) that were within the scope of license renewal and required evaluation were identified. Aging management reviews were performed on these SSCs to determine the materials and environments to which these SSCs are exposed as well as any aging effects requiring aging management. Time-limited aging analyses were also performed to determine time-limited aging effects on the SSCs within the license renewal scope. Aging management activities were identified that provide reasonable assurance that SSCs within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the renewal period. This is consistent with the station license renewal effort that is evaluating the renewal of the Surry Power Station Operating License for a total of 60 years.

Requirements of Section 72.7

The specific requirements for granting an exemption from 10 CFR 72 regulations are set forth in 10 CFR 72.7. Under 10 CFR 72.7, the NRC is authorized to grant an exemption upon a demonstration that the exemption: (i) is authorized by law, (ii) will not endanger life or property or the common defense and security, and (iii) is in the public interest. The following addresses each of these requirements and demonstrates that the NRC should grant the exemption request.

A. <u>The Exemption Request is Authorized By Law</u>

The NRC's authority to grant an exemption from its regulations in 10 CFR 72 is established by law as discussed in 10 CFR 72.7. Therefore, granting an exemption is explicitly authorized by the NRC's regulations.

B. <u>The Exemption Request Will Not Endanger Life or Property or the Common Defense and Security</u>

An exemption from the Staff interpreted license renewal period of 20 years does not endanger life or property, as discussed in the Environmental Report Supplement, Appendix E to the ISFSI LRA (Attachment 2). A 40 year license renewal period has been evaluated in the ISFSI LRA and determined that new and existing monitoring activities provide reasonable assurance that SSCs within the scope of license renewal will continue to perform their intended functions. The common defense and security of the United States is not endangered by the renewal of the ISFSI license for 40 years. A 40 year ISFSI license renewal period will support continued operation of the Surry Power Station until 2033, assuming plant license renewal is granted. Since the spent fuel pool at the Surry Power Station is at full usable storage capacity, continued operation of the plant is dependent on an operational ISFSI. The continued safe operation of nuclear power stations, including the Surry Power Station, enhances the common defense and security of the United States by providing dependable, low-cost electricity.

C. <u>The Exemption is in the Public Interest</u>

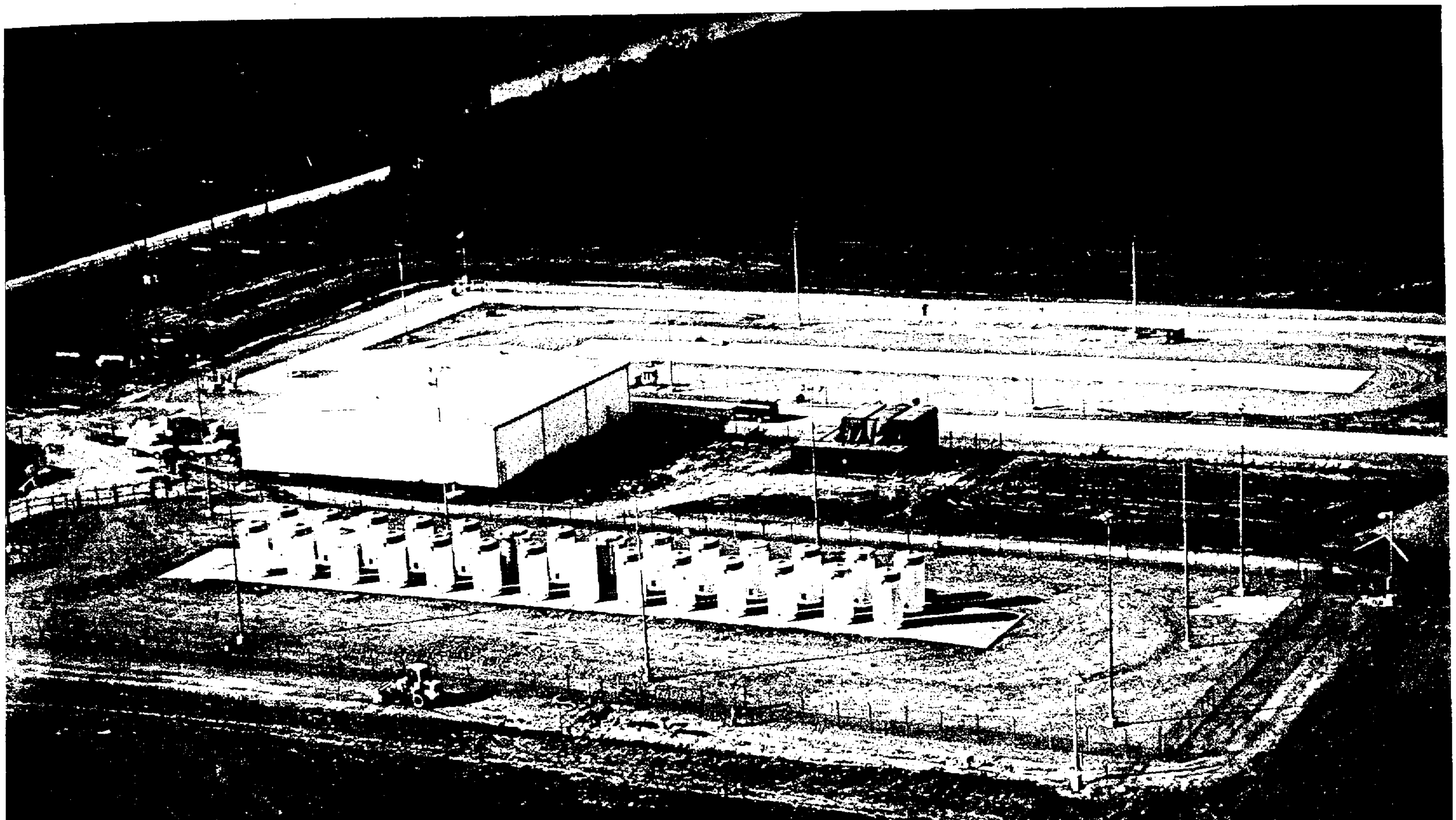
The subject exemption would allow the Surry Power Station to continue operation for the duration of its proposed renewed operating license (until 2033) without having to repeat the ISFSI license renewal process. The granting of this exemption would conserve both Dominion and NRC resources, permitting more focused attention to areas of nuclear safety significance.

<u>Conclusion</u>

The requested exemption from the interpreted 20 year ISFSI license renewal period has no adverse impact on safety and is consistent with Commission activities to reduce unnecessary regulatory burden. Since operation of the two Surry units is now dependent on the continued ability of the Surry ISFSI to store spent fuel, the ISFSI must be available to store spent fuel for the expected duration of the station operating license. In addition, based on decommissioning activities, the ISFSI must be available to store spent fuel until the last fuel assembly is removed from the site. The Surry ISFSI is, therefore, required until the DOE is able to accept all of the Surry spent fuel which is currently not predicted to occur until 2046.

Since there is a clear need for the ISFSI, subsequent renewal of the license for a third period is an unnecessary use of Dominion and NRC resources. Technical justification provided in the ISFSI LRA (Attachment 2) establishes that new and existing monitoring activities provide reasonable assurance that SSCs within the scope of license renewal will continue to perform their intended functions.

Therefore, because the requested exemption for the Surry ISFSI license renewal period is authorized by law, will not endanger life or property or the common defense and security, is in the public interest, and is requested for good cause, Dominion respectfully requests that, in accordance with the requirements of 10 CFR 72.7, the NRC grant the requested exemption.



Surry

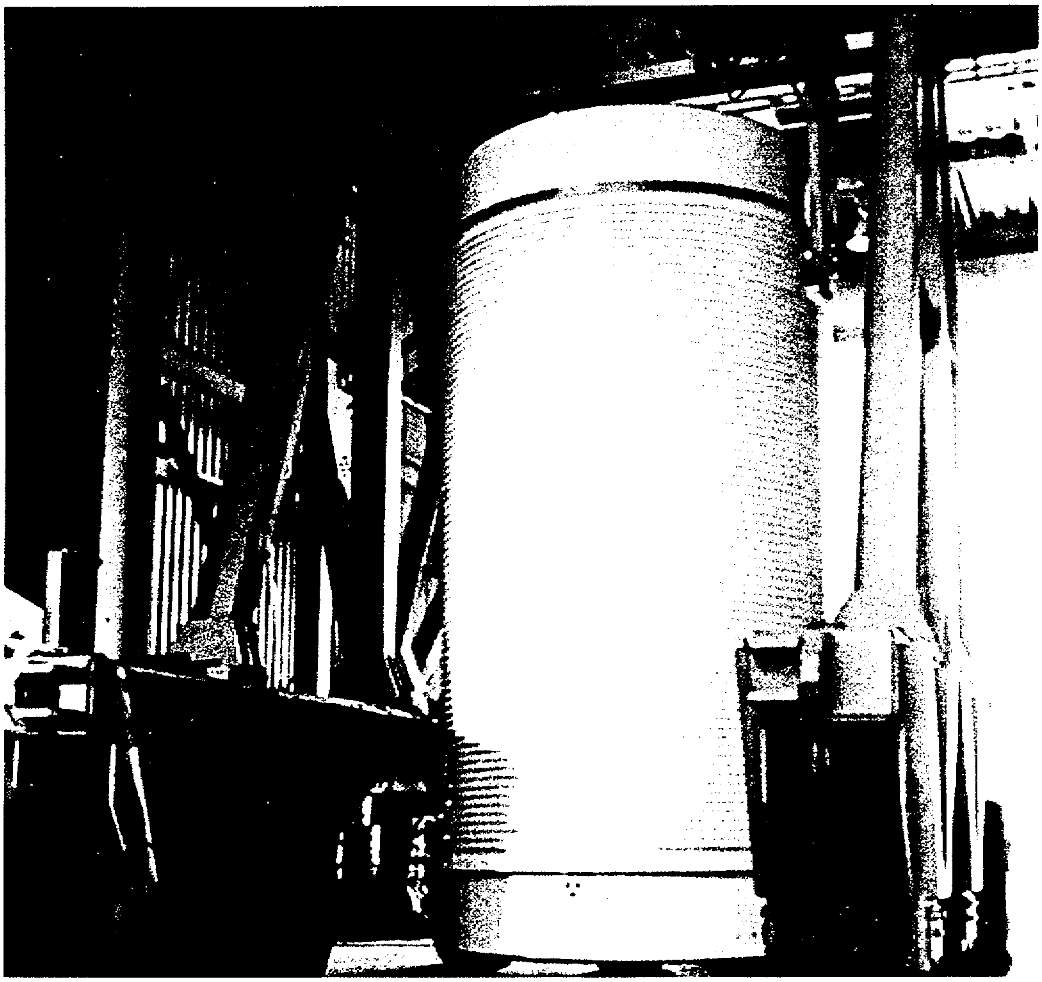
Independent Spent Fuel Storage Installation Facility

Dominion

Site-Specific
License Renewal Application
April 2002

Attachment 2

APPLICATION FOR RENEWED ISFSI SITE-SPECIFIC LICENSE



SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION

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TECHNICAL AND ADMINISTRATIVE INFORMATION

1.0 GENERAL INFORMATION

Virginia Electric and Power Company (Dominion) is filing an application for renewal of the Independent Spent Fuel Storage Installation (ISFSI) license for Surry Power Station, License Number SNM-2501. The original 20 year ISFSI license will expire July 31, 2006. This application is for the renewal of the original ISFSI license for a renewal period of 40 years and includes the applicable general, technical, and environmental supporting information required by 10 CFR 72.42(b).

The information contained in this section includes:

1. Information on the organization of the application (Section 1.1).
2. A general description of the ISFSI site (Section 1.2).
3. The administrative information required by 10 CFR 72.22 (Section 1.3).
4. Summary of abbreviations and intended function code definitions (Section 1.4).
5. A distribution list for written communications related to the application (Section 1.5).

1.1 Application Format and Content

The application format and content are based on the preliminary guidance for renewal of site-specific Part 72 licenses and include:

1. General Information - Section 1.0 has been expanded beyond the requirements of 10 CFR 72.22 to provide (1) information on the format and content of the application, (2) a general facility description, (3) a summary of abbreviations and passive function code definitions used in the application, and (4) a distribution list for written communications related to the application.
2. Scoping Evaluation - Section 2.0 provides the scoping evaluation for the ISFSI components.
3. Aging Management Review - Section 3.0 includes the methodology used to perform aging management reviews (AMRs).
4. Appendices

   Appendix A: Aging Management Activities

   Appendix B: Time-Limited Aging Analyses (TLAAs)

   Appendix C: FSAR Supplement

   Appendix D: Technical Specifications Changes

   Appendix E: Environmental Report Supplement

Appendix F: Additional Information (training and qualifications, financial assurance for decommissioning, and emergency planning.)

1.2 Facility Description

The Surry ISFSI is located on a site situated on Gravel Neck, adjacent to the James River in Surry County, Virginia. The site comprises about 840 acres in Surry County, Virginia. The ISFSI is located near the center of the site, about 3300 feet east of Units 1 and 2 of the Surry Power Station.

The Surry ISFSI consists of concrete pads on which the loaded dry storage casks are placed. Two of the three licensed pads are in place at the time of this application. Each pad is surrounded by an inner security fence which in turn is surrounded by an outer fence. The outer fence also surrounds the nearby Low Level Waste Storage Facility (LLWSF). A complete description of the Surry ISFSI is provided in the Surry Final Safety Analysis Report.

The Surry Power Station Unit 1 and 2 reactors and the LLWSF are operated under separate licenses issued pursuant to the provisions of 10 CFR Part 50 and are, therefore, not addressed in this application.

1.3 Information Required by10 CFR 72.22

1.3.1 Name of Applicant

Virginia Electric and Power Company (Dominion)

1.3.2 Address of Applicant

Virginia Electric and Power Company
5000 Dominion Boulevard
Glen Allen, VA 23060

1.3.3 Description of Business or Occupation of Applicant

Virginia Electric and Power Company (Dominion) was incorporated in Virginia in 1909. Dominion is a subsidiary of Dominion Resources, Inc., a Virginia corporation that on May 19, 1983 became the holding company of Dominion and its wholly-owned subsidiaries. Dominion is a regulated public utility engaged in the generation, transmission, distribution, and sale of electric energy within a 32,000 square mile service area. It transacts business in Virginia and northeastern North Carolina. In its service area, it sells electricity to retail customers (including governmental agencies) and to wholesale customers such as rural electric cooperatives and municipalities. Dominion is subject to regulation in numerous respects by various commission and other state and local governmental agencies of the two states in which it operates. It is also subject to regulation by the Federal Energy Regulation Commission, the Nuclear Regulatory Commission, and other federal agencies.

1.3.4 Organization and Management of Applicant

Dominion is not owned, controlled or dominated by an alien, a foreign corporation, or a foreign government. All officers and directors are citizens of the United States of America. The names and addresses of the directors and principal officers are provided below:

Directors

Name	Address
Thomas E. Capps Chairman of the Board	P. O. Box 26532 Richmond, VA 23261
Thomas F. Farrell, II Director	P. O. Box 26532 Richmond, VA 23261
Edgar M. Roach, Jr. Director	P. O. Box 26666 One James River Plaza Richmond, VA 23261

Principal Officers

Name	Address
Thomas F. Farrell, II Chief Executive Officer	P. O. Box 26532 Richmond, VA 23261
James P. O'Hanlon President and Chief Operating Officer	P. O. Box 26532 Richmond, VA 23261
Edgar M. Roach, Jr. President and Chief Executive Officer	P. O. Box 26666 One James River Plaza Richmond, VA 23261
M. Stuart Bolton, Jr. Senior Vice President - Financial Management	P. O. Box 26666 One James River Plaza Richmond, VA 23261
David A. Christian Senior Vice President - Nuclear Operations and Chief Nuclear Officer	Innsbrook Technical Center 5000 Dominion Boulevard Glen Allen, VA 23060-6711
G. Scott Hetzer Senior Vice President and Treasurer	P. O. Box 26532 Richmond, VA 23261

E. Paul Hilton Senior Vice President	P. O. Box 26532 Richmond, VA 23261
Thomas A. Hyman, Jr. Senior Vice President - Gas Distribution and Customer Services	Dominion Tower 625 Liberty Avenue Pittsburgh, PA 15222
Paul D. Koonce Senior Vice President - Portfolio Management	120 Tredegar Street Richmond, VA 23219
Margaret E. McDermid Senior Vice President - Information Technology & Chief Information Officer	P. O. Box 26532 Richmond, VA 23261
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Mary C. Doswell Vice President - Billing and Credit	701 East Cary Street Richmond, VA 23219
Pamela F. Faggert Vice President - Chief Environmental Officer	Innsbrook Technical Center 5000 Dominion Boulevard Glen Allen, VA 23060
Eugene S. Grecheck Vice President - Nuclear Support Services	Innsbrook Technical Center 5000 Dominion Boulevard Glen Allen, VA 23060
Eric S. Hall Vice President - Gas Engineering	1201 E. 55th Street Cleveland, OH 44103-1028

Leslie N. Hartz Vice President - Nuclear Engineering and Services	Innsbrook Technical Center 5000 Dominion Boulevard Glen Allen, VA 23060
Karen E. Hunter Vice President - Tax	P. O. Box 26666 One James River Plaza Richmond, VA 23261
Craig S. Ivey Vice President - Electric Operations	701 East Cary Street Richmond, VA 23219
Steven A. Rogers Vice President (Principal Accounting Officer)	P. O. Box 26532 Richmond, VA 23261
Patricia A. Wilkerson Vice President and Corporate Secretary	P. O. Box 26532 Richmond, VA 23261
James F. Stutts Vice President and General Council	P. O. Box 26532 Richmond, VA 23261
Richard H. Blount, II Site Vice President - Surry	Surry Power Station 5570 Hog Island Road Surry, VA 23883
David A. Heacock Site Vice President - North Anna	North Anna Power Station P.O. Box 402 Mineral, VA 23117-0402

1.3.5 Financial Qualifications

As required by 10 CFR 72.22(e), Dominion will remain financially qualified to carry out the activities associated with operating the ISFSI during the renewal period. All construction costs will be accounted for in the original license period. Operations and maintenance costs associated with the renewal period are revised from the original estimates contained in the initial ISFSI license application (Reference 1) based on operating experience. Revised estimates are $1.3 million annually up to the end of the operating license period for the Surry Power Station. Dominion's revenues are orders of magnitude greater than this annual cost and provide ample assurance of Dominion's ability to meet the ISFSI operating costs. Dominion has more than 17,000 megawatts of generating capacity providing over $3 billion annually in total operating revenues and over $350 million annually in net revenues. In addition, Dominion's current collections from ratepayers include an allowance for post-shutdown spent fuel management costs, which is deposited in Dominion's decommissioning trusts and maintained under a separate sub-account. Currently, over $90 million has been collected and allocated to the sub-account for post-shutdown spent fuel management at Surry. This funding reasonably assures coverage of post-shutdown operations and maintenance cost for spent fuel storage, including the ISFSI.

Additional information on financial assurance for decommissioning is provided by reference in Appendix F: Additional Information.

1.4 Abbreviations and Intended Function Code Definitions

1.4.1 Abbreviations

This section contains the abbreviations that pertain to the administrative and technical information within this application, Appendices A through D, and Appendix F. The abbreviations that pertain to the environmental information are included in the front of Appendix E (Environmental Report Supplement).

Abbreviation	Definition
AMA	Aging Management Activity
AMR	Aging Management Review
CLB	Current Licensing Basis
DCSS	Dry Cask Storage System
DHC	Delayed Hydride Cracking
FSAR	Final Safety Analysis Report
INEEL	Idaho National Engineering and Environmental Laboratory
ISFSI	Independent Spent Fuel Storage Installation
LLWSF	Low Level Waste Storage Facility
LRA	License Renewal Application
MAER	Material Aging Effects Report
SAR	Safety Analysis Report
SCC	Stress Corrosion Cracking
SPS	Surry Power Station
SRP	Standard Review Plan

Abbreviation	Definition
SSCs	Systems, Structures, and Components
SSSC	Sealed Surface Storage Cask
TLAA	Time-Limited Aging Analysis
TSAR	Topical Safety Analysis Report

1.4.2 Intended Function Code Definitions

This section contains the meanings for the subcomponent intended function represented by the abbreviations used in Table 3.2-1 through Table 3.3-1. Subcomponent intended functions are the specific functions that support the intended function of the component of which they are a part.

Abbreviation	Definition
CC	Provides criticality control of spent fuel
HT	Provides heat transfer
PB	Directly or indirectly maintains the cask pressure boundary (confinement)
SH	Provides radiation shielding
SS	Provides structural support (structural integrity)

1.5 Communications

Written communications on this application should be directed to:

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with copies to:

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Mr. Stephen P. Sarver
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Section 1.0 References (General Information)

1. Letter from R. H. Leasburg, Vice President, Nuclear Operations, to R. E. Cunningham, Office of Nuclear Material Safety and Safeguards, NRC, dated October 8, 1982, with License Application for Surry Power Station, Dry Cask Independent Spent Fuel Storage Installation.

2.0 SCOPING EVALUATION

2.1 Introduction

Dominion and the Nuclear Regulatory Commission (NRC) have agreed to use the Surry Power Station (SPS) Independent Spent Fuel Storage Installation (ISFSI) as a pilot to develop a 10 CFR Part 72 ISFSI (Reference 1) license renewal process and a prototype license renewal application (LRA) for site-specific licenses.

A description of the Surry ISFSI facility is provided in Section 1.2, Facility Description. Additionally, Chapter 4 of the Final Safety Analysis Report (FSAR) provides descriptive information on the Surry ISFSI structures, systems and components.

Dominion's ISFSI license renewal methodology is documented by means of comments on the Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs) (Reference 2) that were provided to the NRC on June 26, 2001 (Reference 3). This methodology is patterned after the requirements of 10 CFR Part 54, the License Renewal Rule (Reference 4). The proposed Part 72 license renewal process adopts the regulatory philosophy of 10 CFR Part 54. This philosophy is summarized in the two principles of license renewal from the Part 54 Final Rule Statements of Consideration published in Federal Register Vol. 60 No. 88, May 8, 1995, page 22464 and re-stated below:

"The first principle of license renewal was that, with the exception of age-related degradation unique to license renewal and possibly a few other issues related to safety only during the period of extended operation of nuclear power plants, the regulatory process is adequate to ensure that the licensing bases of all currently operating plants provides and maintains an acceptable level of safety so that operation will not be inimical to public health and safety or common defense and security. Moreover, consideration of the range of issues relevant only to extended operation led the Commission to conclude that the detrimental effects of aging is probably the only issue generally applicable to all plants. As a result, continuing this regulatory process in the future will ensure that this principle remains valid during any period of extended operation if the regulatory process is modified to address age-related degradation that is of unique relevance to license renewal.

"The second and equally important principle of license renewal holds that the plant-specific licensing basis must be maintained during the renewal term in the same manner and to the same extent as during the original licensing term. This principle would be accomplished, in part, through a program of age-related degradation management for systems, structures, and components that are important to license renewal ...."

Based on these principles, license renewal is not intended to impose requirements beyond those that were met by the facility when it was initially licensed by the NRC. Therefore, the current licensing basis (CLB) for the ISFSI will be carried forward through the renewal period.

The evaluations performed for renewal of the ISFSI site-specific license include:

- Scoping
- Aging Management Review
- Time-Limited Aging Analyses
- Environmental Review

During scoping, the systems, structures, and components (SSCs) of the ISFSI that are within the scope of license renewal, and require evaluation for the effects of aging, were identified. A description of the scoping process is provided in Section 2.2, Scoping Methodology.

Following scoping, aging management reviews (AMRs) were performed on those in-scope SSCs requiring AMR. A description of the AMR process is provided in Section 3.1, Aging Management Review Methodology.

Time-limited aging analyses (TLAAs) were also evaluated. The identified TLAAs and the results of the evaluations performed on the TLAAs identified for the ISFSI casks are provided in Appendix B: Time-Limited Aging Analyses (TLAAs).

A supplement to the ISFSI Environmental Report has been prepared in accordance with the NRC regulations specified in 10 CFR Part 51. As required by 10 CFR 72.34, the results of the environmental review are included as part of the ISFSI license renewal application and are provided in Appendix E, Environmental Report Supplement.

A listing of the abbreviations used in this section is provided in Section 1.4.

2.2 Scoping Methodology

The first step in the license renewal process involved the identification of the in-scope ISFSI SSCs. This was done by evaluating the SSCs that comprise an ISFSI against the following scoping criteria definition provided in the comments on the Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs) (Reference 3):

> *Any SSC that meets either of the criteria shall be evaluated further in the aging management review (AMR) process described later. The categories of SSCs are those that are:*
>
> 1. *Important to safety; that is, the SSCs are relied on to perform any of the following functions:*
>
>   *i. Maintain the conditions required to store spent fuel safely.*
>
>   *ii. Prevent damage to the spent fuel during handling and storage.*

iii. *Provide reasonable assurance that spent fuel can be received, handled, packaged, stored, and retrieved without undue risk to the health and safety of the public, as identified in the current licensing basis (CLB).*

These SSCs ensure that these important safety functions are met: (1) criticality, (2) shielding, (3) confinement, (4) heat transfer, and (5) structural integrity.

2. *Classified as not important to safety, but, according to the CLB, whose failure could prevent an important to safety function from being fulfilled or whose failure as a support SSC could prevent an important to safety function from being fulfilled.*

The function performed by an SSC that causes it to be within the scope of license renewal is its intended function.

Also, SSCs which perform ISFSI support functions are generally not within the scope of license renewal.

Any ISFSI SSC that met either Criteria 1 or 2 above was determined to be within the scope of license renewal. The scoping results are presented in Section 2.3.

2.2.1 Documentation Sources used for Scoping Process

The basic premise of the license renewal scoping process is that the CLB determines which SSCs perform intended functions that meet either Scoping Criterion 1 or 2, as defined in Section 2.2 above. The following documents comprise the Surry ISFS CLB:

- Final Safety Analysis Report (Reference 5)
- Technical Specifications (Reference 6)
- Docketed Licensing Correspondence

The Final Safety Analysis Report (FSAR) provides a description of the ISFSI facility and all ISFSI SSCs, including safety classifications as established by the safety analyses and functions.

The Technical Specifications govern the safety of, the receipt, possession, and storage of irradiated nuclear fuel at the ISFSI, and the transfer of such irradiated fuel to and from Surry Power Station and the ISFSI.

Additionally, the Safety Evaluation Report, which summarizes the results of the NRC staff's safety review of the original licensing, was used in the license renewal scoping process.

2.3 Scoping Results

The SSCs comprising the ISFSI are identified in Table 2.3-1, Scoping Results. Those SSCs meeting Scoping Criterion 1 or Criterion 2 are identified in the table as being within the scope of license renewal.

As indicated in Table 2.3-1, only the ISFSI dry storage casks, and spent fuel assemblies stored in the casks, have been determined to be within the scope of license renewal and require further review in the aging management review process. The remaining SSCs, i.e., pads, monitors, power supplies, lights, etc., do not meet any license renewal criteria and therefore, are not within the scope of license renewal. The intended functions performed by the individual subcomponents of the casks and spent fuel assemblies are identified in the aging management review results summary tables for the casks and spent fuel assemblies (Table 3.2-1 through Table 3.2-5 and Table 3.3-1).

A list of the specific cask designs in use at the Surry ISFSI, and a reference to the section of the ISFSI FSAR that provides a brief description of each cask is provided below:

- General Nuclear Services CASTOR V/21 (ISFSI FSAR Appendix A.1)
- General Nuclear Services CASTOR X/33 (ISFSI FSAR Appendix A.4)
- Westinghouse MC-10 (ISFSI FSAR Appendix A.2)
- Transnuclear TN-32 (ISFSI FSAR Appendix A.5)
- Nuclear Assurance Corporation I-28 (ISFSI FSAR Appendix A.3)

Additional details on the spent fuel stored in the ISFSI casks are provided in Section 3.1.1, and Section 3.3.7.1 of the ISFSI FSAR.

The aging management review results for the ISFSI casks and spent fuel assemblies are provided in Section 3.2, Aging Management Review Results - Casks and Section 3.3, Aging Management Review Results - Spent Fuel Assemblies, respectively.

Section 2.0 References (Scoping Evaluation)

1. *10 CFR, Part 72, Licensing Requirements For The Independent Storage Of Spent Nuclear Fuel And High-Level Radioactive Waste*, Code of Federal Regulations, U.S. Nuclear Regulatory Commission, 1988.

2. *Preliminary NRC Staff Guidance for 10 CFR Part 72 License Renewal*, U.S. Nuclear Regulatory Commission, March 29, 2001, (Dominion Letter Serial No. 01-203).

3. Letter Serial No. 01-367, *Surry Independent Spent Fuel Storage Installation, Comments on NRC Preliminary Guidance,* L. N. Hartz to NRC Document Control Desk, June 26, 2001.

4. 10 CFR, Part 54, *Requirements for License Renewal of Operating Licenses for Nuclear Power Plants*, Code of Federal Regulations, U. S. Nuclear Regulatory Commission, 1995.

5. *Surry Independent Spent Fuel Storage Installation Final Safety Analysis Report*, Surry Power Station, Amendment 14.

6. *Surry Independent Spent Fuel Storage Installation Technical Specifications for Safety,* Surry Power Station, Amendment 12.

7. *Safety Evaluation Report of Surry Dry Cask Independent Spent Fuel Storage Installation*, U.S. Nuclear Regulatory Commission, 1986.

Table 2.3-1 Scoping Results

SSC[1]	Criterion 1	Criterion 2	In-Scope
Dry Storage Casks	Y	N/A	Y
Spent Fuel Assemblies	Y	N/A	Y
Reinforced Concrete Pad	N	N	N
Transporter and Supporting Equipment	N	N	N
ISFSI Pressure Monitoring System	N	N	N
Lighting	N	N	N
Backup Diesel Generator	N	N	N
Diesel Fuel Tank Collection Trench	N	N	N
Security Fence	N	N	N

1. See Table 3.2-1 through Table 3.2-5 and Table 3.3-1 for subcomponent intended functions.

3.0 AGING MANAGEMENT REVIEWS

3.1 Aging Management Review Methodology

The scoping process identified the ISFSI dry storage casks and spent fuel assemblies as individual SSCs that are within the scope of license renewal and require evaluation in the aging management review (AMR) process.

The AMR process involved the following four (4) major steps:

1. Identification of in-scope subcomponents requiring AMR
2. Identification of materials and environments
3. Identification of aging effects requiring management
4. Determination of the activities required to manage the effects of aging

Each of these steps is discussed in Section 3.1.1 through Section 3.1.4, respectively.

The results of the aging management review for the subcomponents of the ISFSI dry storage casks and spent fuel assemblies are provided in Section 3.2, Aging Management Review Results - Casks and Section 3.3, Aging Management Review Results - Spent Fuel Assemblies, respectively.

3.1.1 Identification of In-scope Subcomponents Requiring AMR

The scoping process did not identify the specific subcomponents for the in-scope ISFSI SSCs that require AMR. Therefore, during the first step in the AMR process, the dry storage casks and spent fuel assemblies were further reviewed to identify the subcomponents that support the SSC intended function. The subcomponents and associated intended functions have been identified by reviewing the documentation sources identified in Section 3.1.6. Subcomponents that perform or support any one of the identified intended functions (Section 1.4.2, Intended Function Code Definitions) in a passive manner, without moving parts or a change in configuration or properties were determined to require an aging management review. Those SSCs that perform an intended function by a change in configuration or properties or have their condition monitored at some established frequency may be excluded from further evaluation in the aging management review with supporting justification.

Table 3.2-1 through Table 3.2-5 and Table 3.3-1 identify the intended functions for the dry storage casks and spent fuel assembly subcomponents, respectively, that require aging management review. The tables also identify subcomponents that did not support the SSC intended function and are not within the scope of license renewal.

3.1.2 Identification of Materials and Environment

The second step of the AMR process involved the identification of the materials of construction and the environments to which these materials are exposed, for the subcomponents that require an AMR.

The materials have been identified within the references in Section 3.1.6. A summary of the materials of construction is provided in Section 3.2.2 for all the dry storage casks and Section 3.3.2 for the spent fuel assemblies. The specific materials of construction for cask and fuel assembly subcomponents requiring aging management review are reflected in the AMR results tables.

Some subcomponents have external coatings. Although the coating may be designed to inhibit degradation of the underlying material, it is not credited for the elimination of aging effects requiring management.

The environmental conditions identified include any conditions known to exist on a recurring basis. They are based on operating experience, unless design features have been implemented to preclude those conditions from recurring. Descriptions of the internal and external environments, which have been used in the aging management review, are included in Section 3.2.3 for the dry storage casks and Section 3.3.3 for the spent fuel assemblies, and are reflected in the AMR results tables.

3.1.3 Identification of Aging Effects Requiring Management

The third step in the AMR process involved the identification of the aging effects requiring management. The aging effects requiring management have been documented into a material aging effects report. This report has incorporated aging effects that theoretically occur as well as aging effects that have actually occurred based upon industry operating experience and Dominion operating experience for the appropriate material and environment combinations. The aging effects have been presented in terms of material and environment combinations. Therefore, the information is applied to subcomponents, regardless of form (i.e., cask body, cover, lid, guide tube, etc.). The environments considered in the report are the environments that the subcomponents normally experience. Environmental stressors that are not conditions normally experienced, or that may be caused by a design problem (such as inadequate design analysis), are called event-driven or service-driven situations and have not been characterized as sources of aging. As such, they will be evaluated and corrective action implemented at the time of the event.

Aging effects are the manifestation of aging mechanisms. In order to effectively manage an aging effect, it was necessary to first determine the aging mechanisms that are potentially at work for a given material and environment application. Therefore, the AMR process addressed both the aging effects and the associated aging mechanisms. The ISFSI material aging effects report (MAER) has been used to identify the aging mechanisms/effects that require management for in-scope subcomponents. If a material-environment combination was not already addressed in the MAER, a review of Dominion operating experience and other industry sources was initiated to identify any aging effects that require management. Where appropriate, the MAER has been revised to incorporate the information from those sources. The material aging effect report has also been revised to include any aging effects that have been found to exist at Surry, but that have not been previously addressed.

A summary of aging effects requiring management is provided in Section 3.2.4 and Section 3.3.4 for the dry storage casks and spent fuel assemblies, respectively.

3.1.4 Determination of the Activities Required to Manage the Effects of Aging

The final step in the AMR process involved the determination of the Aging Management Activities (AMAs) to be credited or developed for managing the effects of aging. The existing AMA for dry storage cask inspection, which has been enhanced to manage the aging effect of loss of material for the applicable cask subcomponents, is described in Appendix A, Section A2.1, Dry Storage Cask Inspection Activities. There are no aging effects requiring management for the spent fuel assemblies in the cask storage environment as indicated in Section 3.3.4.

3.1.5 Confirmation of the AMR Process through Operating Experience Review

As described in subsection 3.1.3, the material aging effects report (MAER) was developed from industry and plant operating experience, as well as various metallurgical literary references relating specific materials and environments to aging effects and mechanisms. The MAER was developed based on the premise that similar materials in similar environments experience similar aging effects and mechanisms. The MAER also considers applied and residual stresses that may impact applicable aging mechanisms (i.e., stress corrosion cracking of stainless steels). As noted in Section 3.1.5.1, applied thermal stresses are not a significant factor in the determination of applicable aging effects.

Some cask subcomponents such as welds, bolts, and metallic seals may experience higher residual and/or applied levels of stress, as compared to other subcomponents. The ISFSI operating experience review is described in the following subsections, and includes specific operating experience associated with welds, bolts, and metallic seals. The review was conducted to identify any aging effects not previously addressed in the aging effects evaluation.

3.1.5.1 Cracking of Welds

Cracking of fuel basket welds in a CASTOR V/21 dry storage demonstration cask was reported to the NRC in 1985. Additional cracking in the same Castor V/21 fuel basket was identified in 1999, as part of the Dry Cask Storage Characterization Project conducted by the Electric Power Research Institute (EPRI).

In order to allow the installation of test instrumentation into the demonstration cask, the lateral movement of the fuel basket was restricted to a value less than that of the original design. Therefore, during cask thermal testing, unusually high compressive stresses developed in the fuel basket plates as the basket expanded. Ultimately, the plate welds cracked. This weld degradation is not considered to be age-related, but a design-related issue. Additionally, EPRI concluded that the cracked welds had no impact on cask safety. NRC Review of this weld degradation and acceptance of the CASTOR V/21 fuel basket design is documented in a letter from the NRC to General Nuclear Systems, Inc. dated April 3, 1987.

Applied thermal stresses were considered in the initial licensing of the cask designs. The thermal analysis predicted stresses based on maximum heat load, which occurs following the initial loading of fuel into the cask. Cask thermal stresses are a function of cask design and decrease with time due to decreasing fuel clad temperature. Therefore, these thermal stresses are not considered in the determination of applicable aging effects.

3.1.5.2 Corrosion of Bolts, Metallic Seals and Cask External Surfaces

As part of the Dry Cask Storage Characterization Project, EPRI identified heavy corrosion of one of the thirty-three rear breach plate bolts on the CASTOR V/21 cask. It was determined that the bolt corrosion was caused by long-term exposure to wet weather conditions and possible condensation on the top-side of the rear breach plate penetrating the bolt thread region.

The Castor V/21 cask primary lid closure bolts were also examined during the project. EPRI reported that none of the forty-four primary lid closure bolts showed signs of pitting or general corrosion, cracks, thread damage, discoloration, or any additional defects. The secondary lid closure bolts were not included in the inspection since the secondary lid was not in place on the demonstration cask.

Dominion has identified corrosion of the Transnuclear TN-32 lid bolts and outer metallic lid seals. The corrosion was most prevalent on the down-slope side of the cask lid (The concrete storage pad is crowned in the middle to facilitate drainage). As part of the investigation, Dominion verified bolt torque and determined that there had been no bolt relaxation. The corrosion of the lid bolts and outer metallic seal was the result of external water intrusion in the vicinity of the lid bolts and outer metallic seal. It was determined that the Conax connector seal for the electrical connector in the cask protective cover was leaking due to improper installation of the connectors. Therefore, this degradation was not related to aging.

To reduce the likelihood of protective cover leakage, the pressure sensing instrumentation was relocated outside of the cover. This required routing pressure sensor tubing through the side of the cover and mounting the pressure switches on the side of the cask. The original openings for the Conax connectors in the top of the protective cover were welded closed.

Dominion has also identified chipping of external cask coatings. These conditions were identified through routine visual observations. Identified coating defects are repaired in accordance with approved procedures.

3.1.5.3 Evaluation of the Operating Experience Review

The above review of operating experience did not identify any aging mechanisms or effects, beyond those previously identified in the MAER. Additionally, the appropriateness of assigned aging management activities was confirmed as part of this review.

3.1.6 Documentation Sources Used for AMR Process

The following ISFSI cask Topical Safety Analysis Reports were used to determine the intended functions and materials for cask subcomponents determined to be in-scope of license renewal.

- *General Nuclear Services CASTOR V/21 Cask* (Reference 1)
- *General Nuclear Services CASTOR X/33 Cask* (Reference 2)
- *Westinghouse MC-10 Cask* (Reference 3)
- *Transnuclear TN-32 Dry Storage Cask* (Reference 4)
- *Nuclear Assurance Corporation Storage/Transport Cask I-28* (Reference 5)

Documents such as drawings and technical reports have been reviewed during the AMR process as required to obtain clarifications of the intended functions performed by in-scope ISFSI subcomponents.

The documentation sources listed in Section 2.2.1, Documentation Sources used for Scoping Process, have also been used in the AMR process.

3.2 Aging Management Review Results - Casks

This section provides the results of the aging management review of the subcomponents determined to require aging management review for those casks identified in Section 2.3, Scoping Results.

A summary of the results of the aging management review for the ISFSI cask subcomponents is provided in the following tables. For each cask, the tables provide the following information related to each subcomponent determined to require aging management review: (1) the intended function, (2) the material group, (3) the environment, (4) the aging effects requiring management, and (5) the specific aging management activities that manage those aging effects. The tables also identify subcomponents that did not support the SSC intended function and are not within the scope of license renewal.

Table 3.2-1, General Nuclear Services CASTOR V/21

Table 3.2-2, General Nuclear Services CASTOR X/33

Table 3.2-3, Westinghouse MC-10

Table 3.2-4, Transnuclear TN-32

Table 3.2-5, Nuclear Assurance Corporation I-28

A description of cask subcomponents is provided in Section 3.2.1 for each cask and a summary of the materials and environments for all the casks is provided in Section 3.2.2 and Section 3.2.3, respectively.

Section 3.2.4 and Section 3.2.5 provide a discussion of the aging effects requiring management for the casks and the aging management activities used to manage the effects of aging, respectively.

3.2.1 Description of Cask Subcomponents

General Nuclear Services CASTOR V/21

The following subcomponents of the CASTOR V/21 are described in this section:

- Cask Body (including surface cooling fins and neutron moderator rods within cask wall)
- Fuel Basket
- Primary Lid
- Secondary Lid
- Multiple Sealing System

Cask Body and Associated Subcomponents

The CASTOR V/21 cask body is a one-piece ductile cast iron cylindrical structure. Cooling fins run circumferentially around the external surface of the cask and the entire external surface is coated with epoxy paint for corrosion protection and ease of decontamination. Polyethylene neutron moderator rods are incorporated within the wall of the cask body to provide additional neutron shielding. The internal cavity surfaces and sealing surfaces have a galvanically applied nickel-based alloy coating. Two lifting trunnions are bolted at each end of the cask body. A rear breech plate is bolted to the bottom of the cask to close the area of the moderator holes.

An environmental cover fits over the top of the cask to provide weather protection.

Fuel Basket

The fuel basket structure, which holds the fuel assemblies in position, is a weldment made of stainless steel and borated stainless steel plates.

A drainage guide pipe is welded to the side of the fuel basket near the outer circumference of the basket. The location of this pipe corresponds to a penetration in the primary lid. This pipe provides a guide path for a flanged pipe which is inserted through the primary lid to fill and drain the cask.

Primary Lid

The primary lid is fabricated from stainless steel and is mounted directly above the fuel basket. Holes are machined in the lid perimeter to allow insertion of the stainless steel bolts used to secure the lid to the cask body. Two grooves located around the lid circumference, inside of the bolt circle are provided for the O-ring seals. The inner groove accepts a metal O-ring (metallic seal), which serves as the first barrier between the stored fuel and the inside and outside environment. The outer groove accepts an elastomer O-ring. A small penetration through the lid provides access to the annulus between the two seals to support leak testing. This penetration is plugged when it is not in use.

Three additional penetrations through the lid are provided for various operations. A straight through penetration used for water fill and drain operations is located near the perimeter of the lid and is sealed with a shield plug/cover plate. This location corresponds to the drainage guide pipe attached to the fuel basket. An additional inner cover plate is also provided at this location. The inner cover is secured by bolts and sealed with an elastomer O-ring. The outer cover for this penetration is secured by bolts and sealed with a metal O-ring.

The other two penetrations, closely spaced, and covered by a single cover secured by bolts, are also located near the lid perimeter, but 180° from the fill/drain penetration. The through lid penetration at this location is equipped with a quick-disconnect fitting, which is used for vacuum drying and backfilling with the inert gas. The second penetration at this location leads to the lower edge of the lid. Although not currently in use, this penetration is designed for leak testing an optional third lid seal. In addition to the outer cover plate, a seal plug and gasket seal this penetration.

Secondary Lid

The secondary lid is mounted above the primary lid. Holes are machined in the perimeter of the stainless steel secondary lid to accept the bolts that secure the lid to the cask body. Two concentric grooves located inside the bolt circle are provided for a metal O-ring/elastomer O-ring sealing system of the same design as that used on the primary lid. Three normally sealed penetrations are provided for the various cask operations. One lid penetration provides access to the annulus between the two seals for post-assembly seal testing. A seal plug and gasket are used to close this penetration.

A second penetration is equipped with a quick-disconnect fitting which is used for vacuum drying and inert gas backfilling of the primary-secondary inter-lid space. A bolted cover plate and gasket is in place when this penetration is not used. The third penetration provides a pressure sensing port between the inter-lid space and a pressure sensor, which is mounted in the secondary lid with bolts and sealed with metallic O-rings.

Multiple Sealing System

The seal system consists of multiple lids and seals to assure the leak tightness of the cask. An elastomer seal ring, which acts in series with a corresponding metal O-ring, serves as a barrier for functionally testing the cask seal system. However, the presence of this seal is not credited in the cask safety analysis calculations. Therefore, it is not within the scope of license renewal. The annulus formed between each set of metal O-rings (metallic seal) and elastomer O-rings, along with the test penetration through the lid, provides a means to verify that a proper seal has been obtained.

A monitoring scheme is also incorporated to ensure that corrective action can be taken in the unlikely event that a seal failure occurs during long-term storage. During cask assembly, an excess pressure is set up in the inter-lid space. A leak in the primary cover would result in this excess pressure bleeding into the cask inner cavity. Secondary cover leakage would result in this inert gas escaping to atmosphere. In either case, the stainless steel pressure sensor incorporated in the secondary lid provides an alarm function if a pressure reduction below a predetermined setpoint occurs in the inter-lid space.

The materials, environments, aging effects requiring management, and the aging management activities for all the casks are provided in the section indicated below:

Section 3.2.2, Materials Evaluated

Section 3.2.3, Environments

Section 3.2.4, Aging Effects Requiring Management

Section 3.2.5, Aging Management Activities

The results of the aging management review specifically for the General Nuclear Services CASTOR V/21 cask are provided in Table 3.2-1.

General Nuclear Services CASTOR X/33

The following subcomponents of the CASTOR X/33 are described in this section:

- Cask Body (including neutron moderator rods within cask wall)
- Fuel Basket

- Primary Lid
- Secondary Lid
- Multiple Sealing System

Cask Body and Associated Subcomponents

The CASTOR X/33 cask body is a one-piece cast iron cylindrical structure. The external surface of the cask is coated with epoxy paint for corrosion protection and ease of decontamination. Incorporated within the wall of the cask body are polyethylene moderator rods, which provide additional neutron shielding. Stainless steel moderator rod springs located below the moderator rods ensure the rods remain fully elevated to minimize neutron flux at the top of the cask. The internal cavity surfaces and sealing surfaces have galvanically applied nickel-based alloy coating. Two stainless steel lifting trunnions are bolted at each end of the cask body. An environmental cover fits over the top of the cask to provide weather protection.

An aluminum impact limiter attached to the top of the X/33 cask during storage is designed to absorb the impact force during a tip-over accident.

Fuel Basket

The fuel basket structure is made of welded stainless steel plates, and borated stainless steel tubes.

Internal gussets within the fuel basket guide the insertion of the drain lance. The location of the gussets corresponds to a penetration in the primary lid.

Primary Lid

The primary lid is fabricated from stainless steel and is mounted above the fuel basket. Holes are machined in the lid perimeter to allow insertion of the stainless steel studs used to secure the lid to the cask body. Stainless steel cap nuts are attached to the studs to secure the primary lid in place. Two grooves located around the lid circumference, inside of the bolt circle are provided for the O-ring seals. The inner groove accepts a metal O-ring (metallic seal), which serves as the first barrier between the stored fuel and the environment. The outer groove accepts an elastomer O-ring. A small penetration through the lid provides access to the annulus between the two seals to perform leak testing. This penetration is plugged when not in use.

Two penetrations located near the perimeter of the lid are provided for flushing and venting of the cask. One penetration which is provided for fill and drain operations is sealed with a shield plug/cover plate that is secured by bolts and sealed with an metal O-ring. The other penetration is secured by a bolted cover plate with a metal O-ring seal. The through-lid penetration at this location is equipped with a quick disconnect fitting, which is used for vacuum drying and backfilling with inert gas.

Secondary Lid

The secondary lid is mounted above the primary lid. Holes are machined in the perimeter of the stainless steel secondary lid and accept the bolts which secure the lid to the cask body. Two concentric grooves located inside the bolt circle are provided for a metal O-ring/elastomer O-ring sealing system of the same design as that used on the primary lid. Three normally sealed penetrations are provided for the various cask operations. One lid penetration provides access to the annulus between the two seals for post-assembly seal testing. A seal plug and gasket are used to close this penetration.

A second penetration is equipped with a quick disconnect fitting which is used for vacuum drying and inert gas backfilling of the primary-secondary inter-lid space. A cover plate and gasket are secured in place with bolts when this penetration is not used. The third penetration provides a pressure sensing port between the inter-lid space and a pressure sensor, which is mounted in the secondary lid and sealed with metallic O-rings.

Multiple Sealing System

The seal system consists of multiple lids and seals to assure the leak tightness of the cask. An elastomer seal ring, which acts in series with a corresponding metal O-ring, serves as a barrier for functionally testing the cask seal system. However, the presence of this seal is not credited in the cask safety analysis calculations. Therefore, it is not within the scope of license renewal. The annulus formed between each set of metal and elastomer O-rings, along with the test penetration through the lid, provides a means to verify that a proper seal has been obtained.

A monitoring scheme is also incorporated to ensure that corrective action can be taken in the unlikely event that a seal failure occurs during long-term storage. During cask assembly, an excess pressure is set up in the inter-lid space. A leak in the primary cover would result in this excess pressure bleeding into the cask inner cavity. Secondary cover leakage would result in this inert gas escaping to atmosphere. In either case, the stainless steel pressure sensor incorporated in the secondary lid provides an alarm function if a pressure reduction below a predetermined setpoint occurs in the inter-lid space.

The materials, environments, aging effects requiring management, and the aging management activities for all the casks are provided in the section indicated below:

Section 3.2.2, Materials Evaluated

Section 3.2.3, Environments

Section 3.2.4, Aging Effects Requiring Management

Section 3.2.5, Aging Management Activities

The results of the aging management review specifically for the General Nuclear Services CASTOR X/33 cask are provided in Table 3.2-2.

Westinghouse MC-10

The following subcomponents of the Westinghouse MC-10 are described in this section:

- Cask Body (including neutron shielding materials)
- Fuel Basket
- Cask Covers and Penetrations
- Instrumentation Port
- Cask Seals

Cask Body and Associated Subcomponents

The MC-10 cask is a right circular cylinder with a solid, low-alloy steel body. The cask walls and cask bottom are coated internally with thermally sprayed aluminum. The outer shell of the cask is coated externally with an epoxy coating. Carbon steel vessel ribs extend outward from the cask body and connect to the carbon steel outer shell. Neutron shielding is provided by BISCO NS3 (boron carbide) between the cask body and the outer shell and ribs.

Low-alloy steel trunnions are bolted to the cask body to permit cask movement. The trunnions and trunnion bolts are removed following transfer of the MC-10 cask to the storage pad. Trunnion shield plugs made of BISCO NS3 (boron carbide) are installed in place of the trunnions. The trunnions and trunnion bolts are stored in a sheltered environment. All cask-sealing surfaces are clad with stainless steel. Draining of the cask cavity is accomplished through a drain lance, which penetrates the shield cover.

Fuel Basket

The fuel basket is made primarily of a stainless steel enclosure, neutron poison material, and stainless steel wrappers. Neutron absorbing material (Boral) is sandwiched between two pieces of aluminum. These sheets are positioned on the basket walls and held in place with wrapper plates which are welded to the basket cell.

Cask Covers and Penetrations

The cask cover design is comprised of four separate lids (shield cover, primary cover, seal cover and closure cover).

The shield cover is directly above the fuel basket and is made of low alloy steel. It is secured to the cask by studs and nuts. The shield is coated with thermally sprayed aluminum for corrosion protection. The cover is positioned on a stainless steel clad seating surface, which is recessed into the cask body. A single metallic "O" ring provides the cover seal. Two penetrations are provided in the shield cover for cask draining and helium gas filling.

The primary cover, which is located above the shield cover, is made of carbon steel. Metallic and elastomer "O" rings provide the cover seal. The primary cover rests on a stainless steel clad seating surface that is recessed into the cask body, just above the shield cover. The primary cover is held in place with low-alloy steel cap screws. The cap screws are plated with a nickel-based alloy. Two penetrations are provided in the primary cover for leak testing.

The seal cover is located between the primary cover and the closure cover and is made of carbon steel. It is secured to the primary cover with studs.

The closure cover, which is exposed to atmosphere, is made of Bisco NS3 encased in stainless steel (neutron attenuation material) and secured to the seal cover by nuts using the same studs as the seal cover. Elastomer O-rings provide a seal for these closure cover nuts.

Two penetrations are provided in the shield cover for venting and draining of the cask. Each penetration is provided with a stainless steel cover, which is secured by stainless steel bolts. The covers are sealed with metallic seals. The drain port is also equipped with a shield plug.

Instrumentation Port

A pressure sensor port is located in the side of the cask. It consists of an inner and an outer housing. The stainless steel inner housing cover is sealed with metallic seals and stainless steel bolts. The outer housing cover is sealed with elastomer seals and bolts. The outer housing minimizes the introduction of moisture into the housing during cask immersion in the spent fuel pool.

Cask Seals

For redundancy, at least two metal seals exist at each leak path between the cask cavity and the environment. The metal seals consist of a nickel-based alloy spring with an aluminum jacket and stainless steel sleeve. The metal seals are designed to be leak tight. Elastomer seals associated with the cask do not perform a license renewal intended function.

The materials, environments, aging effects requiring management, and the aging management activities for all the casks are provided in the section indicated below:

Section 3.2.2, Materials Evaluated

Section 3.2.3, Environments

Section 3.2.4, Aging Effects Requiring Management

Section 3.2.5, Aging Management Activities

The results of the aging management review specifically for the Westinghouse MC-10 cask are provided in Table 3.2-3.

Transnuclear TN-32

The following subcomponents of the Transnuclear TN-32 are described in this section:

- Cask Body (including neutron shielding materials)
- Fuel Basket
- Cask Lid
- Cask Seals

Cask Body and Associated Subcomponents

The TN-32 containment vessel is comprised of: an inner shell, which is a welded carbon steel cylinder with an integrally-welded carbon steel bottom; a welded flange forging (with shims); a flanged and bolted carbon steel lid; and vent and drain port seals, covers and bolts. The inner shell and bottom are lined with a carbon steel containment. Neutron shielding is provided by borated polyester resin enclosed in aluminum, which surrounds the exterior of the cask inner shell wall. The outer shell of the cask is carbon steel. Additional neutron shielding is provided by a disc of polypropylene encased in carbon steel, and bolted to the cask lid.

The inner and bottom containment surfaces have a sprayed metallic coating of aluminum for corrosion protection. The cask external surfaces are painted for corrosion protection and ease of decontamination. The cask sealing surfaces are clad with stainless steel for corrosion protection.

Carbon steel trunnions are provided at the cask upper and lower ends to permit cask movement and transport. An environmental cover fits over the top of the cask to provide weather protection. The cover is sealed with an elastomer O-ring.

Fuel Basket

The fuel basket structure is made of an assembly of stainless steel cells joined by a fusion welding process and separated by aluminum and borated aluminum plates which form a sandwich panel. The fuel basket structure is designed to hold 32 fuel assemblies.

Cask Lid

The lid is fabricated of carbon steel and secured to the cask body with bolts. The sealing arrangement consists of double metallic O-ring seals. Two penetrations are provided in the lid for cask venting and draining evolutions. One additional penetration is provided for the overpressure system. The overpressure system is designed to maintain helium pressure between the cask lid seals and cask lid penetration seals at a pressure greater than the pressure in the cask and greater than atmospheric pressure. Therefore, any seal leakage would be either to atmosphere or into the cask. An overpressure tank, equipped with a fill valve and pressure sensors, maintains pressure between the seals. The overpressure tank is mounted on top of the cask under the environmental cover.

Cask Seals

The cask lid is equipped with double metallic O-ring seals.

There are three access ports in the cask lid; 1) Drain Port, 2) Vent Port, and 3) Overpressure Port. For ease of operation, the drain and vent ports are equipped with a quick-disconnect valve.

Each of the three access ports is provided with a bolted stainless steel cover, which is equipped with metallic O-ring seals. The vent and drain port covers have two O-rings, while the overpressure port cover has only one O-ring.

The materials, environments, aging effects requiring management, and the aging management activities for all the casks are provided in the section indicated below:

Section 3.2.2, Materials Evaluated

Section 3.2.3, Environments

Section 3.2.4, Aging Effects Requiring Management

Section 3.2.5, Aging Management Activities

The results of the aging management review specifically for the Transnuclear TN-32 cask are provided in Table 3.2-4.

Nuclear Assurance Corporation I-28

The following subcomponents of the Nuclear Assurance Corporation (NAC) I-28 are described in this section:

- Cask Body (including neutron shielding materials)
- Fuel Basket
- Closure Lid and Penetrations
- Cask Seals

Cask Body and Associated Components

The wall and bottom of the NAC I-28 cask are comprised of a stainless steel inner shell, a middle lead gamma shield, a stainless steel outer shell, and upper and lower ring plates. The stainless steel outer shell is surrounded by a radial neutron shield, which consists of a layer of BISCO NS4-FR. A stainless steel skin protects the exterior surface of the radial neutron shield from the outside atmosphere.

Two stainless steel lifting trunnions are bolted at the cask upper end for vertical lifting. Two stainless steel rotation trunnions are also provided at the cask lower end. The lid surfaces on the cask are precision finished to ensure adequate sealing. A side impact limiter minimizes the forces imposed on the cask during a cask tipover accident.

Fuel Basket

The fuel basket is made of stainless steel, aluminum alloys, and borated aluminum alloys. A fill/drain pipe is attached to the side of the fuel cavity to facilitate fluid movement during the various cask evolutions.

Closure Lid and Penetrations

The cask closure lid is composed of stainless steel and lead gamma shielding. The lid is secured to the cask body by bolts located around the lid's circumference. The sealing arrangement consists of two concentric grooves machined into the lid, which retain two metal O-rings. Four lid penetrations are provided for cask draining, drying, helium gas filling, and pressure monitoring/leak testing. Neutron emissions from the top of the cask are minimized by an upper neutron shield. The upper neutron shield is encased in stainless steel and bolted to the closure lid.

Cask Seals

The metallic O-ring seals are designed to be leak tight. For redundancy, at least two metallic O-ring seals exist in every possible leak path between the fuel and the environment. The cask lid metallic seals form an annulus for leak testing. The seals are stainless steel with a silver plating.

There are four access ports in the cask; 1) Cavity Drain Port, 2) Cavity Vent Port, 3) Inter-seal Test Line Port, and 4) Pressure Monitoring Port. For ease of operation, the cavity drain, cavity vent, and inter-seal test line ports are equipped with a quick-disconnect fitting. Each of the four access ports is provided with a bolted internal stainless steel support plate, which is equipped with double metallic O-ring seals. A bolted stainless steel outer cover plate fits over the support plate and is also equipped with two metallic O-ring seals. Wiring for the pressure monitoring system penetrates the support and cover plates through hermetically sealed penetrations.

The materials, environments, aging effects requiring management, and the aging management activities for all the casks are provided in the section indicated below:

Section 3.2.2, Materials Evaluated

Section 3.2.3, Environments

Section 3.2.4, Aging Effects Requiring Management

Section 3.2.5, Aging Management Activities

The results of the aging management review specifically for the Nuclear Assurance Corporation I-28 cask are provided in Table 3.2-5.

3.2.2 Materials Evaluated

The materials of construction for the subcomponents of the casks are listed below, grouped by metallics and non-metallics. The specific type of metallic or non-metallic material used for each cask subcomponent is identified in the AMR summary results tables, Table 3.2-1 through Table 3.2-5.

Metallics

- Cast Iron
- Low-alloy Steel
- Carbon Steel
- Nickel-based Alloy
- Stainless Steel (includes borated stainless steel)
- Aluminum (includes borated aluminum)
- Lead
- Silver

Non-Metallics

- Polyethylene
- Polypropylene
- BISCO NS-3
- BISCO NS-4 FR
- Borated Polyester

3.2.3 Environments

External

The dry storage casks are located at the Surry ISFSI site, in Surry County, on the south shore of the James River. The external environment for the casks is bounded by an air temperature range of -20°F to 115°F. The outdoor air environment includes precipitation, ultraviolet radiation, ozone, and wind.

Internal

The five different types of dry storage casks in use at Surry Power Station are filled with helium gas. Additionally, trace amounts of nitrogen, oxygen, argon and fission product gasses may be present (Reference 7).

The cask internal pressure varies between 800 and 2230 mbar (11.6 and 32.3 psia), depending upon the cask type. The helium gas temperature inside the casks is a function of fuel cladding temperature, and decreases over time.

Following initial cask loading, the fuel temperature inside the fuel cladding is expected to be less than 662°F (350°C) except in some localized areas where the temperature may be slightly higher during the first few years after cask loading (Reference 6)(Reference 8). After 20 years of dry storage, the fuel cladding temperature is expected to be less than 347°F (175°C) and to decrease to less than 248°F (120°C) after several years of extended storage (Reference 7).

After 20 years of dry storage, the fast neutron flux and gamma radiation doses are expected to be less than approximately 10^{14} n/cm^2 and 10^9 R, respectively. (Reference 7)

The dry storage casks are exposed to borated water during fuel loading. This water, with the exception of trace amounts, is removed following fuel loading. Therefore, borated water is not considered an internal environment during long-term storage.

3.2.4 Aging Effects Requiring Management

The following aging effect, associated with the ISFSI casks, requires management:

- Loss of Material

A review of ISFSI site-specific and industry operating experience has been conducted to identify any aging effects that had not previously been addressed. This review did not identify any other aging effects. However, the operating experience review results described below confirmed the need for periodic inspections in accordance with the Dry Storage Cask Inspection Activities to provide reasonable assurance that the casks will perform their intended function(s) throughout the renewal period.

- Several instances of chipped external coatings on the casks have been identified.
- The Transnuclear TN-32 cask outer metallic seals and lid bolts have experienced loss of material due to the intrusion of rainwater in the vicinity of the outer metallic seal.
- The EPRI Dry Cask Storage Characterization Project, Interim Progress Report (Reference 6), identified the potential for corrosion of the rear breech plate bolts on the CASTOR V/21 cask. These bolts are located on the bottom of the cask and may be exposed to water which can pool beneath the cask due to precipitation.

Additionally, the closure cover on the Westinghouse MC-10 cask is held in place by fasteners, which are hand tightened. Elastomer O-rings are compressed to form a seal against the outside atmosphere. These elastomer O-rings were not credited in the aging management review of the cask; therefore, the potential for loss of material of the carbon steel components below the closure cover is managed.

3.2.5 Aging Management Activities

The Dry Storage Cask Inspection Activities manage the aging effect of loss of material for the subcomponents of the ISFSI dry storage casks identified in Table 3.2-1 through Table 3.2-5.

A description of this aging management activity is provided in Appendix A along with the demonstration that the identified aging effect will be effectively managed for the renewal period.

3.2.6 Conclusion

Based on the demonstrations provided in Appendix A: Aging Management Activities, loss of material associated with the ISFSI dry storage cask subcomponents will be adequately managed so that there is reasonable assurance that the intended function(s) will be maintained consistent with the current licensing basis during the renewal period.

3.3 Aging Management Review Results - Spent Fuel Assemblies

This section provides the results of the aging management review for the spent fuel assemblies that were identified in Section 2.3, Scoping Results, as being subject to aging management review.

A summary of the results of the aging management review for the ISFSI spent fuel assemblies is provided in Table 3.3-1, Spent Fuel Assemblies. The table provides the following information related to each subcomponent determined to be within the scope of license renewal: (1) the intended function, (2) the material group, (3) the environment, (4) the aging effects requiring management, and (5) the specific aging management activities that manage those aging effects. The table also identifies subcomponents that did not support the SSC intended function and are not within the scope of license renewal.

Fuel assemblies from Surry Power Station were used in a study by Idaho National Engineering and Environmental Laboratory and Argonne National Laboratory to determine the aging effects on fuel in dry storage casks. The fuel assemblies have been in dry storage casks for over fourteen years. A visual examination and a material analysis were performed on the fuel assemblies. The results of this study have been included in EPRI reports including the most recent report, Dry Cask Storage Characterization Project, Interim Progress Report (Reference 6). This project identified and examined several questions concerning fuel behavior during dry cask storage. The results of this analysis have been incorporated into the aging management review of the spent fuel assemblies presented in this section.

The EPRI Dry Cask Storage Characterization Project is performing additional evaluations and will issue a final report following completion of these evaluations (Reference 6). As indicated in Appendix C, Dominion will follow the progress of this project and appropriately incorporate any recommendations and/or results.

3.3.1 Description of Fuel Subcomponents

The spent fuel stored and received at the ISFSI is required to meet functional and operational limits. Specifically, the spent fuel stored in the ISFSI shall be intact unconsolidated, shall not have gross fuel cladding defects, and shall not have visible physical damage which would inhibit insertion or removal of the spent fuel assembly from the cask fuel basket.

The following subcomponents of a fuel assembly are described in this section:

- Fuel Cladding (including End Plugs)
- Guide Tube
- Grid Assembly
- Bottom Nozzle
- Top Nozzle

Fuel Cladding (including End Plugs)

The fuel cladding is a tube that is designed to keep the fuel pellets in the desired configuration. Unlike conventional material cladding, the fuel cladding is not mechanically bonded to the fuel pellets that it protects. The fuel cladding end plugs are used to close each end of the fuel tubes, containing the fuel pellets within the fuel tube.

Guide Tube

The guide tube intended function is to provide sufficient fuel assembly structural integrity to allow retrievability of the assembly from the dry storage casks. The guide tubes provide structural support and a means to align insert components, such as burnable poison rod assemblies and thimble plugging devices within the fuel assembly. The guide tubes are attached to the grid assemblies, the top nozzle and the bottom nozzle. The guide tubes are attached to the top nozzle using sleeves. The guide tubes are mechanically attached to the bottom nozzle using threaded fasteners.

Grid Assembly

The grid assemblies, which are attached to the guide tubes provide support for the fuel cladding tubes, positioning them in a square array.

Bottom Nozzle

The bottom nozzle is connected to the guide tubes and provides a base to support the fuel assembly.

Top Nozzle

The top nozzle provides a means to lift the entire fuel assembly. The top nozzle is attached to the guide tubes as described above. It is possible to retrieve a fuel assembly without a top nozzle by lifting the fuel assembly by the guide tubes with a specially designed tool.

3.3.2 Materials Evaluated

The materials of construction for the spent fuel assembly subcomponents that are subject to aging management review are zirconium-based alloy, stainless steel, and nickel-based alloy.

3.3.3 Environments

Internal

The fuel cladding and guide tubes are the only two fuel assembly subcomponents that have internal environments. The guide tubes are open on the end and have the same internal and external environment. Therefore, this environment is discussed in the external environment section.

The fuel cladding internal environment is a combination of helium and fission product gases. The initial helium fill gas pressure in PWR fuel rods is between 200 and 500 psia at 20°C (Reference 7). The internal pressure during cask storage depends upon fuel temperature, void volume inside the fuel tube (Reference 7), and cladding integrity.

Following initial cask loading, the fuel temperature inside the fuel cladding is expected to be less than 662°F (350°C) except in some localized areas where the temperature may be slightly higher during the first few years after cask loading (Reference 6)(Reference 8). After 20 years of dry storage, the fuel cladding temperature is expected to be less than 347°F (175°C) and to decrease to less than 248°F (120°C) after several years of extended storage (Reference 7).

External

Externally, the fuel rods are exposed to the helium gas inside the dry storage cask. Additionally, trace amounts of nitrogen, oxygen, argon, and fission product gases may be present inside the cask (Reference 7). The helium gas temperature external to the fuel rods is a function of fuel cladding temperature and decreases over time, as described in the internal environment discussion. The helium gas pressure inside the dry storage casks varies between 800 and 2230 mbar (11.6 and 32.3 psia), depending upon cask type.

After 20 years of dry storage, the fast neutron flux and gamma radiation doses are expected to be less than approximately 10^{14} n/cm^2 and 10^9 R, respectively. (Reference 7)

The dry storage casks are exposed to borated water during fuel loading. This water, with the exception of trace amounts, is removed following fuel loading. Therefore, borated water is not considered an external environment during long-term storage.

3.3.4 Aging Effects Requiring Management

Based on a review of the environment of the ISFSI fuel assemblies and the materials of construction, there are no aging effects requiring management during the renewal period for the ISFSI fuel assembly subcomponents subject to aging management review. This is consistent with the EPRI Dry Cask Storage Characterization Project, Interim Progress Report (Reference 6), which also did not identify any evidence of aging degradation of fuel assembly subcomponents from the time of initial loading up to the time of testing.

3.3.5 Aging Management Activities

There are no Aging Management Activities required during the renewal period for the ISFSI fuel assembly subcomponents subject to aging management review.

3.3.6 Conclusion

There are no aging effects requiring management during the renewal period for the ISFSI fuel assembly subcomponents.

Therefore, the intended function(s) of the ISFSI fuel assemblies will be maintained consistent with the current licensing basis during the renewal period.

Section 3.0 References (Aging Management Reviews)

1. *Topical Safety Analysis Report for the CASTOR V/21 Cask Independent Spent Fuel Storage Installation*, Rev. 2A, General Nuclear Systems, Inc., June 1987.
2. *Topical Safety Analysis Report for the CASTOR X Cask For An Independent Spent Fuel Storage Installation*, Rev. 4A, General Nuclear Systems, Inc., January, 1997.
3. *Topical Safety Analysis Report for the Westinghouse MC-10 Cask for an Independent Spent Fuel Storage Installation (Dry Storage)*, Rev. 2A, Westinghouse Nuclear Energy Systems, November, 1987.
4. *TN-32 Dry Storage Cask Topical Safety Analysis Report*, Rev. 9A, Transnuclear, Inc., December, 1996.
5. *Topical Safety Analysis Report for the NAC Storage/Transport Cask for use at an Independent Spent Fuel Storage Installation*, I-28, Rev. 2A, Nuclear Assurance Corporation, September, 1992.
6. EPRI Report No. 1003010, October 2001, Dry Cask Storage Characterization Project, Interim Progress Report.
7. ASTM Draft Standard, Guide for Evaluation of Materials Used in Extended Service of Interim Spent Nuclear Fuel Dry Storage System
8. EPRI NP-4887, The Castor-V/21 PWR Spent-Fuel Storage Cask: Testing and Analysis, Interim Report, November 1986, Electric Power Research Institute.

See Section 1.4 for abbreviations.

Table 3.2-1 General Nuclear Services CASTOR V/21

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Cask Body and Cooling Fins (includes internal nickel-based alloy coating)[3]	PB, SS, SH, HT	Cast Iron	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Nickel-Based Alloy	(I) Helium	None	N/A
Primary Lid	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Helium	None	N/A
Primary Lid Closure Bolts	PB, SS	Stainless Steel	(E) Helium	None	N/A
Primary Lid Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Primary Lid Quick Disconnect Cover	PB, SS, SH	Stainless Steel	(E) Helium	None	N/A
Primary Lid Quick Disconnect Cover Bolts	PB, SS	Stainless Steel	(E) Helium	None	N/A
Primary Lid Quick Disconnect Cover Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Fill/Drain Outer Cover	PB, SS, SH	Stainless Steel	(E) Helium	None	N/A
Fill/Drain Outer Cover Bolts	PB, SS	Stainless Steel	(E) Helium	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-1 General Nuclear Services CASTOR V/21

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Fill/Drain Outer Cover Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Primary and Secondary Lid Seal Test Penetration Plugs and Seal Rings	None	N/A - Not within the scope of license renewal.			
Elastomer Seals	None	N/A - Not within the scope of license renewal.			
Secondary Lid	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Secondary Lid Closure Bolts	PB, SS	Stainless Steel	(E) Atmosphere /Weather	Loss of Material	Dry Storage Cask Inspection Activities
Secondary Lid Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Secondary Lid Quick Disconnect Cover	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Secondary Lid Quick Disconnect Cover Bolts	PB, SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities

See Section 1.4 for abbreviations.

Table 3.2-1 General Nuclear Services CASTOR V/21

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Secondary Lid Quick Disconnect Cover Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Pressure Sensor	None	N/A - Not within the scope of license renewal.			
Pressure Sensor Bolts	None	N/A - Not within the scope of license renewal.			
Pressure Sensor Metallic Seal	None	N/A - Not within the scope of license renewal.			
Fill/Drain Inner Cover and Bolts	None	N/A - Not within the scope of license renewal.			
Quick Disconnects	None	N/A - Not within the scope of license renewal.			
Fuel Basket (includes welds)	SS, HT, CC	Stainless Steel (includes borated stainless steel)	(E) Helium	None	N/A
Fuel Basket Bolts	SS	Stainless Steel	(E) Helium	None	N/A
Rear Breech Plate	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Rear Breech Plate Bolts	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Trunnions	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Trunnion Bolts	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities

See Section 1.4 for abbreviations.

Table 3.2-1 General Nuclear Services CASTOR V/21

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Environmental Cover	None	N/A - Not within the scope of license renewal.			
External Epoxy Coating	None	N/A - Not within the scope of license renewal.			
Moderator Rods	SH	Polyethylene	(E) Air	None[4]	N/A

1 Trace amounts of fission product gases may also be present in the helium environment because the potential for minor fuel cladding defects exists.

2 Temperature and radiation have been considered as described in Section 3.2.3, Environments.

3 The cask body is provided with an external epoxy coating. The aging management review does not take credit for the epoxy coating.

4 Small gaps may exist where metal-to-metal or metal-to-polymer subcomponents interface. These gaps contain either air or helium gases. The limited amount of oxygen in these locations will be depleted and oxidation will be arrested. Therefore, aging management of these interface locations is not required.

See Section 1.4 for abbreviations.

Table 3.2-2 General Nuclear Services CASTOR X/33

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Cask Body (includes internal nickel-based alloy coating)[3]	PB, SS, SH, HT	Cast Iron	(E) Atmosphere/ Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Nickel-Based Alloy	(I) Helium	None	N/A
Primary Lid	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Helium	None	N/A
Primary Lid Closure Studs and Cap Nuts	PB	Stainless Steel	(E) Helium	None	N/A
Primary Lid Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Primary Lid Quick Disconnect Cover	PB, SS, SH	Stainless Steel	(E) Helium	None	N/A
Primary Lid Quick Disconnect Cover Bolts	PB, SS	Stainless Steel	(E) Helium	None	N/A
Primary Lid Quick Disconnect Cover Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Fill/Drain Cover	PB, SS, SH	Stainless Steel	(E) Helium	None	N/A
Fill/Drain Cover Bolts	PB, SS	Stainless Steel	(E) Helium	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-2 General Nuclear Services CASTOR X/33

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Fill/Drain Cover Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Primary and Secondary Lid Seal Test Penetration Plugs and Seal Rings	None	N/A - Not within the scope of license renewal.			
Elastomer Seals	None	N/A - Not within the scope of license renewal.			
Secondary Lid	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Secondary Lid Closure Bolts	PB, SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Secondary Lid Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Secondary Lid Quick Disconnect Cover	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Secondary Lid Quick Disconnect Cover Bolts	PB, SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities

See Section 1.4 for abbreviations.

Table 3.2-2 General Nuclear Services CASTOR X/33

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Secondary Lid Quick Disconnect Cover Metallic Seal	PB	Aluminum	(E) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Pressure Sensor	None	N/A - Not within the scope of license renewal.			
Pressure Sensor Bolts	None	N/A - Not within the scope of license renewal.			
Pressure Sensor Metallic Seal	None	N/A - Not within the scope of license renewal.			
Fill/Drain Inner Cover and Bolts	None	N/A - Not within the scope of license renewal.			
Quick Disconnects	None	N/A - Not within the scope of license renewal.			
Fuel Basket (includes welds)	SS, HT, CC	Stainless Steel (includes borated stainless steel	(E) Helium	None	N/A
Fuel Basket Bolts	SS	Stainless Steel	(E) Helium	None	N/A
Trunnions	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Trunnion Bolts	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Environmental Cover	None	N/A - Not within the scope of license renewal.			
External Epoxy Coating	None	N/A - Not within the scope of license renewal.			

See Section 1.4 for abbreviations.

Table 3.2-2 General Nuclear Services CASTOR X/33

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Impact Limiter (includes welds)	SS	Aluminum	(E) Atmosphere / Weather	None	N/A
Moderator Rod Springs	SH	Stainless Steel	(E) Air	None	N/A
Moderator Rods	SH	Polyethylene	(E) Air	None[4]	N/A
Moderator Rod Hole Plugs	SS	Cast Iron	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities

1 Trace amounts of fission product gases may also be present in the helium environment because the potential for minor fuel cladding defects exists.

2 Temperature and radiation have been considered as described in Section 3.2.3, Environments.

3 The cask body is provided with an external epoxy coating. The aging management review does not take credit for the epoxy coating.

4 Small gaps may exist where metal-to-metal or metal-to-polymer subcomponents interface. These gaps contain either air or helium gases. The limited amount of oxygen in these locations will be depleted and oxidation will be arrested. Therefore, aging management of these interface locations is not required.

See Section 1.4 for abbreviations.

Table 3.2-3 Westinghouse MC-10

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Cask Body (includes thermally sprayed aluminum coating)	PB, SS, SH, HT	Low-Alloy Steel	(E) Air/Gas	None[3]	N/A
		Aluminum	(I) Helium	None	N/A
Cask Bottom (includes thermally sprayed aluminum coating)	PB, SS, SH, HT	Low-Alloy Steel	(E) Air/Gas	None[3]	N/A
		Aluminum	(I) Helium	None	N/A
Shield Cover (includes thermally sprayed aluminum coating)	PB, SS, SH, HT	Low-Alloy Steel	(E) Air/Gas	None	N/A
		Aluminum	(I) Helium	None	N/A
Shield Cover Studs and Nuts	PB	Low-Alloy Steel	(E) Air/Gas	None	N/A
Shield Cover Metallic Seal (includes stainless steel cladding on sealing surfaces)	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Primary Cover	PB	Carbon Steel	(I) Air/Gas	None	N/A
			(E) Air/Gas	None	N/A
Primary Cover Cap Screws (includes nickel-based alloy plating)	PB, SS	Low-Alloy Steel	(E) Air/Gas	None	N/A
		Nickel-Based Alloy	(E) Air/Gas	None	N/A
Primary Cover Metallic Seal (includes stainless steel cladding on sealing surfaces)	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-3 Westinghouse MC-10

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Seal Test Port Covers	PB	Stainless Steel	(E) Air/Gas	None	N/A
Seal Test Port Cover Bolts	PB, SS	Low-Alloy Steel	(E) Air/Gas	None	N/A
Seal Test Port Cover Metallic Seals (includes stainless steel cladding on sealing surfaces)	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Seal Cover	PB	Carbon Steel	(I) Air/Gas	None	N/A
			(E) Atmosphere / Weather[4]	Loss of Material	Dry Storage Cask Inspection Activities
Closure Cover	SH	Stainless Steel[5]	(I) Air	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Closure Cover Nuts	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Closure Cover Studs	SS	Low-Alloy Steel	(E) Air	None	N/A
Drain Port Cover	PB	Stainless Steel	(E) Air/Gas	None	N/A
Drain Port Cover Bolts	PB, SS	Stainless Steel	(E) Air/Gas	None	N/A
Drain Port Shield Plug	SH	Stainless Steel	(E) Helium	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-3 Westinghouse MC-10

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Drain Port Cover Metallic Seals (includes stainless steel cladding on sealing surfaces)	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Vent Port Cover	PB	Stainless Steel	(E) Air/Gas	None	N/A
Vent Port Cover Bolts	PB, SS	Stainless Steel	(E) Air/Gas	None	N/A
Outer Instrument Housing Cover and Bolts	None	N/A - Not within the scope of license renewal.			
Quick Disconnects	None	N/A - Not within the scope of license renewal.			
Vent Port Cover Metallic Seals (includes stainless steel cladding on sealing surfaces)	PB	Aluminum	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Fuel Basket (includes welds)	SS, HT, CC	Stainless Steel	(E) Helium	None	N/A
		Aluminum	(E) Helium	None	N/A
Fuel Basket Neutron Poison	SS, HT, CC	Borated Aluminum	(E) Helium	None	N/A
Trunnions[7]	SS	Low-Alloy Steel	(E) Air/Gas	None	N/A
Trunnion Bolts[7]	SS	Low-Alloy Steel	(E) Air/Gas	None	N/A
External Epoxy Coating	None	N/A - Not within the scope of license renewal.			

See Section 1.4 for abbreviations.

Table 3.2-3 Westinghouse MC-10

Subcomponent	Intended Function	Material Group	Environment[1, 2]	Aging Effects Requiring Management	Aging Management Activity
Pressure Sensor (includes valves and tubing)	None	N/A - Not within the scope of license renewal.			
Inner Instrument Housing Cover	PB	Stainless Steel	(I) Air	None	N/A
			(E) Air	None	N/A
Inner Instrument Housing (includes welds)	PB	Stainless Steel	(I) Air	None	N/A
			(E) Air	None	N/A
Inner Instrument Housing Cover Bolts	PB, SS	Stainless Steel	(E) Air	None	N/A
Inner Instrument Housing Cover Metallic Seal (includes stainless steel cladding on sealing surfaces)	PB	Aluminum	(E) Air	None	N/A
		Stainless Steel	(E) Air	None	N/A
		Nickel-Based Alloy	(E) Air	None	N/A
Elastomer Seals	None	N/A - Not within the scope of license renewal.			
Outer Shell (includes trunnion shield plug enclosure)[6]	SS	Carbon Steel	(I) Air/Gas	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Outer Shielding (includes trunnion shield plugs)	SH	BISCO NS-3	(I) Air/Gas	None[3]	N/A
			(E) Air/Gas	None[3]	N/A
Vessel Ribs	SS, HT	Carbon Steel	(E) Air/Gas	None[3]	N/A

1 Trace amounts of fission product gases may also be present in the helium environment because the potential for minor fuel cladding defects exists.

2 Temperature and radiation have been considered as described in Section 3.2.3, Environments.

See Section 1.4 for abbreviations.

3 Small gaps may exist where metal-to-metal or metal-to-polymer subcomponents interface. These gaps contain either air or helium gases. The limited amount of oxygen in these locations will be depleted and oxidation will be arrested. Therefore, aging management of these interface locations is not required.

4 It is assumed that there is leakage past the elastomer O-rings that seal the closure cover nuts. Therefore, the seal cover, which is below the closure cover is exposed to an Atmosphere / Weather environment.

5 The closure cover consists of BISCO NS-3 shielding material enclosed in stainless steel.

6 The cask body is provided with an external epoxy coating. The aging management review does not take credit for the epoxy coating.

7 The trunnions and trunnion bolts are removed following transfer of the MC-10 cask to the storage pad. Trunnion shield plugs are installed in place of the trunnions. The trunnions and trunnion bolts are stored in a sheltered environment.

See Section 1.4 for abbreviations.

Table 3.2-4 Transnuclear TN-32

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Inner Shell	PB, SS, SH, HT	Carbon Steel	(I) Air/Gas	None[3]	N/A
			(E) Air/Gas	None[3]	N/A
Lid	PB, SS, SH, HT	Carbon Steel	(I) Air/Gas	None	N/A
			(E) Atmosphere / Weather[4]	Loss of Material	Dry Storage Cask Inspection Activities
Inner Containment (includes sprayed aluminum coating)	PB, SH, HT	Carbon Steel	(E) Air/Gas	None[3]	N/A
		Aluminum	(I) Helium	None	N/A
Bottom[5]	PB, SS, SH, HT	Carbon Steel	(I) Air/Gas	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Bottom Containment (includes sprayed aluminum coating)	PB, SH, HT	Carbon Steel	(E) Air/Gas	None[3]	N/A
		Aluminum	(I) Helium	None	N/A
Trunnions (includes welds)	SS	Carbon Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Shield Plate	SH	Carbon Steel	(I) Helium	None	N/A
			(E) Air/Gas	None	N/A
Outer shell[5]	SH	Carbon Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Top Neutron Shield	SH	Polypropylene (encased in carbon steel)	(E) Air/Gas	None[3]	N/A

See Section 1.4 for abbreviations.

Table 3.2-4 Transnuclear TN-32

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Top Neutron Shield Enclosure	SS	Carbon Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Top Neutron Shield Bolts	SS	Low-alloy Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Radial Neutron Shield	SH	Borated Polyester (encased in aluminum)	(E) Air/Gas	None[3]	N/A
Radial Neutron Shield Box	SS	Aluminum	(I) Air/Gas	None[3]	N/A
			(E) Air/Gas	None[3]	N/A
Lid Bolts	PB, SS	Low-alloy Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Lid Seal (includes stainless steel cladding on sealing surfaces)	PB	Aluminum[6]	(E) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
		Silver [6]	(E) Helium	None	N/A
			(E) Atmosphere / Weather	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Over Pressure Port Cover	None	N/A - Not within the scope of license renewal.			

See Section 1.4 for abbreviations.

Table 3.2-4 Transnuclear TN-32

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Over Pressure Port Cover Seal (includes stainless steel cladding on sealing surfaces)	None	N/A - Not within the scope of license renewal.			
Over Pressure Port Cover Bolts	None	N/A - Not within the scope of license renewal.			
Over Pressure Tank (includes tubing)	None	N/A - Not within the scope of license renewal.			
Over Pressure Tank Isolation Valve	None	N/A - Not within the scope of license renewal.			
Vent and Drain Port Covers	PB	Stainless Steel	(I) Helium	None	N/A
			(E) Air/Gas	None	N/A
Vent and Drain Port Cover Bolts	PB, SS	Low-alloy Steel	(E) Air/Gas	None	N/A
Vent and Drain Quick Disconnects	None	N/A - Not within the scope of license renewal.			
Vent and Drain Port Cover Seals (includes stainless steel cladding on sealing surfaces)	PB	Aluminum[6]	(E) Helium	None	N/A
		Silver[6]	(E) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Basket Rails	SS, HT	Aluminum	(E) Helium	None	N/A
Fuel Compartment (includes welds)	SS, HT, CC	Stainless Steel	(E) Helium	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-4 Transnuclear TN-32

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Aluminum Plate	SS, HT, CC	Aluminum	(E) Helium	None	N/A
Poison Plate	SS, HT, CC	Aluminum (includes borated aluminum)	(E) Helium	None	N/A
Drain Tube	None	N/A - Not within the scope of license renewal.			
Pressure Sensors	None	N/A - Not within the scope of license renewal.			
Flange[5] (includes welds and shims)	SS	Carbon Steel	(I) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Environmental Cover and Bolts	None	N/A - Not within the scope of license renewal.			
External Epoxy Coating	None	N/A - Not within the scope of license renewal.			

1 Trace amounts of fission product gases may also be present in the helium environment because the potential for minor fuel cladding defects exists.

2 Temperature and radiation have been considered as described in Section 3.2.3, Environments.

3 Small gaps may exist where metal-to-metal or metal-to-polymer subcomponents interface. These gaps contain either air or helium gases. The limited amount of oxygen in these locations will be depleted and oxidation will be arrested. Therefore, aging management of these interface locations is not required.

4 Operating experience has shown that the seals on the environmental cover can leak. Therefore, the aging management review assumes the cask lid underneath the cask protective cover are exposed to an Atmosphere/Weather environment.

5 The cask body is provided with an external epoxy coating. The aging management review does not take credit for the epoxy coating.

6 The seal external overlay material is either aluminum or silver.

See Section 1.4 for abbreviations.

Table 3.2-5 Nuclear Assurance Corporation I-28

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Cask Inner Shell	PB, SS, SH, HT	Stainless Steel	(I) Helium	None	N/A
			(E) Air/Gas	None[3]	N/A
Cask Outer Shell	SS, SH, HT	Stainless Steel	(I) Air/Gas	None[3]	N/A
			(E) Air/Gas	None[3]	N/A
Cask Bottom (includes welds)	PB, SS, SH, HT	Stainless Steel	(I) Helium	None	N/A
			(E) Air/Gas	None[3]	N/A
Cask Bottom Cover	SS, SH, HT	Stainless Steel	(I) Air/Gas	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Gamma Shielding	SH	Lead	(I) Air/Gas	None[3]	N/A
			(E) Air/Gas	None[3]	N/A
Closure Lid	PB, SS, SH	Stainless Steel	(I) Helium	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Closure Lid Bolts	PB, SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Closure Lid Metallic Seals	PB	Stainless Steel	(E) Air/Gas	None	N/A
		Silver	(I) Air/Gas	None	N/A
			(E) Helium	None	N/A
			(E) Atmosphere / Weather	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-5 Nuclear Assurance Corporation I-28

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Upper Ring Plate (includes welds)	SS	Stainless Steel	(I) Helium	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Lower Ring Plate (includes welds)	SS	Stainless Steel	(I) Air/Gas	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Radial Neutron Shield	SH	BISCO NS-4 FR	(I) Air/Gas	None[3]	N/A
			(E) Air/Gas	None[3]	N/A
Radial Neutron Shield Enclosure	SS	Stainless Steel	(I) Air/Gas	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Upper Neutron Shield	SH	BISCO NS-4 FR	(E) Air/Gas	None[3]	N/A
Upper Neutron Shield Enclosure	SS	Stainless Steel	(I) Air/Gas	None[3]	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Upper Neutron Shield Enclosure Bolts	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Side Impact Limiter (includes welds)	SS	Aluminum	(E) Air	None	N/A
		Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Trunnions	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities

See Section 1.4 for abbreviations.

Table 3.2-5 Nuclear Assurance Corporation I-28

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Trunnion Bolts	SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Fuel Basket (includes welds)	SS, HT, CC	Aluminum	(E) Helium	None	N/A
Basket Poison	CC	Aluminum (includes borated aluminum)	(E) Helium	None	N/A
Basket Nuts and Lockwashers	SS	Stainless Steel	(E) Helium	None	N/A
Basket Spacers	SS	Stainless Steel	(E) Helium	None	N/A
		Aluminum	(E) Helium	None	N/A
Drain Tube	None	N/A - Not within the scope of license renewal.			
Pressure Sensor	None	N/A - Not within the scope of license renewal.			
Vent, Drain, and Seal Test Port Inner Covers	PB	Stainless Steel	(I) Helium	None	N/A
			(E) Air	None	N/A
Vent, Drain, and Seal Test Port Inner Cover Metallic Seals	PB	Stainless Steel	(E) Air/Gas	None	N/A
		Silver	(I) Air/Gas	None	N/A
			(E) Helium	None	N/A
Elastomer Seals	None	N/A - Not within the scope of license renewal.			
Vent, Drain, and Seal Test Port Inner Cover Bolts	PB, SS	Stainless Steel	(E) Air	None	N/A

See Section 1.4 for abbreviations.

Table 3.2-5 Nuclear Assurance Corporation I-28

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Vent, Drain, and Seal Test Port Outer Covers	PB	Stainless Steel	(I) Air	None	N/A
			(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Vent, Drain, and Seal Test Port Outer Cover Metallic Seals	PB	Stainless Steel	(E) Air/Gas	None	N/A
		Silver	(I) Air/Gas	None	N/A
			(E) Helium	None	N/A
			(E) Atmosphere / Weather	None	N/A
Vent, Drain, and Seal Test Port Outer Cover Bolts	PB, SS	Stainless Steel	(E) Atmosphere / Weather	Loss of Material	Dry Storage Cask Inspection Activities
Pressure Sensor Inner and Outer Covers and Bolts	None	N/A - Not within the scope of license renewal.			
Pressure Sensor Inner and Outer Cover Electrical Feedthroughs	None	N/A - Not within the scope of license renewal.			
Drain, Vent, and Seal Port Quick Disconnects	None	N/A - Not within the scope of license renewal.			

1 Trace amounts of fission product gases may also be present in the helium environment because the potential for minor fuel cladding defects exists.

2 Temperature and radiation have been considered as described in Section 3.2.3, Environments.

3 Small gaps may exist where metal-to-metal or metal-to-polymer subcomponents interface. These gaps contain either air or helium gases. The limited amount of oxygen in these locations will be depleted and oxidation will be arrested. Therefore, aging management of these interface locations is not required.

See Section 1.4 for abbreviations.

Table 3.3-1 Spent Fuel Assemblies

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Fuel Assembly Insert	None	N/A - Not within the scope of license renewal.			
Fuel Pellet	None	N/A - Not within the scope of license renewal.			
Fuel Rod Spring	None	N/A - Not within the scope of license renewal.			
Fuel Cladding	CC, HT, SS	Zirconium-Based Alloy	(E) Helium	None	N/A
			(I) Helium	None	N/A
Fuel Cladding End Plug (includes welds)	CC, HT, SS	Zirconium-Based Alloy	(E) Helium	None	N/A
Guide Tube	SS	Zirconium-Based Alloy	(E) Helium	None	N/A
			(I) Helium	None	N/A
		Stainless Steel	(E) Helium	None	N/A
Grid Assembly, Mid Fuel Assembly (includes welds)	CC, HT, SS	Zirconium-Based Alloy	(E) Helium	None	N/A
		Nickel-Based Alloy	(E) Helium	None	N/A
Grid Assembly, Protective (P-Grid)	None	N/A - Not within the scope of license renewal.			
Grid Assembly, Top & Bottom (includes welds)	CC, HT, SS	Nickel-Based Alloy	(E) Helium	None	N/A
Instrument Tube	None	N/A - Not within the scope of license renewal.			
Bottom Nozzle (includes welds)	SS	Stainless Steel	(E) Helium	None	N/A

See Section 1.4 for abbreviations.

Table 3.3-1 Spent Fuel Assemblies

Subcomponent	Intended Function	Material Group	Environment[1,2]	Aging Effects Requiring Management	Aging Management Activity
Top Nozzle (includes welds)	SS	Stainless Steel	(E) Helium	None	N/A
Nozzle Spring Set	None	N/A - Not within the scope of license renewal.			

1 Trace amounts of fission product gases may also be present in the helium environment because the potential for minor fuel cladding defects exists.

2 Temperature and radiation have been considered as described in Section 3.3.3, Environments.

See Section 1.4 for abbreviations.

APPENDIX A

AGING MANAGEMENT ACTIVITIES

Contents

APPENDIX A: AGING MANAGEMENT ACTIVITIES

A1.0 INTRODUCTION

Appendix A summarizes the activities that manage the effects of aging for ISFSI subcomponents that have been identified in the License Renewal Application (LRA) as being subject to aging management review. One Aging Management Activity (AMA) has been identified for the Surry ISFSI casks. Appendix Section A2.0 provides a description of this AMA which includes an introduction to the AMA, an evaluation of the AMA in terms of the aging management program attributes provided in the preliminary guidance for renewal of site-specific Part 72 licenses, and a summary paragraph.

The Aging Management Reviews (AMRs) in Section 3.0 of the LRA provide tables that summarize the results of the AMRs. These tables identify the AMA credited for managing the aging effects for each subcomponent listed in the AMR. The identified AMA manages the aging effects applicable to the subcomponent, and provides reasonable assurance that the integrity of the subcomponent will be maintained during the renewal period.

A2.0 AGING MANAGEMENT ACTIVITIES

A2.1 Dry Storage Cask Inspection Activities

The Surry Independent Spent Fuel Storage Installation (ISFSI) is a facility to place and store spent fuel in licensed containers (dry storage casks) until such time that the fuel may be shipped off-site for final disposition. There are currently 5 types of dry storage casks, supplied by 4 vendors, in use at the Surry ISFSI. The dry storage casks at the Surry ISFSI are designed for outdoor storage. Accordingly, the exterior materials and coatings are capable of withstanding the anticipated effects of "weathering" under normal conditions.

The dry storage casks in use at the Surry ISFSI include:

- General Nuclear Services CASTOR V/21, (21 fuel assembly capacity)
- General Nuclear Services CASTOR X/33, (33 fuel assembly capacity)
- Westinghouse MC-10, (24 fuel assembly capacity)
- Nuclear Assurance Corporation I-28, (28 fuel assembly capacity)
- Transnuclear TN-32, (32 fuel assembly capacity)

The purpose of the Dry Storage Cask Inspection Activities is to:

1. Determine that no significant deterioration of the exterior of the dry storage casks which are inservice has occurred, and

2. Determine that no significant degradation of the dry storage cask seals has occurred.

An evaluation of the activities for Dry Storage Cask Inspection Activities in terms of the aging management program attributes provided in the preliminary guidance for renewal of site-specific Part 72 licenses (Reference 1) is as follows:

Scope

The scope of the Dry Storage Cask Inspection Activities involves 1) the continuous pressure monitoring of the inservice dry storage casks, 2) the quarterly visual inspection of all types of licensed dry storage casks that are inservice at the Surry ISFSI, 3) a visual inspection of the MC-10 dry storage cask seal cover area which is to be performed prior to the end of the original operating license period, and 4) the visual inspection of the normally inaccessible areas of casks in the event they are lifted in preparation for movement or an environmental cover is removed for maintenance.

Preventive Actions

The Dry Storage Cask Inspection Activities is designated a condition monitoring activity. No preventive actions are performed.

Parameters Monitored or Inspected

The pressure of the cover gas is monitored (at various locations, depending on the cask type) to verify the integrity of the seals in the dry storage cask closure covers. Seal degradation due to loss of material (corrosion) would be detected.

The condition of the exterior of each dry storage cask is inspected visually to ensure that the intended function of the casks exterior subcomponents is not compromised. Visual inspections will look for signs of deterioration (corrosion) of the dry storage cask surface. Additionally, the inspections will identify any debris accumulating on the dry storage cask surfaces. Debris can create the potential for localized conditions to support the corrosion process. Additionally, the normally inaccessible areas of the casks will be visually inspected if they are lifted in preparation for movement or if an environmental cover is removed for maintenance. The aging effect that is monitored by these inspections is loss of material.

An inspection to assess the condition of the MC-10 dry storage cask seal cover area will be performed prior to the end of the current ISFSI license period. This will be a visual inspection to ensure that water intrusion is not occurring. This visual inspection will look for signs of deterioration (corrosion) in the area of the seal cover.

Detection of Aging Effects

Visual inspections identify degradation of the physical condition of the exterior surfaces of all of the dry storage casks. These inspections check for loss of material of the dry storage casks.

Pressure monitoring of the dry storage casks provides a means to detect seal degradation. Seal degradation could occur as a result of loss of material (corrosion) of metallic O-ring seals. Loss of material may result from moisture in the seal area for seals that have exposure to an atmosphere/weather environment.

A visual inspection of the seal cover area of the MC-10 dry storage cask will identify degradation of the material resulting from water intrusion. Inspections provide reasonable assurance that any degradation of the dry storage casks is identified.

Monitoring and Trending

Periodic visual inspections determine the existence of loss of material in the dry storage cask exterior regions. The inspection frequency is quarterly. All observations regarding the material condition of the dry storage casks are recorded in inspection procedures. Engineering evaluations assess whether the extent of any observed corrosion could cause a loss of intended function. Pressure monitoring of each dry storage cask is a continuous process.

Visual inspections of normally inaccessible areas on the casks are on an opportunity only basis and will be evaluated on a case-by-case basis and not trended.

Acceptance Criteria

The acceptance criterion for all visual inspections is the absence of anomalous indications that are signs of degradation. Engineering evaluations determine whether observed deterioration of material condition is significant enough to compromise the ability of the dry storage cask to perform its intended function. Occurrence of degradation that is adverse to quality will be entered into the Corrective Action System.

The acceptance criterion for pressure monitoring is the absence of an alarmed condition. Alarm panel response procedures identify the various criteria for the different types of dry storage casks in use at the Surry ISFSI, and specify any required corrective actions and responses.

Corrective Actions

Corrective actions for conditions that are adverse to quality are performed in accordance with the requirements of the Quality Assurance Program. Any resultant maintenance or repair activities or special handling requirements are performed in accordance with approved procedures. Corrective actions provide reasonable assurance that deficiencies adverse to quality are either promptly corrected or are evaluated to be acceptable. Where evaluations are performed without repair or replacement, engineering analysis reasonably assures that the intended function is maintained consistent with the current licensing basis. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined, and an action plan is developed to preclude a repeat occurrence. Corrective actions identify recurring discrepancies and initiate additional corrective action to preclude recurrence.

Confirmation Process

Evaluation of post-maintenance conditions, that occur as a result of required repairs or replacements, provides reasonable assurance that the corrective actions have been satisfactorily implemented. The quarterly inspections of the dry storage casks provide confirmation that corrective actions have been completed and are effective.

Administrative Controls

Administrative and implementation procedures are reviewed, approved, and maintained as controlled documents in accordance with the procedure control process and the Quality Assurance Program.

Operating Experience

The Surry ISFSI has been in operation since the mid-1980s. The required quarterly inspections of the dry storage casks have identified minor cases of corrosion or coating degradation (a precursor to corrosion). During 2000 and the first half of 2001, approximately 40 dry storage casks were visually inspected 6 times. This corresponds to approximately 240 individual dry storage cask inspections. A total of 5 work activities were initiated to repair coating on 4 dry storage casks. When degradation has been discovered, the condition has been repaired.

There have been six instances of seal replacement since the placement of the first dry storage cask at the Surry ISFSI. One occurred on a CASTOR X/33 dry storage cask secondary lid. The other five occurred on lid seals for the TN-32 dry storage cask (single lid design). An evaluation of the TN-32 lid seal failures identified a design problem involving moisture intrusion into the environmental cover. This problem has been resolved.

The EPRI Dry Cask Storage Characterization Project, Interim Progress Report, (Reference 2) documented the occurrence of corrosion on one of the bolts holding the rear breech plate in place on the CASTOR V/21 cask. It was concluded that the entrapment of water between the cask bottom and the concrete pad provided the necessary conditions for pitting corrosion of the stainless steel fasteners. Similar conditions exist at the Surry ISFSI, therefore, this potential aging mechanism requires management.

Summary

Operating experience indicates that while degradation of the dry storage cask exterior surfaces has occurred, there have been no cases of loss of intended function due to cask exterior problems. Instances of seal degradation have been promptly identified and corrected. Corrective actions have been effectively implemented when monitoring and inspection results have indicated degradation. On the basis of this on-going surveillance, the infrequency of observed instances of degradation, and corrective actions implemented, the effects of aging on the dry storage casks is not significant.

The effects of aging associated with subcomponents within the scope of the Dry Storage Cask Inspection Activities will be adequately managed so that there is reasonable assurance that their intended functions will be performed consistently with the current licensing basis during the renewal period.

Appendix A References (Aging Management Activities)

1. Letter Serial No. 01-367, *Surry Independent Spent Fuel Storage Installation, Comments on NRC Preliminary Guidance,* L. N. Hartz to NRC Document Control Desk, June 26, 2001

2. EPRI Report No. 1003010, Dry Cask Storage Characterization Project, Interim Progress Report, October 2001.

APPENDIX B

TIME-LIMITED AGING ANALYSES (TLAAs)

Contents

APPENDIX B: TIME-LIMITED AGING ANALYSES (TLAAs)

B1.0 INTRODUCTION

Dominion's ISFSI license renewal methodology is documented by means of comments on the Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs) (Reference 1) that were provided to the NRC on June 26, 2001 (Reference 2).

The identifications and evaluations of time-limited aging analyses included in this appendix are in accordance with the comments provided on the Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs) (Reference 2).

B2.0 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

TLAAs are defined in the comments on the Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSIs) as those licensee calculations and analyses that meet all of the following criteria:

1. Involve systems, structures, and components within the scope of license renewal.
2. Consider the effects of aging.
3. Involve time-limited assumptions defined by the current licensing term (e.g., 20 years).

   The defined licensing 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.
4. Must be pertinent to a specific safety determination that exists in the CLB.

   Such analyses would have initially provided the basis for the applicant's initial safety determination, and without the analyses, the applicant may have reached a different safety conclusion.
5. 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 functions of the SSCs are not considered TLAAs, and
6. Must already be contained or incorporated by reference in the current licensing basis (CLB) for the ISFSI.

   Facility-specific documentation contained or incorporated by reference in the CLB includes SARs, SERs, Technical Specifications, fire protection plan/hazards analyses, correspondence to and from the NRC, QA plan, and topical reports included as references in the SAR. Calculations and analyses that are not in the CLB or not incorporated by reference are not TLAAs.

B2.1 Identification Process and Results of the Time-Limited Aging Analysis

B2.1.1 Casks

The following casks are identified in Section 2.3, Scoping Results, as being in the scope of license renewal:

- General Nuclear Services CASTOR V/21
- General Nuclear Services CASTOR X/33
- Westinghouse MC-10
- Transnuclear TN-32
- Nuclear Assurance Corporation I-28

The TLAA identification process for these casks required a review of the design basis documents to provide reasonable assurance that TLAAs will be identified. Calculations that meet the six criteria given in the definition of TLAAs have been identified by searching the CLB, which includes ISFSI cask Topical Safety Analysis Reports (TSARs), engineering calculations and/or other design basis documents. Additional details of the identification process are given in Section B2.1.3 through Section B2.1.7. Identified TLAAs are also listed in these sections. As indicated in the comments provided on the Preliminary Guidance for License Renewal for Site-Specific Independent Spent Fuel Storage Installations (ISFSI) (Reference 2), once a TLAA is identified, an evaluation is performed to disposition each ISFSI-specific TLAA using one of three different approaches described below:

i. The analyses will remain valid for the license renewal period.

ii. The analyses have been projected to the end of the license renewal period.

iii. The effects of aging on the intended function(s) will be adequately managed for the license renewal period.

Evaluations and the discussion of the identified TLAAs are provided in Section B2.2.

B2.1.2 Spent Fuel Assemblies

As identified in the EPRI Report, Creep Modeling and Analysis Methodology for Spent Fuel in Dry Storage Report (Reference 3), the potential damage mechanisms for spent fuel in dry storage include stress corrosion cracking (SCC), delayed hydride cracking (DHC) and creep. Earlier studies identified in the EPRI Report have shown that the spent fuel rod's internal chemical environment and its thermal and mechanical histories are not sufficient to promote the SCC and DHC mechanisms during the fuel assembly dry storage. Therefore, creep is the only mechanism that needs to be addressed.

The driving forces for creep in the fuel rods are high temperature and high stresses that are created due to internal pressure. Fuel rod creep is self-limiting because the driving forces decrease with time. The fuel decay heat power decreases with time, and the rod's internal pressure decreases both by decreasing temperature and by slight increases in the gas volume caused by creep itself. The most severe conditions with regard to temperature will occur during the initial licensing period (i.e., the first 20 years), and any further creep after this period is judged to be negligible.

Twenty-one Westinghouse 15 x 15 PWR spent fuel assemblies - contained in a CASTOR V/21 stored at Dominion's Surry Power Station - were examined and tested for integrity after a 14-year storage duration. The results of the testing are documented in Reference 4. Based on the report (Reference 4), the maximum creep was estimated to be between 0.3 and 0.5% after 14 years of storage. This estimate of creep does not account for oxide growth, which may lower these estimates by as much as 0.3%. Note that the fuel assemblies stored in the CASTOR V/21 at Idaho National Engineering and Environmental Laboratory (INEEL) had higher heat load than those stored in CASTOR V/21 casks at Surry. Also, it is expected that a majority of fuel rod creep would be completed at the end of the 14-year storage period experienced at INEEL.

As explained above, the driving forces - temperature and internal pressure - for creep will decrease with additional storage time, and the additional creep will be negligible, if any. The amount of creep measured on fuel rods stored in a CASTOR V/21 at INEEL is very small. Therefore, it is concluded that the total creep for sixty years of storage is representative of, if not bounded by, that measured at INEEL.

No TLAAs were identified during the review.

B2.1.3 Identification Process for General Nuclear Services CASTOR V/21

Gesellschaft fur Nuklear-Behälter mbH (GNB) is the design authority for the CASTOR V/21 casks, and these casks are manufactured to the GNB design specification. GNB reviewed the following design basis document for the purpose of identifying TLAAs:

- TSAR for CASTOR V/21 (Reference 8)

The only TLAA identified for the CASTOR V/21 casks was a fatigue analysis for the cask wall. A summary of the evaluation and a discussion of the identified TLAA are provided in Section B2.2.1.

B2.1.4 Identification Process for General Nuclear Services CASTOR X/33

GNB is also the design authority for the CASTOR X/33 casks, and these casks are manufactured to the GNB design specification. GNB reviewed the following design basis documents for the purpose of identifying TLAAs:

- TSAR for CASTOR X/33 (Reference 9)

The TLAAs identified for the CASTOR X/33 casks were a fatigue analysis of the cask wall and a fatigue analysis of the secondary lid bolts. Evaluations and the discussion of the identified TLAAs are provided in Section B2.2.2.

B2.1.5 Identification Process for Westinghouse MC-10

Westinghouse is the design authority for the MC-10 cask, and these casks are manufactured to the Westinghouse design specification. Westinghouse reviewed the following design basis documents for the purpose of identifying TLAAs:

- Westinghouse MC-10 Certificate of Compliance (Reference 5)
- MC-10 Safety Evaluation Report (Reference 6)
- MC-10 Topical Safety Analysis Report (TSAR) (Reference 7)

In addition, Westinghouse has reviewed these more recent analyses:

- Evaluation of the Effects of 1490 lb. Fuel Assemblies on the Structural Margins Given in the TSAR for the MC-10.
- Evaluation of the Effect of 1490 lb Fuel Assemblies on the Structural Margins Given in the MC-10 TSAR, Based on Design Temperatures.
- Estimate of the Amount of Hydrogen that Could Be Generated in an MC-10 Cask in the Event of a Fire.

The following three TLAAs have been identified in the review of the MC-10 cask:

- Neutron Irradiation Influence Analysis on the Nil Ductility Temperature (NDT) of the Cask Body
- Thermal Fatigue Analyses
- Analysis for the affect on Criticality due to Depletion of the Boron-10 in the Boral™ Plates due to Spontaneous Fission.

Evaluations and the discussion of these identified TLAAs are provided in Section B2.2.3.

B2.1.6 Identification Process for Transnuclear the TN-32

Transnuclear is the design authority for TN-32 casks, and these casks are manufactured to the Transnuclear design specification. Transnuclear reviewed the following design basis documents for the purpose of identifying TLAAs:

- Calculations/evaluations

The review to identify TLAAs was performed in two steps. In the first step, a screening review was performed to identify the calculations and evaluations having a time-limiting parameter that was either explicitly included or implied. In the second step, the calculations and evaluations identified in the screening review have been further evaluated to identify the limiting conditions and if any of the calculations met all six criteria of TLAAs. No TLAAs were identified during the review.

B2.1.7 Identification Process for Nuclear Assurance Corporation I-28

The Nuclear Assurance Corporation (NAC) is the design authority for the NAC I-28 casks, and these casks are manufactured to the NAC design specification. NAC reviewed the following design basis documents for the purpose of identifying TLAAs:

- The calculations and analyses relied on in the licensing basis of the NAC I-28 casks.
- The work requests and work request reports that formed the licensing bases for the NAC I-28 casks.

These documents were reviewed for conditions, parameters, criteria, and assumptions that were either time dependant or which included a reference to a time frame. No TLAAs were identified during the review.

B2.2 Evaluations and Discussion of the Identified TLAAs

Evaluations of the TLAAs identified in Section B2.1 have been performed to demonstrate that each identified ISFSI-specific TLAA is dispositioned using one of three different approaches described below:

i. The analyses will remain valid for the license renewal period.

ii. The analyses have been projected to the end of the license renewal period.

iii. The effects of aging on the intended function(s) will be adequately managed for the license renewal period.

B2.2.1 General Nuclear Services CASTOR V/21 Casks

The only TLAA identified for the CASTOR V/21 casks is a cask wall fatigue analysis due to daily temperature cycles. The original fatigue analysis was performed for cask wall for a 30-year period consisting of 900 cycles of temperature range of 0°F to 70°F, 150 cycles of temperature range of 0°F to 70°F with rain and/or snow, and 9900 cycles of temperature range of 50°F to 90°F.

The maximum Cumulative Usage Factor (CUF) for fatigue was calculated to be 0.111 for 30 years. The total period for the renewed license will be the original 20 year license period plus the renewal period of 40 years. Therefore, extrapolating linearly, CUF for sixty (60) years can be conservatively estimated to be 0.222. This value of 0.222 is less than the allowable value of 1.0. The CUF has been re-analyzed and projected to be valid for the license renewal period, in accordance with approach (ii) defined in Section B2.1.

B2.2.2 General Nuclear Services CASTOR X/33 Casks

The TLAAs identified for the CASTOR X/33 casks were a fatigue analysis of the cask wall and a fatigue analysis of the secondary lid bolts.

The original cask wall fatigue analysis was performed for 900 cycles of a temperature range of 0°F to 70°F, 150 cycles of a temperature range of 0°F to 70°F with rain and/or snow, and 9900 cycles of a temperature range of 50°F to 90°F for a 30-year period. The maximum CUF for fatigue was calculated to be 0.128 for 30 years. The total period for the renewed license will be the original 20 year license period plus the renewal period of 40 years. Therefore, extrapolating linearly, CUF for sixty (60) years can be conservatively estimated to be 0.256. This value of 0.256 is less than the allowable value of 1.0.

The original fatigue analysis was also performed for the secondary lid bolts for 100 cycles of a pressure range of 0 psi to 90 psi, and 10^6 cycles ±3g acceleration for the transport load. The maximum CUF for fatigue was calculated to be 0.14 for 30 years. The total period for the renewed license will be the original 20 year license period plus the renewal period of 40 years. Therefore, extrapolating linearly, CUF for sixty (60) years can be conservatively estimated to be 0.28 by extrapolating linearly. This value of 0.28 is less than the allowable value of 1.0.

The CUF has been re-analyzed and projected to be valid for the license renewal period, in accordance with the approach (ii) defined in Section B2.1.

B2.2.3 Westinghouse MC-10 Casks

The following three TLAAs have been identified in the review of the MC-10 casks:

- Neutron Irradiation Influence on the Nil Ductility Temperature (NDT) of the Cask Body
- Thermal Fatigue Analyses
- Affect on Criticality due to Depletion of the Boron-10 in the Boral^{TM} Plates due to Spontaneous Fission

Neutron Irradiation Influence on the Nil Ductility Transition (NDT) Temperature of the Cask Body

One of the TLAAs that needs to be evaluated is the influence of neutron irradiation over sixty years on the nil ductility transition (NDT) temperature of the MC-10 cask body.

The MC-10 SAR states, "A 40 year neutron fluence ... at the vessel wall is not expected to shift the NDT temperature." Since this statement implies that there is a TLAA related to

NDT temperature, a calculation has been performed to show that the expected shift in the NDT temperature due to 60-year neutron fluence would be acceptable. Based on testing, no shift is expected in NDT temperature below the irradiation value of 10^{17} Neutrons /cm^2. Since the neutron fluence for sixty years is calculated to be 2.2 x 10^{14} Neutrons/cm^2, it is concluded that there will be no shift in NDT temperature. The neutron irradiation influence on the NDT temperature of the cask body has been re-analyzed and projected to be valid for the license renewal period, in accordance with approach (ii) defined in Section B2.1.

Thermal Fatigue Analyses

Cumulative Usage Factor (CUF) for thermal fatigue for several components were identified as TLAAs and are listed in the following table:

Cumulative Usage Factors (CUF) For Thermal Fatigue

Components	CUF for 40 years	CUF for 60 years
Cask Body (Vessel Wall)	0.0146	0.0219
Cask Bottom (Lower Head)	0.0146	0.0219
Shield Cover	0.0146	0.0219
Primary Cover	0.0146	0.0219
Seal Cover	0.0146	0.0219
Shield Cover Studs	0.0146	0.0219
Primary Cover: Cap Screw threads and shank-to-head shoulder	0.82	Recalculated to be 0.43 for cap screw threads and 0.022 for shank-to-head shoulder.
Closure Cover Studs (Seal Cover Studs)	0.0146	0.0219
Seal Cover Weld[1]	0.0146	0.0219

1. Seal Cover weld on MC-10 cask is optional. Seal cover on MC-10 cask at Surry is currently not welded.

Cumulative Usage Factor (CUF) for thermal fatigue of primary cover cap screws due to temperature variation was initially calculated to be 0.82 for 40 years. This was the only CUF, that would exceed the allowable value of 1.0 if linearly projected for 60 years. A single evaluation for cap screw threads and shank-to-head shoulder region for 40 years was, originally, performed conservatively by using the smaller diameter of the cap screw shank, and applying reduction factor for the threaded end to it. In the evaluation of the

Primary Cover Cap Screw for sixty years, separate CUFs for cap screw threads and the shank-to-head shoulder region were calculated. The calculations have been based on daily fluctuations with total cycles of 21,900 for 60 years. The CUF values are determined to be 0.43 for cap screw threads and 0.022 for shank-to-head shoulder region, which are within allowable value of 1.0.

The thermal fatigue of the above components has been re-analyzed and projected to be valid for the license renewal period in accordance with approach (ii) defined in Section B2.1.

Affect on Criticality due to Depletion of the Boron-10 in the Boral™ Plates due to Spontaneous Fission

When the cask cavity is dry or has borated water in it, the MC-10 meets the criticality criterion of $k_{eff} < 0.95$ without other neutron poisons present (i.e., the Boral™ that is a part of the cask design). These are the likely future scenarios for the cask, (i.e., continued dry storage followed by placement in the fuel pool for fuel transfer to a transportation cask). With pure water in the cask, the MC-10 meets the criticality criterion of $k_{eff} < 0.95$ with the Boral™ poison in the cask, but the analysis showed that the criterion may not be met if the Boral™ is not present. A small fraction of the original Boron-10 (neutron poison material) could be consumed over time by the $B^{10}(n,\alpha)Li^7$ reaction, resulting from spontaneous fission within the spent fuel. A calculation was performed to demonstrate that there is sufficient neutron poison material remaining over the additional 40-year life with the pure water present in the cask cavity and that the TSAR conclusions do not change for the license period of 60 years. The affect on criticality due to depletion of the Boron-10 in the Boral™ plates due to spontaneous fission has been re-analyzed and projected to be valid for the license renewal period, in accordance with approach (ii) defined in Section B2.1.

B2.2.4 Transnuclear TN-32 Casks

No TLAAs have been identified during the review.

B2.2.5 Nuclear Assurance Corporation I-28 Casks

No TLAAs have been identified during the review.

B2.3 Conclusions

The following TLAAs have been identified by reviewing necessary design basis documents and are projected to be valid for the license renewal period, in accordance with approach (ii) defined in Section B2.1.

- Fatigue Analysis for Cask Wall for CASTOR V/21 Casks.

- Fatigue Analysis of Cask Wall and secondary lid bolts for CASTOR X/33 Casks.
- Neutron Irradiation Influence on the Nil Ductility Transition (NDT) Temperature of the Cask Body for Westinghouse MC-10 Casks.
- Thermal Fatigue Analyses for Westinghouse MC-10 Casks
- Affect on Criticality due to Depletion of the Boron-10 in the Boral™ Plates due to Spontaneous Fission for Westinghouse MC-10 Casks.

Appendix B References (Time-Limited Aging Analyses)

1. *Preliminary NRC Staff Guidance for 10 CFR Part 72 License Renewal*, U.S. Nuclear Regulatory Commission, March 29, 2001, (Dominion Letter Serial No. 01-203).

2. Letter Serial No. 01-367, *Surry Independent Spent Fuel Storage Installation, Comments on NRC Preliminary Guidance,* L. N. Hartz to NRC Document Control Desk, June 26, 2001

3. EPRI Report No. 1003135, Creep Modeling and Analysis Methodology for Spent Fuel in Dry Storage, November 2001.

4. EPRI Report No. 1003010, Dry Cask Storage Characterization Project, Interim Progress Report, October 2001.

5. U.S. NRC Certificate Number 1001, Certificate of Compliance for Dry Spent Fuel Storage Casks (MC-10), August 17, 1990.

6. U.S. NRC Safety Evaluation Report (SER), Safety Evaluation Report Related to the Topical Safety Analysis Report for MC-10 Dry Spent Fuel Storage Cask Submitted by Westinghouse Electric Corp., September 1987.

7. Westinghouse TSAR, Topical Safety Analysis Report for the Westinghouse MC-10 Cask for an Independent Spent Fuel Installation (Dry Storage), November 1987.

8. GNSI report, Topical Safety Analysis Report for the CASTOR V/21 Cask Independent Spent Fuel Storage Installation (Dry Storage), Rev. 2A, General Nuclear systems, INC.

9. GNSI report, Topical Safety Analysis Report for the CASTOR X/33 Cask Independent Spent Fuel Storage Installation (Dry Storage), Rev. 4A, General Nuclear systems, INC.

APPENDIX C

ISFSI FINAL SAFETY ANALYSES REPORT (FSAR) SUPPLEMENT

Contents

APPENDIX C: FSAR SUPPLEMENT

C1.0 INTRODUCTION

This appendix provides a supplement to the Surry ISFSI Final Safety Analysis Report (FSAR). Section C2.0 of this appendix contains a proposed new section for the ISFSI FSAR to be added under Chapter 9, Conduct of Operations. The new section 9.7, Aging Management, provides a summarized description of the activities for managing the effects of aging. This proposed new FSAR section will also present the evaluations of time-limited aging analyses (TLAAs) for the renewal period.

Additionally, EPRI's Dry Cask Storage Characterization Project is performing additional evaluations and will issue a final report following completion of these evaluations. Dominion will follow the progress of this project and incorporate any applicable recommendations and/or results. Any revisions to aging management activities resulting from this project, will be incorporated into future FSAR updates per the requirements of 10 CFR 72.70.

C2.0 PROPOSED NEW SURRY ISFSI FSAR SECTION 9.7

C2.1 Aging Management

An assessment of the Surry ISFSI inspection activities identified new and existing activities necessary to provide reasonable assurance that ISFSI cask subcomponents within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the renewal period. This section describes these aging management activities.

This section also discusses the evaluation results for each of the cask-specific time-limited aging analyses (TLAAs) performed for license renewal. The evaluations have demonstrated that the analyses remain valid for the renewal period; the analyses have been projected to the end of the renewal period; or that the effects of aging on the intended function(s) will be adequately managed for the renewal period.

C2.1.1 Dry Storage Cask Inspection Activities

The Surry ISFSI is a facility to place and store spent fuel in licensed containers (dry storage casks) until such time that the fuel may be shipped off-site for final disposition. The dry storage casks at the Surry ISFSI are designed for outdoor storage. Accordingly, the exterior materials and coatings are capable of withstanding the anticipated effects of "weathering" under normal conditions.

The purpose of the Dry Storage Cask Inspection Activities is to:

1. Determine that no significant deterioration of the exterior of the dry storage casks which are inservice has occurred, and

2. Determine that no significant degradation of the dry storage cask seals has occurred.

The scope of the Dry Storage Cask Inspection Activities involves 1) the continuous pressure monitoring of the inservice dry storage casks, 2) the quarterly visual inspection of all types of licensed dry storage casks that are inservice at the Surry ISFSI, 3) a visual inspection of the MC-10 dry storage cask seal cover area which is to be performed prior to the end of the original operating license period, and 4) the visual inspection of normally inaccessible cask areas in the event a cask is lifted in preparation for movement or an environmental cover is removed for maintenance.

Visual inspections identify degradation of the physical condition of the exterior surfaces of the dry storage casks. These inspections check for loss of material (corrosion) of the dry storage casks. Pressure monitoring of the dry storage casks provides a means to detect seal degradation. Seal degradation could occur as a result of loss of material (corrosion) of the metallic O-ring seals as a result of exposure to moisture from water intrusion. A visual inspection of the seal cover area of the MC-10 dry storage cask will identify degradation of the material resulting from water intrusion. Inspections provide reasonable assurance that any degradation of the dry storage casks is identified.

The acceptance criterion for all visual inspections is the absence of anomalous indications that are signs of degradation. Engineering evaluations determine whether observed deterioration of material condition is significant enough to compromise the ability of the dry storage cask to perform its intended function. Occurrence of degradation that is adverse to quality will be entered into the Corrective Action System. The acceptance criterion for pressure monitoring is the absence of an alarmed condition. Alarm panel response procedures identify the various criteria for the different types of dry storage casks in use at the Surry ISFSI, and specify any required corrective actions and responses.

C2.1.2 Time-Limited Aging Analysis

As part of an application for a renewed ISFSI operating license, ISFSI-specific time-limited aging analyses (TLAAs) must be identified. The TLAA identification process required a review of the design basis documents to provide a reasonable assurance that TLAAs will be identified.

Once a TLAA is identified, an evaluation is performed to disposition each ISFSI-specific TLAA using one of three different approaches described below:

(i) The analyses will remain valid for the license renewal period.

(ii) The analyses have been projected to the end of the license renewal period.

(iii) The effects of aging on the intended function(s) will be adequately managed for the license renewal period.

The following TLAAs have been identified by reviewing the necessary design basis documents and are projected to be valid for the license renewal period, in accordance with approach (ii) defined above.

General Nuclear Services CASTOR V/21 Casks

- Fatigue Analysis for Cask Wall.

General Nuclear Services CASTOR X/33 Cask

- Fatigue Analysis for Cask Wall.
- Fatigue Analysis for Secondary Lid Bolts.

Westinghouse MC-10 Cask

- Neutron Irradiation Influence on the Nil Ductility Transition (NDT) Temperature of the Cask Body.
- Thermal Fatigue Analyses.
- Affect on Criticality due to Depletion of the Boron-10 in the Boral Plates due to Spontaneous Fission.

A summary of potential aging effects addressed by the listed TLAAs and their disposition basis is presented in the following sections. No TLAAs were identified for the Nuclear Assurance Corporation I-28 casks, the Transnuclear TN-32 casks, or spent fuel assemblies.

C 2.1.2.1 General Nuclear Services CASTOR V/21 Casks

The only TLAA identified for the CASTOR V/21 casks is a cask wall fatigue analysis due to daily temperature cycles. The original fatigue analysis was performed for the cask wall for a 30-year period consisting of 900 cycles of a temperature range of 0°F to 70°F, 150 cycles of a temperature range of 0°F to 70°F with rain and/or snow, and 9900 cycles of a temperature range of 50°F to 90°F.

The maximum Cumulative Usage Factor (CUF) for fatigue was calculated to be 0.111 for 30 years. The total period for the renewed license will be the original 20 year license period plus the renewal period of 40 years. Therefore, extrapolating linearly, the CUF for 60 years can be conservatively estimated to be 0.222. This value of 0.222 is less than the allowable value of 1.0. Therefore, the cask wall CUF has been projected to be valid for the license renewal period.

C 2.1.2.2 General Nuclear Services CASTOR X/33 Cask

The TLAAs identified for the CASTOR X/33 casks are fatigue analyses for 1) the cask wall due to daily temperature cycles and 2) pressure loading and transport loads for the secondary lid bolts.

Cask Walls

The original cask wall fatigue analysis was performed for 900 cycles of a temperature range of 0°F to 70°F, 150 cycles of a temperature range of 0°F to 70°F with rain and/or snow, and 9900 cycles of a temperature range of 50°F to 90°F for a 30-year period.

The maximum CUF for fatigue was calculated to be 0.128 for 30 years. The total period for the renewed license will be the original 20 year license period plus the renewal period of 40 years. Therefore, extrapolating linearly, the CUF for 60 years can be conservatively estimated to be 0.256. This value of 0.256 is less than the allowable value of 1.0. Therefore, the cask wall CUF has been projected to be valid for the license renewal period.

Secondary Lid Bolts

The original fatigue analysis for the secondary lid bolts was performed for 100 cycles of a pressure range of 0 psi to 90 psi, and 10^6 cycles ±3g acceleration for the transport load. The maximum CUF for fatigue was calculated to be 0.14 for 30 years. The total period for the renewed license will be the original 20 year license period plus the renewal period of 40 years. Therefore, extrapolating linearly, CUF for sixty (60) years can be conservatively estimated to be 0.28 by extrapolating linearly. This value of 0.28 is less than the allowable value of 1.0. Therefore, the CUF has been projected to be valid for the license renewal period.

C 2.1.2.3 Westinghouse MC-10 Cask

Thermal Fatigue

The CUF for thermal fatigue analyses for several components were identified as TLAAs. The original thermal fatigue calculations were performed for a 40 year license period. With the exception of the primary cover cap screws, the original values were extrapolated linearly to provide a conservative projection of the CUFs for 60 years. The following table list the components evaluated along with the original and projected/re-calculated CUF values:

Cumulative Usage Factors (CUF) For Thermal Fatigue

Components	CUF for 40 years	CUF for 60 years
Cask Body (Vessel)	0.0146	0.0219
Cask Bottom (Lower Head)	0.0146	0.0219
Shield Cover	0.0146	0.0219
Primary Cover	0.0146	0.0219
Seal Cover	0.0146	0.0219
Shield Cover Studs	0.0146	0.0219
Closure Cover Studs (Seal Cover Studs)	0.0146	0.0219
Primary Cover: Cap ScrewsThreads and shank-to-head shoulder region	0.82	Recalculated to be 0.43 for cap screw threads and 0.022 for shank-to-head shoulder region.

The CUF for thermal fatigue of the primary cover cap screws due to temperature variation was initially calculated to be 0.82 for 40 years. This was the only CUF that would exceed the allowable value of 1.0 if linearly projected for 60 years. A single evaluation for cap screw threads and shank-to-head shoulder region for 40 years was, originally, performed conservatively by using the smaller diameter of the cap screw shank, and applying reduction factor for the threaded end to it. In the evaluation of the Primary Cover Cap Screw for sixty years, separate CUFs for cap screw threads and the shank-to-head shoulder region were calculated. The calculations have been based on daily fluctuations with total cycles of 21,900 for 60 years. The CUF values are determined to be 0.43 for cap screw threads and 0.022 for shank-to-head shoulder region, which are within allowable value of 1.0.

Therefore, the thermal fatigue of the above components have been re-analyzed or projected to be valid for the license renewal period.

Shift of Nil Ductility Transition (NDT) Temperature

A TLAA was identified for the influence of neutron irradiation over sixty years on the nil ductility transition (NDT) temperature of the MC-10 cask body.

The MC-10 SAR states, "A 40 year neutron fluence ... at the vessel wall is not expected to shift the NDT temperature." Since this statement implies that there is a TLAA related to NDT temperature, a calculation has been performed to show that the expected shift in the NDT temperature due to 60-year neutron fluence would be acceptable. Based on testing, no shift is expected in NDT temperature below the irradiation value of 10^{17} Neutrons /cm^2. Since the neutron fluence for sixty years is calculated to be 2.2×10^{14} Neutrons/cm^2, it is concluded that there will be no shift in NDT temperature.

Therefore, the neutron irradiation influence on the NDT temperature of the cask body has been projected to be valid for the license renewal period.

Depletion of the Boron-10

When the cask cavity is dry or has borated water in it, the MC-10 meets the criticality criterion of $k_{eff} < 0.95$ without other neutron poisons present (i.e., the Boral™ that is a part of the cask design). These are the likely future scenarios for the cask, (i.e., continued dry storage followed by placement in the fuel pool for fuel transfer to a transportation cask). With pure water in the cask, the MC-10 still meets the criticality criterion of $k_{eff} < 0.95$ with the Boral poison in the cask. However, analysis has shown that the criterion may not be met if the Boral is not present. Some of the Boron-10 (neutron poison material) could be consumed over time by the $B^{10}(n,\alpha)Li^7$ reaction, resulting from spontaneous fission within the spent fuel. Depletion is expected to only reduce the Boron-10 content by a small fraction of the original amount. A calculation was performed to demonstrate that there is sufficient neutron poison material remaining over the additional 40 year license renewal period with the pure water present in the cask cavity and that the TSAR conclusions do not change for tthe total license period of 60 years.

Therefore, the affect on criticality due to depletion of the Boron-10 in the Boral plates due to spontaneous fission has been re-analyzed and projected to be valid for the license renewal period.

C 2.1.2.4 Nuclear Assurance Corporation I-28 Casks

No TLAAs have been identified for this cask.

C 2.1.2.5 Transnuclear TN-32 Casks

No TLAAs have been identified for this cask.

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

Contents

APPENDIX D: TECHNICAL SPECIFICATION CHANGES

Section 72.42 of 10 CFR Part 72 lists the requirements that a licensee must meet for renewal of an independent spent fuel storage installation (ISFSI) license. The preliminary guidance for license renewal for site-specific ISFSIs, requires that an application for license renewal include any Technical Specification changes, or additions that are necessary to manage the effects of aging during the renewal period. A review of the information provided in this License Renewal Application and the Surry ISFSI Technical Specifications confirms that no changes to the ISFSI Technical Specifications are necessary.

Application for Renewed ISFSI Site-Specific License

Appendix E

Supplement to the Applicant's Environmental Report

Surry Independent Spent Fuel Storage Installation

Virginia Electric and Power Company

License Number SNM - 2501

Dominion

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ACRONYMS AND ABBREVIATIONS

ALARA	as low as reasonably achievable
CFR	Code of Federal Regulations
DOE	U.S. Department of Energy
EA	Environmental Assessment
EIS	Environmental Impact Statement
FSAR	Final Safety Analysis Report
FWS	U.S. Fish and Wildlife Service
GEIS	Generic Environmental Impact Statement
ISFSI	Independent Spent Fuel Storage Installation
kV	kilovolt
LLWSF	low-level waste storage facility
MteU	metric tons equivalent Uranium
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NRC	U.S. Nuclear Regulatory Commission
SHPO	State Historic Preservation Officer
SPS	Surry Power Station
SSSC	sealed surface storage cask
TMI	Three Mile Island
TIGER	Technology Integrated Geographic Encoding and Referencing

1.0 INTRODUCTION

1.1 Purpose and Need for the Proposed Action

The U.S. Nuclear Regulatory Commission (NRC) licenses the operation of independent spent fuel storage installations (ISFSIs) for storing power reactor spent fuel and associated radioactive materials in accordance with the Atomic Energy Act of 1954 (42 USC 2011, et seq.) and NRC implementing regulations. Dominion Generation (Dominion) operates the Surry ISFSI pursuant to NRC license SNM-2501 (Ref. 1.1-1). This license will expire July 31, 2006. Dominion has prepared this supplemental environmental report in conjunction with its application to NRC to renew the license, as provided by the following NRC regulations:

- Title 10, Energy, Code of Federal Regulations (10 CFR), Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste, Sections 72.42, Duration of License; Renewal, and 72.34, Environmental Report, and
- 10 CFR 51, Environmental Protection Requirements for Domestic Licensing and Regulatory Functions, Section 51.60, Environmental Report - Materials License

The purpose and need for the proposed action, renewal of the Surry ISFSI license, is to provide an option that allows for interim spent fuel storage and, indirectly, power generation capability, beyond the term of the current ISFSI license to meet future system generating needs, as such needs may be determined by Dominion decision makers. The storage is interim pending the availability of a federal repository for permanent disposal.

The renewed ISFSI license would permit 40 additional years of storage beyond the currently licensed period. The additional time would give Dominion approximately 13 years beyond the current station operating licenses' terms to arrange for shipment to the federal repository[1].

1. Assumes NRC renewal of the station operating licenses, the subject of NRC review of a May 29, 2001, application.

1.2 Environmental Background

NRC has extensive experience evaluating environmental impacts from ISFSIs. This experience includes the following:

- Preparing an environmental impact statement in conjunction with establishing its ISFSI regulation (10 CFR 72) and two environmental assessments for substantive revisions to the regulation
- Preparing an environmental impact statement for an ISFSI at the Idaho National Engineering and Environmental Laboratory for Three Mile Island Unit 2 spent fuel
- Preparing a generic environmental impact statement for station license renewal
- Preparing environmental assessments for site-specific ISFSI licenses at nine nuclear power plants (Surry, Robinson, Oconee, Fort St. Vrain, Calvert Cliffs, Prairie Island, Rancho Seco, Trojan, and North Anna)
- Approving ISFSI operation under its general license provisions at six plants (Palisades, Point Beach, Davis-Besse, Arkansas Nuclear One, Susquehanna, Hatch, McGuire, Dresden, and Peach Bottom)
- Preparing an environmental impact statement for a private, commercial ISFSI (Skull Valley)
- Issuing and twice updating its waste confidence decision (codified at 10 CFR 23) that considers, among other things, operation of spent fuel storage for 30 years beyond the term of a renewed reactor operating license

Table 1-1 identifies each evaluation (Refs. 1.2-1 to 1.2-18) and summarizes their conclusions. In the 22 years represented by these evaluations, NRC has not identified any significant environmental impact associated with ISFSI operation.

The U.S. Department of Energy (DOE) has also analyzed ISFSI environmental impacts. As part of its evaluation of the impact of constructing a national repository for spent nuclear fuel, DOE analyzed environmental impacts from a no-action alternative that included leaving spent nuclear fuel in power plant ISFSIs (Ref. 1.2-19). The analysis accounted for the fuel at all operating nuclear power plants, including Surry Power Station. DOE concluded that environmental impacts would be small for at least 100 years and, with appropriate institutional controls, could continue to be small for thousands of years.

Table 1-1
NRC Environmental Reviews of Spent Fuel Storage in ISFSI[a]

Date	Subject	Conclusion
1979	Establishment of regulation 10 CFR 72 authorizing spent fuel storage at an ISFSI (Ref. 1.2-1)	Regulations in place will assure protection of the environment
1984	Final Waste Confidence Decision (Ref. 1.2-2)	Spent fuel generated in any reactor can be stored without significant impacts for at least 30 years beyond expiration of that reactor's operating license at that reactor's spent fuel storage basin or at an onsite or offsite ISFSI
1984	Revision of regulation 10 CFR 72 to authorize offsite ISFSI (monitored retrievable storage) (Ref. 1.2-3)	Environmental consequences of long-term storage not significant
1985	Surry ISFSI EA (Ref. 1.2-4)	No significant environmental impact; see also Refs. 1.2-20 and 1.2-21
1986	Robinson ISFSI EA (Ref. 1.2-5)	No significant environmental impact
1988	Revision of regulation 10 CFR 72 to authorize ISFSI general license (Ref. 1.2-6)	No significant environmental impact
1988	Oconee ISFSI EA (Ref. 1.2-7)	No significant environmental impact
1990	Review and Final Revision of Waste Confidence Decision (Ref. 1.2-8)	Spent fuel generated in any reactor can be stored without significant impacts for at least 30 years beyond the licensed life for operation (which may include the term of a revised or renewed license) of that reactor at its spent fuel storage basin or at an onsite or offsite ISFSI
1991	Fort St. Vrain ISFSI EA (Ref. 1.2-9)	No significant environmental impact
1991	Calvert Cliffs ISFSI EA (Ref. 1.2-10)	No significant environmental impact
Undated	Prairie Island ISFSI EA (Ref. 1.2-11)	No significant environmental impact
1994	Rancho Seco ISFSI EA (Ref. 1.2-12)	No significant environmental impact
1996	Trojan ISFSI EA (Ref. 1.2-13)	No significant environmental impact
1996	Nuclear plant license renewal (Ref. 1.2-14)	No significant environmental impact from spent fuel storage
1997	North Anna ISFSI EA (Ref. 1.2-15)	No significant environmental impact
1998	TMI 2 ISFSI at Idaho National Engineering and Environmental Laboratory EIS (Ref. 1.2-16)	Small and acceptable effects on the environment
1999	Waste Confidence Decision Review; Status (Ref. 1.2-17)	No significant and unexpected events have occurred that would cast doubt on NRC's waste confidence findings
2001	Skull Valley ISFSI EIS (Ref. 1.2-18)	Environmental impacts from operation small

a. In addition to the site-specific reviews listed, NRC prepares an environmental assessment for each dry storage cask listed in 10 CFR 72.214. Currently, 14 casks are listed.

EA = Environmental Assessment
EIS = Environmental Impact Statement
ISFSI = Independent Spent Fuel Storage Installation
Ref. = Reference
TMI = Three-Mile Island

1.3 Environmental Report Scope and Methodology

NRC regulation 10 CFR 72.42 provides for ISFSI license renewal and regulation 72.34 requires an application to include an environmental report that meets the requirements of 10 CFR 51 Subpart A. In Subpart A, 10 CFR 51.60 requires that the environmental report be a separate document entitled "Supplement to Applicant's Environmental Report" and specifies environmental report contents. The regulation focuses on presenting any significant environmental change from the previously submitted environmental report. Dominion has prepared Table 1-2 to verify conformance with the regulatory requirements. For each requirement of 10 CFR 51.60, including 10 CFR 51.45 as adopted by reference, Table 1-2 indicates which environmental report section provides responsive information.

Table 1-2
Sections of this Environmental Report that Respond to License Renewal Environmental Regulatory Requirements at 10 CFR 51

Regulatory Requirement	Responsive Environmental Report Sections(s)	
10 CFR 51.60(a)		Entire Document
10 CFR 51.45(a) description of proposed action	3.0	Proposed Action
10 CFR 51.45(a) statement of purposes	1.1	Purpose and Need for Action
10 CFR 51.45(a) affected environment	2.0	Site and Environmental Interfaces
10 CFR 51.45(b)(1)	4.0	Environmental Consequences and Mitigating Actions
10 CFR 51.45(b)(2)	4.0	Environmental Consequences and Mitigating Actions
	6.3	Unavoidable Adverse Impacts
10 CFR 51.45(b)(3)	7.0	Alternatives
	8.0	Comparison of Environmental Impacts of License Renewal with the Alternatives
10 CFR 51.45(b)(4)	6.5	Short-Term Use Versus Long-Term Productivity of the Environment
10 CFR 51.45(b)(5)	6.4	Irreversible and Irretrievable Resource Commitments
10 CFR 51.45(c) alternatives for reducing or avoiding effects	4.0	Environmental Consequences and Mitigating Actions
	6.2	Mitigation
10 CFR 51.45(b) benefit/cost analysis	4.5	Benefit - Cost Analysis
10 CFR 51.45(d)	9.0	Status of Compliance
10 CFR 51.53(c)(3)(iv)	5.0	Assessment of New and Significant Information

CFR = Code of Federal Regulations

In determining the appropriate scope for the ISFSI license renewal environmental report, Dominion had to determine an appropriate license renewal term. The ISFSI license authorizes Dominion to store spent fuel assemblies from the Surry Power Station Units 1 and 2. The current station operating licenses expire in 2012 and 2013, respectively, and NRC is currently reviewing a Dominion application to renew the station licenses to 2032 and 2033, respectively. Figure 1-1 illustrates the relationship between the key station and ISFSI license dates.

Figure 1-1
License Renewal Dates

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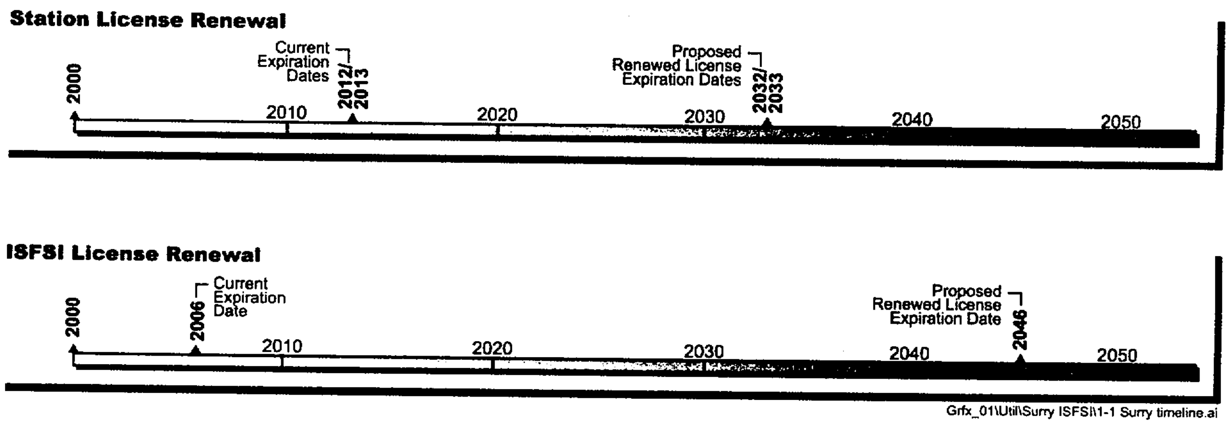
License Renewal Dates.



Dominion and NRC intend for storage at the ISFSI to be interim pending availability of a federal repository. However, there is uncertainty regarding when a repository will be available and the schedule under which it will accept spent fuel shipments. The repository schedule drives the ISFSI schedule; the longer it takes for the repository to begin accepting spent fuel shipments, the longer the ISFSI must store spent fuel. The earliest that DOE anticipates accepting shipments at the Yucca Mountain repository is the year 2010 (Ref. 1.2-22). Dominion believes it is prudent to plan for the possibility that shipments to a federal repository will be delayed until later in the first quarter of the 21st century, consistent with the NRC's finding in its Waste Confidence Rule. Therefore, to be conservative Dominion has assumed that shipments will begin in 2026. Based on the inventory that the ISFSI will have at that time and the time that Dominion will need to eliminate ISFSI inventory once the station stops generating (currently proposed for 2033), Dominion proposes the year 2046 as the end of the period of extended ISFSI operation. This environmental report analyzes renewal of the ISFSI license assuming that shipments will be according to plans and consistent with the NRC's Waste Confidence Rule.

As mentioned previously, NRC has prepared a generic environmental impact statement (GEIS) for station license renewal (Ref. 1.2-14). While the GEIS considers spent fuel storage during the license renewal of an ISFSI license as being an inherent part of reactor license renewal. The GEIS describes spent fuel generation and storage during current station license terms and during station license renewal terms. This discussion includes the Surry ISFSI (Ref. 1.2-14, Section 6.4.6). The GEIS generically discusses land use and terrestrial resources; water use and aquatic resources; radiological impacts of normal operations, off-normal events and accidents; off-site dose; occupational dose; other effects, and resources committed.

ISFSIs located at nuclear plant sites, such as Surry, share many attributes such as affected environment, monitoring and reporting programs, and staffing with the power plant. The Dominion application to renew the Surry Power Station licenses includes an environmental report (Ref. 1.2-23). Because the GEIS addresses ISFSI operations during a station license renewal term, and because Dominion recently prepared an environmental report for station license renewal, Dominion has adopted by reference [per 10 CFR 51.53(a) and 51.60] in the ISFSI license renewal environmental report some material from the GEIS and the station license renewal environmental report.

The ISFSI license renewal environmental report comprises nine chapters. This chapter describes the purpose and need for the proposed action, renewal of the ISFSI operating license. Chapter 2.0 describes the environs affected by ISFSI operations and Chapter 3.0 describes pertinent aspects of the installation. Chapter 4.0 provides results of the analyses of impacts on the environment from ISFSI license renewal. Chapter 5.0 describes the process Dominion used to identify any new and significant information regarding environmental impacts. Chapter 6.0 summarizes the impacts of license renewal and mitigating actions. Chapter 7.0 describes feasible alternatives to the proposed action and their environmental impacts. Chapter 8.0 compares the impacts of license renewal with those alternatives. Chapter 9.0 discusses ISFSI compliance with regulatory requirements. As shown in this Environmental Report, renewal of the ISFSI license will result in no significant environmental impacts.

1.4 References

Ref. 1.1-1 U.S. Nuclear Regulatory Commission. 1986. License for Independent Storage of Spent Nuclear Fuel and High-level Radioactive Waste. July 2. License Number SNM-2501. Washington, D.C.

Ref. 1.2-1 U.S. Nuclear Regulatory Commission. 1979. Final Generic Environmental Impact Statement on Handling and Storage of Spent Light Water Power Reactor Fuel. NUREG-0575. August. Washington, D.C.

Ref. 1.2-2 U.S. Nuclear Regulatory Commission. 1984. "Waste Confidence Decision." Federal Register. August 31, 1984. p 34658 et seq.

Ref. 1.2-3 U.S. Nuclear Regulatory Commission. 1984. Licensing Requirements for the Independent Storage of Spent Fuel and High-Level Radioactive Waste. NUREG-1092. August. Washington, D.C.

Ref. 1.2-4 U.S. Nuclear Regulatory Commission. 1985. Environmental Assessment Related to the Construction and Operation of the Surry Dry Cask Independent Spent Fuel Storage Installation. April. Washington, D.C.

Ref. 1.2-5 U.S. Nuclear Regulatory Commission. 1986. Environmental Assessment Related to the Construction and Operation of the H. B. Robinson Independent Spent Fuel Storage Installation. March. Washington, D.C.

Ref. 1.2-6 U.S. Nuclear Regulatory Commission. 1988. Environmental Assessment for Proposed Rule Entitled "Storage of Spent Nuclear Fuel in NRC-Approved Storage Casks at Nuclear Power Reactor Sites." Washington, D.C.

Ref. 1.2-7 U.S. Nuclear Regulatory Commission. 1988. Environmental Assessment Related to the Construction and Operation of the Oconee Nuclear Station Independent Spent Fuel Storage Installation. October. Washington, D.C.

Ref. 1.2-8 U.S. Nuclear Regulatory Commission. 1990. "Consideration of Environmental Impacts of Temporary Storage of Spent Fuel After Cessation of Reactor Operation." Federal Register. September 18. p 38472-4. and "Waste Confidence Decision Review." Federal Register. September 18. p 38474-514.

Ref. 1.2-9 U.S. Nuclear Regulatory Commission. 1991. Environmental Assessment Related to the Construction and Operation of the Fort St. Vrain Independent Spent Fuel Storage Installation. February. Washington, D.C.

Ref. 1.2-10 U.S. Nuclear Regulatory Commission. 1991. Environmental Assessment Related to the Construction and Operation of the Calvert Cliffs Independent Spent Fuel Storage Installation. March. Washington, D.C.

Ref. 1.2-11 U.S. Nuclear Regulatory Commission. Undated. Environmental Assessment Related to the Construction and Operation of the Prairie Island Independent Spent Fuel Storage Installation. Washington, D.C.

Ref. 1.2-12 U.S. Nuclear Regulatory Commission. 1994. Environmental Assessment Related to the Construction and Operation of the Rancho Seco Independent Spent Fuel Storage Installation. August. Washington, D.C.

Ref. 1.2-13 U.S. Nuclear Regulatory Commission. 1996. Environmental Assessment Related to the Construction and Operation of the Trojan Independent Spent Fuel Storage Installation. November. Washington, D.C.

Ref. 1.2-14 U.S. Nuclear Regulatory Commission. 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. NUREG-1437. May. Washington, D.C. Available online at http://www.nrc.gov/reading-rm/adams.html. Accessed November 29, 2001.

Ref. 1.2-15 U.S. Nuclear Regulatory Commission. 1997. Environmental Assessment Related to the Construction and Operation of the North Anna Independent Spent Fuel Storage Installation. March. Washington, D.C.

Ref. 1.2-16 U.S. Nuclear Regulatory Commission. 1998. Final Environmental Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation to Store the Three Mile Island Unit 2 Spent Fuel at the Idaho National Engineering and Environmental Laboratory. NUREG-1626. March. Washington, D.C.

Ref. 1.2-17 U.S. Nuclear Regulatory Commission. 1999. "Waste Confidence Decision Review; Status." Federal Register. December 6. pages 68005-7.

Ref. 1.2-18 U.S. Nuclear Regulatory Commission. 2001. Final Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah. NUREG-1714. December. Washington, D. C.

Ref. 1.2-19 U.S. Department of Energy. 1999. Draft Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada. DOE/EIS-0250D. July. Washington, D. C.

Ref. 1.2-20 Virginia Electric and Power Company. 1982. Environmental Report; Surry Power Station Dry Cask Independent Spent Fuel Storage Installation. October. Richmond, Virginia.

Ref. 1.2-21 Virginia Electric and Power Company. 1985. Environmental Report; Surry Power Station Dry Cask Independent Spent Fuel Storage Installation, Amendment 1. May. Richmond, Virginia.

Ref. 1.2-22 U.S. Department of Energy. Timeline/Milestones. Available online at http://www.ymp.gov/timeline/index.htm. Accessed October 8, 2001.

Ref. 1.2-23 Dominion. 2001. Surry Power Station Units 1 and 2. Volume 3. License Renewal Application. Appendix E - Applicant's Environmental Report; Operating License Renewal Stage; Surry Power Station Units 1 and 2. May. Richmond, Virginia.

2.0 SITE AND ENVIRONMENTAL INTERFACES

2.1 Location and Features

The Surry Independent Spent Fuel Storage Installation (ISFSI) is located in Surry County, Virginia, on the south side of the James River, approximately 25 miles upstream of the point where the river enters the Chesapeake Bay. Figures 2-1 and 2-2 are 50-mile and 6-mile vicinity maps, respectively.

The Surry site consists of approximately 840 acres on Gravel Neck Peninsula. In addition to the ISFSI, the site includes two nuclear reactors and their turbine building, intake and discharge canals, auxiliary buildings; the Gravel Neck Combustion Turbines Station; and a switchyard. Figure 2-3 is the site layout.

Gravel Neck Peninsula is at the approximate upstream limit of saltwater incursion to the James River; upstream of Gravel Neck is tidal river and downstream is an estuary. The 840-acre site extends as a band across the peninsula. Steep bluffs drop to the river on either side and to the tip of the peninsula, which is low and marshy. Hog Island Wildlife Management Area, a Commonwealth wildlife management area, is located on the tip of the peninsula (Figure 2-3).

The site is 7 miles south of Colonial Williamsburg and 8 miles east-northeast of the town of Surry. Jamestown Island, part of the Colonial National Historic Park, is to the northwest on the northern shore of the James River. The area within 10 miles of the site includes parts of Surry, Isle of Wight, York, and James City Counties, and parts of the cities of Newport News and Williamsburg. The counties surrounding the site are predominantly rural, characterized by farmland, woods, and marshy wetlands. East and south of the site, at distances between 10 and 30 miles, are the urban areas of Hampton, Newport News, Norfolk, and Portsmouth, Virginia (Ref. 2.1-1, Section 2.1), and others, collectively known as Hampton Roads.

Section 3.1 describes key features of the ISFSI.

Figure 2-1
50-Mile Vicinity Map

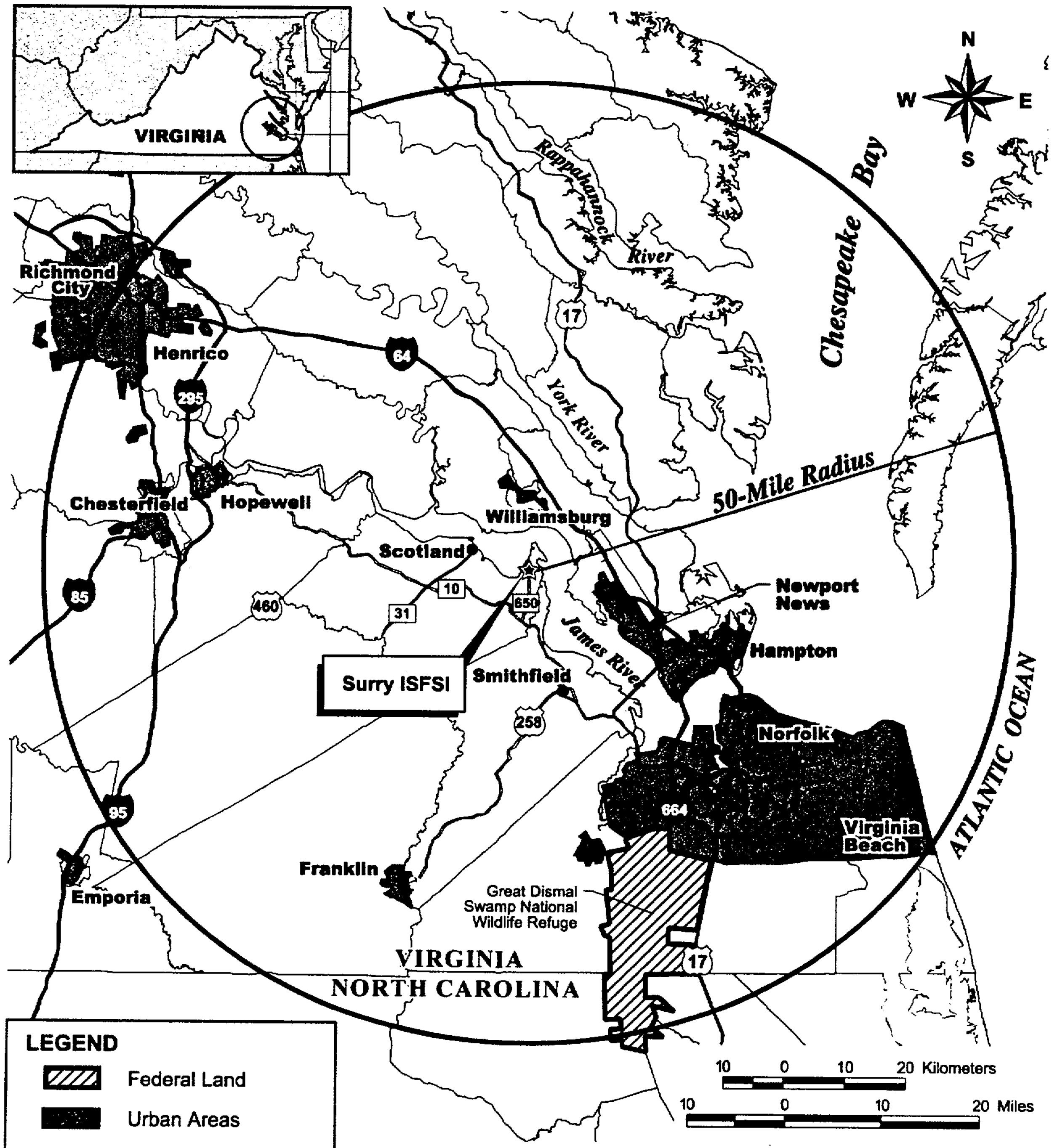


Figure 2-2
6-Mile Vicinity Map

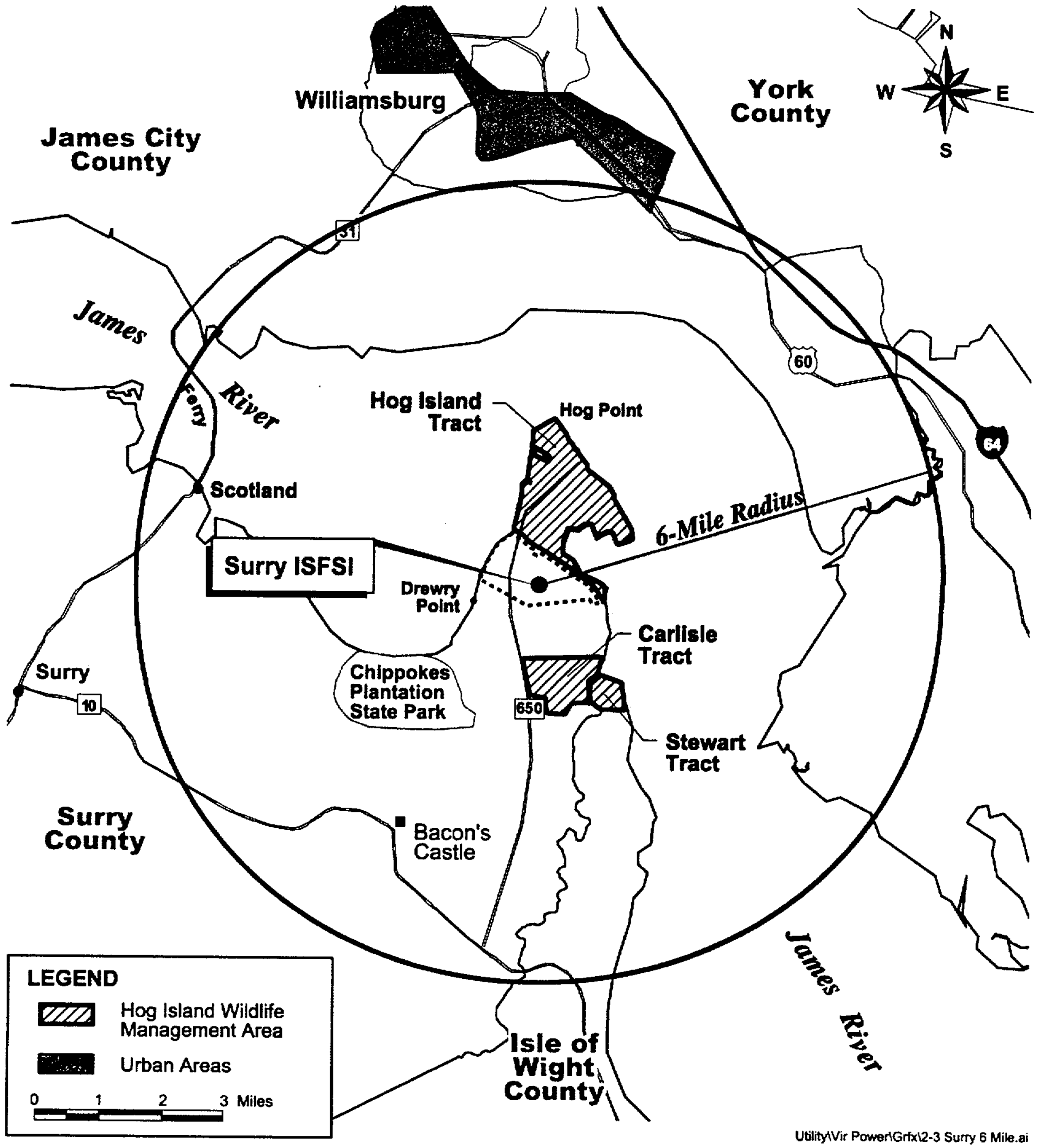
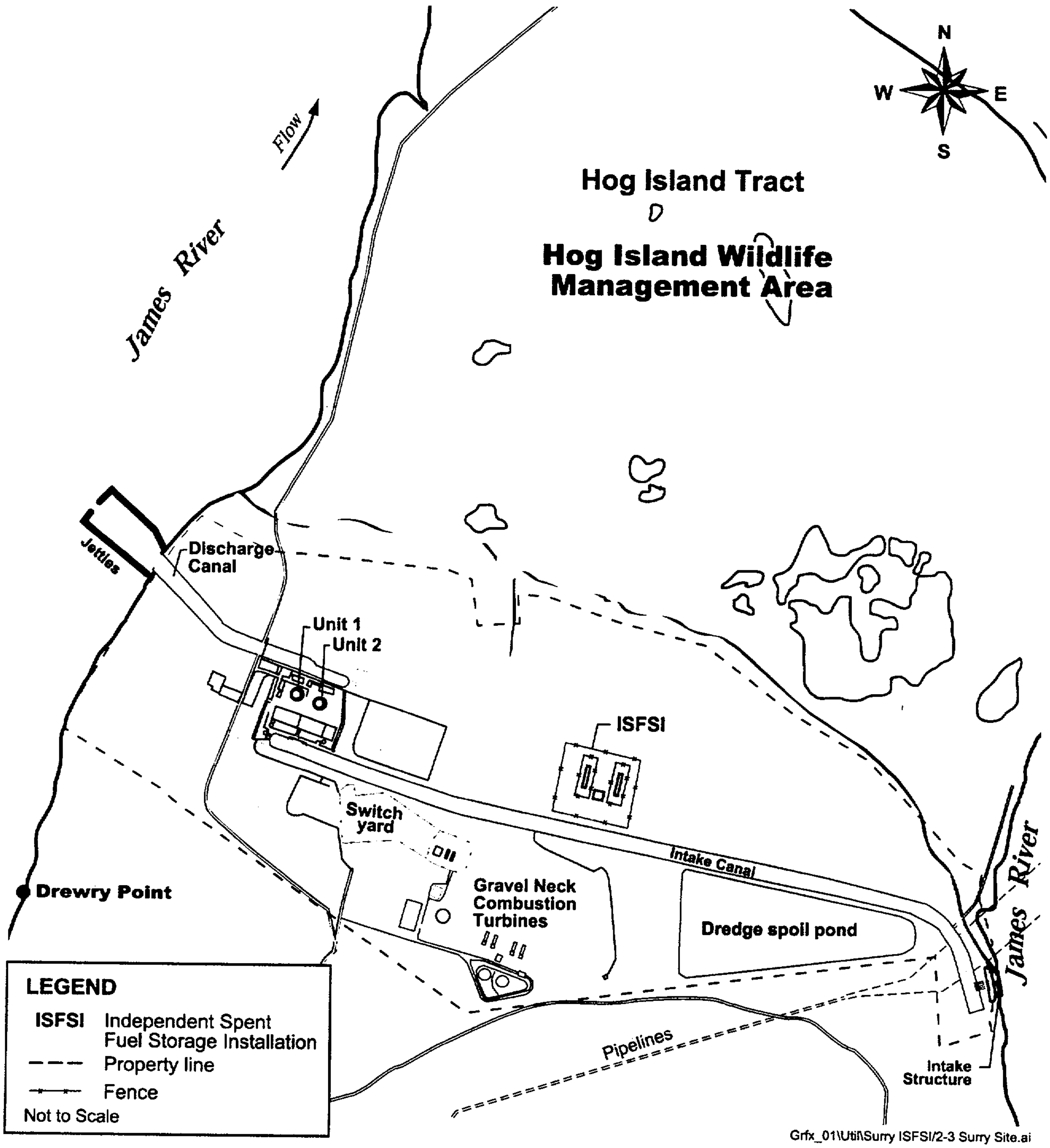
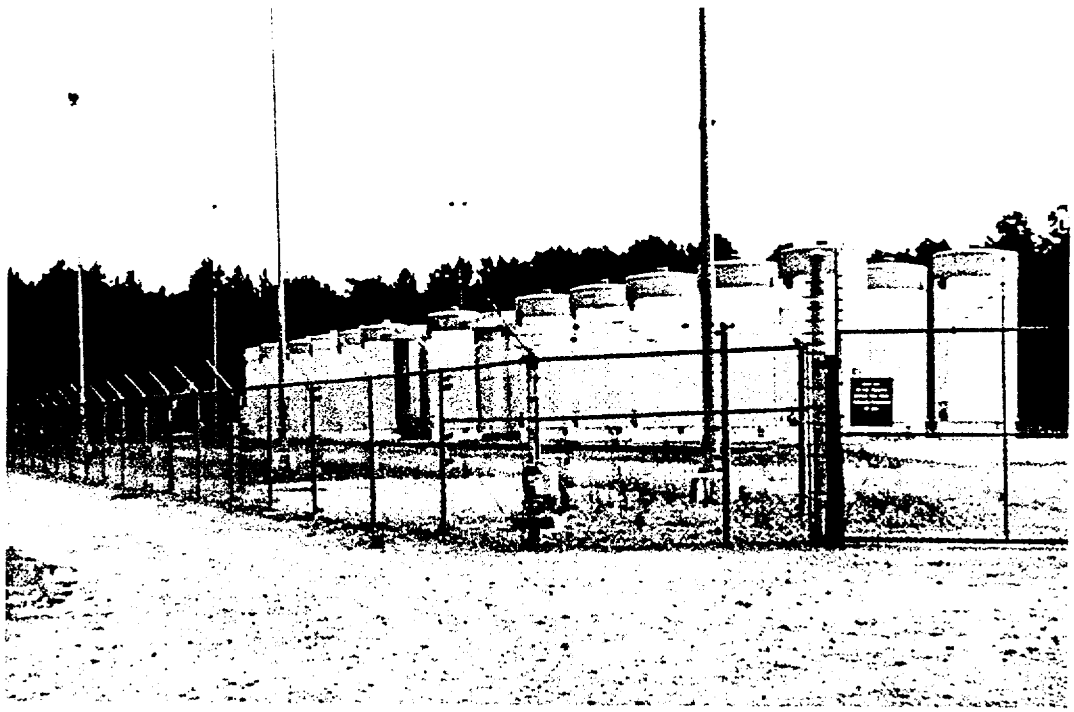


Figure 2-3
Site Layout



2.2 Geology, Soils, and Groundwater

The Surry Power Station site is in the Coastal Plain physiographic province. In the vicinity of the site the upper 20 to 35 feet consists of layers of sand, silty sand, and organic and inorganic silts and clays. A survey of the site prior to its selection for the ISFSI indicated that subsidence was not a problem (Ref. 2.2-1). Elevation at the Surry Power Station ranges from 25 to 35 feet above sea level (Ref. 2.2-2) and the water table at the site is 1 to 2 feet above sea level (Ref. 2.2-3).



2.3 Threatened or Endangered Species

The 1985 Surry ISFSI environmental report (Ref. 2.2-1, Section 2.2) referenced a previous environmental report with inventories of flora and fauna for the site vicinity. The referenced environmental report contained a general listing of species in the area but identified no threatened or endangered species as being known to occur on the Surry site (Ref. 2.3-1 Section 2.7).

The Surry Power Station license renewal environmental report describes the Surry site, nearby terrestrial habitats, and threatened and endangered species (Ref. 2.1-1, Sections 2.4 and 2.5). No areas designated by the U.S. Fish and Wildlife Service as "critical habitat" for endangered species exist at the site. The only terrestrial community at the site consists of remnants of mixed pine-hardwood forests that were used for timber production prior to the site's acquisition by Dominion.

Endangered or threatened animal and plant species that could occur (based on habitat and known geographic range) in the vicinity of the ISFSI are the federally-listed threatened bald eagle (*Haliaeetus leucocephalus*) and threatened sensitive joint-vetch (*Aeschynomene virginica*), and the state-listed threatened barking treefrog (*Hyla gratiosa*).

Eagles are regularly seen on the Surry site. There is an inactive bald eagle nest near the ISFSI. The nest was active for several years but has not been used recently. The pair of eagles associated with this nest has apparently constructed a nest at the Hog Island Wildlife Management Area (Figure 2-3) approximately ½ mile from the site. This nest has successfully fledged two eaglets a year for the past 5 years. Although it has not been proven that the eagles associated with this nest are the same pair that formerly nested on the Surry site, it seems to be a reasonable assumption because the Surry nest became inactive at the same time that the Hog Island nest was constructed.

The barking treefrog inhabits low, wet, wooded areas, and is known from Surry County, but Dominion biologists have not observed it at the Surry site. The sensitive joint-vetch occurs in fresh to slightly brackish tidal river systems, typically at the outer edge of marshes. Appropriate habitat might exist at the perimeter of the Surry site, not near the ISFSI, but Dominion knows of no occurrences of the sensitive joint-vetch on the site. Dominion knows of no other federal- or state-listed threatened or endangered species, or species proposed for such listing, on the Surry site.

2.4 Regional Demography

2.4.1 General Population

The 1985 ISFSI environmental report (Ref. 2.2-1) estimated the population within 10 miles and 50 miles of the site, with projections to the year 2020. Estimates were based on 1980 census data and Commonwealth of Virginia growth projections.

Table 2-1 compares these estimates to current information. The following paragraph describes the Dominion methodology for generating current demographic information.

Dominion used the Arcview® geographic information system software to combine U.S. Bureau of the Census Year 2000 block-group data with the Environmental Systems Research Institute, Inc. spatial data to determine 10-, 20- and 50-mile radii populations on a block-group basis, and to calculate the population used in the accident analysis in Chapter 4. In the event that a block group fell partially within a radius, an average population density for the entire block group was calculated. Then, the average density was multiplied by the percentage of the block group's physical land area that fell within the radius to produce an estimated number of persons located within the radius.

The 10- and 50-mile 2000 populations (Table 2-1) were calculated and compared with the same data in the original ISFSI environmental report to ensure that conclusions in the original would remain valid. The current 2000 populations were calculated using 2000 block census data and Arcview®, as described in the previous paragraph. Population projections to 2050 were estimated from the 2000 census block data using the Virginia Employment Commission projected 10-year growth rate from 2000 to 2010 of 10.6 percent for the Commonwealth (Ref. 2.4-1). As Table 2-1 illustrates, current populations in the vicinity of Surry are less than projections in the 1985 Surry ISFSI environmental report and population projections based on this more recent data are also lower than those projected in the 1985 Surry ISFSI environmental report.

The 20- and 50-mile 2000 populations were calculated to determine the population density in the vicinity of the Surry ISFSI. As derived from 2000 Census Bureau information, approximately 426,000 people live within 20 miles, a population density of approximately 350 persons per square mile (Ref. 2.1-1). Approximately 2,100,000 people live within 50 miles of the Surry ISFSI, a population density of approximately 320 persons per square mile. Applying the sparseness and proximity measures used in the Generic Environmental Impact Statement for License Renewal of Power Plants (Ref. 2.4-2, pg. C-159), the site is characterized as being in a high population area

Table 2-1
Surry ISFSI Regional Population[a]

Input Source	1980	1990	2000	2010	2020	2030	2040	2050
Population within 10 miles								
1985 environmental report (Ref. 2.2-1)	161,119[b]	179,033[c]	191,311[d]	199,622[e]	208,309[f]	not included	not included	not included
Current data	NA	102,343[g]	113,866[h]	125,936[h]	139,285[h]	154,049[h]	170,378[h]	188,438[h]
Population within 50 miles								
1985 environmental report (Ref. 2.2-1)	2,009,029[b]	2,186,245[c]	2,324,051[d]	2,457,668[e]	2,659,185[f]	not included	not included	not included
Current data	NA	1,892,210[i]	2,010,009[h]	2,223,069[h]	2,458,715[h]	2,719,339[h]	3,007,589[h]	3,326,393[h]

a. Population numbers include permanent resident, transient, and institutionalized populations.
b. Ref. 2.2-1, Figure 2.1-3. Based on 1980 census data.
c. Ref. 2.2-1, Figure 2.1-4. Based on 1980 census data.
d. Ref. 2.2-1, Figure 2.1-5. Based on 1980 census data.
e. Ref. 2.2-1, Figure 2.1-6. Based on 1980 census data.
f. Ref. 2.2-1, Figure 2.1-7. Based on 1980 census data.
g. Based on 1990 census data.
h. Based on 2000 census block data and Ref. 2.4-1.
i. Ref. 2.1-1. Based on 1990 census data.

2.4.2 Minority and Low-Income Populations

When the Nuclear Regulatory Commission (NRC) has performed environmental justice analyses for previous license renewal applications, it used a 50-mile radius as the area that could contain environmental impact sites and the state as the geographic area for comparative analysis. Dominion has adopted this approach for identifying the minority and low-income populations that could be affected by ISFSI operations.

Dominion used ArcView® geographic information system software to combine U.S. Census Bureau TIGER line data with Census Bureau 2000 census data to determine the minority characteristics on a block-group level. Census Bureau 2000 low-income census data was not available at the time this document was prepared, therefore, Dominion used 1990 tract data for its low-income analysis. Dominion included a block group or tract if any of its area lay within 50 miles of the ISFSI. The 50-mile radius includes 1,499 block groups and 542 tracts. Dominion defines the geographic area for ISFSI as the entire states of Virginia or North Carolina. Block groups or tracts in each state were analyzed separately against their state's data.

2.4.2.1 Minority Populations

The NRC Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues defines a "minority" population as: American Indian or Alaskan Native; Asian; Native Hawaiian or other Pacific Islander; Black races; other; multi-racial; the aggregate of all minority races; or Hispanic ethnicity (Ref. 2.4-3, Appendix D). The guidance indicates that a minority population exists if either of the following conditions exists:

- The minority population of the census block or environmental impact site exceeds 50 percent
- The minority population percentage of the environmental impact area is significantly greater (typically at least 20 percentage points) than the minority population percentage in the geographic area chosen for comparative analysis

The NRC guidance calls for use of the most recent U.S. Census Bureau decennial census data. Dominion used 2000 census data from the U.S. Census Bureau website (Ref. 2.4-4) in determining the percentage of the total population within Virginia and North Carolina for each minority category, and in identifying minority populations within 50 miles of ISFSI.

Dominion divided Census Bureau population numbers for each minority population within each block group by the total population for that block group to obtain the percent of the block group's population represented by each minority. For each of the 1,499 block groups within 50 miles of ISFSI, Dominion compared the percent of the population in each minority category to the corresponding geographic area's minority category threshold percentage to determine if that block group constituted a minority population. Census Bureau data (Ref. 2.4-4) for Virginia characterize 0.30% as American Indian or Alaskan Native; 3.70% Asian; 0.10% Native Hawaiian or other Pacific Islander; 19.60% Black races; 2.00% all other single minorities; 2.00% multi-racial; 27.67% aggregate of minority races; and 4.70% Hispanic ethnicity. Census Bureau data (Ref. 2.4-4) for North Carolina characterizes 1.20% as American Indian or Alaskan Native; 1.40% Asian; 0.00% Native Hawaiian or other Pacific Islander; 21.60% Black races; 2.30% all other single minorities; 1.30% multi-racial; 27.89% aggregate of minority races; and 4.70% Hispanic ethnicity.

Based on the "more than 20 percent" or the "exceeds 50 percent" criteria, no Native Hawaiian or other Pacific Islander minorities exist in the geographic area. Table 2-2 presents the numbers of block groups within each county that exceed the threshold for other minority populations.

Based on the "more than 20 percent" criterion, an American Indian or Alaskan Native minority population exists in one block group, in Charles City, Virginia (Figure 2-4).

Based on the "more than 20 percent" criterion, Asian minority populations exist in three block groups (Table 2-2). Figure 2-5 locates these minority block groups in Norfolk and Virginia Beach, Virginia.

Based on the "more than 20 percent" criterion, Black races minority populations exist in 556 block groups (Table 2-2). Figure 2-6 locates these minority block groups distributed among the counties in the geographic area.

Based on the "more than 20 percent" criterion, an all-other-single-minorities population exist in one block group, in Petersburg, Virginia (Figure 2-7).

Based on the "more than 20 percent" criterion, a multi-racial minority population exists in one block group, in Norfolk, Virginia (Figure 2-8).

Based on the "more than 20 percent" criterion, an aggregate-of-Minority-Races population exists in 549 block groups (Table 2-2). Figure 2-9 displays the locations of these block groups distributed among the counties in the geographic area.

Based on the "more than 20 percent" criterion, an Hispanic ethnicity minority population exists in two block groups (Table 2-2). Figure 2-10 displays the minority block groups in Chesterfield County and Petersburg, Virginia.

Table 2-2
Minority Block Groups and Low-Income Population Tracts

County/City	State	2000 Block Groups	American Indian or Alaskan Native	Asian	Native Hawaiian or other Pacific Islander	Black Races	All Other Single Minorities	Multi-racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity	1990 Tracks	1990 Tracts Low-income
Camden	NC	1	0	0	0	0	0	0	0	0	1	0
Currituck	NC	1	0	0	0	0	0	0	0	0	1	0
Gates	NC	11	0	0	0	7	0	0	7	0	3	0
Hertford	NC	1	0	0	0	1	0	0	1	0	1	0
Northampton	NC	3	0	0	0	3	0	0	0	0	1	0
Pasquotank	NC	1	0	0	0	0	0	0	0	0	1	0
Accomack	VA	1	0	0	0	0	0	0	0	0	1	0
Charles	VA	6	1	0	0	4	0	0	4	0	3	1
Chesterfield	VA	78	0	0	0	16	0	0	16	1	31	2
Dinwiddie	VA	16	0	0	0	5	0	0	4	0	6	0
Essex	VA	5	0	0	0	1	0	0	0	0	3	0
Gloucester	VA	20	0	0	0	1	0	0	0	0	5	0
Greensville	VA	1	0	0	0	0	0	0	1	0	1	0
Hanover	VA	27	0	0	0	0	0	0	29	0	7	0
Henrico	VA	49	0	0	0	31	0	0	0	0	19	1
Isle of Wight	VA	21	0	0	0	5	0	0	4	0	4	0
James City	VA	25	0	0	0	3	0	0	2	0	4	0
King and Queen	VA	6	0	0	0	3	0	0	0	0	2	0
King William	VA	10	0	0	0	1	0	0	1	0	3	0
Lancaster	VA	12	0	0	0	4	0	0	4	0	3	1
Mathews	VA	4	0	0	0	0	0	0	0	0	2	0
Middlesex	VA	10	0	0	0	0	0	0	0	0	4	1
New Kent	VA	10	0	0	0	0	0	0	0	0	3	0
Northampton	VA	11	0	0	0	7	0	0	5	0	3	2
Northumberland	VA	6	0	0	0	2	0	0	0	0	2	0
Prince George	VA	17	0	0	0	4	0	0	4	0	7	0
Richmond	VA	5	0	0	0	3	0	0	0	0	2	0
Southampton	VA	11	0	0	0	7	0	0	6	0	6	3

Table 2-2 (Continued)
Minority Block Groups and Low-Income Population Tracts

County/City	State	2000 Block Groups	American Indian or Alaskan Native	Asian	Native Hawaiian or other Pacific Islander	Black Races	All Other Single Minorities	Multi-racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity	1990 Tracks	1990 Tracts Low-income
Surry	VA	5	0	0	0	5	0	0	4	0	2	0
Sussex	VA	12	0	0	0	9	0	0	9	0	4	2
York	VA	29	0	0	0	4	0	0	3	0	13	1
Chesapeake	VA	104	0	0	0	30	0	0	28	0	33	5
Colonial Hghts	VA	11	0	0	0	0	0	0	0	0	5	0
Franklin	VA	7	0	0	0	3	0	0	3	0	4	1
Hampton	VA	91	0	0	0	45	0	0	45	0	26	7
Hopewell	VA	17	0	0	0	6	0	0	5	0	7	2
Newport News	VA	112	0	0	0	54	0	0	55	0	35	7
Norfolk						80			86	0	90	21
Petersburg	VA	31	0	0	0	30	1	0	31	1	13	6
Poquoson	VA	10	0	0	0	0	0	0	0	0	3	0
Portsmouth	VA	78	0	0	0	43	0	0	42	0	34	11
Richmond	VA	110	0	0	0	97	0	0	96	0	57	26
Suffolk	VA	30	0	0	0	15	0	0	15	0	13	4
Virginia Beach	VA	286	0	1	0	26	0	0	38	0	66	1
Williamsburg	VA	9	0	0	0	1	0	0	1	0	8	2
TOTAL		1,499	1	3	0	556	1	1	549	2	542	107

State Averages

State			American Indian Alaskan Native	Asia	Native Hawaiian or other Pacific Islander	Black Races	All Other Single Minorities	Multi-racial Minorities	Aggregate of Minority Races	Hispanic Ethnicity	Low-Income	
North Carolina			1.20	1.40%	0.00%	21.60%	2.30%	1.30%	27.89%	4.70%		13.98%
Virginia			0.30	3.70%	0.10%	19.60%	2.00%	2.00%	27.67%	4.70%		10.52%

Figure 2-4
American Indian Locations

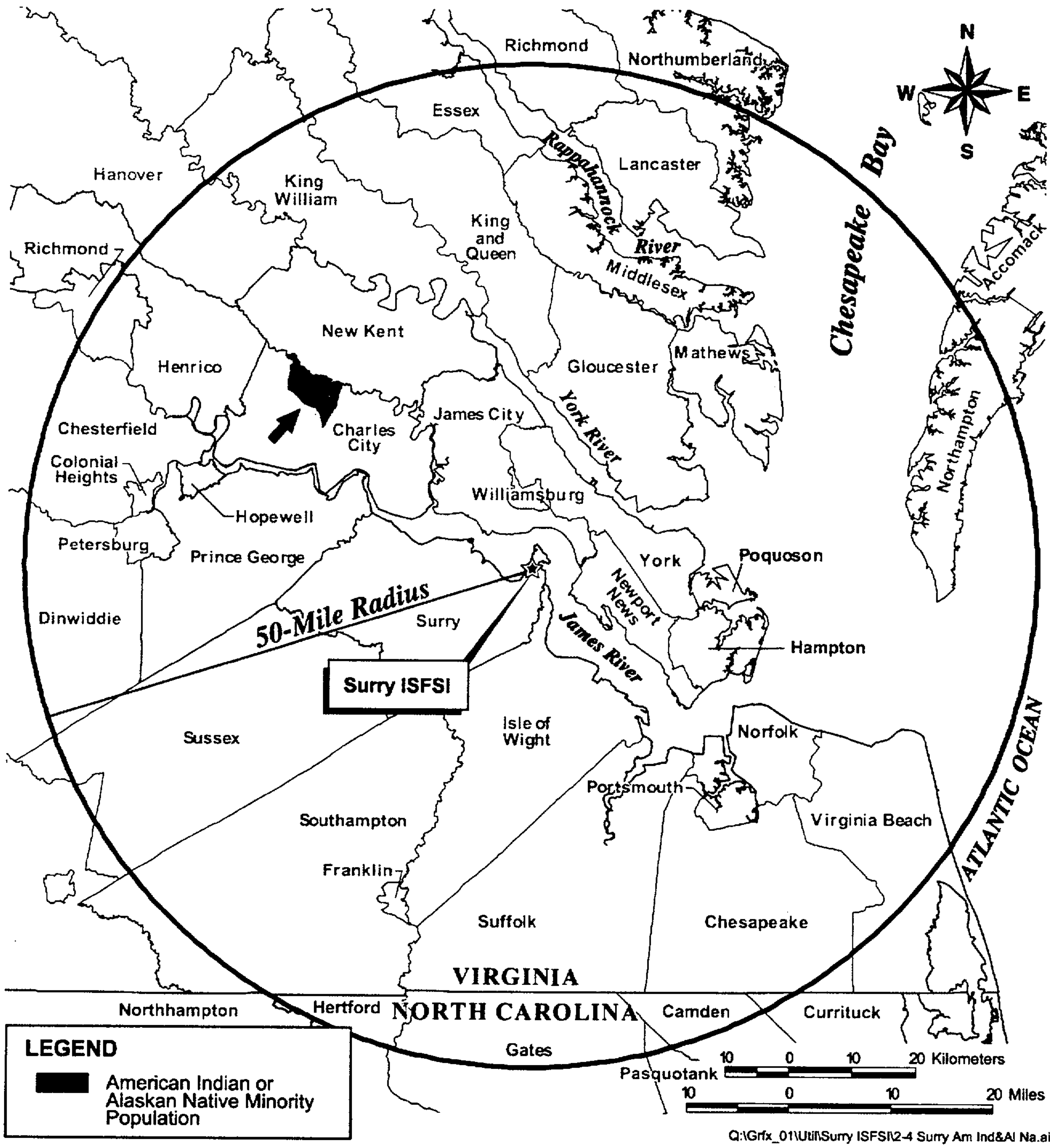


Figure 2-5
Asian Locations

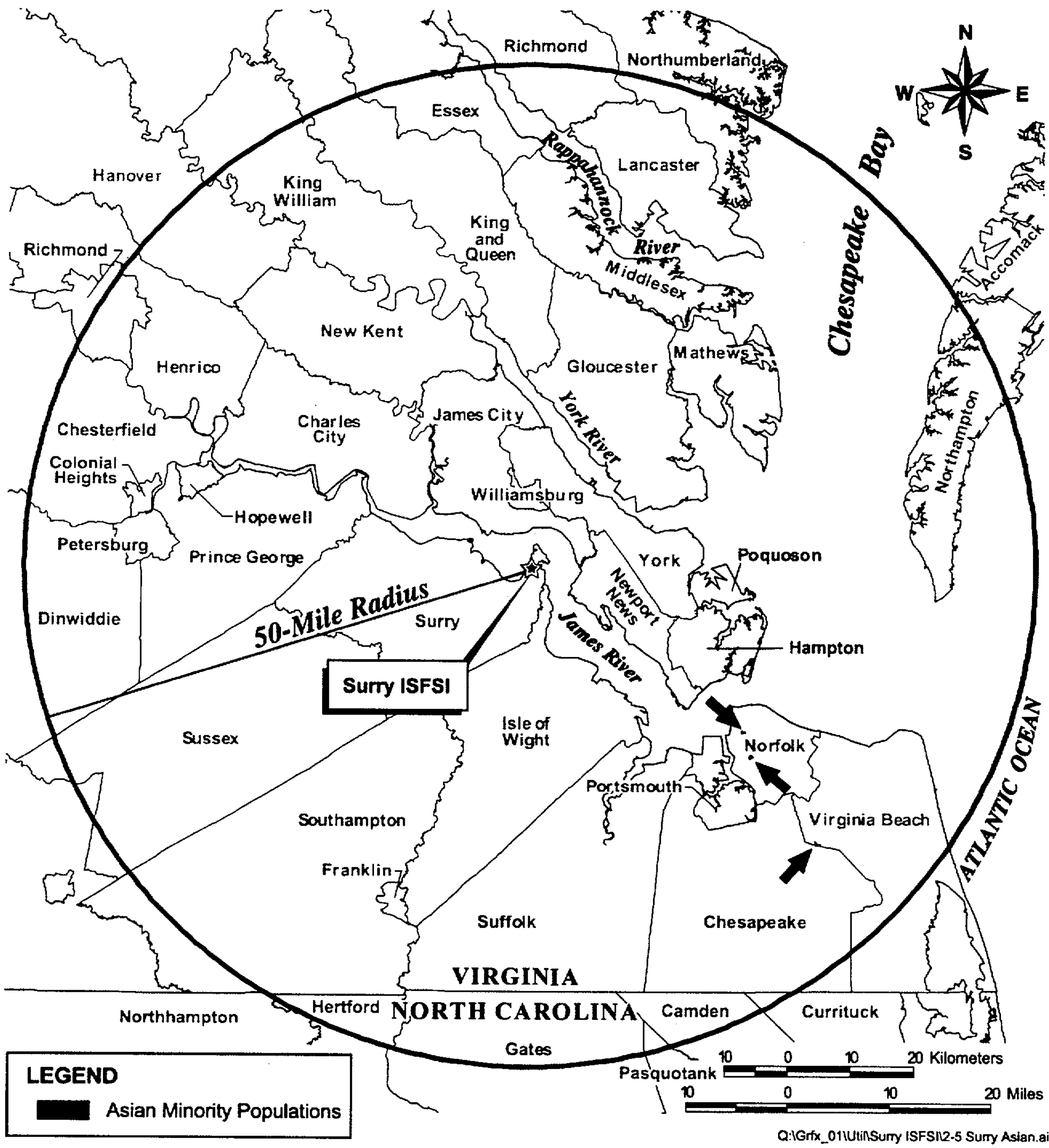


Figure 2-6
Black Races Locations

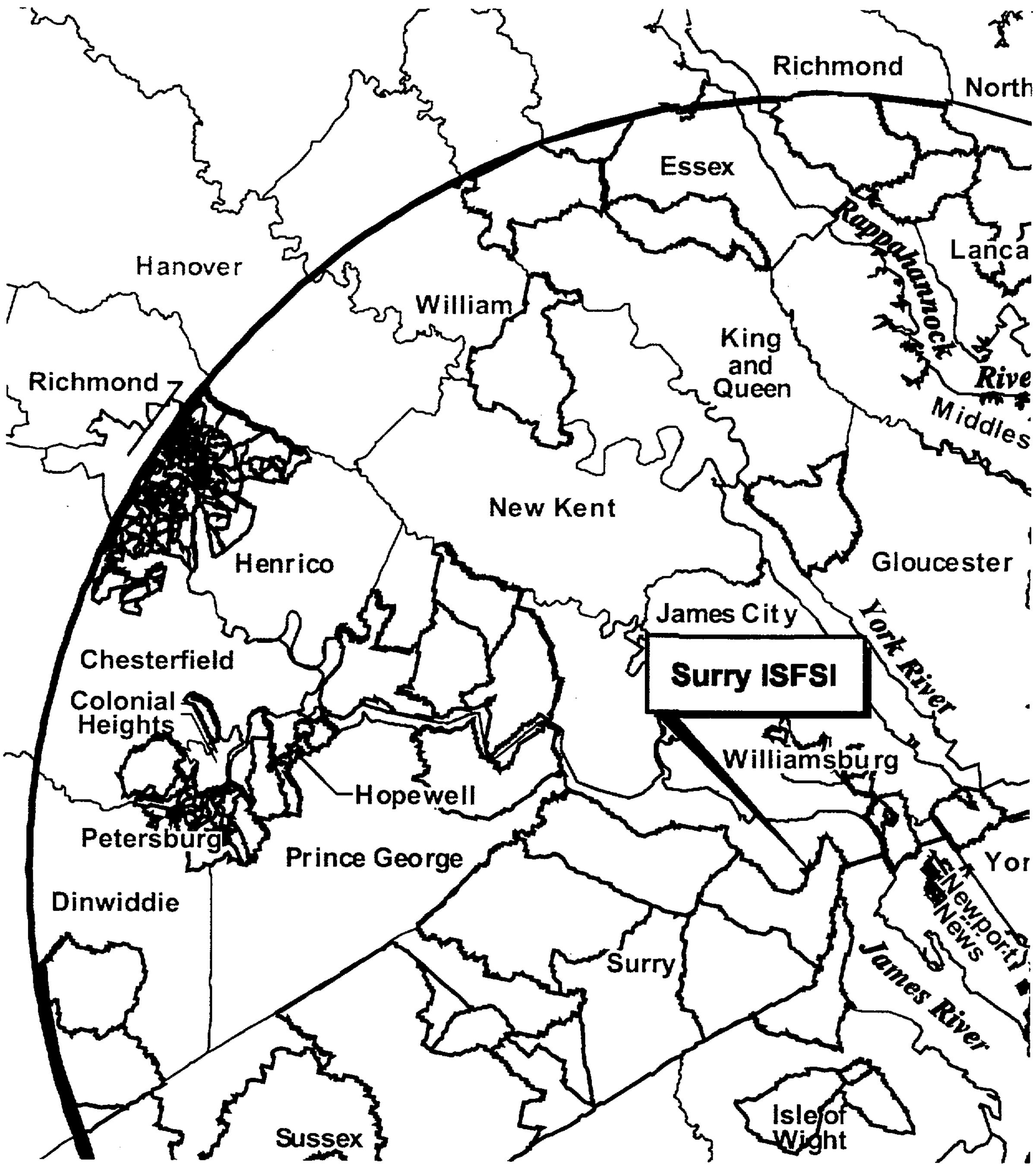


Figure 2-7
All Other Single Minorities Location

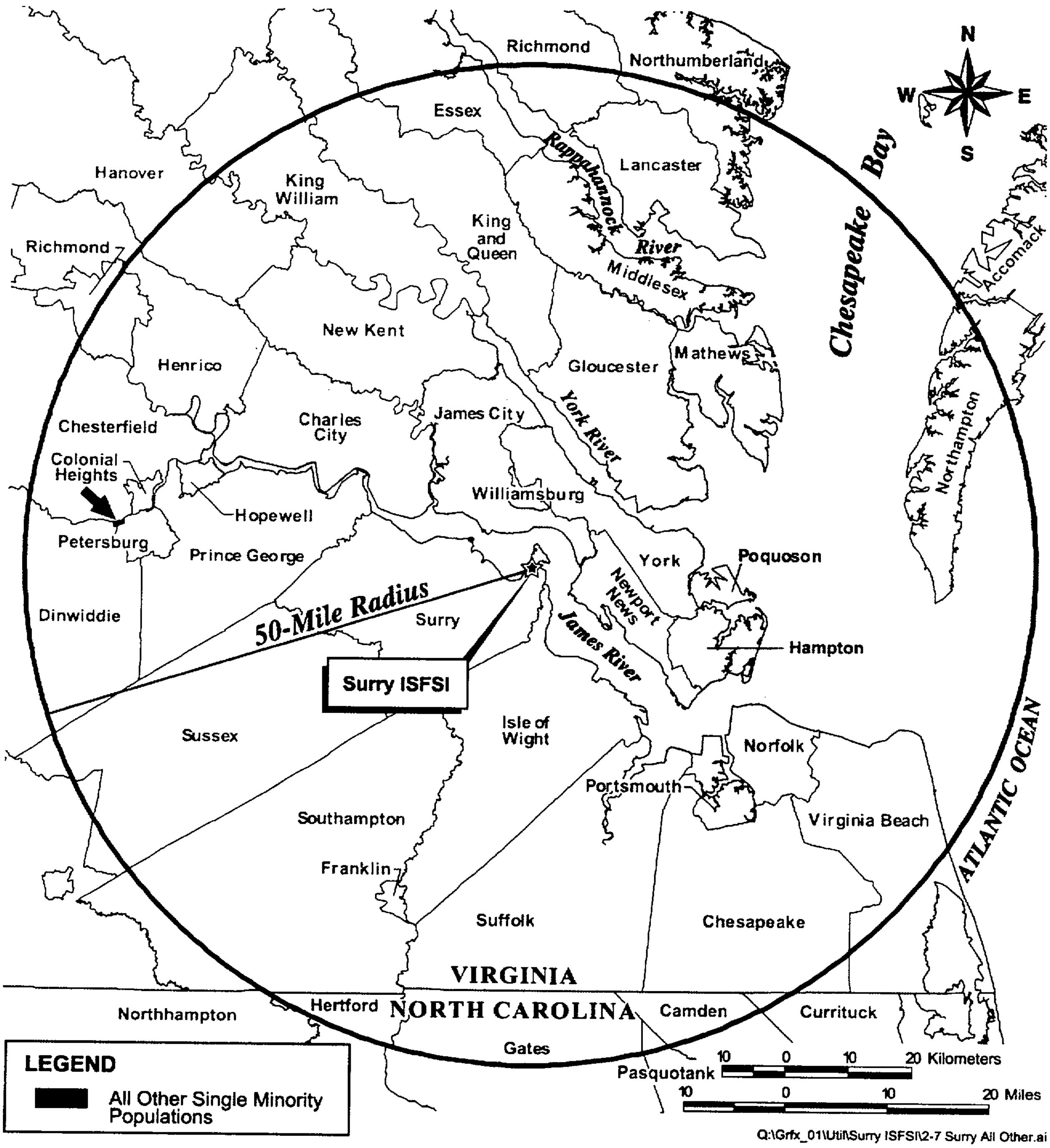


Figure 2-8
Multi-Racial Minority Location

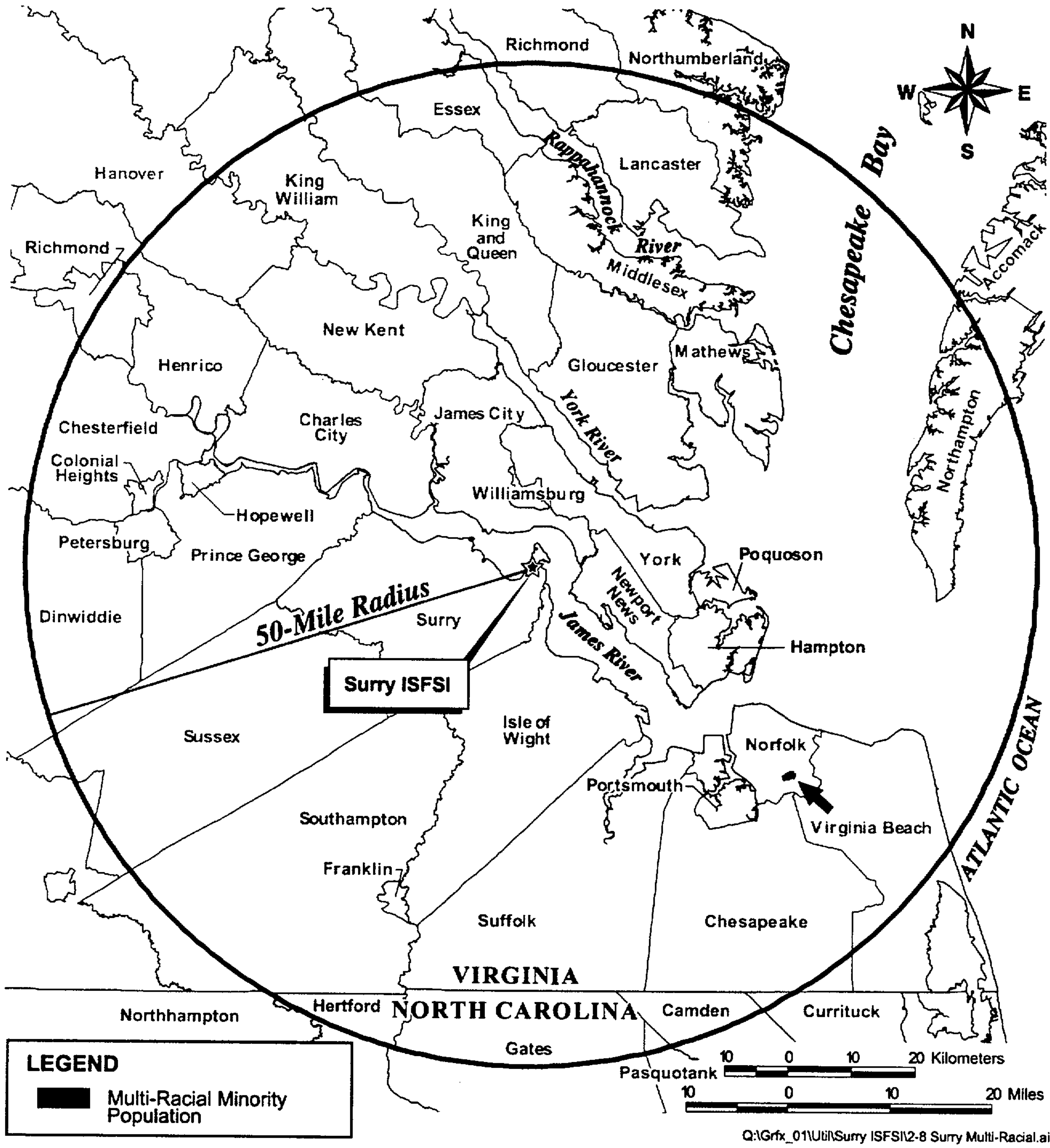


Figure 2-9
Aggregate of Minority Races Locations

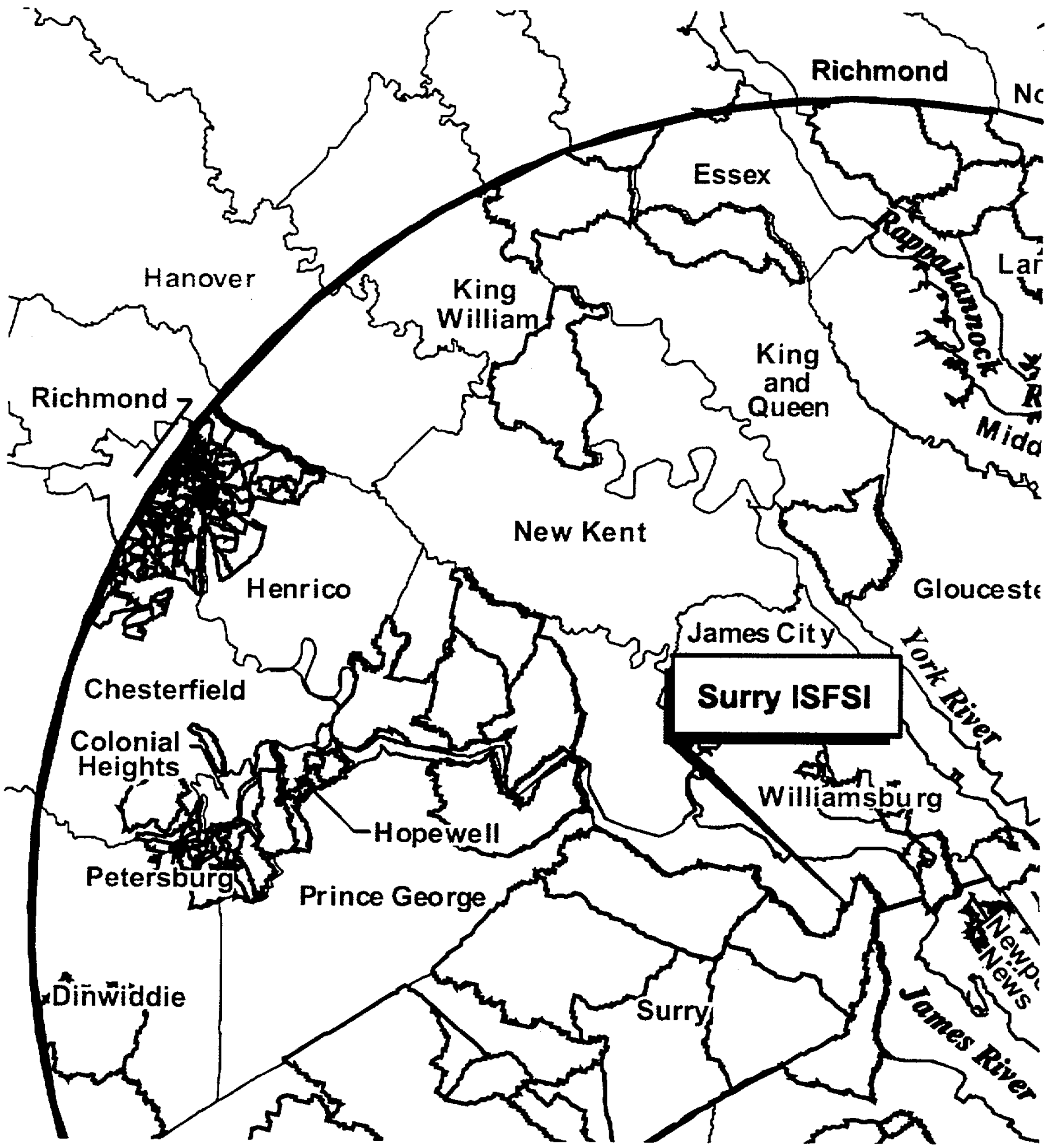
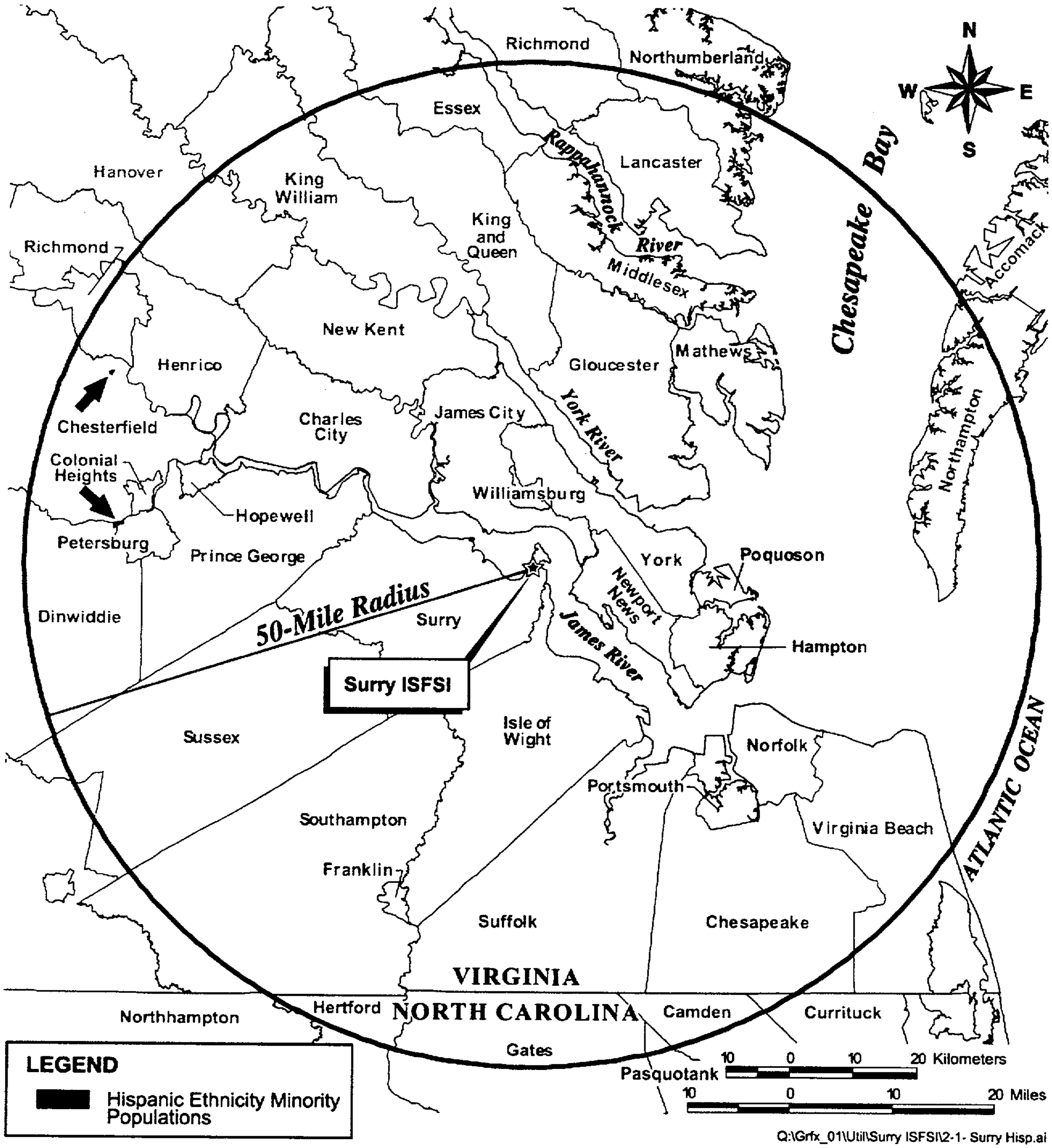


Figure 2-10
Hispanic Ethnicity Locations



2.4.2.2 Low-Income Populations

NRC guidance defines "low-income" using U.S. Census Bureau statistical poverty thresholds (Ref. 2.4-3, Appendix D). Dominion divided U.S. Census Bureau "low-income" household numbers for each census tract by the total households for that tract to obtain the percentage of "low-income" households per tract. U.S. Census Bureau data (Ref. 2.4-5) characterize 10.52 percent of Virginia households and 13.98 percent of North Carolina households as low-income. A "low-income population" is considered to be present if:

- The low-income population of the census tract or environmental impact site exceeds 50 percent
- The percentage of households below the poverty level in an environmental impact area is significantly greater (typically at least 20 percentage points) than the low-income population percentage in the geographic area chosen for comparative analysis

Based on the "more than 20 percent" criterion, within 50 miles of the Surry ISFSI 107 census tracts are considered low-income. Table 2-2 lists the low-income household tract distributions among the counties in the geographic area. Figure 2-11 locates the locations of these low-income tracts among the counties in the geographic area.

2.5 Taxes

Dominion pays annual property taxes to Surry County for the Surry Power Station, which includes the ISFSI. Taxes fund Surry County operations, including the school system and road maintenance. For the years 1995 to 1998, SPS's property taxes provided about 76 percent of Surry County's total property tax revenue (Table 2-3). Property taxes cover about 66 percent of Surry County's total operating budget. If the operating licenses for SPS were not renewed and the plant was decommissioned, impacts to the tax base of the surrounding communities and their economic structures could be significant, as discussed in Section 8.4.7 of the GEIS (Ref. 2.4-2).

Dominion projects that SPS's annual property taxes will remain constant at about $10 million through the power station's period of extended operation (Ref. 2.1-1, Section 2-8), however, the potential effects of deregulation on tax rates are not yet fully known. After the end of the period of extended operation, when the nuclear plants are no longer operational, Dominion expects that the property taxes will be reduced.

Figure 2-11
Low-Income Population Locations

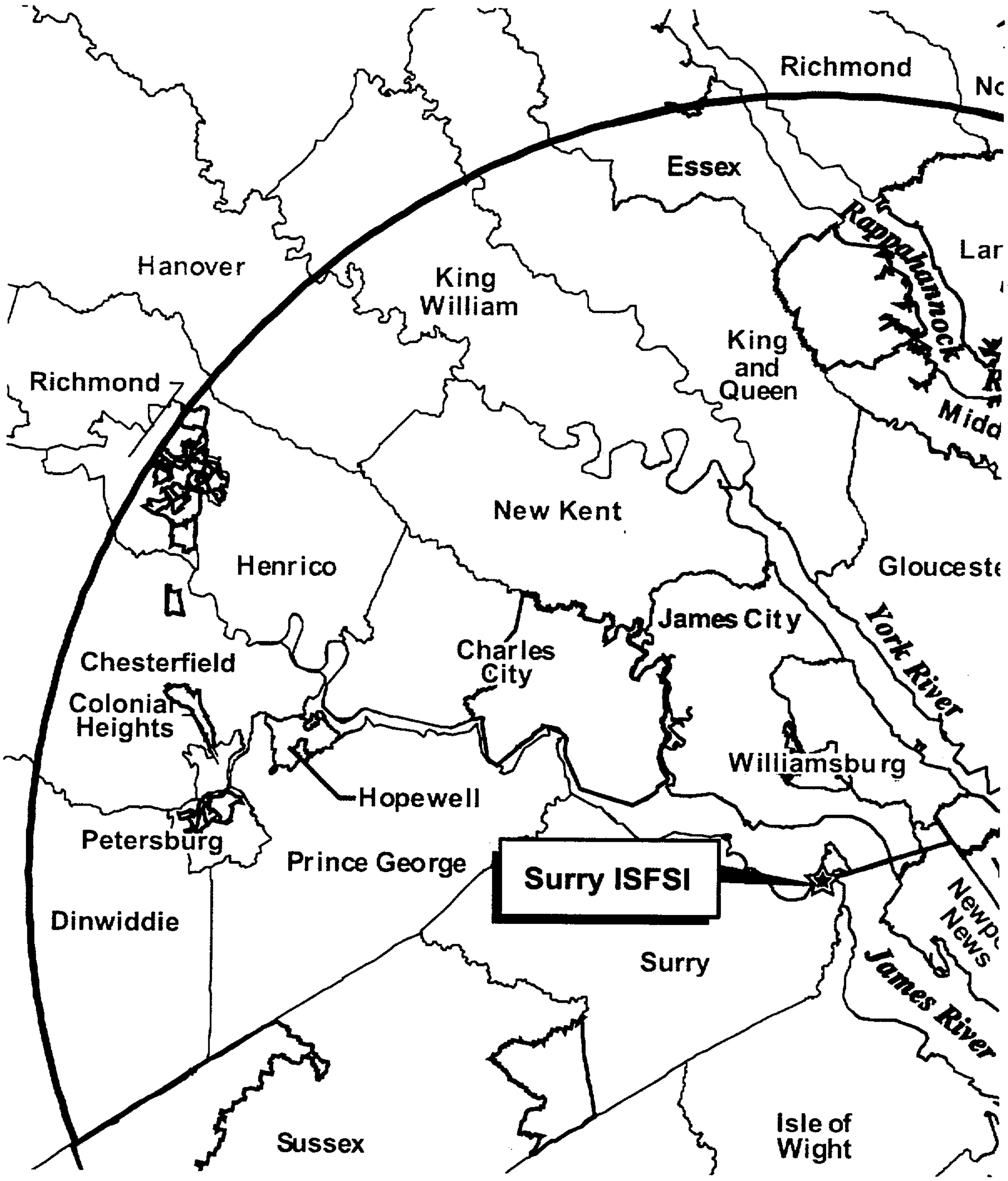


Table 2-3
Property Tax Revenues Generated in Surry County, Virginia; Property Taxes Paid to Surry County by Surry Power Station; and Surry County Operating Budget, 1995 - 1998

Year	Property Taxes Paid to Surry County	Property Taxes Paid by SPS	Percent of Total Property Taxes Paid by SPS	Surry County by Operating Budget
1995	$10,929,247	$8,339,169	76	$16,737,107
1996	$11,763,226	$8,994,835	76	$16,818,954
1997	$12,463,315	$9,428,802	76	$18,156,965
1998	$12,208,208	$9,154,251	75	$18,589,526

Source: Ref. 2.1-1.

2.6 Land Use Planning

This discussion summarizes a more lengthy discussion of land use in the Surry Power Station Environmental Report (Ref. 2.1-1).

Approximately 60 percent of the Surry Power Station permanent work force reside in either Isle of Wight County, James City County, the City of Newport News, or Surry County, and Dominion pays property taxes in Surry County. Therefore, the discussion in the Surry Power Station environmental report focuses on those locations. Isle of Wight County, James City County, and the City of Newport News have all experienced significant growth in the last decade, and their comprehensive plans reflect planning efforts and public involvement in the planning process undertaken during the 1990s.

During the 30 years since Surry Power Station was constructed, Surry County has experienced little growth. County population declined by 6 percent during the 1960s and grew only 2 percent during the 1970s, 3 percent during the 1980s, and an estimated 7 percent during the 1990s. The County's economic base continues to be agricultural production. The dominant land use remains commercial forest.

2.7 Social Services and Public Facilities

As described in the Surry Power Station Environmental Report (Ref. 2.1-1, Section 2.10.1) the public water systems in the locations where most Surry Power Station employees reside provide sufficient water to the populations in their service areas. Some of the systems are reaching or slightly exceeding their capacities, but other systems have excess capacity available for their use, and the utilities are increasing capacity.

As described in Section 2.10.2 of (Ref. 2.1-1), the transportation system in the vicinity of Surry is adequate to support the level of traffic it receives.

2.8 Historic and Archaeological Resources

No significant discoveries of historic or archaeological resources were noted during the construction of the nuclear facilities in the 1970s (Ref. 2.1-1). The Environmental Assessment for the ISFSI construction acknowledged that although the station was located in an historic region, "there does not appear to by anything of historical interest within the boundaries of the site" (Ref. 2.8-1). However, there are numerous historic sites located and recorded in Surry County near SPS. Within Surry County, 16 sites are currently listed on the National Register of Historic Places (Table 2-4).

During the nuclear station license renewal process, Dominion commissioned a cultural resource survey of the property. The survey identified one previously recorded archaeological site on the west side of the property and classified the remainder of the property into one of three categories, based on the potential for archaeological resources (Ref. 2.8-2). The ISFSI, because it rests on previously disturbed land, was classified as having no potential for cultural resources. The wooded area on the west, south and east sides of the ISFSI were classified as moderate to high potential because they are less disturbed.

Table 2-4
Surry County, Virginia Sites on the National Register of Historic Places

Sites	Locations
Bacon's Castle	Off State Highway 10 in Bacon's Castle
Chippokes Plantation	Chippokes State Park, State Highways 634 and 633
Enos House	Address restricted; Surry
Four Mile Tree	Northeast of the junction of State Highways 618 and 610
Glebe House of Southwark Parish	East of Spring Grove on State Highway 10
Melville	East of Surry
Montpelier	1.4 miles southwest of Cabin Point
Old Brick Church	State Highway 10 in Bacon's Castle
Pleasant Point	4 mile south of Scotland on State Highway 637
Rich Neck Farm	East of Surry
Second Southwark Church Archaeological Site (44SY65)	Address restricted, Surry
Smith's Fort	Address restricted, Surry
Snow Hill	State Highway 40 Gwaltney Corner
Surry County Courthouse Complex	State Highway 10 Surry
Swann's Point Plantation Site	Address restricted; Scotland

Source: Ref. 2.1-1.

2.9 References

Ref. 2.1-1 Dominion. 2001. Surry Power Station Units 1 and 2. Volume 3. License Renewal Application. Appendix E - Applicant's Environmental Report, Operating License Renewal Stage, Surry Power Station, Units 1 and 2. May. Richmond, VA.

Ref. 2.2-1 Virginia Power. 1985. Environmental Report Surry Power Station, Dry Cask Independent Spent Fuel Storage Installation. Amendment 1. May. Richmond, VA.

Ref. 2.2-2 Viriginia Power. 1993. Oil Discharge Contingency Plan. Groundwater Characterization Study, Viriginia Power, Gravel Neck Combustion Station, Richmond, VA.

Ref. 2.2-3 U.S. Atomic Energy Commission. 1972. Final Environmental Statement related to operation of Surry Power Station Unit 1. Virginia Electric and Power Company. Docket No. 50-280. Directorate of Licensing. Washington, DC. May

Ref. 2.3-1 Virginia Electric and Power Company. 1973. Applicant's Environmental Report; Surry Power Station Units 3 and 4; Construction Permit Stage. April. Richmond, Virginia.

Ref. 2.4-1 Virginia Employment Commission. 1999. "Population Projections-2000" and "Population Projections-2010." Available at http://www.vec.state.va.us/index.cfm?loc=lbrmkt&info=poproj. Accessed December 8, 2001.

Ref. 2.4-2 U.S. Nuclear Regulatory Commission. 1996. Generic Environmental Impact Statement for License Renewal of Nuclear Plants. Vols. 1 and 2 NUREG-1437. Washington, DC.

Ref. 2.4-3 U.S. Nuclear Regulatory Commission. 2001. "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues." NRR Office Instruction No. LIC-203, June 21. Washington, D.C.

Ref. 2.4-4 U.S. Census Bureau. 2000. "Summary File 1: Census 2000." Available at http://www.census.gov/Press-Release/www/2001/sumfile1.html. Accessed August 8, 2001.

Ref. 2.4-5 U.S. Census Bureau. 1990. "1990 Census Data." Available at http://venus.census.gov/cdrom/lookup. Accessed July 19, 2000.

Ref. 2.8-1 U.S. Nuclear Regulatory Commission. 1985. Notice of Issuance of Environmental Assessment and Finding of No Significant Impact for the Surry Dry Cask Independent Spent Fuel Storage Installation at the Surry Power

Station. Docket No. 72-2 (50-280 and -281). Virginia Electric and Power Company. Washington D.C.

Ref. 2.8-2 Mullin, J. 2001. Cultural Resource Assessment Surry Power Station, Surry County Virginia. The Louis Berger Group, Inc. March. Richmond, Virginia.

3.0 PROPOSED ACTION

The proposed action is to renew the operating license of the Surry Independent Spent Fuel Storage Installation (ISFSI) for an additional 40 years beyond the current license term.

Much of the information presented in this chapter was taken from the Final Safety Analysis Report (FSAR; Ref. 3.1-1). Except for the discussion of possible future expansion, the information is consistent with the construction environmental report (Ref. 3.1-2) and the environmental assessment (Ref. 3.1-3)

3.1 General Installation Information

Location

Chapter 4 of the FSAR provides descriptive information on the Surry ISFSI structures, systems and components. The ISFSI is approximately 3,300 feet southeast of the Surry Power Station Units 1 and 2 reactor buildings and within the boundaries of the Surry site (see Figure 2-3). The facility currently occupies approximately 15 acres.

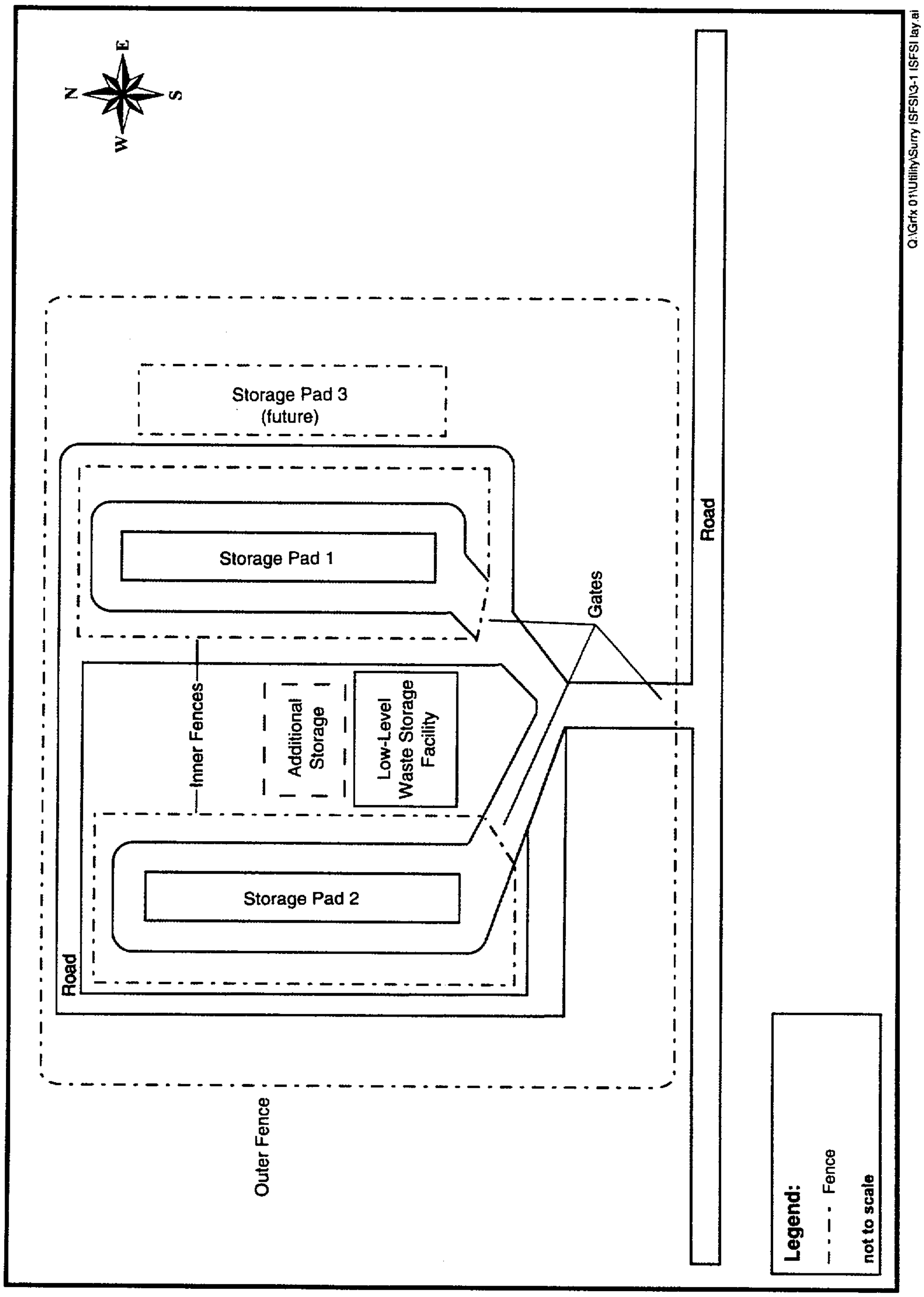
Surrounding Areas and Boundaries

The Surry ISFSI is approximately 800 × 800 feet. It is fenced, with an entrance on the south side. Consistent with the Surry ISFSI FSAR (Ref. 3.1-1), the restricted area for the ISFSI is the Surry site boundary. The controlled area boundary is also the site boundary. No activities unrelated to operation of the Surry Power Station or the ISFSI are permitted within the controlled area. The minimum distance from the ISFSI to the controlled area boundary is approximately 1,500 feet northwest of the ISFSI (see Figure 2-3). The nearest residence is located approximately 1.5 miles from the ISFSI. The Emergency Planning Zone for the Surry ISFSI is the same as for the Surry Power Station.

Layout

Currently, the facility is licensed to store spent fuel storage casks on three 230 × 32 foot and approximately 3.0-foot-thick reinforced concrete slabs. Two of these three storage pads have been built. Inner security fences surround each storage pad (Figure 3-1). Each pad is designed to accommodate 28 casks, each approximately 8 feet in diameter and weighing no more than 125 tons, with approximately 8 feet of clearance between casks.

Figure 3-1
ISFSI Layout



The operation of the Surry Power Station for an additional 20 years beyond the original license term may require that the ISFSI license be amended to allow the construction and utilization of one more pad with a capacity of up to 28 casks. The fourth storage pad would be constructed on previously disturbed land adjacent to the existing pads at the time it was needed. Two acres of woodland could be affected by the possible need to move the perimeter fence 75 feet into the woodlands in the event a fourth pad is constructed. The 1985 Environmental Report and Environmental Assessment evaluated the expansion for Pad 3.

Additional Features

Compacted areas around the storage pads allow positioning of the handling equipment. These compacted areas are connected via an access road to the ISFSI entrance. The area between the compacted areas and the ISFSI fence is seeded with grass and mowed as needed. The areas surrounding additional slabs would be compacted to properly support the haul vehicle and transporter needed for handling the casks.

A low-level waste storage building is located within the ISFSI perimeter, near the entrance and between Pads 1 and 2. Standard metal shipping containers also are stored in the area between the pads, and north of the low-level waste storage building. These containers and the low-level waste storage building are not part of ISFSI operations and are not part of the license renewal application.

Auxiliary Systems

The only utility provided to the Surry ISFSI is electric power for lighting, general utility, and instrumentation purposes. The source of electricity is a 34.5/0.48 kV transformer that provides power to the low-level storage facility. The 34.5 kV line is normally fed from an offsite power source but can be manually transferred to the station switchyard. The low-level storage facility transformer provides power to ISFSI loads through a separate feeder and disconnect and distribution panel located near the ISFSI local annunciator. This distribution panel also provides feed to the storage pads. Service power for lighting and welding receptacles is 480V, 60 Hz, single or three phase.

Annunciator lamps are located on the local ISFSI annunciator. If triggered by cask monitoring devices, they light up and remain lit until reset. In addition, a flashing light visible to personnel at the power station is activated.

Ventilation and offgas systems are not required for the Surry ISFSI and none are provided.

Because there are no airborne contaminants associated with the ISFSI, neither compressed air nor breathing air supply systems are required or provided. Air sampling systems are not required at the Surry ISFSI.

Steam is not required at the Surry ISFSI, and none is provided.

Water is not required at the Surry ISFSI, and none is provided. Potable water is not required because the ISFSI is manned only infrequently, during cask handling operations and inspections. Decontamination of the casks takes place prior to their transfer to the ISFSI.

Fire suppression water is not required. No fires other than small electrical fires are considered credible at the Surry ISFSI. Therefore, the Surry ISFSI does not have a fire protection system other than portable fire extinguishers that are available within the ISFSI. The fire-fighting equipment and personnel at the Surry Power Station would be available if needed.

No chemical operations are required for the Surry ISFSI. No chemical storage, handling, processing, or other activity involving chemical reactions is planned or provided.

Neither sanitary nor chemical sewage is produced at the Surry ISFSI. No permanent sewage treatment system is required or provided. During the infrequent periods of pad construction or cask transfer operations, portable sanitary facilities may be provided in the vicinity of, but not directly in, the ISFSI. Chemical wastes, such as small amounts of ethylene glycol (antifreeze) or drips of lubricating fluid from transport vehicles would be cleaned up and disposed of at appropriate facilities.

Major maintenance operations are not required. Cask design features minimize or eliminate maintenance. Other equipment and instrumentation is selected to withstand the effects of the environment. Periodic maintenance is not required beyond instrument adjustments. Minor maintenance, such as touching up defects in the cask outer coatings, can be performed within the ISFSI area, without moving the casks.

The Surry ISFSI does not include active components such as remotely operated equipment or hot cells. There are no fuel handling facilities exclusively dedicated to the Surry ISFSI. Handling of the fuel and cask loading and decontamination is done in the Surry Power Station fuel building.

There are no credible mechanisms that could result in contamination of the outside surfaces of the casks, other ISFSI components, or operating personnel, after the casks leave the decontamination cell. Therefore, the Surry ISFSI does not include provisions for decontamination. Disposal of contaminated equipment from the ISFSI is not expected.

Incidental operations include receiving new casks from the supplier, temporary empty cask storage, and transfer to the fuel building. During these operations, the casks are inspected in detail and abnormalities corrected. No repair operations at the ISFSI are anticipated once the casks are loaded and placed into spent fuel storage.

In general, cathodic protection is not required for the casks because the surrounding medium for the casks is air, which is a poor electrolyte. Hence, protection from electrolytic decomposition of the casks is not required.

3.2 Inventory

The designs of the casks currently being used at the ISFSI were addressed either in the 1985 Environmental Report and Environmental Assessment, or in the environmental report amendments submitted by Dominion before new designs were used. Other inventory characteristics remain unchanged.

The ISFSI license currently limits the amount of spent fuel that may be stored at the facility to 811.44 metric tons equivalent uranium (MteU). When the original ISFSI license was issued in 1986, the CASTOR V/21, with a capacity of 21 assemblies, was the reference cask design. The current reference design is the TN-32 cask, with a capacity of 32 assemblies. This reference TN-32 cask is designed to hold Westinghouse 15x15 fuel assemblies with the following characteristics:

- Initial enrichment less than or equal to 4.05 weight percent Uranium-235
- Assembly average burnup less than or equal to 45,000 megawatt days per metric ton uranium
- Minimum cooling time: 7 years
- Heat generation, including burnable poison rod assemblies and thimble plug devices, of less than 1.02 kilowatts per assembly
- Fuel assembly uranium content: 467.1 kilograms uranium per assembly
- Fuel assembly weight, including burnable poison rod assemblies and thimble plug devices: 1,533 pounds

Dominion uses only Nuclear Regulatory Commission approved casks. Most of the casks on Pad 1 are CASTOR V/21 casks. Other casks of different capacities also are stored on Pad 1, including the NAC-I28 S/T (28 assemblies per cask), the Westinghouse MC-10 (24 assemblies per cask), and the CASTOR X/33 (33 assemblies per cask). Detailed descriptions of the operational characteristics of all the casks used at the Surry ISFSI are provided in the sealed surface storage cask (SSSC) topical reports and in Appendix A of the FSAR.

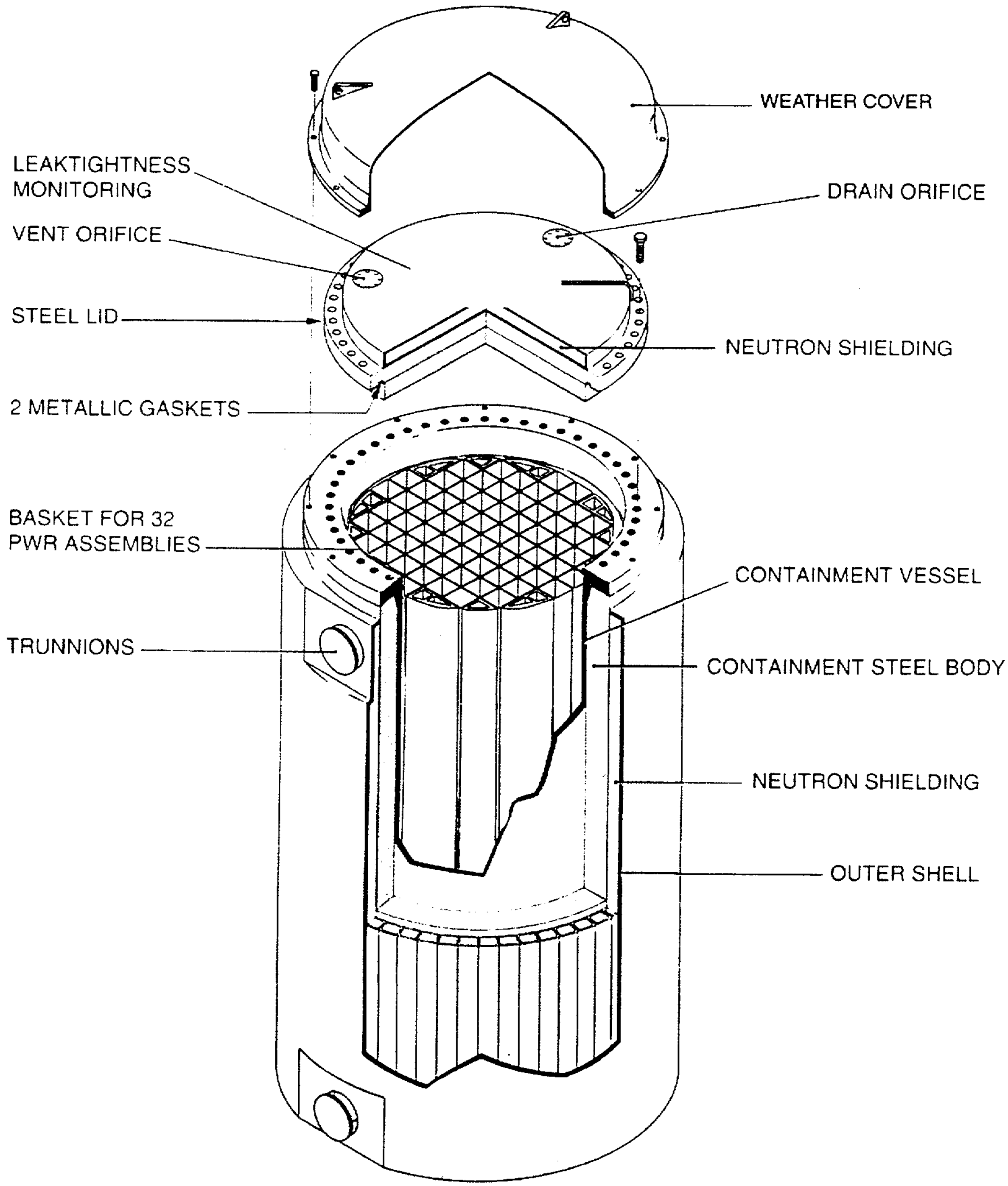
All the casks currently stored on Pad 2 are TN-32 casks except for one CASTOR V/21. The capacity of all three pads is limited to 84 storage locations. Using TN-32 casks for the remaining storage locations would require that the ISFSI license be amended in order to accommodate additional MteU (the difference between 32 assemblies per cask versus 21 for the original reference cask). The exact number of casks will depend on the storage capacity of the particular casks that are used and the number of assemblies requiring storage in the ISFSI. For this environmental report the TN-32 cask is used as the reference cask. Figure 3-2 is a schematic of the TN-32, the reference cask for this environmental report.

As indicated in Section 3.1, operation of the Surry Power Station for an additional 20 years beyond the original license term would result in the generation of additional spent fuel assemblies. This may require that the ISFSI provide additional dry storage capacity (up to a total of four storage pads) and would require a license amendment to increase the amount of spent fuel that may be stored at the facility. The exact number of additional storage casks is difficult to predict due to uncertainties in the anticipated spent fuel off-site shipping schedule. However, it is possible to bound the analysis based on an assembly discharge rate of 60 assemblies per 18-month cycle for each reactor unit. This represents an average discharge rate of about 80 assemblies per year, and an average emplacement rate of less than three TN-32 casks per year.

If the U.S. Department of Energy (DOE) started to take delivery of the assemblies directly from the spent fuel pool in 2010, a fourth storage pad would be unnecessary. In 2010 approximately 71 casks would be stored at the ISFSI. If DOE delayed taking delivery of Surry fuel, a fourth storage pool would be needed. One scenario assumes that DOE would start to take delivery of spent fuel in 2026. In 2026, approximately 104 casks would be stored at the ISFSI, with 20 casks on the fourth storage pad would be necessary. The current FSAR base case assumes that all 84 locations on three pads are full. This environmental report uses for its analyses the FSAR base case of 84 casks on three pads, and 104 casks on four pads, with all future casks being TN-32 casks. The range of 84 to 104 casks was based on assumptions about spent fuel shipping schedules that may not be implemented. However, Dominion feels this range of casks stored on the ISFSI conservatively bounds the analysis of human health impacts.

If high enrichment and high burn-up fuel is available in the future (e.g., 5 weight percent Uranium-235 and 60,000 megawatt days per metric ton uranium), such fuel would exceed the current operational limits allowed in the Technical Specifications for any of the storage casks currently in use at the ISFSI. The advantage of using higher burn-up fuel is that it would reduce the discharge rate from the reactor and could delay or avoid the need for a fourth storage pad. However, for purposes of this analysis, it is assumed that all the fuel stored at the ISFSI is consistent with the reference TN-32 cask fuel specified in the FSAR.

Figure 3-2
Schematic of TN-32 Reference Cask



3.3 Construction

The FSAR base-case scenario is limited to the construction of a third storage pad in addition to the two currently built and in use. Because the third pad will be identical to the first two, the amount of time, personnel and material to construct this pad are assumed to be the same. A fourth pad may need to be constructed in the future. This construction is assumed to require the same time, personnel, and materials as to construct Pad 3. The number of construction workers is discussed in Section 3.5 Employment.

3.4 Aging Management Activities

The casks stored at the Surry ISFSI will be subject to aging management activities to ensure their integrity for the duration of the renewal period.

Aging Management Activities for the casks are summarized in Appendix A of the ISFSI License Renewal Application.

3.5 Employment

The workers involved in routine ISFSI operations are drawn from the general population of employees at the Surry Power Station. The amount of time dedicated to ISFSI operations can be estimated from calculations of the radiation dose to workers presented in Chapter 7 of the FSAR.

One or two employees are required to conduct the maintenance and inspection operations at the ISFSI. Table 7.4-2 of the FSAR estimates the time required for these tasks to be about 10 man-hours per year, assuming 84 casks on three pads. These operations would be required for as long as the ISFSI contains storage casks. The additional amount of time required to maintain 104 casks on four pads would be another 2 to 3 hours.

As many as three employees are required to load, transport and emplace each cask. Table 7.4-1 of the FSAR estimates the time required in radiation areas for these tasks to be 174 man-hours per year, assuming that an average of three TN-32 casks are loaded each year. Work in non-radiation areas, including receipt and inspection of empty casks, is estimated to require an additional 44 hours for a total of approximately 220 man-hours per year. Moving a cask back to the spent fuel pool in preparation for unloading the assemblies for shipment is expected to take less time. However, the frequency at which casks are removed from the ISFSI pad may be greater than the frequency of emplacement. Transporting the casks between the Surry Power Station fuel building and the ISFSI is expected to stop or be curtailed when DOE is accepting spent fuel that is stored in the spent fuel pool. It is anticipated that the cask removal frequency will peak at the end of the reactor license period, at which time more employees would be available for this task.

Based on the above considerations, it is unlikely that ISFSI operations will require more than one full-time-equivalent employee. The addition of up to 104 total casks will not increase this estimate. This is a very small fraction of the Surry Power Station work force, which is slightly less than 1,000 workers, including utility and contractor personnel. ISFSI operations will continue to be performed by Surry Power Station employees who have additional responsibilities at the Power Station. Employment at Surry Power Station will not be affected by continued ISFSI operations.

The construction of a third and possibly a fourth storage pad will require approximately 20 temporary workers each time. The time required to build each pad is estimated to be 7,090 man-hours or approximately 6 weeks.

Decommissioning the ISFSI may require that the concrete slabs be removed and the site restored to pre-ISFSI conditions. Since no decontamination of the ISFSI structures is expected, such restoration would be limited in large part to the removal and disposal of the concrete slabs in a construction debris landfill, followed by back filling, grading, and landscaping. Although detailed decommissioning plans have not been developed it is assumed that such activities would not require a workforce greater than that used to construct the ISFSI.

3.6 Decommissioning

The following discussion is based on information in the FSAR (Ref. 3.1-1) and the decommissioning plan included in the license application. The dry casks used at the Surry ISFSI are designed to simplify decommissioning. Cask decommissioning could be accomplished one of two ways:

- The ISFSI cask, including the spent fuel stored inside, could be shipped to an offsite facility for temporary or permanent storage. Depending on licensing requirements at the time of offsite shipment, placement of the entire ISFSI cask inside a supplemental shipping container or an overpack would be considered.
- The spent fuel could be removed from the ISFSI cask and shipped in a licensed shipping container to a suitable fuel repository. Any contamination on the interior of the storage cask would be from crud on the outside of the fuel pins and from crud in the spent fuel pool water. The expected low levels of contamination on the interior of the cask could easily be removed with a high pressure water spray wash. Cask activation analyses predict that the cask materials would be only slightly activated by the low-level neutron flux from the stored spent fuel, even after years of storage. Consequently, radiation levels from activation products would be negligible and, after the surface decontamination, the cask could be cut-up for scrap or partially scrapped with any remaining contaminated portions shipped as radioactive waste to a radioactive waste disposal facility.

The spent fuel pool or other appropriate fuel transfer options will remain functional at Surry until the ISFSI is decommissioned. This will allow Dominion to transfer fuel from other storage casks to licensed shipping containers for shipment offsite and to conduct cask maintenance as necessary.

Due to the zero-leakage design of the sealed surface storage casks, no residual contamination is expected to be left behind on the concrete base pad. In essence, radiological decommissioning of the ISFSI would be complete when the last cask was removed from the site.

3.7 References

Ref. 3.1-1 Dominion. 2000. Surry ISFSI Final Safety Analysis Report. Amendment 14. June.

Ref. 3.1-2 Virginia Power. 1985. Environmental Report Surry Power Station, Dry Cask Independent Spent Fuel Storage Installation. Amendment 1. May. Richmond, VA.

Ref. 3.1-3 U.S. Nuclear Regulatory Commission. 1985. Environmental Assessment Related to the Construction and Operation of the Surry Dry Cask Independent Spent Fuel Storage Installation. April. Washington, D.C.

4.0 ENVIRONMENTAL CONSEQUENCES AND MITIGATING ACTIONS

4.1 NRC Reviews

The U.S. Nuclear Regulatory Commission (NRC) has reviewed the environmental impacts of dry storage of spent nuclear fuel many times (Section 1.2). As noted in Table 1-1, each analysis concluded that the activity would have no significant impacts on the affected environment.

4.2 Impacts from Refurbishment and Construction

No refurbishment of the ISFSI is planned during the 40-year license renewal period. Therefore, there would be no impacts from refurbishment.

As discussed in Section 3.1 the Surry Independent Spent Fuel Storage Installation (ISFSI) will require one and possibly two additional storage pads during the license renewal term. The pads would be built on previously disturbed ground adjacent to the existing pads. Best management practices during construction would prevent erosion and sedimentation of surface water. Stormwater runoff is diverted to a percolation basin. The ISFSI is approximately 35 feet above the mean sea level at Hampton Roads, VA. The pads are approximately 3 feet thick. As described in Section 2.2, Geology, Soils, and Groundwater, the Surry Power Station site is 25 to 35 feet above sea level and groundwater is approximately 1 to 2 feet above sea level. Construction of one or possibly two pads at the ISFSI would not adversely affect the geology, soils, groundwater or surface water of the area.

The perimeter fence could need to be moved about 75 feet into the surrounding woodland. If this occurred an additional two acres would be incorporated into the facility. The woods surrounding the facility are mixed pine/hardwood forest that has been timbered in the past. No threatened or endangered species occur in the immediate vicinity of the ISFSI. Land immediately west of the facility slopes toward a northerly drainage into the wetlands of the Hog Island Wildlife Management Area. Surveys for cultural resources have not identified any sites in the potentially affected area, and indicated that there would be no potential for cultural or archaeological resources at the ISFSI.

All Dominion land-disturbing activities are done according to the requirements of permits issued by Surry County. In addition, Dominion has procedures in place for sediment and erosion control best management practices, and for identifying and preserving previously unknown cultural artifacts. All land-disturbing activities at the ISFSI would be conducted using these procedures. For these reasons, any impacts from construction would be small and would not warrant mitigation.

4.3 Impacts from Operations

4.3.1 Occupational and Public Health

Radiological protection and doses from ISFSI operations are discussed in Chapter 7 of the FSAR (Ref. 4.3-1). The major aspects of the radiological protection program are summarized in the following sections. There are no other potential health impacts other than the hazards associated with moving heavy objects and equipment during cask transfer operations.

Radiological Controls and Design Considerations

Operations at the Surry ISFSI are conducted to ensure that the radiation dose to both workers and the public is as low as reasonably achievable (ALARA). The Surry Power Station ALARA program, including ISFSI operations, complies with 10 CFR 20.1101, Radiation Protection Programs, and is consistent with Regulatory Guide 8.8, Information Relevant to Ensuring That Occupational Radiation Exposures at Nuclear Power Stations Will Be As Low As Reasonably Achievable (Ref. 4.3-2). Facility layout and design, as well as operations, have been analyzed to ensure that the goals of the ALARA program are met. In addition, Dominion regularly reviews operational experience from throughout industry and incoporates any relevant lessons learned into their ISFSI operations.

The location of the ISFSI within the Surry Power Station site allows the health physics facilities, equipment, and personnel to be readily available at all times to ensure that ALARA considerations are met. The ISFSI is located a sufficient distance from buildings and occupied spaces to minimize total personnel exposure. This location was chosen based on several considerations, including ALARA, as follows:

- The ISFSI is centrally located within the Surry site property, thus minimizing offsite exposures.
- The ISFSI is of sufficient distance from the Surry Power Station so that the increased dose to Surry Power Station personnel is minimal.
- The layout of the ISFSI is designed to reduce exposures because the casks are stored with sufficient separation between them to allow personnel adequate access between the casks for surveillance and handling operations.

The fuel is stored dry, inside sealed, heavily-shielded casks. The shielding minimizes personnel exposure. Storage of the fuel in dry, sealed casks eliminates the possibility of leaking contaminated liquids, and gaseous releases are not considered credible because of the dual-seal cask design. The exteriors of the casks are decontaminated before leaving the Surry Power Station fuel building. There is no radioactive equipment at the ISFSI so there can be no exposures from surface contamination associated with maintenance of equipment. The required surveillance and maintenance of the casks is minimal. This method of spent fuel storage minimizes direct radiation exposures and eliminates the potential for contamination incidents.

The general order of cask placement in the ISFSI was developed based on ALARA considerations. The second storage pad was not used until the first storage pad was filled and, likewise, Pad 3 would not be used until Pad 2 is filled. Casks are placed on a pad in rows of two starting at the northern end and finishing at the southern end. Therefore, personnel placing the first casks on the second pad were closer to the spent fuel emplaced on the first pad at the start of ISFSI operations and farther from the spent fuel discharged more recently from the fuel pool, thus minimizing the amount of radiation exposure from previously filled pads. In addition, the third pad would be built nearest Pad 1, some distance from the most recently discharged spent fuel on Pad 2. The location of the fourth pad, if required, will be evaluated considering construction and worker dose.

Sources of Radiation

Neutron and gamma radiation emanating from the shielded casks is the primary source of radiation exposure. Descriptions of the fuel that the casks are designed to store are provided in the Sealed Surface Storage Cask (SSSC) topical reports and in Appendix A of the FSAR. The exterior surfaces of the casks are decontaminated prior to transfer to the ISFSI. The fuel is not removed from the casks nor are the casks opened while at the ISFSI.

The original environmental report analysis assumed a CASTOR V/21 reference storage cask loaded with 21 fuel assemblies with an initial enrichment of 3.5 weight percent U-235, a burn-up of 45,000 megawatt days per metric ton uranium, and a cooling time of 5 years. A bounding factor of 3 was applied to that analysis to account for future cask designs. The current reference cask used in the FSAR for purposes of analysis is a TN-32 cask loaded with 32 fuel assemblies with an initial enrichment of 3.5 weight percent U-235, a burn-up of 45,000 megawatt days per metric ton uranium, and a cooling time of 7 years. This enrichment, rather than the approved limit of 4.05 percent, yields a more conservative radionuclide inventory. The average (neutron plus gamma) dose rate limits for the reference TN-32 cask are 224 mrem/hr and 76 mrem/hr for the side and top surfaces, respectively. The dose rate decreases as a function of time due to radioactive decay. However, to simplify the analysis, the dose-rate calculations in the FSAR conservatively assumes that 84 TN-32 reference casks are emplaced simultaneously. The calculated dose rate from 84 casks decreases rapidly as a function of distance, as shown in Figure 4-1.

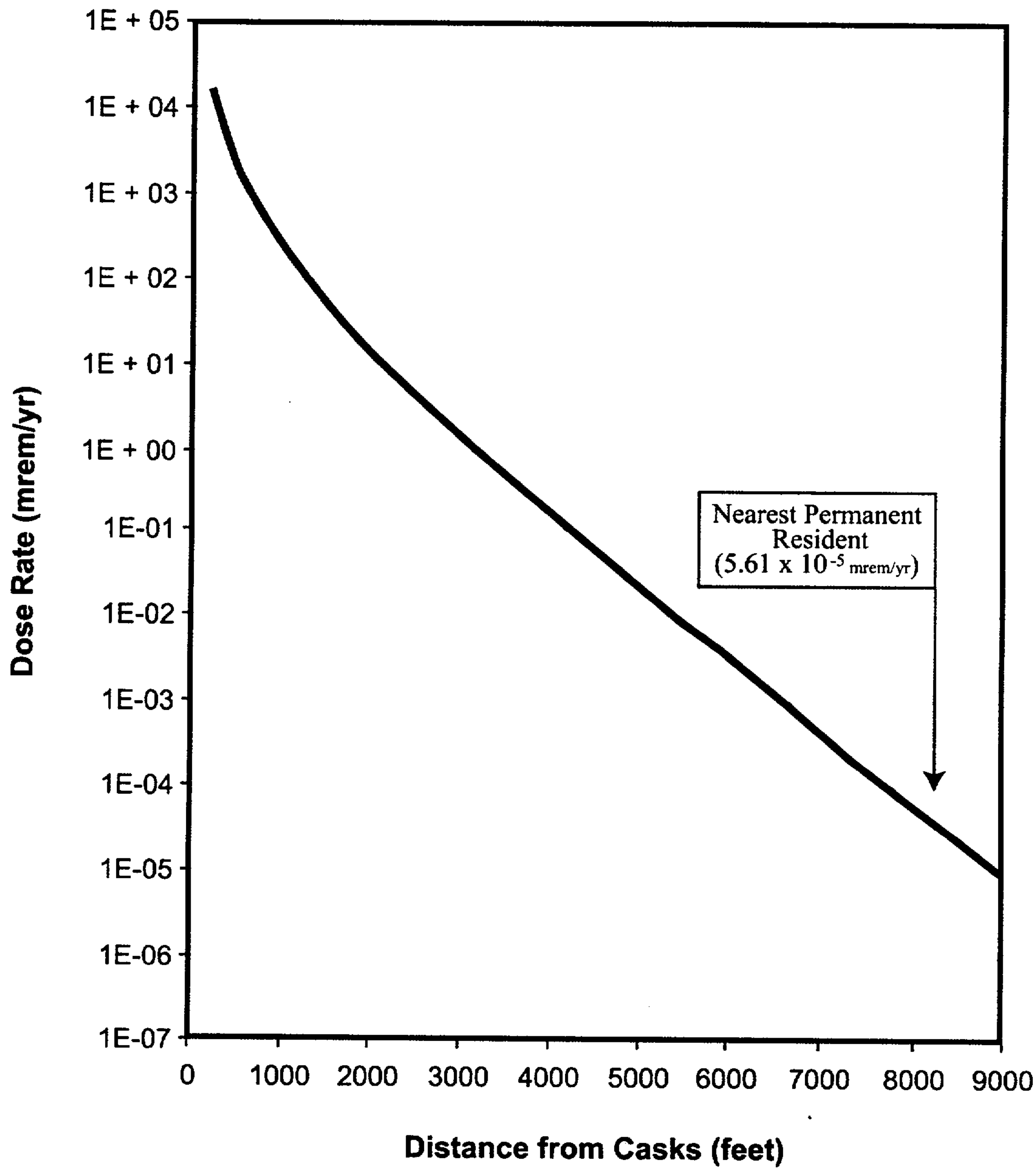
Occupational Dose

Surry Power Station personnel involved in ISFSI and LLWSF operations will incur the highest occupational doses from the ISFSI because of their proximity to the casks. Due to the distance between the ISFSI, the power station, and the site boundary, much smaller dose are incurred by other plant workers and members of the public.

The occupational exposures to ISFSI personnel from ISFSI operations are calculated in Section 7.4.1 of the FSAR. The collective dose to workers involved in the loading, transport, and emplacement of a single cask was estimated to be 2.65 person-rem (Table 4-1), assuming a reference TN-32 cask and 84 casks in the ISFSI. The contribution from 20 additional casks (on Pad 4, if it were required) would not significantly increase this estimate because most of the dose is contributed by the cask being emplaced.

The annual collective dose for surveillance and maintenance activities was estimated to be 1.4 person-rem (Table 4-1). To estimate the dose rates for operability tests and calibration, the worker was assumed to be located at the control panel at the perimeter fence entrance. Visual surveillance assumed a walk-down of each of the three pads at a distance no closer than 2 meters to the casks. During surface defect repairs, the worker was assumed to be positioned next to a cask. The five surrounding casks (all within 16 feet of the worker) would be the predominant dose contributors during repair work. Base-case TN-32 surface dose rates were utilized and it was assumed that three storage pads were filled with 84 casks. If a fourth pad were to be required to accommodate an additional 20 casks, this estimate would increase very little, because most of the dose is from the nearest casks.

Figure 4-1
Dose Rate for 84 Base-case Casks versus Distance



Grfx_01\Util\Surry ISFSI/4-1 Dose Rate Base-case Casks.ai

Table 4-1
Annual Doses from ISFSI Operations

Task	Person-Rem
LLWSF[a]	1.3
Surry Power Station[a]	1.3
ISFSI Operations -	
Cask Preparation and Placement[b]	7.9
Maintenance and Surveillance[a]	1.4
Total	11.9

Source: Ref. 4.3-1.
a. Assumes completed ISFSI (84 design-basis casks).
b. Assumes 3 TN-32 casks per year.

The annual dose to LLWSF workers from the ISFSI was estimated to be 1.3 person-rem, assuming that all three pads were full (Table 4-1). Credit was taken for air attenuation of neutrons and gammas; however, no credit was taken for the shielding effect of one cask behind another or the shielding provided by the LLWSF building to the personnel. Because the LLWSF is located between the first and second pads, any contributions from the casks on the third and fourth pads would be smaller than contributions from casks on the first two pads.

To evaluate the additional annual dose to station personnel from ISFSI operations, the FSAR conservatively assumes 84 TN-32 casks in the ISFSI. All workers at the Surry Power Station are assumed to be in offices, nonshielded buildings, or in the plant yard. This population includes a normal work force of utility and contractor personnel as well as the increased staffing required during outages. As a bounding estimate, the total number of workers assumed in the FSAR was 600 spending a total of 1,248,000 man-hours per year in the Surry yard area and in offices. The shortest distance between the Surry Units 1 and 2 perimeter fence and the nearest cask is approximately 2,100 feet. The dose rate from the ISFSI to a yard location 2,100 feet away is 0.001 mrem/hr. The exposure for station workers due to the ISFSI is conservatively estimated to be 1.3 person-rem per year (Table 4-1).

The annual occupational dose for ISFSI operations is given in Table 4-1. The estimated total occupational dose of 11.9 person-rem per year is based on the transfer of three reference casks per year and an ISFSI with 84 reference casks. A facility with 104 casks would result in a slightly higher annual occupational dose, but still less than the 21.2 person-rem estimate in the original environmental report.

In the future, Surry Power Station may be authorized to store fuel that exceeds the enrichment and burn-up limits specified in the current ISFSI license. In-reactor residence time would increase, and the required minimum spent fuel pool storage times could exceed 7 years. However, it is unlikely that such fuel would be available for storage at the ISFSI before 2005. Therefore, casks containing such fuel could be stored on the third and possibly fourth pads, if necessary. It is likely that casks designed to store the higher burn-up assemblies would require that such assemblies be stored in the middle of a cask, with lower burn-up assemblies placed in the outer locations, to minimize the dose rates at the cask surface. Due to surface dose rate limitations and the potential for regionalized storage within the cask, it is unlikely that casks containing higher burn-up fuel would result in higher occupational doses than estimated in the original environmental report. The environmental impacts, if any, of storing spent fuel with higher enrichment and burn-up limits would be evaluated more precisely if and when Dominion applies for authority to store such spent fuel in the ISFSI.

Dose to the Public

The only doses to members of the public during normal operations will result from the gamma and neutron radiation that is emitted from the cask surfaces. The dose rate decreases rapidly as a function of distance from the ISFSI, as indicated in Figure 4-1. The calculated dose rate at the nearest site boundary, located approximately 1,500 feet northwest of the ISFSI, is 50 mrem/year from 84 reference TN-32 casks. This estimate is lower than the original dose rate estimate of 136 mrem/year, which was based on a factor of 3 times the dose from 84 CASTOR V/21 reference casks.

If 20 additional TN-32 casks were required for storage on a fourth pad, the calculated dose rate at the site boundary based on the reference cask design would increase by approximately 25 percent. While a fourth storage pad may be slightly closer to the site boundary, it would not noticeably affect the dose rates calculated for a location 1,500 feet away. In any event, the estimated dose rate for 104 TN-32 casks would be lower than 100 mrem/year and would meet the requirements of 10 CFR 20.301. Depending on the cask design, storing higher burn-up fuel on a fourth pad could increase the calculated dose rates. However, it is unlikely that the small number of casks containing high burn-up assemblies would result in an overall dose rate at the nearest boundary in excess of 100 mrem/yr (which is the annual dose rate limit prescribed by regulation).

The ISFSI licensing basis for the annual dose to the nearest permanent resident, located 1.5 miles from the ISFSI, was based on 84 CASTOR V/21 reference casks. The annual dose calculated for that case was 6.0×10^{-5} millirem, several orders of magnitude below the 10 CFR 72.104 limit of 25 millirem per year from all doses associated with Surry Power Station operations. The revised calculations based on 84 TN-32 reference casks result in a dose of 5.6×10^{-5} millirem per year, which is less than the original licensing basis. Twenty additional TN-32 reference casks would result in a dose to the nearest resident of 6.9×10^{-5} millirem per year, or 15 percent higher than the original licensing basis. As indicated earlier, the use of higher burn-up fuel may result in slightly higher dose rates from individual casks. However, the dose to the nearest resident from Station and ISFSI operations would still be well below the 25 millirem per year regulatory limit.

The collective dose to the public from normal operations was conservatively estimated by assuming that all residents within a 2-mile radius of the plant were at the same distance from the ISFSI as the nearest permanent resident. The annual collective dose from 84 TN-32 reference casks to 48 residents (in 1980) within a two-mile radius of the ISFSI is calculated to be 2.7×10^{-6} person-rem. Assuming a 20 percent growth in the number of residents within 2 miles and a maximum of 104 TN-32 reference casks would result in a collective dose of 4.0×10^{-6} person-rem. In either case, the collective dose from ISFSI operations would be several orders of magnitude lower than the collective dose from natural background radiation. This is additionally conservative because much of the area within 2 miles of the ISFSI is station property, part of the Hog Island Wildlife Management Area, or surface water, and thus, not available for new housing.

Dose from Construction Activities

The collective exposure to construction workers is expected to be higher for the construction of the third pad relative to the collective exposure from the construction of the second pad due to the additional casks now stored on the second pad and the proximity of the third pad to Pad 1.

The exposure analysis in the original environmental report estimated that construction of a third pad would result in a collective dose of 78 person-rem to 20 workers. This estimate was based on an average dose rate of 11 millirem per hour and a construction time of 7,090 man-hours. A radiological survey conducted on July 2, 2001, with the second pad approximately 50 percent full, reported a dose rate of 0.33 millirem per hour along the east side of the security fence surrounding Pad 1. This is the closest point at which Pad 3 construction workers would be exposed. The dose rate measured at the east perimeter fence of the ISFSI was 0.12 millirem per hour, which would be the dose rate to workers involved in extending that side of the perimeter fence. Based on these measurements, the collective dose from Pad 3 construction is likely to be 20-30 times lower than the original estimate.

A fourth pad, if needed would likely be constructed adjacent to the west side of Pad 2's security fence and could require the extension of the west side perimeter fence. However, the most suitable location for a possible fourth pad has not yet been evaluated. The dose rates measured at these locations were 1.2 millirem per hour, and 0.25 millirem per hour, respectively, on July 2, 2001. These are likely to increase once Pad 2 is full. Because Pad 3 would be located at a significant distance from the new Pad 4, any contributions from the newly-placed casks on Pad 3 are expected to be smaller than the current contribution from Pads 1 and 2. Some reduction in the contribution from all three pads would occur due to radioactive decay by the time Pad 4 was built. It is estimated that the average dose rate to Pad 4 construction workers would be well below 11 millirem per hour. Therefore, the constructions of Pads 3 and 4 are bounded by the existing analysis.

4.3.2 Other Impacts

The continued operation of the Surry Power Station ISFSI during the 40-year license renewal term would have no impacts on the following resources:

- Geology or soils
- Hydrology
- Air quality
- Aquatic resources
- Socioeconomics
- Social Services or Public Utilities
- Land Use
- Aesthetics

There are no liquid discharges from the ISFSI, so no geologic or water resources or aquatic resources would be affected. As described in Section 4.2, Impacts from Refurbishment and Construction, all stormwater runoff is diverted to a percolation basin. There are no air emissions from the ISFSI so air resources would not be affected.

As described in Section 3.5, Employment, all operations, maintenance and surveillance activities at the ISFSI would be performed by Surry Power Station employees as part of their job. No additional employees would be required to operate the ISFSI. Construction of up to two additional pads would require approximately 20 construction workers for 6 weeks twice during the 40-year license renewal term. Twenty additional employees is an order of magnitude less than the number of additional employees during Surry Power Station outages. As stated in the Surry Power Station Environmental Report (Ref. 4.3-3), 700 additional employees during annual outages do not adversely affect social services and public facilities such as public water supplies or transportation. Analyses done for the Surry Power Station indicate that the addition of 60 new permanent employees also would not strain the available social services and public facilities. Therefore, based on these bounding analyses done for the Surry Power Station in connection with renewal of the reactors operating licenses, Dominion concludes that the continued operation of the Surry ISFSI would not affect regional socioeconomics, social services, or public facilities.

As described in Section 2.6, Land Use, the presence of Surry Power Station has had little impact on land use in Surry County. The continued operation of the ISFSI would not affect land use patterns in the county.

As described in Section 2.3, federally threatened bald eagles are present at the Surry Power Station site, and nest at the Hog Island Wildlife Management Area immediately north of the ISFSI. Dominion is aware of no activities related to continued ISFSI operations during the license renewal term that would adversely affect this species.

As described in Section 2.8, Historic and Cultural Resources, the ISFSI is located on land that has no potential for unknown cultural resources. Construction-related impacts are discussed in Section 4.2. Continued operations for the 40-year license extension would have no adverse effect on historic or cultural resources.

4.4 Impacts from Potential Accidents

Chapter 8 of the FSAR (Ref. 4.3-1) describes the potential impacts from off-normal operations, defined as events which can be expected to occur with moderate frequency (Category II), and accidents, defined as serious occurrences which are expected to happen on an extremely infrequent basis, if ever, during the lifetime of the facility (Category III). The FSAR also describes a maximum hypothetical accident, which is considered not credible (Category IV).

4.4.1 Category II Events

The FSAR defines one off-normal scenario: a total loss of power to the ISFSI. The event could be initiated as a result of natural phenomena, such as lightning or extreme wind, or as a result of undefined disturbances in the non-safety-related portion of the electric power system of the Surry Power Station.

This event would have no safety or radiological consequences, because none of the systems whose failure could be caused by this event are necessary to the safety function of the ISFSI. The lighting is for convenience and visual monitoring, and the instrumentation monitors the continuous performance of the casks with respect to heat transfer and seal integrity. Neither of these parameters is expected to change rapidly and their status is not dependent upon electric power.

4.4.2 Category III Events

The FSAR defines 10 Category III events, 3 of which could be initiated by natural phenomena. One accident involved a dropped fuel assembly during a cask loading procedure and is included in the Surry Power Station Final SAR as well as the ISFSI FSAR. However, because all fuel transfer activities occur inside the Surry Power Station and not at the ISFSI, that accident discussion has not been included in this environmental report. Nine Category III accidents are summarized below.

<u>Earthquake</u>

The design earthquake is postulated as the design-basis extreme natural phenomenon. Such an earthquake would have an acceleration of 0.07*g* (gravity) and is expected to occur less than once in 500 years. The SSSC topical reports indicate the design earthquake would not compromise the cask integrity and that no damage would be sustained. Therefore, this event would not have any off-site radiological consequences.

<u>Extreme Winds</u>

Another natural phenomenon, extreme winds, is described in the FSAR. The extreme winds are assumed to be associated with the passage of a design tornado, defined as one with rotational wind velocity of 300 mph, a translational velocity of 60 mph, and a pressure drop of 3 psi in 3 seconds. The analyses in the SSSC topical reports, as presented in the FSAR, indicate that, with the exception of the Westinghouse MC-10 cask, extreme winds are not capable of overturning any of the casks currently used at Surry nor of rupturing or opening them. In the case of the Westinghouse MC-10 cask, the design tornado could generate a sufficient load to topple the cask. The consequences of a postulated cask tip-over are conservatively bounded by the 5-foot drop accident in Section 8.2.6 of the Westinghouse Topical Report. This event would not have any off-site radiological consequences, but could result in small additional external doses to workers involved in the recovery operation.

Flooding

A third natural phenomenon event, flooding, is listed in the FSAR, but is classified as a non-credible event. The Surry ISFSI is considered flood-dry because the finished grade elevation is more than 6 feet above the maximum flood level.

Explosion

The possibility of an explosion in the vicinity of the Surry ISFSI was considered in the FSAR. Sources of explosion and formation of flammable vapor clouds include the natural gas or petroleum products carried by the pipelines passing near the site, and explosive materials/chemicals used by nearby industrial facilities, carried by truck traffic on Virginia Highway 10, or by barge on the James River. The FSAR describes an explosion that is postulated to occur at the natural gas pipeline approximately 1,300 ft from the ISFSI. This occurrence is conservatively estimated to produce a pressure wave of less than 1 psi at the closest cask location. The SSSC topical reports describe the impact of a gas cloud explosion on the casks; the analyses indicate that a potential cask tip-over due to a gas cloud explosion is not capable of producing leakage from the cask. Because no radioactivity would be released, no off-site doses would occur, but workers involved in the recovery operation could receive an external dose. The consequences from all other potential sources of explosion are bounded by the pipeline explosion.

Fire

The FSAR discussed the following potential sources of fire in the vicinity of the Surry ISFSI:

- fossil fuels stored on or off the Surry Power Station site;
- the flammable liquids carried by the truck traffic on Virginia Highway 10;
- the flammable liquids carried by barge on the James River;
- the flammable liquids/gases in pipelines passing near the site; and
- security-related equipment.

The bounding fire was assumed to originate from burning 320,000 gallons of No. 2 fuel oil stored in a tank located 1,300 feet southwest of the ISFSI. The tank is surrounded by a dike. An open pool of fire, restricted to the area enclosed by the dike, was assumed for evaluation of heat effects on the casks. Based on the results of a simplified study, the estimated air temperature 1,300 feet away from the fire would be 8°F higher than the ambient temperature. This temperature difference is less than the 10°F margin between the cask design-basis temperature and the maximum recorded temperature for the area of 105°F. Because the distance between other potential fire sources and the Surry ISFSI is greater than the distance between the No. 2 fuel oil storage tank and the ISFSI, the heat effects on the casks from any of the potential fire sources would be less than the heat effect resulting from the No. 2 fuel oil burning.

The FSAR indicates that no fires other than small electrical fires are considered credible at the ISFSI. The probability of an accidental aircraft crash into the ISFSI was conservatively estimated to be less than 1.0×10^{-7} per year and the consequences of such an accident were therefore not analyzed (Ref. 4.4-1). The only combustible materials on the ISFSI pads are insulation on instrumentation wiring, and the coating on the outside of the casks. No other combustible or explosive materials are allowed to be stored on the ISFSI pads. The ISFSI area is cleared of trees and is seeded with grass. Other equipment in the area is adequately separated from the ISFSI pads. The ability of the casks to withstand postulated fires and the consequence of postulated fires are addressed in the SSSC topical reports. The fire protection capabilities available at the ISFSI include portable fire extinguishers within the ISFSI and the fire protection system for the Surry Power Station.

Inadvertent Loading of a Newly Discharged Fuel Assembly

The possibility of a newly discharged assembly (one with a heat generation rate greater than the maximum allowable) being erroneously selected for storage in a storage cask was considered in the FSAR. Such an accident could result from an error during the loading operations (e.g., wrong assembly picked by the fuel handling crane) or a failure in the administrative controls governing the fuel handling operations. Currently, the ISFSI Technical Specifications require that fuel assemblies be stored in the spent fuel pool while the heat generation decays to an acceptable rate. Depending on the storage cask being used, the minimum time in a fuel pool is currently 5 or 7 years. This accident scenario postulates the inadvertent loading of an assembly not intended for storage in the cask and possibly with a heat generation rate in excess of that specified for that cask.

To preclude this error from going undetected, and to ensure that appropriate corrective actions would occur prior to sealing the cask, a final verification of the assemblies loaded into the cask and a comparison with fuel management records would be performed to ensure that the loaded assemblies do not exceed any of the specified limits. Because these appropriate and sufficient actions would be taken, an erroneously loaded fuel assembly would not remain undetected. The storage of a fuel assembly with heat generation in excess of the maximum allowable for a storage cask is considered not credible.

Loss of Neutron Shield

The design of some storage casks includes both internal and external neutron-absorbing material. All casks stored at the Surry ISFSI have an external solid neutron shield. None of the casks at the Surry ISFSI has a liquid neutron shield. The SSSC topical reports discuss a postulated loss of neutron shield. As concluded in these documents, a total loss of neutron shield is not a credible event for the Surry ISFSI.

Cask Seal Leakage

The SSSCs feature redundant seals in conjunction with extremely rugged body designs. The sintered fuel pellet matrix and the Zircaloy cladding surrounding the fuel present additional barriers to the release of radioactivity. Except for the TN-32 design, the casks are not artificially pressurized above a small amount due to heating of the air or due to the inert gas (helium) in the cask. As a result, no credible mechanisms that could result in leakage of radioactive products have been identified for such casks.

Discussions of postulated cask seal malfunctions and loss of confinement barrier are presented in the SSSC topical report for the TN-32 design. The analysis concluded that the dose at the site boundary resulting from cask seal leakage is bounded by consequences from a complete loss of the storage cask confinement capability. This accident is described in Section 4.4.3.

Because the cavity of the TN-32 cask is pressurized, there is a potential for gases to leak out of these casks. However, leakage would require the failure of both primary and secondary seals. The space between these seals is pressurized in excess of both cask cavity and external pressures. Therefore, the failure of either or both seals would result in out-leakage of the gas from the inter-seal space. If this occurred, the monitoring system would detect the pressure drop in the inter-seal space and alarm.

When single-seal failures have occurred, the integrity of the primary seal was not violated, nor was any material released to the environment. These incidents were detected by the seal-pressure monitoring system. The casks were returned to the spent fuel pool building for inspection, and the causes of the seal failures were identified and remedied.

Cask Drops

Cask handling and drop accidents postulated to occur within the fuel and decontamination buildings are addressed as part of the Surry Power Station operating license. The casks are designed to withstand drops onto the ISFSI pads without compromising the cask integrity. ISFSI Technical Specifications limit the lift height for each cask. Cask drops in excess of these heights at the ISFSI, or enroute to it, are not considered credible because of procedures that preclude the lifting of the casks any higher. Analyses of cask drop accidents are presented in the SSSC topical reports.

4.4.3 Category IV Event (Loss of Confinement Barrier)

The following postulated accident scenario was not considered to be credible in the FSAR. It is hypothesized solely to demonstrate the inherent safety of the Surry ISFSI by subjecting a cask to a set of simultaneous multiple failures, any one of which is far beyond the capability of natural phenomena or man-made hazards to produce.

In this accident, heat removal and radiation shielding functions operate in the normal passive manner. The noble gas Krypton-85 confinement function is removed. This is equivalent to breaking the cask seal barriers (resulting in no release), removing the closure lids (resulting in no release), failing all the cladding in all the loaded fuel assemblies (with gap activity release), and finally, failing the fuel pellets themselves such that matrix confinement is no longer operable (with remaining Krypton-85 release).

An analysis in the FSAR determined the radiological consequences of a release of the entire gaseous inventory in a cask containing 24 assemblies. The resulting dose of 84 millirem to an individual at the nearest site boundary is well within the 5 rem criteria in 10 CFR 72.68(b). The assumptions are given in Table 4-2. The dose models and dose conversion factors given in Regulatory Guide 1.109, Rev. 1, (Ref. 4.4-2) were used in this analysis. The resulting doses are given in Table 4-3.

Table 4-2
Assumptions Used for Loss of Confinement Barrier Analysis

Activity Release Assumptions	
Spent Fuel Assembly Characteristics	
U-235 Enrichment	4.13 wt.%
Burn-up	45,000 MWd/MtU
Time out of core	5 yr
Kr-85 Inventory Per Assembly	4.39×10^3 Curie
No. Assemblies per Cask	24
Gaseous Inventory Released	100%
Duration of Release	Instantaneous
Dose Model Assumptions	
Nearest Site Boundary from ISFSI χ/Q	1.56×10^{-3} sec/m^3

Mwd= Megawatt day
Mtu = Metric ton Uranium
sec = second
m^3 = cubic meter

Table 4-3
Radiological Consequences From Loss of Confinement Barrier Analysis

Kr-85 Activity Released	105,000 Curie
Total Body Dose from Cloud Immersion at Nearest Site Boundary	84 millirem

To evaluate the impact on the general population from this postulated cask and fuel failure, the population exposure from this postulated event was compared to the population exposure resulting from background radiation sources. The plume of radioactive gas is conservatively assumed to remain within the sector which would result in the highest population exposure (located east-southeast [ESE] of the ISFSI). No credit is taken for the meandering of the plume which would greatly decrease the gaseous concentration in the plume and the fraction of the plume that would enter a given sector.

The specific procedure used to estimate the population growth ESE of the ISFSI (covering a 22.5 degree arc in that direction) involved first dividing the area in that arc into 10 sectors with the following radial intervals: 1-, 2-, 3-, 4-, 5-, 10-, 20-, 30-, 40-, and 50-miles. The block-level 2000 census data were used in a GIS analysis to determine the population in each sector. The population in each of the four sectors closest to the plant (0-4 miles ESE) was assumed to be zero, since no residents are actually present in those sectors, and was assumed to remain zero through the year 2050. The population in the remaining six sectors was projected to the year 2050 by the following method. The 1990 to 2000 population growth rate in each county intercepted by the ESE direction was obtained from 2000 census data. This decennial growth rate was assumed to remain constant over the next five decades (2000-2050). Each sector was divided along county or town boundaries so that each applicable county/town comprises a specific fraction of the individual sector area. Only the land area in each sector was considered, and uniform population density throughout each county/town was assumed. The counties/towns were then assumed to contribute a fraction of their population growth rate to the sector which is directly proportional to the fraction of area they contribute to the sector. The sector-specific decennial population growth rate is then estimated as a summation of the area-weighted fraction, by sector, of the decennial population growth rates contributed by the counties/towns which comprise that sector. The projected population in 2050 in each of the six populated ESE sectors was then calculated as the year 2000 population in each sector (calculated by the GIS/2000 Census Block analysis) multiplied by the sector-specific decennial growth rate raised to the power of 5 (for the 5 decades from 2000 to 2050).

The sector with the highest estimated population is the ESE sector. Based on the 1980 population in this sector, and weighted by the χ/Q (a dispersion term) at the midpoint of each annular sector, the FSAR estimated that this sector would receive an estimated exposure of approximately 153 person-rem. Adjusting this dose by the projected population growth in this sector through 2050, the exposure in 2050 is estimated to be about 1.9 times higher, or 293 person-rem. This is a small fraction of the annual population dose, estimated to be approximately 102,000 person-rem in 2050 from exposure to background radiation. In other words, the exposure due to a hypothetical incredibly severe accident at the Surry ISFSI would result in a general population dose of approximately 0.003 percent of background.

For a cask containing 32 assemblies and the assumptions listed in Table 4-2, the site boundary and 2050-population doses would increase by 33 percent to 112 millirem and 390 person-rem, respectively. In the future, higher burn-up assemblies may be generated; an estimate is made for a cask containing these hypothetical assemblies with a maximum burnup of 60,000 megawatt days per metric ton uranium and a minimum time-out-of-core of 7 years. The estimated dose at the site boundary and the collective dose would not increase by more than 15 percent, because not all of the assemblies in the cask would be at the maximum burn-up level.

4.4.4 Conclusion

Based on the information presented here, the initial accident analyses presented in the FSAR remain valid and bounding for the period of extended ISFSI operations. The impacts of any accident would be small and do not require mitigation.

4.5 References

Ref. 4.3-1 Dominion. 2000. Surry ISFSI Final Safety Analysis Report. Amendment 14. June.

Ref. 4.3-2 U.S. Nuclear Regulatory Commission. 1978. Information Relevant to Ensuring that Occupational Radiation Exposes as Nuclear Power Stations will be as Low as Reasonably Achievable. Regulatory Guide 8.8. Washington DC. June.

Ref. 4.3-3 Dominion. 2001. Surry Power Station Units 1 and 2. Volume 3. License Renewal Application. Appendix E - Applicant's Environmental Report; Operating License Renewal Stage; Surry Power Station Units 1 and 2. May. Richmond, Virginia.

Ref. 4.4-1 U.S. Department of Energy. 1993. Recommendations for the Preparation of Environmental Assessments and Environmental Impact Statements Office of NEPA Oversight. Washington, D.C.

Ref. 4.4-2 U.S. Nuclear Regulatory Commission. 1977. Calculation of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR 50, Appendix I. Office of Standards Development. Washington, DC. October.

5.0 ASSESSMENT OF NEW AND SIGNIFICANT INFORMATION

5.1 Discussion

In assessing whether there has been any significant environmental change since NRC evaluated Surry ISFSI construction and operation, Dominion reviewed the following documents:

- The generic environmental impact statement (GEIS) that the U. S. Nuclear Regulatory Commission (NRC) prepared for station license renewal (Refs. 5.1-1)
- The description of the new and significant information identification process that Dominion undertook for Surry station license renewal (Refs. 5.1-2)

Each of the above-referenced documents represents a structured approach to identifying and evaluating the significance of environmental impacts. The scope of each is station license renewal, and also addresses spent fuel storage, including the Surry Independent Spent Fuel Storage Installation (ISFSI). The GEIS covers the time from construction and start of operation to publication in 1996. The Surry station license renewal application evaluates whether there have been any significant environmental issues not covered in the GEIS, and includes the time from GEIS publication to the present. In combination, therefore, the documents span the time from the Surry ISFSI final environmental statement (Refs. 5.1-3) to the present, and serve as a mechanism for identifying any significant environmental changes since NRC evaluated Surry construction and operation.

The following description is of the process used during the station license renewal investigations. Dominion used a qualified investigative team comprised of corporate and plant personnel. These individuals form a group knowledgeable about plant systems, the site environment, and plant environmental issues. In addition, Dominion contracted with an environmental consulting firm with expertise in the NRC license renewal environmental review process, the National Environmental Policy Act (NEPA), and the scientific disciplines involved in preparing a license renewal environmental report. The team and consultants (1) interviewed Dominion subject matter experts regarding specifics of plant operations including management of, discharges and emissions (2) reviewed environmental documentation, (3) consulted with state and federal agencies to determine if the agencies were concerned about plant operations, and (4) reviewed internal procedures for reporting to the NRC events that could have environmental impacts. The subject matter experts interviewed during the plant license-renewal process included staff responsible for Surry Power Station spent fuel management and Surry ISFSI operations. The results of those interviews identified no new significant information regarding the spent fuel process.

Documentation and procedures reviewed for this application covered ISFSI impacts, and regulatory agencies were afforded the opportunity to address operational issues. While preparing this environmental report, Dominion reviewed the original environmental report for the ISFSI and its amendment, the environmental assessment for the construction and operation of the ISFSI, the ISFSI Safety Analysis Report, and Station monitoring reports. Surry Power Station and corporate personnel familiar with the operation of the ISFSI provided input to and commented on the information provided in this environmental report.

The assessment done for the Surry Power Station license renewals and for the ISFSI were thorough and comprehensive, and would have identified any new and significant issues related to the ISFSI. Dominion is aware of no new and significant information regarding the environmental impacts of the Surry ISFSI license renewal.

5.2 References

Ref. 5.1-1 U.S. Nuclear Regulatory Commission. 1986. License for Independent Storage of Spent Nuclear Fuel and High-level Radioactive Waste. July 2. License Number SNM-2501. Washington, D.C

Ref. 5.1-2 Dominion. 2001. Surry Power Station Units 1 and 2. Volume 3. License Renewal Application. Appendix E - Applicant's Environmental Report, Operating License Renewal Stage, Surry Power Stations Units 1 and 2. May. Richmond, VA.

Ref. 5.1-3 U.S. Nuclear Regulatory Commission. 1985. Environmental Assessment Related to the Construction and Operation of the Surry Dry Cask Independent Spent Fuel Storage Installation. April. Washington, D.C

6.0 SUMMARY OF LICENSE RENEWAL IMPACTS AND MITIGATING ACTIONS

6.1 License Renewal Impacts

This environmental report describes the proposed action, renewing the license of the Surry Independent Spent Fuel Storage Installation (ISFSI) and any impacts. All impacts would be small and not significant. Table 6-1 identifies the impacts license renewal would have on the environmental resources. Based on this evaluation, renewal of the license for the Surry ISFSI will involve no significant environmental impact.

Table 6-1
Environmental Impacts Related to the License Renewal of the Surry ISFSI.

Issue	Environmental Impact
Geology or Soils	None
Hydrology	None
Air Quality	None
Aquatic Resources	None
Socioeconomics	None
Social Services or Public Utilities	None
Land Use	None
Threatened or Endangered Species	None
Historic or Cultural Resources	Small. Dominion follows the requirements of county building codes for all construction activities, and has procedures for protecting previously unknown cultural artifacts.
Occupational Doses from Normal Operations	Small. ISFSI workers would come from the Surry Power Station workforce. The total occupational dose is estimated to be no more than 11.9 person-rem per year.
Other Occupational Health Effects	Small. All other health effects would be the result of hazards associated with moving heavy objects and equipment during cask emplacement.
Doses to the Public from Normal Operations	Small. The maximum dose is estimated to be 4×10^{-6} person rem.
Occupational Doses from Accidents	Small. All doses would be external doses during cask recovery operations.
Doses to the Public from Accidents	Small. The maximum dose estimated from an incredible accident would be 0.003 percent of background.

6.2 Mitigation

All impacts of license renewal are small and would not require mitigation. Current operations include mitigation activities that would continue during the term of the license renewal. Dominion performs routine mitigation and associated monitoring activities to ensure the safety of workers, the public, and the environment. These activities include the radiological environmental monitoring program conducted for Surry Power Station and the Surry ISFSI, periodic monitoring of the casks and preventative maintenance as necessary, monitoring and maintenance of the perimeter and security fences, and maintenance of the grounds on which the ISFSI is located.

6.3 Unavoidable Adverse Impacts

Renewing the Surry ISFSI license would incur no unavoidable adverse impacts as a result of normal operations. In the very unlikely event of an accident that breached a cask, a small amount of radioactive materials could be released to the environment. However, the possibility of such an accident is very small and not considered likely.

6.4 Irreversible and Irretrievable Resource Commitments

The continued operation of the Surry ISFSI for the license renewal term will result in irreversible and irretrievable resource commitments, including the following:

- Materials, including cement, steel, lead and other metals, used to construct the storage pads and the storage casks
- Materials used during the normal operations of the ISFSI that cannot be recovered or recycled or that are consumed or reduced to unrecoverable forms

6.5 Short-term Use versus Long-term Productivity of the Environment

The Surry ISFSI occupies approximately 15 acres of land that was forested when the site was purchased. As discussed in Section 3.1, if an additional 2 pads are constructed, the ISFSI could be expanded to include 17 acres of cleared and disturbed land. However, the ISFSI is a temporary storage facility. Once the spent nuclear fuel is moved to a permanent repository, the concrete pads, fencing, security system, and auxiliary equipment could be removed and the land returned to forest or used for another purpose.

7.0 ALTERNATIVES

Preparatory to construction, Dominion and NRC evaluated the following alternatives to the Surry ISFSI (Ref. 7.0-1, Section 3.0):

- Ship spent fuel to a permanent federal repository
- Ship spent fuel to North Anna
- Increase the storage capacity of the existing spent fuel pool
- Construct a new independent spent fuel storage pool at the Surry site
- Ship spent fuel to a reprocessing facility
- Ship spent fuel to a federal interim storage facility
- Improve fuel usage
- Operate Surry Power Station at reduced power
- Ship spent fuel to other utility companies' reactors for storage
- Construct an ISFSI at a site away from the Surry Power Station
- No Action

As Table 7-1 illustrates, these alternatives encompass alternatives that NRC and license applicants have evaluated for all ISFSIs. In addition, recent evaluations have addressed technologies that were not available at the time of the Surry ISFSI original licensing. The following paragraphs supplement the original Surry ISFSI alternatives evaluation, and address other technologies.

Table 7-1
Alternatives Analyzed in Independent Spent Fuel Storage Installation License Applications

ISFSI[1]	Alternatives										
	Ship To										
	Permanent federal repository	Interim federal repository	Same utility, different reactor site	Other Utility's reactor site	Reprocessing center	Increase existing spent fuel pool storage capacity	Construct new spent fuel storage pool at the site	Improve fuel usage	Operate reactors at reduced power	Construct an ISFSI at a remote location	No Action
Surry	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔	✔
Robinson[2]	✔		✔				✔				
Oconee[3]	✔		✔			✔					
Fort. St.Vrain	✔	✔		✔[4]	✔		✔[5]			✔	
Calvert Cliffs[6]	✔	✔		✔	✔	✔	✔				✔
Prairie Island[7]	✔	✔	✔	✔	✔	✔	✔	✔			✔
Rancho Seco[8]	✔			✔	✔						
Trojan	✔			✔	✔						✔
North Anna[9]			✔			✔	✔	✔			✔
TMI						✔	✔			✔	✔
Skull Valley[10]			✔	✔						✔	✔

ISFSI - Independent Spent Fuel Storage Installation
TMI - Three Mile Island

1 Table 1-1 provides references to source documentation.
2 Robinson also considered other dry storage technologies.
3 Oconee also considered full-scale rod consolidation.
4 Fort St. Vrain evaluated storing fuel at Idaho National Engineering and Environmental Laboratory as well as commercial reactor sites.
5 Fort St. Vrain evaluated storing fuel in fuel storage wells, not spent fuel pools.
6 Calvert Cliffs also considered full-scale rod consolidation and other dry storage technologies.
7 Prairie Island also considered other dry storage technologies.
8 Rancho Seco also evaluated other dry storage technologies and maintaining the fuel in the existing fuel pool.
9 North Anna also considered other dry storage technologies.
10 Skull Valley also evaluated dry and wet storage technologies, and alternatives that would eliminate the need for the proposed storage facility.

7.1 Ship Spent Fuel to a Permanent Federal Repository

NRC noted that shipping spent fuel to a permanent federal repository would be Virginia Electric and Power Company's (VEPCO's)[1] preferred alternative but that the repository was not likely to be ready to receive spent fuel in time to meet the Surry Power Station spent fuel storage needs. This remains true today. The U. S. Department of Energy (DOE) currently expects the Yucca Mountain repository to begin receiving spent fuel no sooner than 2010 (Ref. 7.1-1), four years after the expiration date for the current Surry ISFSI license. In addition, DOE has imposed on commercial nuclear reactor licensees such as Dominion limits on the quantity of spent nuclear fuel that licensees can ship to Yucca Mountain annually. As Section 1.3 discusses, Dominion took this shipping schedule into account in proposing the expiration date for the Surry ISFSI license renewal term. Because a federal repository will not be available in time, shipping spent fuel to a permanent federal repository is not a reasonable alternative to the proposed action, renewing the Surry ISFSI license.

1. Virginia Electric and Power Company (VEPCO) is now Dominion. "VEPCO" was the company name at the time of the original Surry ISFSI licensing and this environmental report uses that name when referring to the original license application.

7.2 Ship Spent Fuel to North Anna

NRC reviewed shipping Surry Power Station spent fuel to the North Anna Power Station spent fuel pool and concluded that the action would have no significant environmental impacts but that it would only provide a short-term solution and could not meet VEPCO's extended spent fuel storage needs. Continued North Anna Power Station operations have depleted that plant's spent fuel pool capacity and VEPCO constructed an ISFSI at North Anna Power Station for additional storage. Due to the lack of storage space, shipping Surry Power Station spent fuel for storage in the North Anna spent fuel pool is not a reasonable alternative to license renewal. See Section 7.10 for discussion of shipment to the newly constructed ISFSI capacity at North Anna Power Station.

7.3 Increase the Storage Capacity of the Existing Spent Fuel Pool

As NRC indicated in the construction environmental assessment, VEPCO had increased the original capacity of the Surry Power Station spent fuel pool and, prior to applying for Surry ISFSI construction approval, had determined that it could not store more spent fuel in the pool. This determination remains valid; increasing pool capacity is not a reasonable alternative to license renewal.

7.4 Construct a New Independent Spent Fuel Storage Pool at the Surry Site

Expansion of the pool would necessitate construction of additional Fuel and Decontamination Building and pool space and transferring assemblies from existing Surry ISFSI storage casks into the pool. Dominion would later have to remove these assemblies from the pool for packaging into casks for shipment to Yucca Mountain and would have to decontaminate the expanded pool space. Occupational doses from these activities would be in addition to those from the proposed action. Constructing new fuel pool storage capacity would adversely affect plant design and facility maintenance. It would also require as operating license amendment. Given the increased environmental impacts from construction, increased worker dose, necessary modifications to plant systems, and increased facility maintenance requirements with no identifiable reduction in significant environmental impact, Dominion concludes that constructing a new pool at the Surry site offers no environmental advantages over ISFSI license renewal.

7.5 Ship Spent Fuel to a Reprocessing Facility

NRC noted in the Surry construction environmental assessment that there is no commercial reprocessing facility in the United States and that there was no prospect for one in the foreseeable future. This status remains unchanged and reprocessing is not a reasonable alternative.

7.6 Ship Spent Fuel to a Federal Interim Storage Facility

NRC has evaluated impacts of storing spent fuel at a federal interim storage facility and some planning has been done for constructing such a facility, most recently at the Yucca Mountain repository site. However, no federal interim storage facility has been built and there appears to be no prospect for one in time to eliminate the need for Surry ISFSI license renewal. Shipping to a federal interim storage facility is not a reasonable alternative.

7.7 Improve Fuel Usage

NRC indicated that VEPCO was participating in a program to extend fuel burnup and the Surry Power Station is now using fuel with increased enrichment and longer burnup times. As at the time of Surry ISFSI construction, such Station operational changes may alter the amount of fuel to be stored but they do not eliminate the need for storage. This remains an alternative that is not reasonable.

7.8 Operate Surry Power Station at Reduced Power

Operating Surry Power Station reactors at reduced power levels would extend the life of the fuel and reduce the rate at which spent fuel is generated. As NRC noted at the time of construction, this alternative postpones, but does not eliminate, the need for storage. The alternative also does not address the need to store spent fuel already generated. Operating Surry Power Station reactors at reduced power levels is not a reasonable alternative to ISFSI license renewal.

7.9 Ship Spent Fuel to other Utility Companies' Reactors for Storage

Only one NRC licensee is performing inter-plant transfers and those transfers are feasible only because of a unique circumstance; the receiving plant, Shearon Harris, constructed spent fuel pool storage capacity for more units than were constructed at the site. The excess capacity is designated for spent fuel from other plants of that licensee, however, and is not available for transfer from other licensee's plants such as Surry. Dominion concludes that shipping Surry spent fuel to any other commercial nuclear plant for storage is not a reasonable alternative to Surry ISFSI license renewal.

7.10 Construct an ISFSI at a Site Away From the Surry Power Station

Dominion could construct an additional ISFSI at North Anna or expand its current ISFSI to contain Surry spent fuel. Dominion estimates this would require an additional approximately 15 acres of land, with attendant environmental impacts from construction. Expansion would require revision of the existing North Anna ISFSI license and construction of a new ISFSI would require obtaining a new site-specific license or use of certified casks. Surry ISFSI casks are not approved for transportation and Dominion would have to transfer assemblies to other casks for transport.

Standards for casks to be used in shipments to Yucca Mountain have not been established and it is not known whether casks used to transport Surry spent fuel to North Anna would be certifiable for shipment to Yucca Mountain or whether Dominion would have to transfer the spent fuel into other casks for shipment to Yucca Mountain. Repackaging Surry ISFSI twice for transport (once to North Anna and once to Yucca Mountain) would effectively double occupational doses for re-packaging and cask decontamination. The cost of transportation to North Anna would also be over and above that necessary to ship to Yucca Mountain. Finally, ISFSI operation has shown no significant environmental impact at Surry or North Anna. Given the addition of construction environmental impacts, potential worker dose increases, and transportation costs, with no significant reduction in operational environmental impacts, Dominion concludes that transfer to North Anna for ISFSI storage does not offer net environmental benefits.

NRC evaluated the environmental impacts of constructing and operating a private ISFSI at the Skull Valley Goshutes Indian Reservation and concluded that the proposed ISFSI would reduce the already small environmental effects of spent fuel storage at reactor sites (Ref. 7.10-1). The Skull Valley ISFSI is being sized to accommodate spent fuel stored at all of the nation's commercial nuclear plants (Ref. 7.10-2) and, if constructed and operated as planned, would be available to Dominion for Surry Power Station spent fuel storage. Given the small nature of ISFSI impacts at either location, Dominion would probably base a decision to use the Skull Valley ISFSI on economic factors. Until Skull Valley is operational, however, Dominion believes that prudent management dictates maintaining the option of continuing Surry ISFSI usage through license renewal.

7.11 Other Technologies

As Section 1.2 discusses, NRC has evaluated numerous dry storage technologies, including different cask designs and storage concepts, and found all to have small environmental impacts. NRC has certified 14 cask designs (10 CFR 72.214) for use under a general license (10 CFR 72 Subpart K). Dominion could repackage Surry ISFSI spent fuel into certified-design casks and continue to store the spent fuel under its license to operate the Surry Power Station. This alternative would obviate the need to renew the Surry ISFSI license. The alternative would, however, add costs and doses associated with repackaging similar to those that Section 7.10 discusses for constructing an ISFSI at the North Anna site. As with that alternative, Dominion concludes that switching to a general license does not offer net environmental benefits over renewing the existing Surry ISFSI license.

7.12 No Action

Under the no-action alternative, NRC would not renew the Surry ISFSI license. Dominion could not lawfully store spent fuel at the ISFSI after July 31, 2006, and would have to remove all spent fuel that it currently stores there. If Dominion could find no other place to store newly generated spent fuel, Dominion would have to cease operating the Surry Power Station.

Other sections of Chapter 7 address potential alternatives for storing Surry ISFSI spent fuel. The Surry Power Station license renewal environmental report evaluated impacts from ceasing Surry Power Station operations. The report notes that the Station produces approximately 12 terawatt hours of electricity annually, and concludes that not replacing Station electric generation is not reasonable and that environmental impacts from alternative sources of generation are the same or greater than continuing Station operation. Dominion concludes that the no-action alternative provides no environmental advantages over license renewal.

7.13 References

Ref. 7.0-1 Virginia Electric and Power Company. 1985. Environmental Report; Surry Power Station Dry Cask Independent Spent Fuel Storage Installation, Amendment 1. May. Richmond, Virginia.

Ref. 7.1-1 U.S. Department of Energy. Timeline/Milestones. Available online at http://www.ymp.gov/timeline/index.htm. Accessed October 8, 2001.

Ref. 7.10-1 U.S. Nuclear Regulatory Commission. 1985. Environmental Assessment Related to the Construction and Operation of the Surry Dry Cask Independent Spent Fuel Storage Installation. April. Washington, D.C.

Ref. 7.10-2 U.S. Department of Energy. Timeline/Milestones. Available online at http://www.ymp.gov/timeline/index.htm. Accessed October 8, 2001.

Ref. 7.10-3 U.S. Nuclear Regulatory Commission. 2001. Final Environmental Impact Statement for the Construction and Operation of an Independent Spent Fuel Storage Installation on the Reservation of the Skull Valley Band of Goshute Indians and the Related Transportation Facility in Tooele County, Utah. NUREG- 1714. December. Washington, D. C.

Ref. 7.10-4 The Skull Valley Goshutes website, available at http://www.skullvalleygoshutes.org/. Accessed November 27, 2001.

8.0 COMPARISON OF THE IMPACTS OF LICENSE RENEWAL WITH THE ALTERNATIVES

Table 8-1 compares the environmental impacts of renewing the license of the Surry Power Station Independent Spent Fuel Storage Installation with the alternatives.

Table 8-1
Comparison of Surry ISFSI License Renewal with the Alternatives

Impacts	Alternatives												
	License Renewal	No Action	Ship to permanent repository	Ship to North Anna	Increase SPS pool capacity	Construct new pool at SPS	Ship to reprocessor	Ship to interim storage facility	Improve fuel usage	Operate SPS at reduced power	Ship to another utility's storage	Construct an ISFSI away from SPS	Other technologies
		No environmental advantage. Requires removal of fuel from the ISFSI and construction of replacement power facility	Not a reasonable alternative	Not a reasonable alterna-ative	Not a reasonable alterna-ative		Not a reasonable alterna-ative	Not a reasonable alterna-ative	Not a reasonable alterna-ative	Not a reasonable alterna-ative	Not a reasonable alterna-ative		
Geology/ Soils	None					Small						Small	None
Hydrology	None					Small						Small	None
Air Quality	None					Small						Small	None
Aquatic Resources	None					None						None	None
Socioeconomics	None					Small						Small	None
Land Use	None					Small						Small	None
Threatened or Endangered Species	None					None						None	None
Historic/ Cultural Resources	Small					Small						Small	Small

Table 8-1 (Continued)
Comparison of Surry ISFSI License Renewal with the Alternatives

Impacts	Alternatives												
	License Renewal	No Action	Ship to perma-nent repository	Ship to North Anna	Increase SPS pool capacity	Construct new pool at SPS	Ship to reprocessor	Ship to interim storage facility	Improve fuel usage	Operate SPS at reduced power	Ship to another utility's storage	Construct an ISFSI away from SPS	Other technologies
Normal Operations													
Occupational Dose	Small					Small, but greater than license renewal						Small, but greater than license renewal	Small, but greater than license renewal
Dose to Public	Small					Small						Small	Small
Accidents													
Occupational Dose	Small					Small						Small	Small
Dose to Public	Small					Small						Small	Small

9.0 STATUS OF COMPLIANCE

9.1 Proposed Action

9.1.1 General

The Surry Power Station (SPS) Environmental Report (Ref. 9.1-1) provides a list of all authorizations (in Table 9-1) for current Surry Power Station operations. Dominion has a conditional use permit to operate the Surry Independent Spent Fuel Storage Installation (ISFSI) issued by Surry County in 1985. The Surry ISFSI does not require any additional permits, licenses, or approvals to operate.

Table 9-1 below lists the authorizations and consultations that are precedent to the Nuclear Regulatory Commission renewing the ISFSI operating license. This section discusses each of these in more detail.

Table 9-1
Environmental Authorizations for Surry Power Station ISFSI License Renewal[a]

Agency	Authority	Requirement	Remarks
U.S. Nuclear Regulatory Commission	Atomic Energy Act (42 USC 2011 et seq.)	ISFSI License renewal	Environmental Report submitted in support of ISFSI license renewal application.
U.S. Fish and Wildlife Service	Endangered Species Act Section 7 (16 USC 1536)	Consultation	Requires Federal agency issuing a license to consult with FWS.
Virginia Department of Historic Resources	National Historic Preservation Act Section 106 (16 USC 470f)	Consultation	Requires Federal agency issuing a license to consider cultural impacts and consult with State Historic Preservation Officer.
Virginia Department of Environmental Quality	Federal Coastal Zone Management Act (16 USC 1451 et seq.)	Certification	Requires an applicant to provide certification to the Federal agency issuing the license that license renewal would be consistent with the Federally-approved state coastal zone management program. Based on its review of the proposed activity, the State must concur with or object to the applicant's certification.

a. No renewal-related requirements identified for local or other agencies.
FWS=U.S. Fish and Wildlife Service

9.1.2 Threatened and Endangered Species Consultation

Section 7 of the Endangered Species Act (16 USC 1531 et seq.) requires federal agencies to ensure that agency action is not likely to jeopardize any species that is listed or proposed for listing as endangered or threatened. The Act addresses consultation with the U.S. Fish and Wildlife Service (FWS) regarding effects on non-marine species. FWS and the National Marine Fisheries Service (which has jurisdiction over marine species) have issued joint procedural regulations in 50 CFR 402, Subpart B, which address consultation, and FWS maintains the joint list of threatened and endangered species in 50 CFR 17.

As discussed in Section 4.3.2, threatened or endangered species are present in the vicinity of SPS. Therefore, under Section 7 of the Endangered Species Act, the NRC may consult with FWS to ensure the proposed action will not jeopardize the continued existence of any threatened or endangered species.

9.1.3 Historic Preservation Consultation

Section 106 of the National Historic Preservation Act (16 USC 470 et seq.) requires federal agencies having the authority to license any undertaking, prior to issuing the license, to take into account the effect of the undertaking on historic properties and to afford the Advisory Committee on Historic Preservation an opportunity to comment on the undertaking. Council regulations provide for establishing an agreement with any State Historic Preservation Officer (SHPO) to substitute State review for Council review (35 CFR 800.7). Therefore, the NRC may request comments from Virginia SHPO prior to renewing the ISFSI license.

9.1.4 Coastal Zone Management Program Compliance

The federal Coastal Zone Management Act (16 USC 1451 et seq.) imposes requirements on applicants for a federal license to conduct an activity that could affect a state's coastal zone. The Act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management plan [16 USC 1456(c)(3)(A)]. The National Oceanic and Atmospheric Administration (NOAA) has promulgated implementing regulations that indicate that the requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.51(b)(1)]. The regulation requires that the license applicant provide its certification to the federal licensing agency and a copy to the applicable state agency [15 CFR 930.57(a)].

The NRC Office of Nuclear Reactor Regulation has issued guidance to its staff regarding compliance with the Act (Ref. 9.1-2). This guidance acknowledges that Virginia has an approved coastal zone management program. Surry Power Station, located in Surry County, is within the Virginia coastal zone (Tidewater Virginia). Concurrent with submitting the Supplement to Applicant's Environmental Report, Application for Renewed ISFSI Site-Specific License, Dominion will submit a copy of the certification to the Commonwealth in fulfillment of the regulatory requirement for submitting a copy of the coastal zone consistency certification to the state. It is anticipated that consistency certification will be acknowledged by Virginia Department of Environmental Quality, similar to the acknowledgement of consistency of the Surry Power Station operations. Appendix A contains a copy of the certification.

9.2 References

Ref. 9.1-1 Dominion. 2001. Surry Power Station Units 1 and 2. Volume 3. License Renewal Application. Appendix E- Applicant's Environmental Report, Operating License Renewal Stage, Surry Power Station, Units 1 and 2. May. Richmond, VA.

Ref. 9.1-2 U.S. Nuclear Regulatory Commission. 2001. "Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues." LIC-203. Office of Nuclear Reactor Regulation. Washington, DC.

APPENDIX A
COASTAL ZONE MANAGEMENT ACT CONSISTANCY CERTIFICATION

Coastal Zone Management Act Consistancy Certification

FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

The Federal Coastal Zone Management Act (16 USC 1451 et seq.) imposes requirements on an applicant for a Federal license to conduct an activity that could affect a state's coastal zone. The Act requires the applicant to certify to the licensing agency that the proposed activity would be consistent with the state's federally approved coastal zone management program. The Act also requires that the applicant provide to the state a copy of the certification statement and requires that the state, at the earliest practicable time, notify the federal agency and the applicant whether the state concurs or objects to the consistency certification. See 16 USC 1456(c)(3)(A).

The National Oceanic and Atmospheric Administration has promulgated implementing regulations that indicate that the certification requirement is applicable to renewal of federal licenses for activities not previously reviewed by the state [15 CFR 930.51(b)(1)]. The Commonwealth of Virginia has a federally approved coastal zone management program described below. Dominion is applying to the U. S. Nuclear Regulatory Commission (NRC) for renewal of the operating license for the Surry Power Station (SPS) Independent Spent Fuel Storage Installation (ISFSI), in Surry County, Virginia.

CONSISTENCY CERTIFICATION

Dominion has determined that NRC renewal of the SPS ISFSI license to operate would comply with the federally approved Virginia Coastal Resources Management Program. Dominion expects SPS ISFSI operations during the license renewal term to be a continuation of current operations as described below, with no changes that would affect Virginia's coastal zone.

NECESSARY DATA AND INFORMATION

Proposed Action

The Surry Power Station ISFSI is located on the Surry Power Station site, in Surry County, Virginia. The site is on the Gravel Neck peninsula, on the south side of the James River, approximately 25 upstream of the Chesapeake Bay. The Virginia Department of Environmental Quality lists Surry Count as part of the Virginia coastal zone (Ref. 2). Figures 1 and 2 show the SPS site 50-mile and 6-mile regions, respectively, and Figure 3 shows the site layout.

Spent nuclear fuel removed from the Surry Power Station spent fuel pool is stored in dry casks on concrete pads at the ISFSI. The ISFSI is approximately 15 acres and currently comprises two concrete pads surrounded by security fencing and perimeter fencing. It is licensed for a third pad, which will be constructed when the second pad is full. Each pad is designed to hold 28 spent fuel casks. Each cask holds between 21 and 32 spent fuel assemblies. The U.S. Department of Energy (DOE) is responsible for the disposal of the spent fuel in a geologic repository. Depending on when DOE begins accepting spent fuel, Dominion may require a fourth pad, if the Surry Power Station's licenses are renewed and the plant continues to produce power for an additional 20 years beyond the current license term. If a fourth pad was required, Dominion would amend the current license.

The proposed action is to renew the operating license of the ISFSI for an additional 40 years which would provide time after the shutdown of the reactors to remove all the fuel from the facility to the geologic repository.

FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

The only utility provided to the ISFSI is electric power for security lights, monitoring instruments, and general use. Potable water, fire protection water, sewage treatment, steam, ventilation, air supply systems, and chemical storage are not required at the ISFSI. It is manned intermittently, to monitor cask integrity, and to emplace casks. The ISFSI does not have a permanent workforce, but Surry Power Station employees are assigned ISFSI responsibilities as part of their job.

Other than the NRC operating license, the ISFSI requires no licenses, permits or authorizations.

Environmental Impacts

The following paragraphs describe the environmental impacts from operating the Surry Power Station ISFSI for 40 years beyond the current license term. For facilities such as the SPS ISFSI that are located in the coastal zone, impacts would affect the coastal zone.

No impacts would occur to surface water hydrology or use, aquatic ecology, groundwater quality or use, air quality, land use, or socioeconomics.

Environmental Impacts that could affect the coastal zone and Dominion's conclusions regarding those impacts are listed below:

- Surface water quality

  This issue addresses the effects of construction of one or two additional concrete storage pads on the water quality of the wetlands at Hog Island Wildlife Management Area and in the James River. Dominion constructs storage pads as they are needed. One and possibly two additional pads likely will be needed during the license term. The pads will be constructed within an industrial area on previously disturbed soil. The ISFSI is approximately 1 mile from the bluffs overlooking the Hog Island Wildlife Management Area, and from the bluffs of the James River. There is little slope at the ISFSI, but there is a ravine immediately west of the facility. Dominion uses sediment and erosion control best management practices and adheres to Surry County building permit requirements. All runoff from the ISFSI in caught in a percolation basin. There is no discharge from the facility to any surface water. Dominion concludes that impacts to water quality from construction will be small.

- Threatened or endangered species

  This issue address effects that ISFSI operations could have on species that are listed under federal law as threatened or endangered. Two such species could occur on the SPS site. Dominion environmental studies and environmental protection programs have identified no adverse impacts to such species and Dominion's consultation with the cognizant Federal agency has identified no impacts of concern. Dominion concludes that impacts to these species are small during current operations and it has no plans that would change this conclusion for the license renewal term.

FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

Human health

- Radiation Dose – This issue addresses the dose to workers and the public from the ISFSI. Because this strictly human-health issue does not directly or indirectly affect natural resources of concern within the Coastal Zone Management Act definition of "coastal zone" [16 USC 1453(1)], Dominion concludes that the issue is not subject to the certification requirement.

♦ Historic and Archaeological Resources

This issue address impacts that license renewal activities could have on resources of historic or archaeological significance. One and possibly two additional pads likely will be needed during the license term. The pads will be constructed within an industrial area on previously disturbed soil. A recent survey of the ISFSI area determined that it has no potential for undiscovered archaeological or cultural resources (Mullin 2001). If placement of the additional pads requires that the perimeter fence be moved, Dominion would follow its procedures for activities that disturb the soil. Included in the procedures are steps to take when a previously unknown artifact is discovered. Dominion concludes that impacts to historic or archaeological resources would be small. Dominion consultation with the State Historic Preservation Officer has identified no issues of concern.

• Postulated accidents

Accidents were evaluated in the Safety Analysis Report done for the ISFSI. An incredible accident would result in a general population dose well below the dose the population receives from background radiation. Dominion concludes that impacts from accidents would be small.

State Program

Like many states, Virginia's coastal zone management program is a "networked" program, which means that it is based on a variety of existing Commonwealth authorities rather than a single law and set of regulations. The U. S. Department of Commerce and the Virginia Department of Environmental Quality have published programmatic documentation of the Virginia program (Ref. 4), called Virginia's Coastal Resources Management Program. The Virginia Department of Environmental Quality administers the program and has identified enforceable regulatory authorities that comprise the program (Ref. 5).

Findings

1. Dominion has determined that all environmental impacts from the operation of the ISFSI are small, and would remain small through the license renewal term.
2. As best assessed, Dominion is in compliance with Virginia licensing and permitting requirements.

FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

3. Dominion's license renewal and continued operation of the Surry Power Station ISFSI would be consistent with the enforceable provisions of the Virginia Coastal Zone Management Program.

STATE NOTIFICATION

By this certification that the Surry Power Station ISFSI license renewal is consistent with Virginia's Coastal Zone Management Program, the Commonwealth of Virginia is notified that it has 3 months from receipt of this letter and accompanying information in which to concur or object with Dominion's certification. However, pursuant to 15 CFR 930.63(b), if the Commonwealth of Virginia has not issued a decision within 3 months following the commencement of state agency review, it shall notify the contacts listed below of the status of the matter and the basis for further delay. The Commonwealth's concurrence, objection, or notification of review status shall be sent to:

TBD

U. S. Nuclear Regulatory Commission
One White Flint North
11555 Rockville Pike
Rockville, MD 20852-2738

Tony Banks
Dominion Generation
Innsbrook Technical Center
5000 Dominion Blvd
Glen Allen, VA 23060

REFERENCES

1. *Procedural Guidance for Preparing Environmental Assessments and Considering Environmental Issues.*" U. S. Nuclear Regulatory Commission. Office of Nuclear Reactor Regulation. Office Instruction No. LIC-203. June 21, 2001.

2. *Virginia Coastal Program; Our Coastal Zone; Virginia's Coastal Environment.* Virginia Department of Environmental Quality. Available online at http://www.deq.state.va.us/coastal/thezone.html. Access October 17, 2001.

3. *Generic Environmental Impact Statement for License Renewal of Nuclear Plants.* U. S. Nuclear Regulatory Commission. May 1996.

4. *Virginia Coastal Resources Management Program Final Environmental Impact Statement.* U. S. Department of Commerce and Council on the Environment and Commonwealth of Virginia. July 1985, reprinted April 1999.

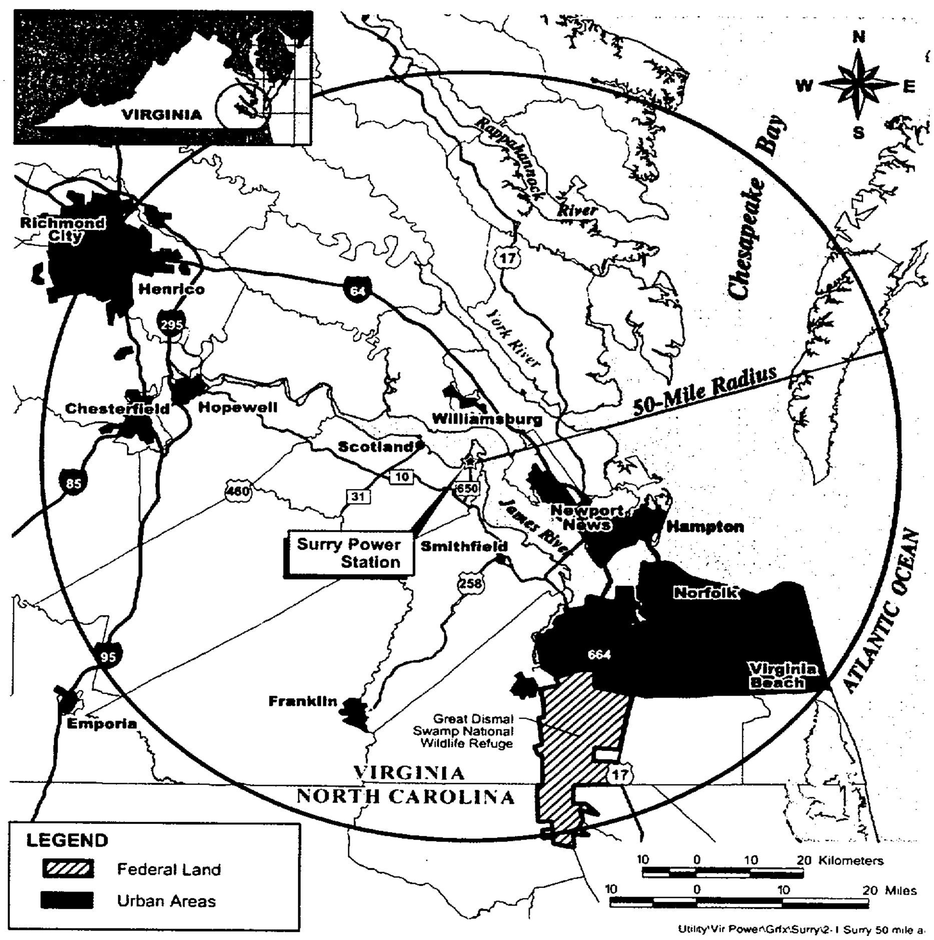
5. *Enforceable Regulatory Programs Comprising Virginia's Coastal Resources Management Program.* Commonwealth of Virginia, Department of Environmental Quality. Undated. Transmitted as Attachment of Letter, E. L Irons, Virginia Department of Environmental Quality, to J. W. White, Dominion Virginia Power Co., October 11, 2001.

ATTACHMENTS

Figure 1 50-Mile Vicinity Map
Figure 2 6-Mile Vicinity Map
Figure 3 Site Layout
Table 1 Compliance With Enforceable Regulatory Programs Comprising Virginia's Coastal Resources Management Program

FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

Figure 1
50-Mile Vicinity Map

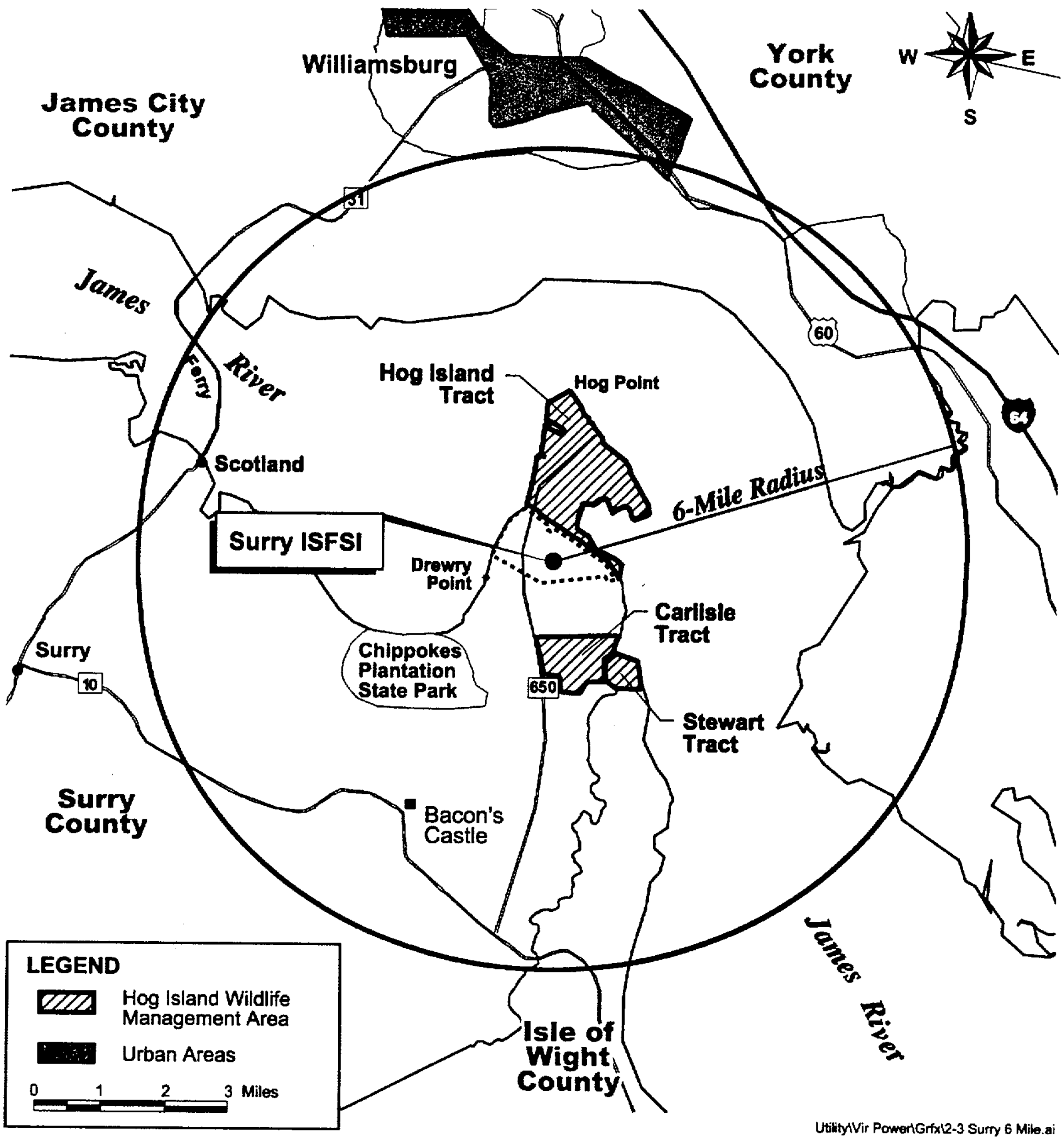


FEDERAL CONSISTENCY CERTIFICATION FOR

SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

Figure 2

6-Mile Vicinity Map

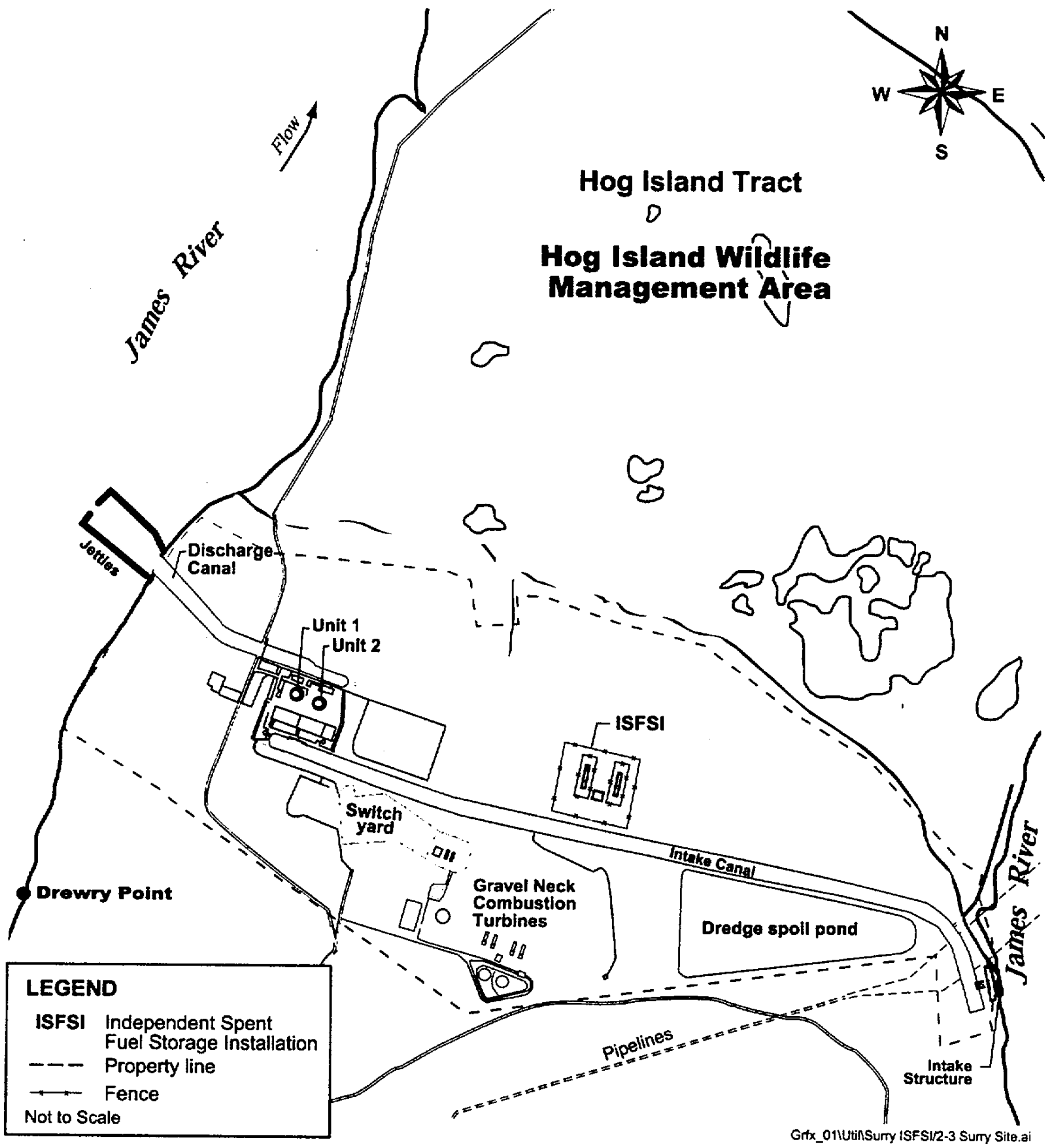


FEDERAL CONSISTENCY CERTIFICATION FOR

SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

Figure 3

Site Layout



FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

Table 1
Compliance With Enforceable Regulatory Programs Comprising Virginia's Coastal Resources Management Program

Item	Topic and Virginia Code Citation	Compliance Status
	Fisheries Management	
a.1.	§28.2-200 to §28.2-713 §29.1-100 to §29.1-570	This applies to activities that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: recreational and commercial fishing, oystering, claming, and crabbing, scientific collecting, hunting, fishing, trapping, dealing in furs, and falconry.
a.2	§3.1-249.59 to §3.1-249.62	This applies to an activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: use of marine anti-fouling paint containing tributylin.
	Subaqueous Lands Management	
b.	§28.2-1200 to §28.2-1213	This applies to an activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: use of state-owned bottomlands.
	Wetlands Management	
c.1	§28.2-1301 to §28.2-1320	This applies to activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: wetlands development.
c.2	§62.1-44.15:5 Water Quality Certification pursuant to Section 401 of the Clean Water Act	This applies to activities that Dominion has no plans to undertake during the license renewal term: excavating in, filling, flooding, and significantly altering wetlands.
	Dunes Management	
d.	§28.2-1400 though §28.2-1420	This applies to activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: development in coastal dunes.

FEDERAL CONSISTENCY CERTIFICATION FOR SURRY POWER STATION INDEPENDENT SPENT FUEL STORAGE INSTALLATION LICENSE RENEWAL

Table 1
Compliance With Enforceable Regulatory Programs Comprising Virginia's Coastal Resources Management Program

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	Fisheries Management	
a.1.	§28.2-200 to §28.2-713 §29.1-100 to §29.1-570	This applies to activities that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: recreational and commercial fishing, oystering, claming, and crabbing, scientific collecting, hunting, fishing, trapping, dealing in furs, and falconry.
a.2	§3.1-249.59 to §3.1-249.62	This applies to an activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: use of marine anti-fouling paint containing tributylin.
	Subaqueous Lands Management	
b.	§28.2-1200 to §28.2-1213	This applies to an activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: use of state-owned bottomlands.
	Wetlands Management	
c.1	§28.2-1301 to §28.2-1320	This applies to activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: wetlands development.
c.2	§62.1-44.15:5 Water Quality Certification pursuant to Section 401 of the Clean Water Act	This applies to activities that Dominion has no plans to undertake during the license renewal term: excavating in, filling, flooding, and significantly altering wetlands.
	Dunes Management	
d.	§28.2-1400 though §28.2-1420	This applies to activity that Dominion has not undertaken at the SPS ISFSI and for which Dominion has no plans to undertake during the license renewal term: development in coastal dunes.

Table 1
Compliance With Enforceable Regulatory Programs Comprising Virginia's Coastal Resources Management Program, Continued

Item	Topic and Virginia Code Citation	Compliance Status
	Chesapeake Bay Preservation Act	
i	§10-1.2100 to §10-1.2114 9 VAC10-20 et seq.	The Commonwealth establishes criteria for delineating Chesapeake Bay Preservation Areas (CBPAs) and performance criteria for use of land within such areas. Local governments establish compliant programs, the focus being on controlling non-point-source pollution. If, in the future, SPS initiated activity that would be subject to CBPA requirements, Dominion would ensure compliance.

SPS = Surry Power Station
VAC = Virginia Administrative Code
§ = Section

APPENDIX F

ADDITIONAL INFORMATION

Contents

APPENDIX F: ADDITIONAL INFORMATION

F1.0 ADDITIONAL INFORMATION

F1.1 Training and Qualifications (72.28)

Chapter 9 of the Surry ISFSI Final Safety Analysis Report (FSAR) provides discussion on the qualifications of Dominion staff to operate the ISFSI, personnel training, and the Dominion nuclear organization. The ISFSI FSAR is updated periodically according to regulatory requirements.

F1.1.1 Technical Qualifications

Dominion has a long history of building and operating safe electric generating stations, including nuclear, fossil, and hydro, and safe transmission systems. Through thorough planning and careful implementation, Dominion has pioneered such industrial milestones as a 500-kV transmission system and innovations in the Mine Mouth Station concept. In the construction of its nuclear stations, Dominion has applied the same managerial techniques used in the past to enforce high standards of design, construction and operation. Since approximately 1968, in preparation for the eventual use of nuclear energy in the generation of electricity, Dominion has followed a policy of educating and training its officers, managers, and employees, both supervisory and non-supervisory, in the nuclear field. Dominion currently operates four nuclear power units at two nuclear power stations and two dry storage cask facilities; one at the Surry nuclear power station and one at the North Anna nuclear power station. This experience and training has enabled Dominion to acquire the expertise needed for operating the Surry ISFSI throughout the renewal period in a manner that ensures the safety of the public and operating personnel.

F1.1.2 Personnel Training Program

The training program has the objective of providing and maintaining a well-qualified work force for the safe and efficient operation of the ISFSI. All personnel working in the fuel storage area receive radiation and safety training. Those personnel actually performing dry storage cask and fuel handling functions are given additional training in specific areas as required by the radiological protection program in effect at the Surry Power Station.

All personnel working at the Surry ISFSI receive training and indoctrination geared toward providing and maintaining a well-qualified work force for the safe and efficient operation of the ISFSI. The existing Surry training programs are INPO accredited and are directly applicable to the Surry ISFSI. Additional training requirements specific to the ISFSI address the following subjects:

- ISFSI Licensing Basis and Technical Specifications
- ISFSI Layout and Function
- ISFSI Security
- ISFSI Communications Systems
- ISFSI Operation, Emergency, Maintenance, and Administrative Procedures
- SSSC Loading and Unloading, Handling and Onsite Transportation
- SSSC Decontamination Techniques

Following completion of the ISFSI training program, trainees are given a written and practical exam to ensure they understand the important aspects of the information described above. Retention of training records and certifications of proficiency is consistent with that for personnel involved in fuel handling operations.

ISFSI continuing training is consistent with the continuing training requirements in effect at the Surry Power Station for personnel involved in fuel handling operations.

Training records are maintained in accordance with the site Quality Assurance Program as presented in the Operational Quality Assurance Topical Report, VEP-1-5A (Reference 1). Such records include dates and hours of training and other documentation on training subjects, information on physical requirements, job performance statements, copies of written examinations, information pertaining to walk-through examinations, and retesting particulars.

F1.1.3 Operating Organization

The ISFSI is operated under the same corporate management organization responsible for operation of the Surry Power Station. This organization is depicted in the Operational Quality Assurance Topical Report, VEP-1-5A (Reference 1).

Due to the passive nature of the ISFSI and its infrequent demands on personnel, ISFSI operations can be scheduled so that the existing station organization can easily accommodate the ISFSI responsibilities without the need for obtaining additional personnel. Dominion hereby commits to have and maintain an adequate complement of trained and certified personnel for ISFSI operation throughout the renewal period.

F1.2 Financial Assurance for Decommissioning (72.30)

A Decommissioning Plan was attached to the original Surry ISFSI license application (Reference 2). The provisions of the original plan are unchanged with respect to this application for ISFSI license renewal. The Surry ISFSI FSAR addresses the ISFSI Decommissioning Plan in Section 9.6. The ISFSI FSAR is updated periodically according to regulatory requirements. No substantive changes to the Decommissioning Plan have occurred since its submittal with the original ISFSI license application.

Decommissioning funding for the Surry ISFSI is currently provided by collecting costs from ratepayers and depositing these funds into an external sinking fund. The external sinking fund for the Surry ISFSI is in the form of a master trust which also holds the funds for decommissioning of the Surry Power Station. A separate sub-account in the master trust has been established specifically for Surry ISFSI decommissioning.

Collection of decommissioning costs from ratepayers will continue until July 1, 2007. A site specific study prepared by TLG Services, Inc. in 1998 estimates that the costs of radiological decommissioning (which excludes non-radiological site restoration) for the Surry ISFSI is approximately $6.1 million. The current levels of collections allocated to ISFSI decommissioning, coupled with two percent real earnings through the projected termination of ISFSI operations, will be are sufficient to fully fund the estimated ISFSI decommissioning cost.

F1.3 Emergency Planning (72.32)

An Emergency Plan was attached to the original Surry ISFSI license application (Reference 2). The provisions of the original plan are unchanged with respect to this application for ISFSI license renewal. Revisions to the site Emergency Plan to incorporate ISFSI related events were made coincident with the issuance of the original ISFSI license. These events (cask drop or seal leakage) were added into the list of events for which a Notification of Unusual Event (NOUE) would be declared thus activating the site Emergency Plan. Additionally; the loss of all cask or fuel containment barriers event was added to the Emergency Plan as an event which requires the declaration of an Alert.

The Surry ISFSI FSAR addresses the Surry Emergency Plan in Section 9.5. The ISFSI FSAR is updated periodically according to regulatory requirements. No substantive ISFSI related changes to the Emergency Plan have occurred since its submittal with the original ISFSI license application and subsequent modification described above.

If the license renewal period for the ISFSI extends beyond the operating license period at the Surry Power Station, then appropriate Emergency Planning provisions will be addressed at that time.

Appendix F References (Additional Information)

1. Operational Quality Assurance Program Topical Report, VEP-1-5A, Chapter 17 of the Surry Updated Final Safety Analysis Report.

2. Letter from R. H. Leasburg, Vice President, Nuclear Operations, to R. E. Cunningham, Office of Nuclear Material Safety and Safeguards, NRC, dated October 8, 1982, with License Application for Surry Power Station, Dry Cask Independent Spent Fuel Storage Installation.