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APPENDIX A

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION

TECHNICAL SPECIFICATIONS FOR SAFETY

LICENSE NO. SNM-2501

February 25, 2005

1.0 INTRODUCTION

These Technical Specifications govern the safety of the receipt, possession and storage of irradiated nuclear fuel at the Surry Dry Cask Independent Spent Fuel Storage Installation (ISFSI) and the transfer of such irradiated nuclear fuel to and from the Surry Power Station and the Surry ISFSI.

1.1 DEFINITIONS

The following definitions apply for the purpose of these Technical Specifications.

a. Administrative Controls: Provisions relating to organization and management procedures, recordkeeping, review and audit, and reporting necessary to assure that the operations involved in the storage of spent fuel at the Surry ISFSI are performed in a safe manner.

b. Design Features: Features of the facility associated with the basic design such as materials of construction, geometric arrangements, dimensions, etc., which, if altered or modified, could have a significant effect on safety.

c. Functional and Operating Limits: Limits on fuel handling and storage conditions necessary to protect the integrity of the stored fuel, to protect employees against occupational exposures, and to guard against the uncontrolled release of radioactive materials.

d. Fuel Assembly: The unit of nuclear fuel in the form that is charged or discharged from the core of a light-water reactor (LWR). Normally, will consist of a rectangular arrangement of fuel rods held together by end fittings, spacers, and tie rods.

e. Limiting Conditions: The minimum functional capabilities or performance levels of equipment required for safe operation of the facility.

f. Surveillance Requirements: Surveillance requirements include: (i) inspection, test and calibration activities to ensure that the necessary integrity of required systems, components and the spent fuel in storage is maintained; (ii) confirmation that operation of the installation is within the required functional and operating limits; and (iii) a confirmation that the limiting conditions required for safe storage are met.

g. Tonne (Te): One metric ton, equivalent to 1000 kg or 2204.6 lb. Fuel quantity is expressed in terms of the heavy metal content of the fuel measured in metric tons and written TeU.

h. Loading Operations: Loading Operations include all cask preparation steps prior to cask transport from the fuel building area.

1.2 PREOPERATIONAL LICENSE CONDITIONS

The license issued under Part 72 shall not allow a given model of cask to be loaded with spent nuclear fuel until such time as the following preoperational license conditions are satisfied:

1. A training exercise (Dry Run) of all cask loading and handling activities for each cask model shall be held which shall include but not be limited to:

    a. Moving cask in and out of spent fuel pool area.

    b. Loading fuel assembly (using dummy assembly).

    c. Cask drying, sealing, and cover gas backfilling operations.

    d. Moving cask to and placing it on the storage pad.

    e. Returning the cask to the reactor.

    f. Unloading the cask assuming fuel cladding failure.

    g. Decontaminating the cask.

    h. All cask handling shall be done using written procedures.

2. The Surry Power Station Emergency Plan shall be reviewed and modified as required to include the ISFSI. (Abnormal event notifications will have to be updated for ISFSI events.)

3. A training module shall be developed for the Surry Power Station Training Program establishing an ISFSI Training and Certification Program which will include the following:

    a. Cask Designs (overview)

    b. ISFSI Facility Design (overview)

    c. ISFSI Safety Analysis (overview)

d. Fuel loading and cask handling procedures and abnormal procedures

e. ISFSI License (overview).

4. The Surry Power Station Health Physics Procedures shall be reviewed and modified as required to include the ISFSI.

5. The Surry Power Station Administrative Procedures shall be reviewed and modified as required to include the ISFSI.

6. A procedure shall be developed for the documentation of the characterizations performed to select spent fuel to be stored in the casks.

7. Written operating and abnormal/emergency procedures shall be prepared.

1.3 GENERAL LICENSE CONDITIONS

1.3.1 Quality Assurance

Activities at the Surry ISFSI shall be conducted in accordance with the requirements of Appendix B, 10 CFR Part 50, as described in the Virginia Electric and Power Company (VEPCO) Topical Report, "Operational Quality Assurance Program Topical Report." This program is implemented through the VEPCO Nuclear Operations Department Standards (NODS) and station procedures.

1.3.2 Fuel and Cask Handling Activities

Fuel and cask movement and handling activities which are to be performed in the Surry Power Station Fuel Building and Crane Enclosure Building will be governed by the requirements of the Surry Power Station Facility Operating Licenses (DPR-32 and DPR-37) and associated Technical Specifications.

1.3.3 Administrative Controls

The Surry ISFSI is located on the Surry Power Station site and will be managed and operated by the Surry Power Station staff. The administrative controls shall be in accordance with the requirements of the Surry Power Station Facility Operating Licenses (DPR-32 and DPR-37) and associated Technical Specifications.

1.3.4 Special Requirements for TN-32 - Thermal Testing

Each contractor authorized by the licensee to complete final assembly of the TN-32 cask body shall verify the heat transfer performance of a single cask. This test shall be performed prior to the first loading of any cask assembled by that contractor with a heat load greater than 27.1 kilowatts. A letter report summarizing the test performed, measured temperature data, and the calculated results of the test shall be submitted to the NRC in accordance with 10 CFR 72.4 at least 30 days prior to the use of a cask loaded with a heat load greater than 27.1 kilowatts. Proposed modifications to the fabrication process shall be evaluated for their potential to impact the heat transfer performance of the cask body. If the modification could result in adverse impact to the heat transfer performance of the cask body, the heat transfer performance of the modified cask shall be verified by an additional thermal test, prior to loading the first modified cask with a heat load greater than 27.1 kilowatts. The results of additional thermal tests shall be retained in accordance with 10 CFR 72.80.

2.0 FUNCTIONAL AND OPERATING LIMITS

2.1 FUEL TO BE STORED AT ISFSI

2.1.1 Specification

The spent nuclear fuel to be received and stored at the Surry ISFSI shall meet the following requirements:

1. Only fuel irradiated at the Surry Power Station Unit Nos. 1 and 2 may be used.

2. Fuel shall be intact unconsolidated fuel. Partial fuel assemblies, that is, fuel assemblies from which fuel pins are missing must not be stored unless dummy fuel pins are used to displace an amount of water equal to that displaced by the original pins.

3. Fuel assemblies known or suspected to have structural defects sufficiently severe to adversely affect fuel handling and transfer capability unless canned shall not be loaded into the cask for storage.

4. A procedure shall be developed for the documentation of the characterizations performed to select spent fuel to be stored in the casks. Such procedure shall include independent verification of fuel assembly selection by an individual other than the original individual making the selection.

5. Prior to insertion of a spent fuel assembly into a cask, the identity of the assembly shall be independently verified by two individuals.

6. The fuel selected must meet the cask specific parameters stated in Section 2.2.

2.1.2 Basis

The design criteria and subsequent safety analyses of the Surry ISFSI and storage casks assumed certain characteristics and limitations for the fuels that are to be received and stored. Specification 2.1.1 assures that these bases remain valid by defining the source of the spent fuel, maximum initial enrichment, irradiation history, maximum thermal heat generation, and minimum post irradiation cooling time.

2.2 DRY STORAGE CASK OPERATING LIMITS

2.2.1 Specification

The GNSI CASTOR V/21 cask used to store spent nuclear fuel at the Surry ISFSI shall have the operating limits shown in Table 2-1.

2.2.2 Basis

The design criteria and subsequent safety analysis of the GNSI CASTOR V/21 assumed certain characteristics and operating limits for the use of the casks. This specification assures that those design criteria are not exceeded.

2.2.3 Specification

The Westinghouse MC-10 cask used to store spent nuclear fuel at the Surry ISFSI shall have the operating limits shown in Table 2-2.

2.2.4 Basis

The design criteria and subsequent safety analysis of the Westinghouse MC-10 cask assumed certain characteristics and operating limits for the use of the casks. This specification assures that those design criteria are not exceeded.

2.2.5 Specification

The NAC-I28 cask used to store spent nuclear fuel at the Surry ISFSI shall have the operating limits shown in Table 2-3.

2.2.6 Basis

The design criteria and subsequent safety analysis of the NAC-I28 S/T cask assumed certain characteristics and operating limits for the use of the casks. This specification assures that those design criteria are not exceeded.

2.2.7 Specification

The GNSI CASTOR X/33 cask used to store spent nuclear fuel at the Surry ISFSI shall have the operating limits shown in Table 2-4.

2.2.8 Basis

The design criteria and subsequent safety analysis of the GNSI CASTOR X/33 assumed certain characteristics and operating limits for the use of the casks. This specification assures that those design criteria are not exceeded.

2.2.9 Specification

The TN-32 cask used to store spent nuclear fuel at the Surry ISFSI shall have the operating limits shown in Table 2-5, and Sections 2.8 through 2.11.

2.2.10 Basis

The design criteria and subsequent safety analysis of the TN-32 assumed certain characteristics and operating limits for the use of the casks. This specification assures that those design criteria are not exceeded.

Table 2-1
GNSI CASTOR V/21 CASK OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Non-Redundant Lifting Device	
· with impact limiters	5 feet
· without impact limiters	15 inches
Dose Rate	
· 2 m Distance	≤ 10 mrem/hr
· Surface	≤ 200 mrem/hr
(These limits conform to transportation cask dose rate limits. Actual dose rates for the loaded CASTOR V/21 will be significantly less.)	
Cask Tightness	
(Standard He-Leak Rate)	
· Primary Lid Seal	$\leq 10^{-6}$ mbar l/s
· Secondary Lid Seal	$\leq 10^{-6}$ mbar l/s
Max. Cladding Temperature During All Phases of Operation Including Loading	370°C
Helium Pressure Limit (Cask Cavity)	800 ± 100 mbar
Pressure During Cask Drying (Cask Cavity)	≤ 3 mbar (holding for 10 min.)
Water Content (Cask Cavity)	≤ 50 gram
Storage Capacity	
· Intact 14 x 14, 15 x 15 and 17 x 17 Zircaloy clad PWR Fuel Assemblies	≤ 21
Fuel Assembly Characteristics	
· Initial Enrichment, U-235 with:	
Stainless Steel Basket	≤ 2.2 wt.%
Borated Stainless Steel Basket	≤ 3.7 wt.%
· Average Burnup, MWD/MTU	≤ 40,000
· Years after Irradiation (≤ 35,000 MWD/MTU)	≥ 5
· Years after Irradiation (> 35,000 MWD/MTU)	≥ 6
· Heat Generation, kW/Assembly	≤ 1.0

Table 2-1 (Continued)
GNSI CASTOR V/21 CASK OPERATING LIMITS

	Operating Limit
Pressure Monitoring Device Characteristics	
1. Physical specifications	
Switching pressure, main gauge*	4 ± .06 bar
Switching pressure, monitor gauge*	2.625 ± .125 bar
Leak rate	10^{-9} mbar l/s
2. Electrical Specifications	
Maximum allowable switch contact voltage	10V
Maximum allowable switch contact current	10 mA
3. Environmental Requirements	
Maximum allowable service temperature	150°C
Temperature coefficient	10^{-2} mbar/°C

* Calibrated at standard conditions.

Table 2-2
WESTINGHOUSE MC-10 CASK OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Non-Redundant Lifting Device	5 feet
Dose Rate	
• 2 m distance	≤ 10 mrem/hr
• surface	≤ 200 mrem/hr
Cask Tightness	
(Standard He-Leak Rate)	
• primary closure and all penetrations	≤ 10^{-6} mbar l/s
• optional seal cover weld	≤ 2×10^{-4} mbar l/s
Max. Cladding Temperature During All Phases of Operation Including Loading	340°C
Helium Pressure Limit (Cask Cavity)	1.5 ± 0.1 atm (1520 ± 100 mbar) (absolute)
Pressure During Cask Drying (Cask Cavity)	≤ 3.0 mm Hg (4 mbar) (holding for 10 min.)
Water Content (Cask Cavity)	≤ 25,000 ppm
Storage Capacity	
• Intact 14 x 14, 15 x 15 and 17 x 17 Zircaloy clad PWR fuel assemblies	≤ 24
Fuel Assembly Characteristics	
• Initial Enrichment, U-235	≤ 3.7 wt.%
• Average Burnup, MWD/MTU	≤ 35,000
• Time after Irradiation, Years	≥ 10
• Heat Generation, kW/ Assembly	≤ 0.5625
Pressure Monitoring Device Characteristics	
1. Alarm Pressure Setting	
Low Pressure Alarm	1.2 atm ± 0.06 atm (1.22 bar ± 0.06 bar) (absolute)
2. Electrical Specifications	
Power supply/amplifier maximum voltage	24V DC
Power supply/amplifier maximum current	50 mA
3. Environmental Requirements	
Maximum allowable temperature	110°C

Table 2-3
NAC-I28 CASK OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Non-Redundant Lifting Device	
• with impact limiters	4 feet 11 inches
• without impact limiters	15 inches
Dose Rate	
• 2 m Distance	≤ 10 mrem/hr
• Surface	≤ 200 mrem/hr
(These limits conform to transportation cask dose rate limits. Actual dose rates for the loaded NAC-I28 S/T will be significantly less.)	
Cask Tightness	
(Standard He-Leak Rate)	
• Primary Lid Seal	≤ 10^{-6} mbar l/s
• Secondary Lid Seal	≤ 10^{-6} mbar l/s
Max. Cladding Temperature During All Phases of Operation Including Loading	330°C
Helium Pressure Limit (Cask Cavity)	1014 ± 100 mbar
Pressure During Cask Drying (Cask Cavity)	≤ 4 mbar (holding for 10 min.)
Water Content (Cask Cavity)	≤ 45 gram
Storage Capacity	
• Intact 14 x 14, 15 x 15 and 17 x 17 Zircaloy clad PWR Fuel Assemblies	≤ 28
Fuel Assembly Characteristics	
• Initial Enrichment, U-235	≤ 1.9 wt.%
• Average Burnup, MWD/ MTU	≤ 35,000
• Time after Irradiation, Years	≥ 10
• Heat Generation, kW/ Assembly	≤ 0.558
1. Alarm Pressure Setting	
Low Pressure Alarm	4.0 ± 0.1 bar
2. Electrical Specifications	
Supply Voltage	N/A

Table 2-3 (Continued)
NAC-I28 CASK OPERATING LIMITS

	Operating Limit
3. Environmental Requirements	
Operating Temperature Range	N/A (-54°C to 93°C)

Table 2-4
GNSI CASTOR X/33 CASK OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Non-Redundant Lifting Device	
• with impact limiters	5 feet
• without impact limiters	15 inches
Surface Dose Rate	≤ 200 mrem/hr
(This limit conforms to transportation cask dose rate limits. Actual dose rates for the loaded CASTOR X/33 will be significantly less.)	
Cask Tightness	
(Standard He-Leak Rate)	
• Primary Lid Seal	≤ 10^{-6} mbar l/s
• Secondary Lid Seal	≤ 10^{-6} mbar l/s
Max. Cladding Temperature During All Phases of Operation Including Loading	340°C
Helium Pressure Limit (Cask Cavity)	800 ± 100 mbar
Pressure During Cask Drying (Cask Cavity)	≤ 3 mbar (holding for 10 min.)
Water Content (Cask Cavity)	≤ 65 gram
Storage Capacity	
• Intact 14 x 14, 15 x 15 and 17 x 17 Zircaloy clad PWR Fuel Assemblies	33
Fuel Assembly Characteristics	
• Initial Enrichment, U-235	≤ 3.5 wt.%
• Average Burnup, MWD/MTU	≤ 35,000
• Time after Irradiation, Years	≥ 10
• Heat Generation, kW/Assembly	≤ .30
Boron Content of Water Used in Cask Cavity During Fuel Loading or Unloading	≥ 2000 ppm
Pressure Monitoring Device Characteristics	
1. Physical specifications	
Switching pressure, main gauge*	4 ± .06 bar
Switching pressure, monitor gauge*	2.625 ± .125 bar
Leak rate	10^{-9} mbar l/s

* Calibrated at standard conditions.

Table 2-4 (Continued)
GNSI CASTOR X/33 CASK OPERATING LIMITS

	Operating Limit
2. Electrical Specifications	
Maximum allowable switch contact voltage	10V
Maximum allowable switch contact current	10 mA
3. Environmental Requirements	
Maximum allowable service temperature	150°C
Temperature coefficient	10^{-2} mbar/°C

Table 2-5
TN-32 CASK OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Non-Redundant Lifting Device and Without Impact Limiters	18 inches
Pressure During Cask Cavity Vacuum Drying	≤ 4 mbar absolute (holding for 30 min.)
Cask Cavity Helium Backfill Pressure	2230 mbar absolute (± 100 mbar)
Cask Interseal Pressure	> 3250 mbar absolute
Low Pressure Alarm Setting of Cask Interseal Pressure Monitoring Device	> 3250 mbar absolute
Combined Helium Leak Rate	$< 1 \times 10^{-5}$ mbar-l/s
Storage Capacity, Intact 15 x 15 Zircaloy Clad PWR Fuel Assemblies	≤ 32
Fuel Assembly Characteristics	
• Initial Enrichment	≤ 4.05 wt% U-235
• Assembly Average Burnup	≤ 45,000 MWD/MTU
• Minimum Cooling Time	See Figure 2-5.1
• Heat Generation Including BPRA/TPD	≤ 1.02 KW/assembly
• Fuel Assembly Uranium Content	≤ 467.1 KgU/assembly
• Fuel Assembly Inserts	Fuel assemblies may contain burnable poison rod assemblies (BPRAs) and/or thimble plug devices (TPDs)
• Fuel Assembly Design	Westinghouse 15 x 15 Standard Westinghouse 15 x 15 Surry Improved Fuel
• Fuel Assembly Weight Including BPRA/TPD	≤ 1,533 pounds
• Cooling Time After Shutdown for BPRAs in TN-32 Dry Storage Casks	See Figure 2-5.2
• Cooling Time After Shutdown for TPDs in TN-32 Dry Storage Casks	See Figure 2-5.3
Boron Content of Water Used in the Cask Cavity During Fuel Loading or Unloading	≥ 2,300 ppm

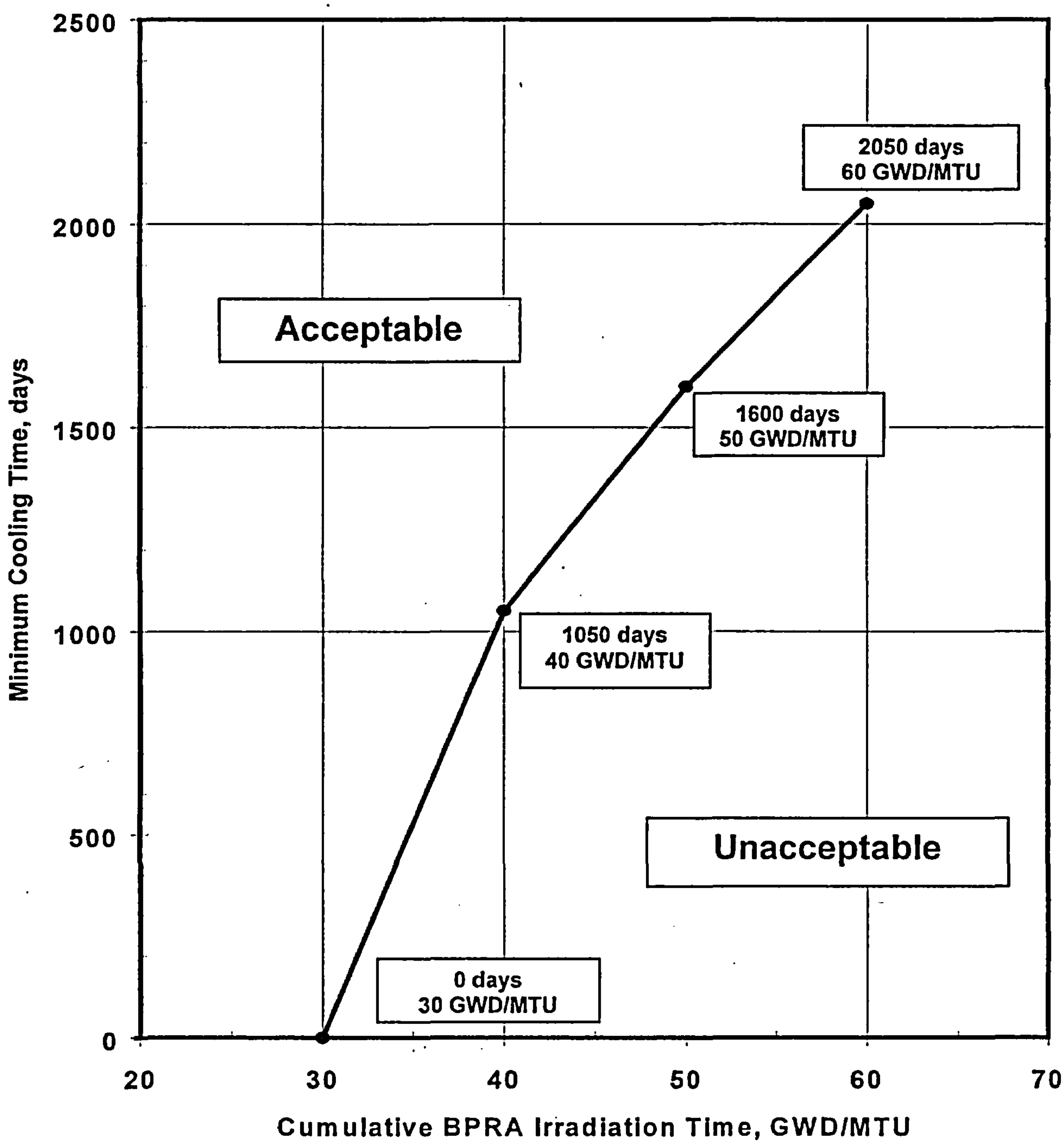
FIGURE 2-5.1
MINIMUM ACCEPTABLE COOLING TIME IN YEARS
AS A FUNCTION OF BURNUP AND INITIAL ENRICHMENT

Initial Enrichment (wt % U-235) (1)	Burnup (GWD/MTU) (2)																
	15	20	30	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1.2	7	7															
1.3	7	7															
1.4	7	7															
1.5	7	7	7	8	8	8	8	9									
1.6	7	7	7	7	8	8	8	9	9	9	9						
1.7	7	7	7	7	8	8	8	8	9	9	9	10					
1.8	7	7	7	7	7	8	8	8	9	9	9	10					
1.9	7	7	7	7	7	7	8	8	8	9	9	9	10	10			
2.0	7	7	7	7	7	7	8	8	8	8	9	9	9	10	10		
2.1	7	7	7	7	7	7	7	8	8	8	9	9	9	10	10		
2.2	7	7	7	7	7	7	7	7	8	8	8	9	9	9	10	10	
2.3	7	7	7	7	7	7	7	7	8	8	8	9	9	9	10	10	
2.4	7	7	7	7	7	7	7	7	8	8	8	8	9	9	9	10	10
2.5	7	7	7	7	7	7	7	7	7	8	8	8	8	9	9	9	10
2.6	7	7	7	7	7	7	7	7	7	7	8	8	8	8	9	9	10
2.7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	9	9	9
2.8	7	7	7	7	7	7	7	7	7	7	8	8	8	8	9	9	9
2.9	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8	9	9
3.0	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	9	9
3.1	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	9	9
3.2	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8	8
3.3	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8
3.4	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	8	8
3.5	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3.6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3.7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3.8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
3.9	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
4.05	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7

■ - not evaluated

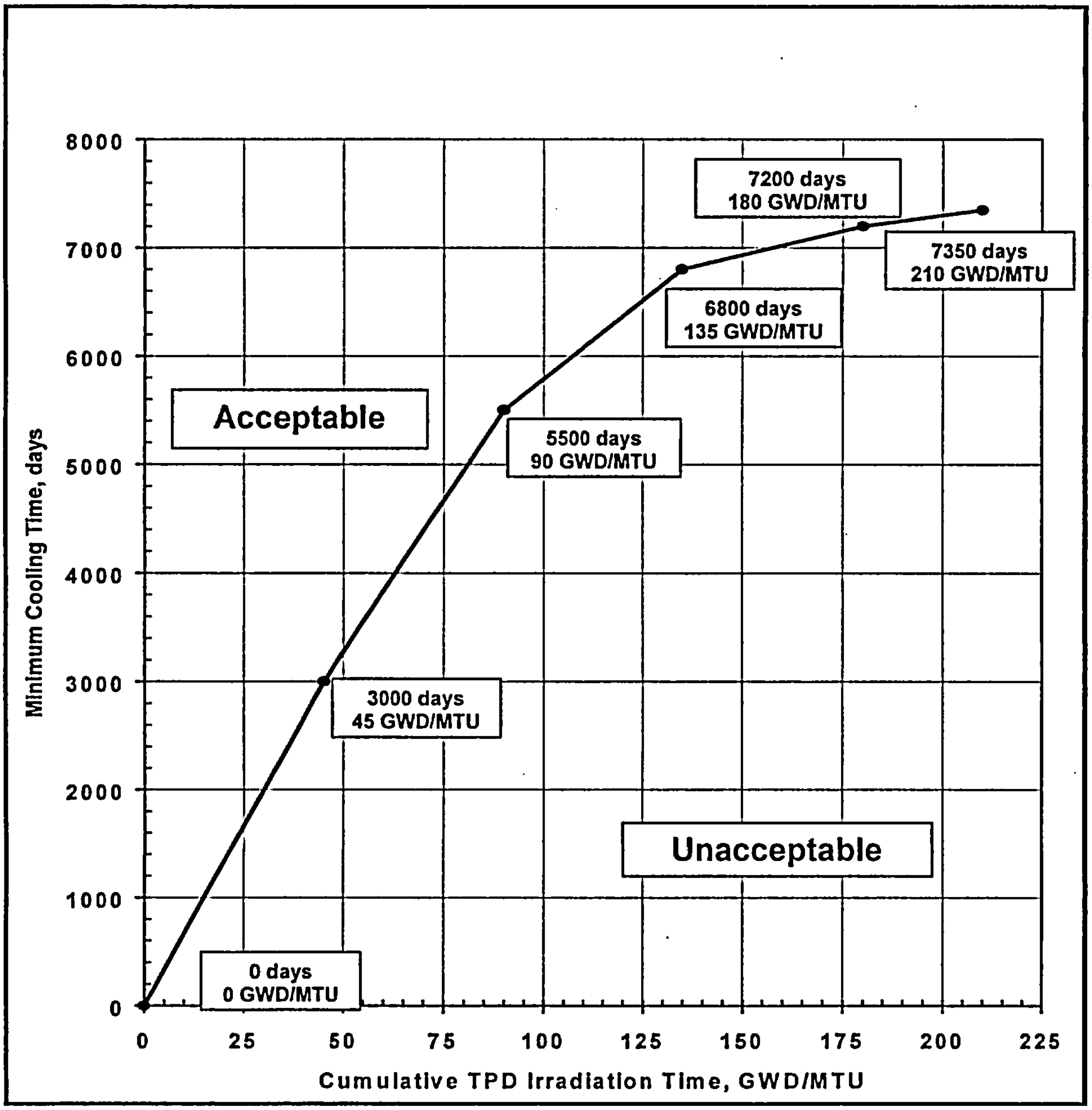
(1) Round actual value down to next lower tenth.
(2) Round actual value up to next higher GWD/MTU.

FIGURE 2-5.2
COOLING TIME AFTER SHUTDOWN FOR BPRAs
IN TN-32 DRY STORAGE CASKS



(The cumulative irradiation is taken to be the sum of the individual fuel assembly burnup values in which the BPRA was resident during in-core operation.)

FIGURE 2-5.3
COOLING TIME AFTER SHUTDOWN FOR TPDs
IN TN-32 DRY STORAGE CASKS



(The cumulative irradiation is taken to be the sum of the individual fuel assembly burnup values in which the TPD was resident during in-core operation.)

2.3 LIMITING CONDITION - HANDLING HEIGHT

2.3.1 Specification

This specification applies to handling of casks, containing spent fuel, outside of the Fuel Building and Crane Enclosure Building. The maximum cask handling height is governed by the cask specific operating limits as listed in Section 2.2.

2.3.2 Basis

The drop analyses performed for postulated cask drop incidents on the Surry ISFSI storage pad require that maximum safe lift heights be established so that the casks can be safely handled without sustaining unacceptable damage to the storage cask and fuel basket. This limiting condition ensures that the handling heights limits will not be exceeded at the storage pad or in transit to and from the reactor.

2.4 CASK SURFACE CONTAMINATION

2.4.1 Specification

Removable contamination on the cask shall not exceed 1000 dis/min/100 cm^2, from beta, gamma emitting sources and 20 dis/min/100 cm^2 from alpha emitting sources.

2.4.2 Basis

Compliance with this limit ensures that the decontamination requirements of 49 CFR 173.443, as discussed in the Surry Dry Cask ISFSI SAR Section 6.3.3, will be met over the lifetime of the cask in storage.

2.5 CASK INTERNAL COVER GAS

2.5.1 Specification

The cask shall be backfilled with a cover gas as listed in the operating limits and conditions in Section 2.2, except for the TN-32 cask (See Section 2.9).

2.5.2 Basis

The thermal analysis performed for the cask assumes the use of a cover gas. In addition, the use of a cover gas is to ensure long-term maintenance of fuel clad integrity.

2.6 LIMITING CONDITION - PRESSURE MONITORING DEVICE

2.6.1 Specification

The pressure monitoring device used to monitor the leak tightness of the cask shall have the cask specific performance characteristics listed in Section 2.2. A functional test shall be performed during cask preparation.

2.6.2 Basis

The cask is monitored to detect leakage from the cask seals.

2.7 BORON CONCENTRATION

2.7.1 Specification

For casks which require the use of boron in the water during cask loading and unloading operations, the boron concentration in the water of the spent fuel pool and the water used to fill the cask shall be as listed in Section 2.2 (Dry Storage Cask Operating Limits.)

2.7.2 Basis

The required boron concentration is based on the criticality analysis for unburned fuel, maximum enrichment, and optimum moderation conditions.

2.8 TN-32 CASK CAVITY VACUUM DRYING

2.8.1 Specification

The cask cavity vacuum drying pressure shall meet the limit as specified in Table 2-5 after isolation from the pumping system.

If the cask cavity vacuum drying pressure does not meet the limit in Table 2-5, following completion of Surveillance Requirement (SR) 3.8.1, then:

a. Achieve or maintain a helium environment of greater than 0.1 atm abs in the cask cavity within 12 hours after completing the SR [this requirement applies until helium is removed for subsequent operations], and

b. Establish the cask cavity vacuum pressure within the limit within 96 hours after completing the SR.

c. If the requirements of 2.8.1.a cannot be met, all fuel assemblies shall be removed from the cask within 7 days.

d. If the requirements of 2.8.1.b cannot be met, all fuel assemblies shall be removed from the cask within 30 days.

2.8.2 Basis

Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This protective environment is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. Achieving the vacuum pressure described in Table 2-5 indicates that all liquid water has evaporated and has been removed from the cask cavity. The removal of moisture from the cask cavity helps to ensure the long-term minimization of fuel clad corrosion.

The thermal analyses of the cask are performed assuming that helium is in the cask. If the cask reaches steady state conditions under air or vacuum, the fuel pin cladding short-term temperature limits will not be exceeded. However, the temperature of the basket could increase beyond the analyzed temperature range since the thermal performance of the cask under vacuum is not as good as when filled with helium. At approximately 36 hours the cask basket materials will reach the maximum temperature for which they have been analyzed under design basis conditions, unless a nominal helium environment (a pressure greater than 0.1 atm abs) has been established.

2.9 TN-32 CASK HELIUM BACKFILL PRESSURE

2.9.1 Specification

The cask cavity shall be filled with helium to the limit as specified in Table 2-5.

If the cask helium backfill pressure does not meet the limit in Table 2-5, following completion of SR 3.9.1, then:

a. Achieve or maintain a helium environment of greater than 0.1 atm abs in the cask cavity within 6 hours after completing the SR [this requirement applies until helium is removed for subsequent operations], and

b. Establish the cask cavity helium pressure within the limit within 48 hours after completing the SR.

c. If the requirements of 2.9.1.a cannot be met, all fuel assemblies shall be removed from the cask within 7 days.

d. If the requirements of 2.9.1.b cannot be met, all fuel assemblies shall be removed from the cask within 30 days.

2.9.2 Basis

Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in the accident analysis. In addition, the thermal analyses of the cask storage operations assume that the cask cavity is filled with helium.

Backfilling the cask cavity with helium at a pressure exceeding atmospheric pressure will ensure that there will be no air in-leakage into the cavity which could damage the fuel cladding over the licensed storage period. The initial helium pressure in Table 2-5 was selected to ensure that the pressure within the cask remains within the design pressure limits over the life of the cask.

The thermal analyses of the cask are performed assuming that helium is in the cask. If the cask cavity helium pressure limit cannot be achieved within 30 hours of completion of cask draining, the cask must be backfilled with helium (a pressure greater than 0.1 atm abs is sufficient to provide required thermal conductivity) within 6 hours. Backfilling with helium to maintain the cask in an analyzed condition allows additional time to determine the source of the helium backfill problem.

2.10 TN-32 COMBINED HELIUM LEAK RATE

2.10.1 Specification

The combined helium leak rate for all closure seals and the overpressure system shall not exceed the limit specified in Table 2-5.

If the combined helium leak rate does not meet the limit in Table 2-5, following completion of SR 3.10.1, then:

a. Establish the leak rate within the limit within 48 hours after completing the SR.

b. If the requirements of 2.10.1.a cannot be met, all fuel assemblies shall be removed from the cask within 30 days.

2.10.2 Basis

Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of one of the confinement barriers is considered as an off normal condition. In addition, the thermal analyses of the cask storage operations assume that the cask cavity is filled with helium.

Verifying that the cask cavity is sealed by measuring the helium leak rate will ensure that the assumptions in the normal, off normal, and accident analyses and radiological evaluations are maintained. The helium leak rate value is used in the confinement analyses presented in Chapter 7 of the TN-32 SAR, Revision 0, January 2000.

2.11 TN-32 CASK INTERSEAL PRESSURE

2.11.1 Specification

The cask interseal pressure shall be maintained as specified in Table 2-5.

During Loading Operations, the cask interseal pressure shall be established within the limit in Table 2-5. After the cask is placed on a storage pad, a monitoring system is used to indicate if loss of interseal pressure has occurred, and to notify the licensee that cask seal integrity is potentially compromised. Upon determination of a valid indication of loss of interseal pressure, then:

a. Ensure the cask interseal pressure is above the limit specified in Table 2-5 within 7 days.

b. If the requirements of 2.11.1.a cannot be met, all fuel assemblies shall be removed from the cask within 30 days.

2.11.2 Basis

The cask is designed with redundant seals to contain the radioactive material. In addition, 10 CFR 72.122(h)(4) and 10 CFR 72.128(a)(1) state that the casks must have the capability to be continuously monitored such that the licensee will be able to determine when corrective action needs to be taken to maintain safe storage conditions.

Long-term integrity of the fuel cladding depends on storage in an inert atmosphere. This is accomplished by removing water from the cask cavity and backfilling the cavity with an inert gas. The failure of storage cask confinement capability is considered in the accident analysis and the off-normal analysis. In addition, the thermal analyses of the cask storage operations assume that the cask cavity is filled with helium.

Verifying cask interseal pressure ensures that the assumptions relating to radioactive releases in the accident analyses and radiological evaluations are maintained. Seal integrity is verified by monitoring interseal pressure indication and alarms.

3.0 SURVEILLANCE REQUIREMENTS

Requirements for surveillance of various radiation levels, cask internal pressure, contamination levels, cask seal leak rates, and fuel related parameters are contained in this section. These requirements are summarized in Table 3-1 from details contained in Section 3.1 through 3.12. Specified time intervals may be adjusted plus or minus 25 percent to accommodate normal test schedules, except for Sections 3.8, 3.9 and 3.10, which must be completed as specified.

Table 3-1
SURVEILLANCE REQUIREMENTS SUMMARY

Section	Quantity or Item	Period
3.1	Cask Seal Testing	L
3.2	Cask Contamination	L
3.3	Dose Rates (Cask surface)	L
	Dose Rates (Fence)	Q
3.4	Cask Pressure Monitoring	P & L
3.5	Alarm Board	A
3.6	Fuel Parameters	P
3.7	Boron Concentration	P, L, & U
3.8	TN-32 Cask Cavity Vacuum Drying	L
3.9	TN-32 Cask Helium Backfill Pressure	L
3.10	TN-32 Combined Helium Leak Rate	L
3.11	TN-32 Cask Interseal Pressure	W & T
3.12	Safety Status Surveillance	Q

P - Prior to cask loading
L - During loading operations
U - Prior to cask unloading
Q - Quarterly
A - Annually
W - Weekly
T - Triennially

3.1 CASK SEAL TESTING

3.1.1 Specification

During cask loading operations, each cask seal shall be tested using a helium leak detector to ensure that the seal leak tightness satisfies the cask specific criteria listed in Section 2.2, except for the TN-32 (See Section 3.10).

3.1.2 Basis

The safety analysis of leak tightness of the cask is based on the seals being leak tight. This check is done to ensure compliance with the cask specific operating limits and conditions.

3.2 CASK CONTAMINATION

3.2.1 Specification

After cask loading and prior to moving the cask to the storage pad, the cask shall be swiped to ensure that removable surface contamination levels are less than specified in Section 2.4.1 (1000 dis/min/100 cm^2, from beta, gamma emitting sources and 20 dis/min/100 cm^2 from alpha emitting sources).

3.2.2 Basis

This surveillance requirement will ensure compliance with the decontamination requirements of Specification 2.4.1 and 49 CFR 173.443 prior to storage in the Surry ISFSI.

3.3 DOSE RATES

3.3.1 Specification

The following dose rate measurements shall be made for the Surry ISFSI:

a. Cask Surface Gamma and Neutron Dose Rates: After completion of cask loading, gamma and neutron dose rate measurements shall be taken on the outside surface of the cask. These dose rates shall be less than an average of 224 mrem/hr for the side surface and an average of 76 mrem/hr for the top surface.

b. Surry ISFSI Boundary: TLDs shall be placed on the Surry ISFSI site fence and shall be read on a quarterly basis. There shall be 2 TLDs on each side of the ISFSI site (8 total).

3.3.2 Basis

The cask surface dose rates must be within the dose rates described in Section 7.3.2.1 of the Surry Dry Cask ISFSI SAR as these dose rates were used in the safety and environmental analyses performed for this installation. TLDs are used to measure radiation levels at the ISFSI site fence to ensure compliance with regulatory limits on dose to the public under normal conditions.

3.4 CASK PRESSURE MONITORING

3.4.1 Specification - GNSI CASTOR V/21 Cask

The cask interlid pressure shall be monitored by use of a pressure switch having the characteristics described in Table 2-1. The switching pressure shall be factory set at 4 bar for the interlid space and a functional test shall be performed during cask preparation.

3.4.2 Basis

This specification requires the interlid space atmosphere be maintained and monitored to detect any possible leakage of either cask seal.

3.4.3 Specification - Westinghouse MC-10 Cask

The cask cavity pressure shall be monitored by use of a pressure sensor having the characteristics described in Table 2-2. A functional test shall be performed during cask preparation.

3.4.4 Basis

This specification requires the cask cavity atmosphere be maintained and monitored to detect any possible leakage of cask seals.

3.4.5 Specification - NAC-I28 Cask

The cask inter-seal pressure shall be monitored by use of a pressure sensor having the characteristics described in Table 2.3. A functional test shall be performed during cask preparation.

3.4.6 Basis

The cask inter-seal pressure is monitored to detect any possible leakage of either cask seal.

3.4.7 Specification - GNSI CASTOR X/33 Cask

The cask interlid pressure shall be monitored by use of a pressure switch having the characteristics described in Table 2-4. The switching pressure shall be factory set at 4 bar for the interlid space and a functional test shall be performed during cask preparation.

3.4.8 Basis

This specification requires the interlid space atmosphere be maintained and monitored to detect any possible leakage of either cask seal.

3.4.9 Specification - TN-32 Cask

The cask inter-seal pressure shall be monitored by use of a pressure sensor having the characteristics described in Table 2-5. A functional test shall be performed during cask preparation.

3.4.10 Basis

The cask inter-seal pressure is monitored to detect any possible leakage of either cask seal.

3.5 ALARM BOARD

3.5.1 Specification

The alarm board to which all of the pressure monitoring devices are connected shall be functionally tested annually to ensure proper operation of the board.

3.5.2 Basis

The alarm board must be checked periodically for general maintenance purposes to ensure that all components of the alarm board are working properly.

3.6 FUEL PARAMETERS

3.6.1 Specification

Prior to cask loading the fuel selected to be loaded shall have been reviewed to ensure that it is within the cask specific parameters stated in Sections 2.1 and 2.2. This information shall be documented for each assembly to be loaded into the cask.

3.6.2 Basis

The design criteria and subsequent safety analyses of the Surry ISFSI assumed certain characteristics and limitations for the fuels that are to be received and stored. Specification 3.6.1 ensures that these bases remain valid by requiring that the source of the spent fuel, maximum initial enrichment, irradiation history, maximum thermal heat generation, and minimum post irradiation cooling time be verified.

3.7 BORON CONCENTRATION

3.7.1 Specification

Written procedures shall be used to independently determine (two samples analyzed by different individuals) that the boron concentration in the water used in the spent fuel pool and that used to fill the casks meets Specification 2.7.1. All boron concentration measurements shall be documented.

1. Within 4 hours before insertion of the first fuel assembly into the cask, the dissolved boron concentration in water in the spent fuel pool and in the water that will be introduced into the cask cavity shall be independently determined.
2. Within 4 hours before flooding the cask cavity for unloading the fuel assemblies, the dissolved boron concentration in water in the spent fuel pool and in the water that will be introduced into the cask cavity shall be independently determined.
3. The dissolved boron concentration in the water shall be reconfirmed at intervals not to exceed 48 hours, until such time as the cask is removed from the spent fuel pool or the fuel has been removed from the cask.

3.7.2 Basis

The required surveillance for the boron concentration is to ensure that the correct amount of boron is in the water to prevent criticality.

3.8 TN-32 CASK CAVITY VACUUM DRYING

3.8.1 Specification

Within 24 hours of completion of cask draining, the equilibrium cask cavity vacuum pressure shall meet the limit as specified in Table 2-5.

3.8.2 Basis

Cavity dryness is demonstrated by evacuating the cavity to a high vacuum and verifying that the vacuum is held over a specified period of time. A high vacuum is an indication that the cavity is dry. This dryness test must be performed successfully on each cask before placing in storage. The test must be performed within 24 hours of draining the cask and removing it from the spent fuel pool. This period allows sufficient time to prepare the cask and perform the test while minimizing the time the fuel is in the cask without a helium atmosphere.

3.9 TN-32 CASK HELIUM BACKFILL PRESSURE

3.9.1 Specification

Within 6 hours of completion of cask cavity vacuum drying, the cask cavity shall be backfilled with helium to the limit as specified in Table 2-5.

3.9.2 Basis

The long-term integrity of the stored fuel is dependent on storage in a dry, inert environment and maintenance of adequate heat transfer mechanisms. Filling the cask cavity with helium at the initial pressure specified will ensure that there will be no air in-leakage, which could potentially damage the fuel and that the cask cavity internal pressure will remain within limits for the life of the cask.

Backfilling with helium must be performed successfully on each cask before placing in storage. The surveillance must be performed within 30 hours after draining the cask. This time is limited to ensure that the cask basket does not exceed the temperatures for which it has been analyzed. This 30-hour period is sufficient time to backfill the cask cavity with helium while minimizing the time the fuel is in the cask without the assumed thermally-conductive atmosphere.

3.10 TN-32 COMBINED HELIUM LEAK RATE

3.10.1 Specification

Within 48 hours of completion of cask cavity helium backfill, verify that the combined helium leak rate for all closure seals and the overpressure system does not exceed the limit as specified in Table 2-5.

3.10.2 Basis

A primary design consideration of the cask is that it adequately can contain radioactive material and retain an inert environment. Measuring the helium leak rate with an appropriate detector demonstrates that the confinement barrier is established and within design assumptions. Measuring the helium leak rate must be performed successfully on each cask prior to placing it in storage. The surveillance must be performed within 48 hours after verifying the cask helium backfill pressure is within limits. This 48-hour period allows sufficient time to perform the surveillance while minimizing the time the fuel is in the cask without verifying that the cask is sealed.

3.11 TN-32 CASK INTERSEAL PRESSURE

3.11.1 Specification

a. Every 7 days after placing the cask at the ISFSI verify that the cask interseal helium pressure is above the limit specified in Table 2-5.

b. Every 36 months after placing the cask at the ISFSI perform a test to verify proper functioning of the pressure monitoring device on the cask overpressure system.

3.11.2 Basis

After the initial leak testing is successfully performed, the cask overpressure tank pressure is routinely monitored every 7 days. This ensures that no leaks have occurred after initial testing is done. Verification of the pressure exceeding 3.2 atmospheres may be performed using alarms, pressure transducers, or other similar verification methods. Seven days is appropriate, based on the extreme low probability of developing a leak during transfer and storage operations.

3.12 SAFETY STATUS SURVEILLANCE

3.12.1 Specification

A visual surveillance shall be performed on a quarterly basis of the Surry ISFSI to determine that no significant damage or deterioration of the exterior of the emplaced casks has occurred. Surveillance shall also include observation to determine that no significant accumulation of debris on cask surfaces has occurred.

3.12.2 Basis

This surveillance requirement shall ensure cask maintenance.

4.0 DESIGN FEATURES

4.1 SITE

4.1.1 Specification

The Surry ISFSI is located on the Surry Power Station site as shown in Figure 2.1-1 of the SAR.

4.2 CASK DESIGN

4.2.1 Specification

The casks used in the Surry ISFSI shall be those identified in Section 2.2.

4.3 STORAGE PAD

4.3.1 Specification

The Surry ISFSI cask storage pads are reinforced concrete pads nominally 32 feet x 230 feet x 3 feet thick with a 20-foot ramp on each end for vehicle access. Each pad is designed to hold 28 casks arranged in two rows, nominally 16 feet apart center to center and in each row spaced nominally 16 feet apart center to center. The total facility will have three storage pads if required. Design criteria of the storage pads are contained in Section 3 of the Surry Dry Cask ISFSI SAR.

4.4 TOTAL STORAGE CAPACITY

4.4.1 Specification

The total storage capacity of the Surry ISFSI is limited to 811.44 TeU.

4.4.2 Basis

The 811.44 TeU is the design basis for the Surry ISFSI site.

4.5 TN-32 CRITICALITY

4.5.1 Specification

The boron content of the TN-32 basket poison material shall have a minimum areal density of 10 mg boron-10/cm^2.

4.5.2 Basis

This boron content helps to ensure that fuel assemblies are maintained in a subcritical condition. Appendix A.5 of the Surry ISFSI SAR describes the testing to ensure that the minimum areal density of the basket poison material is met.

4.6 TN-32 HELIUM PURITY

4.6.1 Specification

The TN-32 cask shall be filled with helium with a purity of at least 99.99%.

4.6.2 Basis

This level of purity will ensure that the residual impurities in the cask cavity will be less than 1 mole.

4.7 TN-32 STORAGE LOCATION

4.7.1 Specification

TN-32 casks shall be spaced a minimum of 16 feet apart, center-to-center.

4.7.2 Basis

This minimum spacing will ensure the proper dissipation of radiant heat energy from an array of TN-32 casks as assumed in the TN-32 SAR, Revision 0, January 2000.

APPENDIX B

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION

SAFEGUARDS LICENSE CONDITIONS

LICENSE NO. SNM-2501

February 25, 2005

1.0 INTRODUCTION

This license condition supplements the requirements of Subpart H, 10 CFR Part 72 to prescribe specific measures for the physical protection of the Surry Independent Spent Fuel Storage Installation (ISFSI).

1.1 PHYSICAL PROTECTION REQUIREMENTS FOR SPENT NUCLEAR FUEL IN DRY STORAGE

1.1.1 The licensee shall fully implement and maintain in effect all Independent Spent Fuel Storage Installation (ISFSI) provisions contained within the site physical security, safeguards contingency, and guard training and qualification plans previously approved by the Commission and all amendments made pursuant to the authority of 10 CFR 72.56, 10 CFR 72.44(e), and 10 CFR 72.186. These plans are entitled: "Surry Power Station Units 1 and 2 Independent Spent Fuel Storage Installation Physical Security Plan," "Surry Power Station Units 1 and 2 Independent Spent Fuel Installation Safeguards Contingency Plan," and "Surry Power Station Units 1 and 2 Nuclear Security Personnel Training and Qualification Plan." These plans contain safeguards information protected under 10 CFR 73.21 except for the Training and Qualification Plan.

APPENDIX C

VIRGINIA ELECTRIC AND POWER COMPANY

SURRY INDEPENDENT SPENT FUEL STORAGE INSTALLATION

TECHNICAL SPECIFICATIONS FOR ENVIRONMENTAL PROTECTION

LICENSE NO. SNM-2501

February 25, 2005

1.0 INTRODUCTION

These technical specifications govern the protection of the environment during the receipt, possession, storage, and transfer of spent fuel at the Surry ISFSI.

1.1 RADIOACTIVE MATERIAL RELEASES

1.1.1 Specification (pursuant to § 72.44(d))

Not applicable.

1.1.2 Basis

Specifications are required pursuant to § 72.44(d), stating limits on the release of radioactive materials for compliance with limits of 10 CFR Part 20 and the "as low as reasonably achievable objectives" for effluents. However, there are no normal or off-normal releases or effluents expected from the double-sealed storage casks at the Surry ISFSI.

1.2 EFFLUENT CONTROL AND WASTE TREATMENT

1.2.1 Specification (pursuant to § 72.44(d)(1))

Not applicable.

1.2.2 Basis

Specifications are required pursuant to § 72.44(d)(1) for operating procedures for control of effluents and for the maintenance and use of equipment in radio active waste treatment systems to meet the requirements of § 72.104. However, there are, by the design of the sealed storage casks at the Surry ISFSI, no effluent releases, and all Surry site cask loading and unloading operations and waste treatment therefrom will occur at the Surry Power Station under the specifications of its operating licenses.

1.3 ENVIRONMENTAL MONITORING PROGRAM

1.3.1 Specification

The licensee shall include the Surry ISFSI in the environmental monitoring for the Surry Power Station.

1.3.2 Basis

An environmental monitoring program is required pursuant to § 72.44(d)(2).

1.4 ANNUAL ENVIRONMENTAL REPORT

1.4.1 Specification

An annual report, which is the Surry Power Station Annual Radioactive Effluent Release Report, will be submitted to the NRC Region II office with a copy to the Director, Office of Nuclear Material Safety and Safeguards, within 60 days after January 1 of each year, specifying the quantity of each of the principal radionuclides released to the environment in liquid and in gaseous effluents during the previous calendar year of operation and such other information as may be required by the Commission to estimate maximum potential radiation dose commitment to the public resulting from effluent release.

1.4.2 Basis

The report of Specification 1.4.1 is required pursuant to 10 CFR § 72.44(d)(3).