APPENDIX A

DUKE ENERGY PROGRESS, LLC.

H.B. ROBINSON

INDEPENDENT SPENT

FUEL STORAGE INSTALLATION

TECHNICAL SPECIFICATIONS FOR

MATERIALS LICENSE NO. SNM-2502

TABLE OF CONTENTS

1.0 INTRODUCTION

These Technical Specifications govern the safety of the receipt, possession, and storage of irradiated nuclear fuel at the H.B. Robinson (HBR) Independent Spent Fuel Storage Installation (ISFSI) and the transfer of such irradiated nuclear fuel to and from Unit 2 of the HBR Steam Electric Plant and the HBR Independent Spent Fuel Storage Installation.

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 HBR 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 or maximum 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. Metric Tons of Uranium (MTU): Fuel quantity is expressed in terms of the uranium content of the fuel measured in metric tons.

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

1.2 PREOPERATIONAL LICENSE CONDITIONS

Deleted

1.3 GENERAL LICENSE CONDITIONS

1.3.1 Quality Assurance

The design, construction, and operation of the ISFSI shall be accomplished in accordance with the U.S. Nuclear Regulatory Commission (NRC) regulations specified in Title 10 of the U.S. Code of Federal Regulations. All commitments to the applicable NRC Regulatory Guides and to engineering and construction codes shall be carried out.

1.3.2 Fuel and Cask Handling Activities

Fuel and cask movement and handling activities which are to be performed in the HBR plant Fuel Handling Building will be governed by the requirements of the HBR Steam Electric Plant Unit 2 Facility Operating License (DPR-23) and associated Technical Specifications.

1.3.3 Administrative Controls

The HBR ISFSI is located on the HBR plant site and will be managed and operated by the HBR plant staff. The administrative controls shall be in accordance with the requirements of the HBR Steam Electric Plant Unit 2 Facility Operating License (DPR-23) and associated Technical Specifications.

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 HBR ISFSI shall meet the following requirements:

(1) Only fuel irradiated at the HBR Unit No. 2 may be used.

(2) Maximum initial enrichment shall not exceed 3.5 weight percent U-235.

(3) Maximum assembly average burnup shall not exceed 35,000 megawatt-days per metric ton uranium.

(4) Maximum heat generation rate shall not exceed 1 kilowatt per fuel assembly.

(5) Fuel shall have cooled a minimum of 5 years after reactor discharge and prior to storage in the HBR ISFSI.

(6) Fuel shall be intact unconsolidated fuel.

(7) Maximum assembly mass shall not exceed 660 kilograms.

(8) Prior to insertion of a spent fuel assembly into a DSC, the identity of the assembly shall be independently verified.

2.1.2 Basis

The design criteria and subsequent safety analysis of the HBR ISFSI 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.

The radiological analyses are based on a radiation spectrum for 3.5 weight percent U-235 fuel at 35,000 MWD/MTU burnup. Compliance with the enrichment and burnup limits will ensure that the Dry Storage Casks design criteria are not exceeded.

2.2 DRY SHIELDED STORAGE CANISTER (DSC)

2.2.1 Specification

The DSCs used to store spent nuclear fuel in HSMs at the HBR ISFSI shall have the operating limits shown in Table 2-1.

2.2.2 Basis

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

2.3 DRY SHIELDED CANISTER INTERNAL COVER GAS

2.3.1 Specification

The DSC shall be backfilled with helium.

2.3.2 Basis

The thermal analysis performed for the DSC assumes the use of helium as a cover gas. In addition, the use of an inert gas (helium) is to ensure long-term maintenance of fuel clad integrity.

2.4 DRY SHIELDED CANISTER SURFACE CONTAMINATION

2.4.1 Specification

Removable contamination on the DSC shall be less than 220,000 dis/min/100 cm^2, from beta, gamma sources and 2,200 dis/min/100 cm^2 from alpha sources. Surveillance requirement 4.5.1 ensures that this requirement will be met.

2.4.2 Basis

Compliance with this limit ensures that the offsite dose limits in 10 CFR Part 20, 10 CFR Part 50 - Appendix I, 10 CFR Part 72, and 40 CFR Part 190 are met.

TABLE 2-1
OPERATING LIMITS

	Operating Limit
Max. Lifting Height with a Non-Redundant Lifting Device for IF-300 Cask	8 ft
Dose Rate	
• • Surface of HSM	≤ 200 mrem/hr
(These limits conform to transportation cask dose rate limits. Actual dose rates for most surface locations on the loaded HSM will be significantly less.)	
DSC Tightness	
(Standard He-Leak Rate)	
• • Primary End Plug Closure Weld	≤ 10^{-5} atm-cc/s
• • Prefabricated Plug Weld	≤ 10^{-5} atm-cc/s
• • Secondary Closure Weld	Dye Penetrant Test (ASME B&PV Code Section III, Division 1, Subsection NB-5350 (1983) Liquid Penetrant Acceptance Standards)
Max. Specific Power of One Fuel Assembly*	1.0kW
Max. Cladding Temperature during storage*	380°C
Helium Pressure Limit (DSC Cavity)	0.0 psig ± 0.5 psig (stable for 30 min after filling)
Pressure during Canister Drying (DSC Cavity)	≤ 3 torr (for not less than 10 min)

*These limits may be analytically determined.

3.0 LIMITING CONDITIONS

3.1 LIMITING CONDITION - HANDLING HEIGHT

3.1.1 Specification

This specification applies to handling of a cask being used for spent fuel storage outside of the Fuel Handling Building and its cask decontamination area.

a. IF-300 cask with its attached HSM docking collar and lid and without an impact limiter shall not be handled at a height of greater than 8 feet.

b. In the event of a cask drop from a height greater than 15 in., fuel in a DSC in the cask shall be removed and inserted into a replacement DSC or returned to the spent fuel pool if damaged. The damaged DSC shall be decontaminated, removed from service, and disposed of, as may be appropriate.

3.1.2 Basis

The drop analyses performed for cask drop incidents for a DSC loaded in a modified IF-300 cask confirm that drops up to 8 feet can be sustained without unacceptable damage to the cask and DSC. This limiting condition ensures that the handling height limits will not be exceeded at the storage pad or in transit to and from the spent fuel pool. Design of the DSC is to ASME B & PV Code Section III, Division 1, Subsection NB for Class 1 components, Service Level D requirements.

4.0 SURVEILLANCE REQUIREMENTS

Requirements for surveillance of various radiation levels, cask internal pressure, contamination levels, DSC weld leak rates, and fuel related leak parameters are contained in this section. These requirements are summarized in Table 4-1 from details contained in Section 4.1 through 4.4.

TABLE 4-1

SURVEILLANCE REQUIREMENTS SUMMARY

Section	Quantity or Item	Period
4.1.1	Surveillance of the HSM Air Inlets and Outlets	D
4.2.1	Dose Rates (HSM surface)	M
4.3.1	Limits for Maximum Air Temperature Rise after Storage	I
4.4.1	Fuel Parameters	P
4.5.1	DSC and Cask Contamination	L
4.6.1	DSC Weld Testing	L
4.7.1	HSM Inspection	N/A
4.8.1	DSC Pressure	L

P - Prior to cask loading
L - During loading operations
D - Daily
M - During maintenance operations
I - At initial storage, 24 hours later, 7 days later
N/A - Not required

4.1 SURVEILLANCE OF THE HSM AIR INLETS AND OUTLETS

The HSM shall be inspected to verify that the air inlets and outlets are free from obstructions.

4.1.1 Specifications

Normal visual inspection frequency	Daily
Accident visual inspection frequency	Within 24 hours after an accident

4.1.2 Basis

To assure that no HSM air inlets or outlets are plugged for more than 48 hours and to assure that complete blockage of all inlets and exits due to an accident will be removed in less than 48 hours. Analysis in Chapter 8 of the HBR ISFSI SAR showed that no temperature limits are exceeded if a module is completely plugged for 48 hours. Therefore, for normal operations, an inspection of the inlets once per day will assure that any local obstructions can be removed. Likewise, after an accident, the HSMs should be examined within 24 hours to assure that air flow can be restored within 48 hours after the accident.

4.2 LIMITS FOR THE SURFACE DOSE RATE OF THE HSM DURING STORAGE

4.2.1 Specification

Surface dose rates at the following locations

(1)	Outside of HSM door on centerline of DSC	200 mrem/hr
(2)	Center of air inlets	200 mrem/hr
(3)	Center of air outlets	200 mrem/hr

Average Dose rates for the following surfaces

(1)	Roof	50 mrem/hr
(2)	Front/Back	50 mrem/hr
(3)	Side	50 mrem/hr

The HSM shall be monitored to verify that this specification has been met immediately after the DSC is placed in storage and the HSM front and rear accesses are closed.

4.2.2 Basis

The dose rates stated in this specification were selected to maintain as-low-as-is-reasonably-achievable exposures to personnel performing air duct clearing on the HSM. These dose rates are within industry accepted standards for contact handling, operation and maintenance of radioactive material.

Personnel will be required to remove any potential air blockage. At 200 mrem/hr, the dose for a one hour job of unblocking the air inlets (or outlets) would be less than 200 mrem (whole body) and, hence, would be only 4% of the total yearly burden. Furthermore, analysis provided in Chapter 7 of the HBR ISFSI SAR shows that the expected dose rates around the HSM surface will be well below the specifications listed above.

4.3 LIMITS FOR THE MAXIMUM AIR TEMPERATURE RISE

4.3.1 Specification

Maximum air temperature rise 100°F (55.6°C). The maximum air temperature rise from HSM inlet to outlet shall be checked at the time the DSC is stored in the HSM, again 24 hours later, and again after 7 days.

4.3.2 Basis

The 100°F (55.6°C) temperature rise was selected to limit the hottest rod in the DSC to below 716°F (380°C). If this temperature rise is maintained, then the hottest rod will be below the 716°F (380°C) limit even on the hottest day conditions of 125°F (51.7°C). The expected temperature rise is less than 100°F (i.e., 82°F (45.5°C); see Section 8.1.3 of HBR ISFSI SAR) and hence, the current design provides adequate margin for this specification. If the temperature rise is within the specifications, then the HSM and DSC are performing as designed and no further temperature measurements are required during normal surveillance.

4.4 FUEL PARAMETERS

4.4.1 Specifications

Type	15 x 15 PWR Fuel
Burnup	≤ 35,000 Mwd/MT
Initial (Beginning of Life)	
Enrichment	≤ 3.5% U-235
Heat generation	≤ 1.0 kW/fuel assembly
Fuel cooling period	≥ 5 years
Total fuel assembly mass	≤ 660 kg

This specification is applicable to all fuel to be stored in the ISFSI. This information shall be documented for each fuel assembly to be loaded in a DSC.

4.4.2 Basis

This specification was derived to insure that the peak fuel rod temperatures, surface doses, nuclear subcriticality and mass are below the design values.

4.5 DSC AND CASK CONTAMINATION

4.5.1 Specification

4.5.1.1

Prior to loading, the cask interior shall be smeared to ensure that removal contamination levels on the interior surfaces of the cask, excluding the drain and vent lines, are less than 22,000 dis/min/100cm^2, from beta, gamma sources, and 220 dis/min/100 cm^2 from alpha sources.

4.5.1.2

After cask loading, but prior to moving the cask to the HSM, the top of the sealed DSC shall be smeared to ensure that removable contamination levels are less than 22,000 dis/min/100 cm^2 from the beta, gamma sources, and 220 dis/min/100 cm^2 from alpha sources. The cask exterior shall be smeared to ensure that removable contamination levels are less than 2,200 dis/min/100 cm^2 from beta, gamma sources, and 220 dis/min/100 cm^2 from alpha sources. This will ensure that the limits in 2.4.1 are met.

4.5.1.3

After cask unloading, the interior surfaces of the cask shall be smeared to ensure that removable contamination levels on the interior surfaces of the cask, excluding the drain and vent lines, are less than 220,000 dis/min/100 cm^2 from beta, gamma sources and 2,200 dis/min/100 cm^2 from alpha sources. This will ensure that the limits in 2.4.1 are met.

4.5.2 Basis

This surveillance requirement will ensure compliance with the DSC surface contamination limits of 2.4.1.

4.6 DSC WELD TESTING

4.6.1 Specification

During DSC loading operations, the primary plug closure and the prefabricated plug welds shall be tested using a helium leak detector to ensure that, for each leak, tightness is less than or equal to 10^{-5} atm-cc/s. The DSC secondary weld will be dye penetrant tested.

4.6.2 Basis

The safety analysis of leak tightness of the DSC as discussed is based on a weld being leak tight to 10^{-5} atm-cc/s. This check is done to ensure compliance with this design criteria.

4.7 HSM INSPECTION

4.7.1 Specification

No visual inspection of the interior concrete surfaces of the HSM is required.

4.7.2 Basis

Analysis of the HBR HSM shows the normal concrete temperature is below the point at which the potential for concrete deterioration or degradation would start, provided no subsequently loaded HSM stores spent fuel such that the total initial heat generation rate for the DSC stored exceeds that for the DSC in the first HSM loaded.

4.8 DSC PRESSURE

4.8.1 Specification

The helium backfill pressure in the DSC cavity shall be 0.0 psig ± 0.5 psig (stable for 30 minutes after filling).

4.8.2 Basis

The value of 0.0 psig was selected to assure that the pressure within the DSC is within pressure design limits of 25 psig during any expected normal operating condition.

5.0 DESIGN FEATURES

The HBR2 ISFSI design approval was based upon review of specific design drawings, some of which have been deemed appropriate for inclusion in the Technical Specifications. The drawings listed below have been reviewed and approved by the NRC either as part of the original license or in subsequent license amendments. This listing is provided for historical purposes; these drawings may be revised under the provisions of 10 CFR 72.48 as appropriate.

Drawings #	Rev. #	Title
RNT-162-C-1100	A	ISFSI (HSM) Horizontal Storage Module Site Plan
RNT-162-M-2701	A	ISFSI Cask Collar
RNT-162-M-2702	A	ISFSI Cask Collar Lid
RNT-162-M-2500	A	ISFSI DSC Assembly
RNT-162-M-2501	A	ISFSI DSC Basket Assembly
RNT-162-M-2402	P2	ISFSI NUHOMS Module Dimensions
RNT-162-C-1101	A	ISFSI Horizontal Storage Modules (HSM) General Layout and Details
RNT-162-C-1102	A	ISFSI HSM Foundation Plan, Sections and Details
RNT-162-M-2600	C	ISFSI Instrumented DSC Assembly
RNT-162-M-2609	E	ISFSI Instrumented DSC Penetration Plug Assembly
RNT-162-C-1113	A	ISFSI HSM Thermocouple Locations, Sections and Details
RNT-162-C-1114	A	ISFSI HSM Heat Shield Thermocouple Locations Plan, Sections and Details

5.1 SITE

5.1.1 Specification

The HBR ISFSI is located on the HBR Steam Electric Plant Unit 2 site as shown in ISFSI SAR Figure 1.1-2, Plot Plan.

5.2 CASK DESIGN

5.2.1 Specification

The cask used in the HBR ISFSI to transfer the DSC to the HSM shall be an IF-300 cask modified with docking collar and lid as shown in Drawing Nos. HBR2-10704 and HBR2-10705, entitled ISFSI Cask Collar and ISFSI Cask Collar Lid, respectively.

5.3 DSC DESIGN

5.3.1 Specification

The DSC shall be as shown in Drawing Nos. HBR2-10656, ISFSI DSC Assembly, and HBR2-10657, ISFSI DSC Basket Assembly.

All components comprising the DSC pressure boundary shall be provided from ASME SA 240, Type 304 stainless steel or its equivalent.

The boron content of the DSC guide sleeves shall contain a minimum effective B-10 loading of 0.004 g/cm^2 over the length of the active fuel.

5.4 HSM DESIGN

5.4.1 Specification

The HSM shall be as shown in Drawing Nos. RNT-162-M-2402, ISFSI NUHOMS Module Dimensions, and RNT-162-C-1101, ISFSI Horizontal Storage Modules (HSM) General Layout and Details.

The HSM shall be constructed of concrete with a compressive strength greater than or equal to 4000 psi (cured for 28 days; 90 percent of all specimens tested) and a minimum unit weight of 145 pounds per cubic foot. The concrete shall be composed of Type II Portland cement meeting the requirements of ASTMC150. The aggregate shall meet the specifications of ASTMC33.

5.5 STORAGE PAD

5.5.1 Specification

As shown in Drawing Nos. RNT-162-C-1102, ISFSI HSM Foundation Plan, Sections and Details, and No. 87081-C-1202, Sheet 1 of 2, HSM Foundation Plan, Sections and Details, the ISFSI storage pads are reinforced concrete pads nominally 3-feet thick with a 2-foot thick unloading slab starting at 5 feet from the front end of the HSM for vehicle access. An 8-inch thick hydraulic ram mounting slab is situated at the rear of the modules. One storage pad supports three HSMs; the second storage pad supports five HSMs. Design criteria of the storage pads are contained in Section 8 of the HBR ISFSI SAR.

5.6 TOTAL STORAGE CAPACITY

5.6.1 Specification

The total storage capacity of the HBR ISFSI is 25.70 MTU.

6.0 MONITORING

Monitoring equipment may be installed in some or all DSCs & HSMs according to the manufacturer's and the Duke Energy Progress, LLC. engineering department's recommendations. This equipment may include thermocouples. These devices do not perform a safety function and are not needed to ensure the proper operation of the ISFSI. However, they may be installed to provide an extra level of assurance in view of the limited experience available with this method of fuel storage at the time of this application.

This section provides proposed commitments to ensure that these instruments, although not important to safety, perform their intended functions.

6.1 THERMOCOUPLES

6.1.1 Specification

a. Thermocouples will be functionally checked before placement in storage per manufacturer's recommendations.

b. The DSC thermocouples will be connected to an external cable by means of a specially designed feed-through. This feed-through incorporates the redundant seal philosophy used in the DSC containment design. Details are shown in Drawings HBR2-10671, Sheets 1 and 2 and HBR2-10680. After the penetration plug assembly has been welded to the bottom of the DSC cover plate, a sleeve will be welded over the plug, forming a redundant seal. Thermocouple sheaths will likewise be brazed to the plug assembly at inner and outer surfaces of the penetrations. To preclude possible leakage through the aluminum oxide insulation, each end of the sheathed thermocouples will be sealed with an environmentally qualified resin. A leakage test will be performed (standard He leak rate ≤ 10^{-5} atm-cc/s) on the sealed DSC prior to loading operations.

c. HSM instrumentation will consist of thermocouples cast in place in the concrete and others attached to the surface and at various locations on the heat shield. Details of the HSM instrumentation are shown on drawings HBR2-10607 and HBR2-10608.

6.1.2 Basis

Emplacement of monitoring equipment must not compromise the design integrity of the DSC or HSM.

APPENDIX B

DUKE ENERGY PROGRESS, LLC.

H. B. ROBINSON

INDEPENDENT SPENT FUEL STORAGE INSTALLATION

SAFEGUARDS LICENSE CONDITION FOR

MATERIALS LICENSE SNM-2502

1.0 SAFEGUARDS

The licensee shall fully implement and maintain in effect all provisions of the Commission-approved Physical Security Plan, Safeguards Contingency Plan and the Guard Training and Qualification Plan, including amendments made pursuant to the authority of 10 CFR 72.58 and 10 CFR 72.186, which are part of the license.

APPENDIX C

DUKE ENERGY PROGRESS, LLC.

H. B. ROBINSON INDEPENDENT SPENT FUEL STORAGE

INSTALLATION

TECHNICAL SPECIFICATIONS FOR

ENVIRONMENTAL PROTECTION

MATERIALS LICENSE SNM-2502

1.0 INTRODUCTION

These Technical Specifications govern the protection of the environment during the receipt, possession, storage, and transfer of spent fuel at the H.B. Robinson ISFSI.

1.1 RADIOACTIVE MATERIAL RELEASES

1.1.1 Specification (pursuant to 10 CFR 72.44(d)) - Not applicable.

1.1.2 Basis

Specifications are required pursuant to 10 CFR 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 is reasonably achievable objectives" for effluents. DSC surface contamination within the limits of 2.4.1 ensures that the offsite dose will be inconsequential. In addition, there are no normal or off-normal releases or effluents expected from the double-sealed storage canisters of the ISFSI.

1.2 EFFLUENT CONTROL AND WASTE TREATMENT

1.2.1 Specification (pursuant to 10 CFR 72.44(d)(1)) - Not applicable.

1.2.2 Basis

Specifications are required pursuant to 10 CFR 72.44(d)(1) for operating procedures for control of effluents and for the maintenance and use of equipment in radioactive waste treatment systems to meet the requirements of 10 CFR 72.104. However, there are, by the design of the sealed storage canisters at the ISFSI, no effluent releases; and all H.B. Robinson site cask loading and unloading operations and waste treatment therefrom will occur at the H.B. Robinson Steam Electric Plant Unit 2 under the specifications of its operating license.

1.3 ENVIRONMENTAL MONITORING PROGRAM

1.3.1 Specification

The licensee shall include the H.B. Robinson ISFSI in the environmental monitoring for the H.B. Robinson Steam Electric Plant Unit 2.

1.3.2 Basis

An environmental monitoring program is required pursuant to 10 CFR 72.44(d)(2).

1.4 ANNUAL ENVIRONMENTAL REPORT

1.4.1 Specification

An annual 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 calendar year, specifying the quantity of each of the principal radionuclides released to the environment in liquid and gaseous effluents during the previous 12 months 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).