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July 19, 2011
U7-C-NINA-NRC-110098

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
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Rockville MD 20852-2738

South Texas Project
Units 3 and 4
Docket Nos. 52-012 and 52-013
Supplemental Response to Request for Additional Information

Reference: Letter from Scott Head to Document Control Desk, "Response to Request for Additional Information," dated June 23, 2011 (U7-C-NINA-NRC-110084) (ML11178A073)

Nuclear Innovation North America LLC's (NINA's) response to Request for Additional Information 09.01.02-2 in the referenced letter stated that a new Tier 1 departure to remove the new fuel storage racks from the New Fuel Vault and a revision to Standard Departure STD DEP 9.1-1 would be submitted separately. The attachments to this letter contain the new site specific Tier 1 Departure (STP DEP T1 2.5-1) to remove the new fuel racks from the New Fuel Vault, a revision to departure STD 9.1-1, and the COLA changes associated with these revisions.

The COLA changes, which will be implemented in the next revision to the COLA, are shown in the attachments by shaded text with the exception of FSAR Figure 9.1-14, which will redrawn, as shown.

There are no commitments in this letter.

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NRO

STI 32899394

If you have any questions regarding these responses, please contact me at (361) 972-7136 or Bill Mookhoek at (361) 972-7274.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on 7/19/11

Scott Head
Manager, Regulatory Affairs
South Texas Project Units 3 & 4

rhs

Attachments:

1. Part 7: Departures
2. Part 2: Tier 1
3. Part 2: Tier 2
4. Part 4: Technical Specifications
5. Part 5: ITAAC

cc: w/o attachment except*
(paper copy)

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Attachment 1

Part 7: Departures

STP DEP T1 2.5-1, Elimination of New Fuel Storage Racks From the New Fuel Vault

Description

This departure eliminates the new fuel storage racks from the New Fuel Vault (NFV). This site specific change will result in there being only a single design for fuel storage racks, all of which are located in the spent fuel pool (SFP). These racks will store both new and spent fuel assemblies.

The reference ABWR DCD provides for new fuel storage racks in the NFV so that new fuel can be stored in the NFV after receipt inspection and subsequently moved to the SFP before being loaded in the Reactor Pressure Vessel (RPV). New fuel also could be moved directly to the SFP after receipt inspection. At STP 3&4, new fuel will always be moved directly to the SFP after receipt inspection. This reduces the number of times fuel must be handled before being loaded in the RPV. By eliminating interim storage in the NFV, the number of fuel handling evolutions is reduced, thereby reducing risk associated with fuel handling. Eliminating the new fuel racks from the design of STP 3&4 avoids the expense of design, procurement and licensing of a system that will not be used.

The following sections are modified by this site specific departure:

- Tier 1 Subsection 2.5.6, Fuel Storage Facility, was modified to remove the new fuel storage rack descriptions.
- Tier 1 Table 2.5.6, Fuel Storage Facility, was modified to remove the new fuel storage rack references.
- Tier 2 Subsection 1.2.2.6.5 was modified to remove the new fuel storage rack references
- Tier 2 Subsection 1.2.2.6.6 was modified to remove the new fuel storage rack references.
- Tier 2 Subsection 3.1.2.6.2.2.1 was modified to remove the new fuel storage rack references.
- Tier 2 Subsection 3.1.2.6.3.2 was modified to remove the new fuel storage rack references.
- Tier 2 Section 9.1 was modified to remove the new fuel storage rack references.
- Tier 2 Subsection 9.1.1 was modified to remove the new fuel storage rack references. Descriptions for storage of new fuel were referenced to the Spent Fuel Storage descriptions in Section 9.1.2.
- Tier 2 Subsection 9.1.4 was modified to remove the new fuel storage rack references and load paths modified to remove the new fuel storage racks as a destination.
- Tier 2 Subsection 9.1.6.1 (COL License Information Items 9.1) was revised to reference COL License Information Item 9.3 based on elimination of the New Fuel Storage Racks.
- Tier 2 Subsection 9.1.6.2 (COL License Information Item 9.2) was revised to reference COL License Information Item 9.4 based on elimination of the New Fuel Storage Racks.
- Tier 2 Table 9.1-8 was revised to remove reference to the new fuel vault.
- Tier 2 Figure 9.1-14 was modified to remove reference to New Fuel Storage Racks in the New Fuel Vault.
- Tier 2 Section 12.3, was modified to add reference to STP DEP T1 2.5-1.
- Tier 2 Subsection 12.3.4.3 was modified to remove the new fuel storage rack references.
- Tier 2 Chapter 16, Technical Specifications Design Features Section 4.3, Fuel Storage, was modified to remove the new fuel storage rack references.

Evaluation Summary

This departure was evaluated per Section VIII.A.4 of Appendix A to 10 CFR Part 52, which requires that (1) the design will not result in a significant decrease in the level of safety otherwise provided by the design; (2) the exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security; (3) special circumstances are present as specified in 10 CFR 50.12(a) (2); and (4) the special circumstances outweigh any decrease in safety that may result from the reduction in standardization caused by the exemption. As shown below, each of these criteria are satisfied.

(1) The change will not result in a decrease in the level of safety otherwise provided by the design since new fuel will be stored in the spent fuel pool directly after receipt inspection. As described above, elimination of the option of storing new fuel in the NFV reduces the potential number of fuel handling evolutions and their associated risk, thereby increasing the level of safety.

(2) The change is not inconsistent with the Atomic Energy Act or any other statute and therefore is authorized by law. As stated above, the change will not present an undue risk to the public health and safety since reducing the potential number of fuel handling evolutions increases the level of safety. This change does not relate to security and does not otherwise pertain to the common defense and security.

(3) Special circumstances are present as specified in 10 CFR 50.12(a)(2). Specifically, special circumstance (ii) is present since storage of new fuel in the NFV is not necessary to achieve the underlying purpose of the design certification rule (which is to store new fuel safely), and special circumstance (iv) is present since the change represents an increase in the level of safety as discussed above and; therefore, provides a benefit to the public health and safety.

(4) The special circumstances outweigh any decrease in safety that may result from the reduction in standardization. Specifically, since the change only eliminates one of the options for storage of new fuel, the reduction in standardization would not result in a significant decrease in safety. As described above, reducing the potential number of fuel handling evolutions represents an improvement in safety and does not adversely affect the configuration of the plant or the manner in which the plant is operated.

As demonstrated above, this exemption complies with the requirements in Section VIII.A.4 of Appendix A to 10 CFR Part 52. Therefore, NINA requests that the NRC approve this exemption.

STD DEP 9.1-1, Update of Fuel Storage and Handling Equipment

Description

Standard Departure 9.1-1 includes the following specific changes:

9.1 Fuel Storage and Handling

The spent fuel storage rack capacity was clarified to be a minimum of 270% to match the description provided in Tier 1 Subsection 2.5.6 and to be consistent with the response to NRC certification question 410.33. In Subsection 9.1.3.3, the maximum 270% has been clarified to be the capacity used for the bounding heat load evaluation. For a pool having a capacity larger than 270%, the additional capacity may not be utilized without revision to the bounding heat load evaluation.

~~The last paragraph was deleted because the new fuel storage racks are revised for dry storage in a fuel vault and are a different design than the spent fuel storage. This requires different analyses and support structures than for the spent fuel racks. Separate discussions are provided for new fuel storage and spent fuel storage.~~

9.1.1.1.1 Nuclear Design

Subsection 9.1.6 was changed to Subsection 9.1.6.1 to provide the specific reference number to COL License information.

~~9.1.1.1.3 Mechanical and Structural Design~~

~~The reference to Subsection 9.1.2.1.3 was deleted because it was desired to have a stand-alone description for new fuel storage. Most of the information added to this section previously existed in Subsection 9.1.2.3 and is not a technical change from the DCD. The new or revised information includes the following:~~

- ~~Changes related to dry vs. wet storage include deleting a liner, and adding a drain and curb to preclude accidental flooding of the new fuel storage racks. Although measures are provided to preclude flooding, COL License Information Item 9.1 (Subsection 9.1.6.1) will demonstrate that Keff is maintained less than or equal to 0.95 with the new fuel racks flooded with unborated water or with the addition of fire extinguishing aerosols.~~

- ~~The new fuel rack design uses the load combinations described in SRP 3.8.4 Appendix D instead of the DCD description of load combinations.~~

- ~~The discussion of rack overturning due to horizontal loads was updated and reference to uplift from vertical loads was deleted.~~

- ~~The supporting gap around new fuel is clarified as being between the fuel and rack instead of between the spent fuel and support tube.~~

~~9.1.1.1.4 Thermal-Hydraulic Design~~

~~The reference to thermal-hydraulic design for new fuel storage was deleted because it is not applicable to the new fuel dry storage.~~

~~9.1.1.1.5 Material Considerations The reference to Subsection 9.1.2.1.5 was deleted because it was desired to have a stand-alone description for new fuel storage. The information added to Subsection 9.1.1.1.5 previously existed in Subsection 9.1.2.1.5 and is not a technical change from the DCD.~~

~~9.1.1.3.2 Structural Design~~

~~Anchoring/support details for the new fuel racks were updated to reflect current ABWR practice for new fuel storage.~~

9.1.1.3.3 Protection Features of the New-Fuel Storage Facilities

Subsection 9.1.1.3.3 is clarified to note that the auxiliary hoist on the Reactor Building crane can be used (vs. is used) for some new fuel movements. The intent is to use the telescoping grapple on the refueling machine for most movements. Refer to Subsection 9.1.4.1 for additional discussion.

Attachment 2

Part 2: Tier 1

2.5 Reactor Servicing Equipment

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures, is incorporated by reference with ~~no departures or supplements~~ the following departure.

STP DEP T1 2.5-1 (Table 2.5.6)

2.5.6 Fuel Storage Facility

Design Description

The Fuel Storage Facility provides storage racks for the temporary and long-term storage of new and spent fuel and associated equipment. The ~~new and~~ spent fuel storage racks ~~use the same~~ configuration ~~and~~ prevents inadvertent criticality.

The racks are classified as non-safety-related.

The spent fuel r~~R~~*acks provide storage for* new and *spent fuel in the spent fuel storage pool in the Reactor Building. ~~New fuel, 40% of reactor core, is stored in the fuel storage vault in the Reactor Building~~. The racks are top loading, with fuel bail extended above the rack. The spent fuel racks have a minimum storage capacity of 270% of the reactor core, which is equivalent to a minimum of 2354 fuel storage positions. The ~~new and~~ spent fuel racks maintain a subcriticality of at least 5% Δk under dry or flooded conditions. The rack arrangement prevents accidental insertion of fuel assemblies between adjacent racks and allows flow to prevent the water from exceeding 100 °C.*

The racks are classified as Seismic Category I.

Inspections, Tests, Analyses and Acceptance Criteria

Table 2.5.6 provides a definition of the inspections, tests, and/or analyses, together with associated acceptance criteria, which will be undertaken for the ~~new and~~ spent fuel storage racks.

Table 2.5.6 Fuel Storage Facility

Inspections, Tests, Analyses and Acceptance Criteria		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
1. The basic configuration of the ~~new and~~ spent fuel racks is described in Section 2.5.6.	1. Inspections of the as-built system will be conducted	1. The as-built ~~new and~~ spent fuel storage racks conform with the basic configuration described in Section 2.5.6
2. The ~~new and~~ spent fuel racks maintain a subcriticality of at least 5% Δk under dry or flooded conditions.	2. Analyses will be performed to determine the k_{eff} of the as-built ~~new and~~ spent fuel racks.	2. An analysis report exists which concludes that the ~~new and~~ spent fuel racks have a subcriticality of at least 5% Δk under dry or flooded conditions.
3. The rack arrangement prevents accidental insertion of fuel assemblies between adjacent racks.	3. Inspections of the as-built ~~new and~~ spent fuel racks will be performed	3. The rack arrangement prevents accidental insertion of fuel assemblies between adjacent racks.
4. The rack arrangement allows flow to prevent the water from exceeding 100°C.	4. An analysis of the as-built spent fuel rack will be performed to determine the maximum water temperature.	4. An analysis report exists which concludes that the rack arrangement allows flow to prevent the water from exceeding 100°C.

Attachment 3

Part 2: Tier 2

1.2.2.6.5 Refueling Equipment

STP DEP T1 2.5-1

The Reactor Building crane handles the spent fuel cask from the transport device to the cask loading pit. The refueling machine transfers the fuel assemblies between the storage area and the reactor core. New fuel bundles are handled by the Reactor Building crane. ~~The bundles are stored in the new fuel vault on the reactor refueling floor and are transferred from the vault to the spent fuel pool with the Reactor Building crane auxiliary hook.~~

1.2.2.6.6 Fuel Storage Facility

STP DEP T1 2.5-1

~~New and s~~ *Spent fuel storage racks are designed to prevent inadvertent criticality and load buckling. Sufficient cooling and shielding are provided to prevent excessive pool heatup and personnel exposure, respectively. The design of the fuel pool provides for corrosion resistance, adherence to Seismic Category I requirements, and prevention of keff from reaching 0.95 under dry or flooded conditions.*

Table 1.9S-4 Conformance of Tier 1 and Tier 2* Departures with the SRP

Departure Number	Subject	Affected COLA Sections	Applicable SRP Sections	Conformance with Applicable SRP/Justification for Differences
STP DEP T1 2.5-1	New Fuel Storage Racks	Tier 1 Section 2.5 Tier 2 Section 1.2 Tier 2 Section 3.1 Tier 2 Section 9.1 Tier 2 Section 12.3 Tier 2 Section 16.4	9.1.1 9.1.2	Conforms with applicable SRP Sections

3.1 Conformance with NRC General Design Criteria

The information in this section of the reference ABWR DCD, including all subsequent subsections, is incorporated by reference with the following departures and supplement.

STP DEP 8.2-1

STP DEP 1.1-2

STD DEP T1 2.4-1

STP DEP T1 2.5-1

STD DEP T1 2.15-1

STD DEP T1 3.4-1

STP DEP T1 5.0-1

3.1.2.6.2.2.1 Fuel Storage and Handling System

STP DEP T1 2.5-1

Fuel storage pools have adequate water shielding for stored spent fuel. Adequate shielding for transporting fuel is also provided. Liquid level sensors are installed to detect low pool water level. Buildings are designed to meet Regulatory Guide 1.13 criteria. The fuel storage pools are designed with no penetrations below the water level that is needed for maintenance of adequate shielding at the operating floor and cooling. Check valves are used in pool circulation lines to prevent siphoning in the event of a break of such a line.

~~*New fuel storage racks are located in the concrete fuel storage vault. No cooling or air filtering system is required. These storage racks preclude accidental criticality (see evaluation against Criterion 62). The new fuel storage racks do not require any special inspection and testing for nuclear safety purposes.*~~

STD DEP T1 2.15-1

Per Regulatory Guide 1.143, the substructure of the radwaste building ~~*is designed as Seismic Category I and it*~~ *is sufficient to contain the maximum liquid inventory expected to be in the building.*

3.1.2.6.3.2 Evaluation Against Criterion 62

STP DEP T1 2.5-1

Appropriate plant fuel handling and storage facilities are provided to preclude accidental criticality for new and spent fuel. Criticality in new and spent fuel storage is prevented by presence of fixed neutron absorbing material. Fuel elements are limited by rack design to only top-loaded fuel assembly positions. The new and spent fuel racks are Seismic Category I components.

~~*New fuel is placed in dry storage in the top-loaded new fuel storage vault. This vault contains a drain to prevent the accumulation of water. Neutron absorbing material in the new fuel storage vault racks prevents an accidental critical array, even in the event the vault becomes flooded or subjected to seismic loadings.*~~

9.0 Auxiliary Systems

9.1 Fuel Storage and Handling

The information in this section of the reference ABWR DCD is subject to numerous design revisions. Consequently, for clarity it is presented in its entirety with the following standard departures incorporated.

STD DEP 9.1-1, Update of Fuel Storage and Handling Equipment (Tables 9.1-3, 9.1-4, 9.1-5, 9.1-6, 9.1-7, 9.1-8, 9.1-11, Figures 9.1-4, 9.1-5, 9.1-7, 9.1-8, 9.1-11, 9.1-12, and 9.1-14)

STD DEP T1 2.4-1, Connection of RHR Loop A to Fuel Pool Cooling. (Figure 9.1-1 Sheet 2 and Figure 9.1-2 Sheet 1 and 2)

STD DEP T1 2.4-1 is incorporated in Section 9.1.3. In addition, standard supplemental information is included in Subsection 9.1.6 to address COL license information items. The original DCD text is presented in *italics,* deletions are shown as *strike throughs*, and new text in underlined regular font. Table additions and deletions for departures have been incorporated using regular font for clarity. Tables 9.1-9, 9.1-10 and 9.1-12 have no changes from ABWR DCD. Figure changes are identified as deleted or modified content is captured in a cloud.

STP DEP T1 2.5-1, Elimination of New Fuel Storage Racks in New Fuel Vault (Table 9.1-8, Figure 9.1-14)

~~*The new-fuel storage vault stores a 40% core load of new fuel assemblies. The fuel is stored in the new-fuel storage racks in the vault, which is located as close as practicable to the spent-fuel storage pool work area to facilitate handling during fuel preparation. The new-fuel inspection stand is close to the new-fuel storage vault to minimize fuel transport distance.*~~

Spent fuel removed from the reactor vessel must be stored underwater while awaiting disposition. Spent-fuel storage racks, which are used for this purpose, are located at the bottom of the fuel storage pool under sufficient water to provide radiological shielding. This pool water is processed through the Fuel Pool Cooling and Cleanup System (FPC) to provide cooling to the spent fuel in storage and for maintenance of fuel pool water quality. The spent-fuel pool storage capacity is a minimum of *270% of the reactor core.*

New fuel will be stored in the spent-fuel storage racks in the fuel storage pools.

~~*The new-fuel and spent-fuel storage racks are the same high density design. The new fuel racks can be used for either dry or submerged storage of fuel. The design of the new-fuel racks will be described. Information on the spent-fuel racks will only be presented when the design is different.*~~

9.1.1 New-Fuel Storage

9.1.1.1 Design Bases
9.1.1.1.1 Nuclear Design

STP DEP T1 2.5-1

See Subsection 9.1.2.1.1

~~*(1) Monte Carlo techniques are employed in the calculations performed to assure that keff does not exceed 0.95 under all normal and abnormal conditions.*~~

~~*(2) The assumption is made that the storage array is infinite in all directions. Since no credit is taken for neutron leakage, the values reported as effective neutron multiplication factors are, in reality, infinite neutron multiplication factors.*~~

~~*(3) The biases between the calculated results and experimental results, as well as the uncertainty involved in the calculations, are taken into account as part of the calculational procedure to assure that the specific keff limit is*~~

~~*met.*~~

~~*The new fuel storage racks are purchased equipment. The purchase specification for these racks* will *require the vendor to provide the information requested in Question 430.180 on criticality analysis for the inadvertent placement of a fuel assembly in other than prescribed locations. See Subsection 9.1.6* 9.1.6.1 *for COL license information requirements.*~~

9.1.1.1.2 Storage Design

STP DEP T1 2.5-1

See Subsection 9.1.2.1.2

~~*The new fuel storage racks provided in the new fuel storage vault provide storage for 40% of one full core fuel load.*~~

9.1.1.1.3 Mechanical and Structural Design

See Subsection 9.1.2.1.3.
~~The new fuel storage racks in the Reactor Building contain storage space for fuel assemblies (with channels) or bundles (without channels). They are designed to withstand all credible static and seismic loadings. The racks are designed to protect the fuel assemblies and bundles from excessive physical damage that may cause the release of radioactive materials in excess of 10 CFR 20 and 10 CFR 100 requirements, under normal and abnormal conditions caused by impacting from the fuel assemblies, bundles, or other equipment.~~

~~The new fuel storage vault is an un-lined reinforced concrete structure. The new fuel is stored dry. The fuel storage vault contains a drain line to prevent accumulation of water in the vault. The new fuel storage vault is surrounded by a raised curb to prevent any inadvertent water on the refueling floor from entering the vault.~~

~~The racks are constructed in accordance with a quality assurance program that ensures that the design, construction, and testing requirements are met. In accordance with Regulatory Guide 1.29, the fuel storage racks are Seismic Category I. The structural integrity of the rack will be demonstrated for the load combinations described in SRP 3.8.4, Appendix D.~~

~~Thermal loads are not included in the above combinations because they are negligible due to the design of the rack (i.e., the rack is free to expand/contract under nominal refueling floor temperature changes).The new fuel storage racks completely fill the storage space and are not subject to overturn from horizontal loads. The analysis of the rack assumes an adequate supporting structure, and loads were generated accordingly.~~

~~Stress analyses are performed using classical methods based upon shears and moments developed by the dynamic method. Using the given loads, load conditions and analytical methods, stresses are calculated at critical sections of the rack and compared to acceptance criteria referenced in ASME Section III, Subsection NF.~~

~~The loads in the three orthogonal directions are considered to be acting simultaneously and are combined using the square root of the sum of the squares (SRSS) method suggested in Regulatory Guide 1.92. Under fuel drop loading conditions, the acceptance criterion is that, although deformation may occur, keff must remain ≤0.95. The rack is designed such that, should the drop of a fuel assembly damage the rack, the keff would still be ≤0.95, as required. The effect of the gap between the fuel and the storage rack is taken into account on a local effect basis. Dynamic response analysis has shown that the fuel contacts the rack over a large portion of its length, thus preventing an overloaded condition of both fuel and rack.~~

9.1.1.1.4 Thermal-Hydraulic Design

See Subsection 9.1.2.1.4.
~~Thermal-hydraulic analysis is not applicable since the new fuel storage vault is dry storage.~~

9.1.1.1.5 Material Considerations

See Subsection 9.1.2.1.5.
~~All structural material used in the fabrication of the fuel storage racks is in accordance with the latest issue of the applicable ASTM specification at the time of equipment order. This material is chosen due to its corrosion resistance and its ability to be formed and welded with consistent quality.~~

~~The new fuel storage rack is compatible with the environment and provides a design life of 60 years.~~

9.1.1.1.6 Dynamic and Impact Analysis

STP DEP T1 2.5-1

~~*The new fuel storage racks are purchased equipment. The purchase specification for the new fuel storage racks* will require *the vendor to perform confirmatory dynamic analyses. The SSE input excitation for these analyses will utilize the horizontal and vertical response spectra provided in Subsection 3A.10.2.*~~

~~*Vertical impact analysis is required because the fuel assembly is held in the storage rack by its own weight without any mechanical holddown devices. Therefore, when the downward acceleration of the storage rack exceeds 1g, contact between the fuel assembly and the storage rack is lost. Horizontal impact analysis is required because a clearance exists between the fuel assembly and the storage rack walls.*~~

See Subsection 9.1.6.2 for COL license information requirements.

9.1.1.1.7 Not Used

9.1.1.2 Facilities Description (New-Fuel Storage Vault)

STP DEP T1 2.5-1

(1) The new-fuel storage vault is located on the refueling floor of the Reactor Building (R/B) (see Figure 1.2-12).

(2) The R/B, a Seismic Category I building, protects the new fuel from seismic events and externally generated missiles. There are no non-seismic systems, high or moderate energy pipes, or rotating machinery located in the vicinity of the new-fuel storage vault.

(3) The R/B HVAC system monitors the building exhausts for radioactivity. If radioactivity is encountered, the system is isolated and the SGTS starts operation. This prevents the possible release of radioactivity from any fuel handling accident.

4) Not Used. ~~*The new fuel storage racks are top entry racks designed to preclude the possibility of criticality under normal and abnormal conditions. The upper tieplate of the fuel element rests against the module to provide lateral support. The lower tieplate sits in the bottom of the rack, which supports the weight of the fuel.*~~

5) Not Used. ~~*The rack arrangement is designed to prevent accidental insertion of fuel assemblies or bundles between adjacent racks. The storage rack is designed to provide accessibility to the fuel bail for grappling purposes.*~~

(6) The floor of the new-fuel storage vault is sloped to a drain located at the low point. This drain removes any water that may be accidentally and unknowingly introduced into the vault. The drain is part of the floor drain subsystem of the Liquid Radwaste System.

(7) The radiation monitoring equipment for the new-fuel storage areas is described in Subsection 12.3.4.

9.1.1.3 Safety Evaluation

9.1.1.3.1 Criticality Control

STP DEP T1 2.5-1

See Subsection 9.1.2.3.1
~~*The design of the new fuel storage racks provides for an effective multiplication factor (keff) for both normal and abnormal storage conditions equal to or less than 0.95 in the new fuel storage racks. To ensure that design criteria are met, the following normal and abnormal new fuel storage conditions were analyzed:*~~

~~*(1) Normal positioning in the new fuel array*~~

~~*(2) Eccentric positioning in the new fuel array*~~

~~*The new fuel storage area will accommodate fuel (kinf < 1.35 at 20°C in standard coregeometry) with no safety implications.*~~

9.1.1.3.2 Structural Design

STP DEP T1 2.5-1

See Subsection 9.1.2.3.2
~~*(1) The new fuel vault contains one or more fuel storage racks which provides storage for fuel a maximum of 40% of one full core fuel load.*~~

~~*(2) The new fuel storage racks are designed to be freestanding (i.e., no supports above the base). This means that the support structure also provides the required dynamic stability.*~~ ~~supported vertically from a base that is not anchored to the bottom of the fuel vault. A small clearance exists around the fuel rack base to a mechanical stop that limits horizontal movement. The top of the fuel rack assemblies are anchored to the fuel vault wall from multiple locations. These supports provide the dynamic stability of the new fuel racks.~~

~~*(3) The racks include individual solid tube storage compartments which provide lateral restraints over the entire length of the fuel assembly.*~~

~~*(4) The weight of the fuel assembly or bundle is supported axially by the rack lower support.*~~

~~*(5) The racks are fabricated from materials used for construction, in accordance with the latest applicable ASTM specifications.*~~

~~*(6) Lead-in guides at the top of the storage spaces provide guidance of the fuel during insertion.*~~

~~*(7) The racks are designed to withstand, while maintaining the nuclear safety design basis, the impact force generated by the vertical free fall drop of a fuel assembly from a height of 1.8 meters.*~~

~~*(8) The rack is designed to withstand a pullup force of 17.79 kN and a horizontal force of 4.45 kN.*~~

~~*(9) The new fuel storage racks require no periodic special testing or inspection for nuclear safety purposes.*~~

9.1.1.3.3 Protection Features of the New-Fuel Storage Facilities

STD DEP 9.1-1
STP DEP T1 2.5-1

The new-fuel storage vault is housed in the Reactor Building. The vault and Reactor Buildings are Seismic Category I, and are designed to withstand natural phenomena such as tornadoes, tornado missiles, floods and high winds.

Fire protection features are described in Subsection 9.5.1 and Appendix 9A.

~~*Procedural fuel handling requirements and equipment design dictate that no more than one bundle at a time can be handled over the storage racks and at a maximum height of 1.8m above the upper rack. Therefore, the racks cannot be displaced in a manner causing critical spacing as a result of impact from a falling object.*~~

The auxiliary hoist on the Reactor Building crane can traverse the full length of the refueling floor. This hoist ~~is~~ can be *used to move new fuel from the entry point into the Reactor Building* and *up the main equipment hatch to the refueling floor~~ and from there to the new fuel storage vault~~. This hoist can move fuel to the new-fuel inspection stand and ~~rechanneling area~~* to the fuel preparation machine *at the end of the spent-fuel storage pool.*

Should it become necessary to move major loads along or over the pools, administrative controls require that the load be moved over the empty portion of the spent-fuel pool and avoid the area of the new-fuel storage vault. The shipping cask cannot be lifted or moved above the new-fuel vault because of their relative locations on the refueling floor.

9.1.4.1 Design Bases

STD DEP 9.1-1
STP DEP T1 2.5-1

The fuel-handling system is designed to provide a safe and effective means for transporting and handling fuel from the time it reaches the plant until it leaves the plant after post-irradiation

cooling. Safe handling of fuel includes design considerations for maintaining occupational radiation exposures as low as reasonably achievable (ALARA).

Design criteria for major fuel-handling system equipment are provided in Tables 9.1-2 through 9.1-4, which list the safety class, quality group and seismic category. Where applicable, the appropriate ASME, ANSI, Industrial and Electrical Codes are identified. Additional design criteria are shown below and expanded further in Subsection 9.1.4.2.

The transfer of new fuel assemblies between the uncrating area and the new-fuel inspection stand ~~and/or the new-fuel storage vault~~ to the fuel storage pool is accomplished using a ~~49.82~~ 49.82 kN auxiliary hoist on the R/B crane ~~equipped with a general purpose grapple~~. From this point on, the fuel will ~~either~~ be handled by the telescoping grapple ~~(or auxiliary hoist)~~ on the refueling machine.

9.1.4.2.2.1 Reactor Building Crane

STD DEP 9.1-1
STP DEP T1 2.5-1

The Reactor Building (R/B) crane is a seismically analyzed piece of equipment. The crane consists of two crane girders and a trolley which carries two hoists. The runway track, which supports the crane girders, is supported from the R/B walls at elevation 34,600 mm. *The trolley travels laterally on the crane girders carrying the main hoist and auxiliary hoist.*

The R/B crane is used to move all of the major components (reactor shield plugs, reactor pressure vessel (RPV) head insulation, reactor *vessel head, shroud head and separator, dryer assembly and pool gates) as required by plant operations. The R/B crane is used for handling new fuel from the R/B entry hatch to ~~new fuel storage, to~~ the new fuel inspection stand and the spent-fuel pool. It also is used for handling the spent fuel cask. The principal design criteria for the R/B crane are described in Subsection 9.1.5*

9.1.4.2.10.2.1.1 Receipt and Inspection of New Fuel

STD DEP 9.1-1

STP DEP T1 2.5-1

Generally, channeled fuel is shipped from the fuel vendor to the site in a stainless steel inner container (two fuel assemblies per container). This inner container is placed into a stainless steel outer container, secured in place, accelerometers may be installed to monitor shipping loads, and the containers are loaded onto a truck for delivery to the site. *The incoming new fuel* ~~*will be*~~ is removed from the truck and delivered ~~*to a receiving station within the Reactor Building (R/B). The crates are unloaded from the transport vehicle and*~~ directly to the refueling floor near the new fuel storage vault where the new fuel is *examined for damage during shipment.*

On the refueling floor, using the auxiliary hoist on the R/B Crane, the outer container lid is removed, accelerometers (if used) are checked, and the inner container lid is removed. The new fuel is removed from the inner container and moved to one of the following locations:

- ~~New fuel vault for temporary storage~~
- ~~New fuel vault for further inspection~~
- Fuel prep machine for storage in the spent fuel pool
- New fuel inspection stand for further inspection

9.1.6.1 New Fuel Storage Racks Criticality Analysis

The following standard supplement addresses COL License Information Item 9.1.

The COL applicant shall provide the NRC a confirmatory criticality analysis for the inadvertent placement of a fuel assembly in other that prescribed locations as required by Subsection 9.1.1.1.1. ~~A confirmatory criticality analysis will be prepared and verified in accordance with ITAAC 2.5.6.1, 2.5.6.2 and 2.5.6.3.~~

~~The analysis will document:~~

~~*(1)* Assumptions and input parameters (i.e. number of racks, fuel capacity, rack material, neutron poison content, fuel center to center distances). Assumptions include highest reactivity fuel and optimum moderators under normal and accident conditions.~~

~~*(2)* The highest reactivity fuel storage array is maintained subcritical (keff≤ 0.95) when fully loaded under varying moderator conditions up to optimum (dry to flooded with fire extinguishing aerosols or non-borated water).~~

~~*(3)* Rack design precludes inadvertent placement of fuel in other than design locations.~~
~~*(4)* Failure of non-safety related structures in vicinity of new fuel storage or fuel load drop will not increase keff> 0.95.~~

~~*(5)* Maximum uplift forces from fuel handling equipment will not increase keff > 0.95 for fuel array.~~

See Subsection 9.1.6.3

The new fuel racks in the new fuel vault were eliminated from the STP 3 & 4 design by STP DEP T1 2.5-1. Refer to criticality analysis requirements (COL License Information Item 9.3) in Subsection 9.1.6.3.

9.1.6.2 Dynamic and Impact Analyses of New Fuel Storage Racks

The following standard supplement addresses COL License Information Item 9.2.

The COL applicant shall provide the NRC confirmatory dynamic and impact analyses of the new fuel storage racks, as requested by Subsection 9.1.1.1.6.~~These analyses are dependent on a vendor specific design and the as-built configuration of new fuel storage racks. A description of the dynamic and Impact (load drop) confirmatory analyses will be provided in an FSAR amendment in accordance with 10 CFR 50.71(e) prior to receipt of fuel. (COM 9.1-1)~~

~~Structural integrity of the racks will be demonstrated for the load combinations described in SRP 3.8.4 appendix D.~~

~~The dynamic analysis will utilize the input excitation provided in Section 3A.10.2 for a SSE. The fuel storage vault and racks meet Seismic Category 1 requirements.~~

~~The impact analysis will confirm that k_{eff} ≤0.95 for a load drop of one fuel assembly and its associated handling tool from a height of 1.8 m above the new fuel racks.~~

See Subsection 9.1.6.4.

The new fuel storage racks in the new fuel vault were eliminated from the STP 3 & 4 design by STP DEP T1 2.5-1. Refer to load drop analysis requirements (COL License Information Item 9.4) in Subsection 9.1.6.4.

Table 9.1-8 Heavy Load Operations (Continued)

Hardware Handling Tasks	Handling Systems*	Handling Equipment	In-Plant Location Elevation
RPV Opening/Closing Operations: (Continued)			
Steam Plugs Temporary Tool Installation and removal	RBS	RB Crane Auxiliary Hoist 4447 N Chain Hoist Service Platform Refueling Machine	RF 26700 IRV 15500
Steam Separator/Shroud Head Removal, storage and reinstallation. Include unbolting shroud head bolts from Refueling Platform	RBS	RB Crane Main Hoist Dryer/Separator Refueling Machine	RW 18700 IRV 9500 D/SP 18700
Refueling Operations:			
New-Fuel: Receive at G/F & lift to RF Receiving, inspection, remove outer container	RBS	RB Crane Auxiliary Hoist	RB 7300 RF 26700
Remove inner container ~~and store fuel bundle in new fuel vault rack~~ . Move fuel to new fuel inspection stand, inspect ~~and return to storage.~~	RBS	RB Crane Auxiliary Hoist	RF 26700 ~~NFS 18700~~ NFI 18700
Move new fuel ~~from vault~~ to fuel pool, storage of fuel channel fixtures. Channel new fuel and store. Move channeled fuel and load into reactor core.	RBS	RB Crane Auxiliary Hoist Refueling Machine Auxiliary Hoist Fuel Grapple	~~NFS 18700~~ FSP 14800 FCF 14800 RF 26700 RVC 9500
Fuel Cask: Receive, lift to refueling floor. Lower into cask washdown area, washdown and move to load pit. Move spent fuel to cask load pit. Move loaded cask to cask washdown area. Move cask to G/F for shipment.	RBS	RB Crane Main Hoist Auxiliary Hoist Refueling Machine Auxiliary Hoists Fuel Grapple	G/F 7300 RF 26700 FWP 18700 FLP 14800

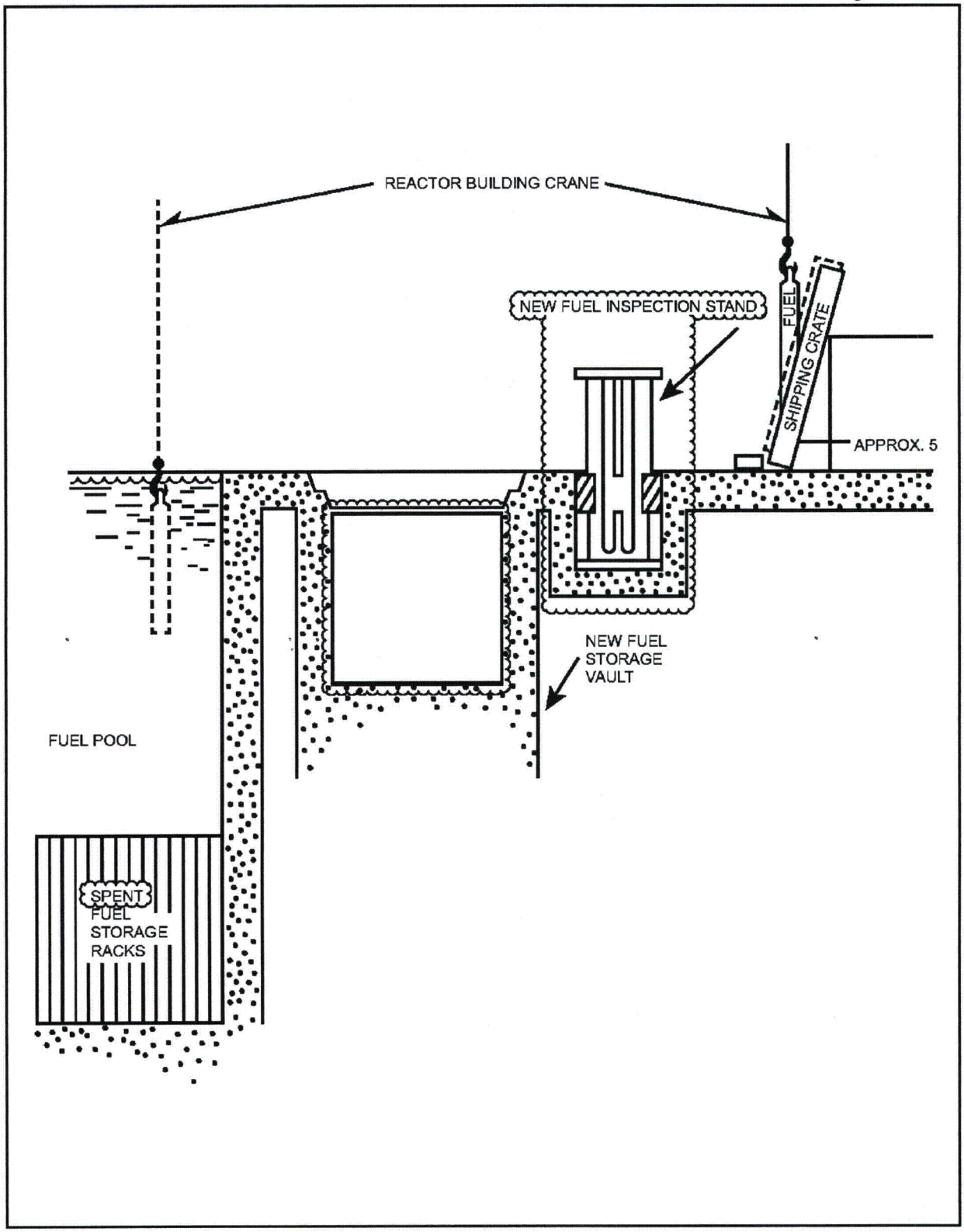

Figure 9.1-14 Simplified Section of New-Fuel Handling Facilities

12.3 Radiation Protection Design Features

The information in this section of the reference ABWR DCD, including all subsections, tables, and figures, is incorporated by reference with the following departures and supplements.

STD DEP T1 2.14-1 (Figures 12.3-5, 12.3-10, 12.3-16 and 12.3-21)

STD DEP T1 3.4-1

STD DEP 1.2-2 (Table 12.3-7, and Figures 12.3-49 thru 12.3-53, 12.3-55, 12.3-68 thru 12.3-73, and 12.3-75 thru 12.3-77)

STD DEP 1.8-1

STP DEP T1 2.5-1

STD DEP 3.8-1 (Table 12.3-7, and Figures 12.3-37 thru 12.3-41, 12.3-65 thru 12.3-68)

12.3.4.3 Pertinent Design Parameters and Requirements

STP DEP T1 2.5-1

Two high-range radiation channels are provided to monitor radiation from accidental fuel handling. One detector is positioned near the fuel pool and the other located in the fuel handling area. Criticality detection monitors are not needed to satisfy the criticality accident requirements of 10CFR70.24, when specialized high density fuel storage racks preclude the possibility of criticality accident under normal and abnormal conditions. The new and ~~*fuel bundles are stored in racks that are located in the fuel vault while the*~~ *spent fuel bundles are stored in racks that are placed at the bottom of the fuel storage pool. A full array of loaded fuel storage racks are designed to be subcritical, as defined in Sections 9.1 and 9.2. The COL applicant must verify and certify that the design meets the criteria specified in Subsection 12.3.7.3.*

FSAR Chapter 16, Section 4.3 will be revised as shown below in shaded text.

4.0 DESIGN FEATURES

The information in this section of the reference ABWR DCD, including all subsections, is incorporated by reference with the following departure and site-specific supplements. The site-specific supplements partially address COL License Information Item 16.1.

STP DEP T1 2.5-1

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum k-infinity of 1.35 in the normalreactor core configuration at cold conditions;

b. keff ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the DCD Tier 2.

STP DEP T1 2.5-1

4.3.1.2 Not Used. ~~*The new fuel storage racks are designed and shall be maintained with:*~~

~~*a. Fuel assemblies having a maximum k-infinity of 1.35 in the normal reactor core configuration at 20°C;*~~

~~*b. keff ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the DCDTier 2;*~~

~~*c. keff ≤ 0.98 if moderated by aqueous foam, which includes an allowance for uncertainties as described in Section 9.1 of the DCD Tier 2; and*~~

~~*d. A nominal [approximately 16] cm center to center distance between fuel assemblies placed in storage racks.*~~

Attachment 4

Part 4: Technical Specifications

4.0 DESIGN FEATURES

4.3 Fuel Storage

4.3.1 Criticality

4.3.1.1 The spent fuel storage racks are designed and shall be maintained with:

a. Fuel assemblies having a maximum k-infinity of 1.35 in the normal reactor core configuration at cold conditions;

b. keff ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the DCD Tier 2.

~~4.3.1.2 The new fuel storage racks are designed and shall be maintained with:~~

~~a. Fuel assemblies having a maximum k-infinity of 1.35 in the normal reactor core configuration at 20°C;~~

~~b. keff ≤ 0.95 if fully flooded with unborated water, which includes an allowance for uncertainties as described in Section 9.1 of the DCD Tier 2;~~

~~c. keff ≤ 0.98 if moderated by aqueous foam, which includes an allowance for uncertainties as described in Section 9.1 of the DCD Tier 2; and~~

~~d. A nominal [approximately 16] cm center to center distance between fuel assemblies placed in storage racks.~~

Attachment 5

Part 9: ITAAC

2.0 Design Certification ITAAC

Design Certification ITAAC in this COLA are based on the ABWR design certification material contained in the reference ABWR DCD, Tier 1, Chapters 2 and 3. The total scope of the design certification material, including ITAAC, is provided in Tier 1 material in COLA Part 2. The Tier 1 ITAAC are incorporated by reference (IBR) with the exception of the ITAAC that are modified by the following departures.

STD DEP T1 2.2-1 (Table 2.2.1)

STD DEP T1 2.4-1 (Table 2.4.1)

STD DEP T1 2.4-3 (Table 2.4.4)

STD DEP T1 2.4-4

STP DEP T1 2.5-1 (Table 2.5.6)

STD DEP T1 2.12-1 (Table 2.12.1, Table 2.12.12, Table 2.12.14, Table 2.12.15) STD DEP T1 2.12-2 (Figure 2.12.15)

STD DEP T1 2.14-1 (Table 2.3.3, Table 2.14.8, Table 2.15.5.c) STD DEP T1 3.4-1 (Table 2.2.11, Table 2.7.5, Table 3.4)

Tier 1 Subsection 2.5.6 Fuel Storage Facility

Table 2.5.6 Fuel Storage Facility

Inspections, Tests, Analyses and Acceptance Criteria		
Design Commitment	**Inspections, Tests, Analyses**	**Acceptance Criteria**
1. The basic configuration of the ~~new and~~ spent fuel racks is described in Section 2.5.6. 2. The ~~new and~~ spent fuel racks maintain a subcriticality of at least 5% Δk under dry or flooded conditions. 3. The rack arrangement prevents accidental insertion of fuel assemblies between adjacent racks. 4. The rack arrangement allows flow to prevent the water from exceeding 100°C.	1. Inspections of the as-built system will be Conducted 2. Analyses will be performed to determine the keff of the as-built ~~new and~~ spent fuel racks. 3. Inspections of the as-built ~~new and~~ spent fuel racks will be performed 4. An analysis of the as-built spent fuel rack will be performed to determine the maximum water temperature.	1. The as-built ~~new and~~ spent fuel storage racks conform with the basic configuration described in Section 2.5.6 2. An analysis report exists which concludes that the ~~new and~~ spent fuel racks have a subcriticality of at least 5% Δk under dry or flooded conditions. 3. The rack arrangement prevents accidental insertion of fuel assemblies between adjacent racks. 4. An analysis report exists which concludes that the rack arrangement allows flow to prevent the water from exceeding 100°C.