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May 12, 2011

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Duke Energy Carolinas, LLC (Duke Energy)
McGuire Nuclear Station, Units 1 and 2
Docket Nos. 72-38, 50-369, 50-370
Request for Exemption from Certain Requirements of
10 CFR 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214

- References:
- (1) Duke Energy letter dated September 16, 2010, Request for Exemption from Certain Requirements of 10 CFR 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214
 - (2) NRC Certificate of Compliance for Spent Fuel Storage Casks Issued to NAC International Inc., Certificate No. 1031, MAGNASTOR[®], Amendment No. 1, Effective Date August 30, 2010
 - (3) NAC International letter dated March 22, 2010, Request to Amend the U. S. Nuclear Regulatory Commission Certificate of Compliance No. 1031 for the NAC International MAGNASTOR[®] Cask System, NRC Docket No. 72-1031 (Resubmitted by letter dated March 30, 2010)
 - (4) NAC International letter dated April 22, 2011, Submission of Supplemental Information to Amend the U. S. Nuclear Regulatory Commission Certificate of Compliance No. 1031 for the NAC International MAGNASTOR[®] Cask System, NRC Docket No. 72-1031

This letter supersedes the September 16, 2010 Duke Energy exemption request (Reference 1), and requests U. S. Nuclear Regulatory Commission (NRC) approval of an exemption to certain requirements of 10 CFR 72.212(a)(2), 72.212(b)(2)(i)¹, 72.212(b)(7)² and 72.214 pursuant to

¹ Under the 10 CFR Part 72 final rule effective May 17, 2011 (76 FR 8872), §72.212(b)(2)(i) will become §72.212(b)(5).

² Under the 10 CFR Part 72 final rule effective May 17, 2011 (76 FR 8872), §72.212(b)(7) will become §72.212(b)(11).

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10 CFR 72.7. The regulations require, in part, compliance to the terms and conditions of the MAGNASTOR® Certificate of Compliance (Reference 2). The Certificate of Compliance conditions require the general licensee to meet the requirements of the Technical Specifications (TS) for the MAGNASTOR® System (Appendix A to the Certificate of Compliance).

The exemption consists of two elements. The first element, "exemption item 1", pertains to the requirements of TS 5.1.2, regarding surface contamination limits for the MAGNASTOR® Transportable Storage Canister (TSC). The second element, "exemption item 2", pertains to the requirements of TS 4.1.1.d, regarding dimensional design features of the TSC fuel basket which are pertinent to criticality control. A detailed discussion of each of these elements is provided in Attachment 1. Duke Energy believes that exemption item 1 is justified and will reduce the risk of substantial occupational exposure during loading operations of the MAGNASTOR® System at Duke Energy's McGuire Nuclear Station (MNS). Duke Energy also believes that exemption item 2 is justified, as it will replace the previous dimensional requirements representing the distance between two points in space with readily measurable and verifiable minimum fuel tube outer diagonal dimensions. Control of the minimum fuel tube outer diagonal dimension provides technical and measurable validation that criticality control for the fuel basket assembly is met.

Loading and storage of the MAGNASTOR® casks under the provisions of the exemption, if approved, will be consistent with elements of a pending license amendment request submitted by NAC International, Inc. (NAC)(Reference 3), as supplemented (Reference 4). Attachment 2 provides the applicable portion of the pending changes to TS Limiting Condition for Operation (LCO) 3.3.2, "Transportable Storage Canister (TSC) Surface Contamination" and TS 5.1, "Radioactive Effluent Control Program," as presented in Reference 3, and TS 4.1.1.d, "Design Features – Criticality Control," as presented in Reference 4. Note that the pending changes to TS 4.1.1.a, as shown in Attachment 2, are not in the scope of this exemption request.

The MNS Independent Spent Fuel Storage Installation (ISFSI) currently contains a number of Transnuclear TN-32A casks and NAC International UMS® casks. For additional storage capacity, Duke Energy plans to add NAC International MAGNASTOR® casks to the MNS ISFSI, with the first cask anticipated to be loaded in December, 2011. NRC approval of this exemption is requested by September 12, 2011. This will allow reasonable time for finalization of the site-specific cask loading procedures and other documents, including integration of the revised TS limits, prior to the planned loading campaign.

NRC approval of the aforementioned license amendment would obviate the need for this exemption. However, based on discussion with the NRC staff, it is not anticipated that the license amendment will be approved and effective to support Duke Energy's anticipated loading schedule; hence, this exemption is necessary. The exemption would continue to apply to all MAGNASTOR® casks loaded under Certificate of Compliance Amendment No. 1. However,

following NRC approval and subsequent implementation at MNS of Amendment No. 2, the exemption would not be required for future cask loadings.

There are no regulatory commitments made in this submittal.

If you have any questions or require additional information, please contact M. K. Leisure at (980) 875-5171.

Sincerely,

A handwritten signature in black ink, appearing to read "Regis T. Repko". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Regis T. Repko

Attachments:

1. Request for Exemption from Certain Requirements of Title 10 of Code of Federal Regulations Part 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214
2. Pending Changes to MAGNASTOR® Certificate of Compliance Appendix A, Technical Specifications

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Request for Exemption from Certain Requirements of Title 10 of Code of Federal Regulations Part 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214

1. Request for Exemption

Duke Energy hereby requests an exemption from certain requirements of 10 CFR 72.212(a)(2), 72.212(b)(2)(i)¹, 72.212(b)(7)² and 72.214 that require compliance with the terms and conditions of the MAGNASTOR[®] Certificate of Compliance (Reference 1) (Note: "References" in this attachment refer to Section 7.0 of this attachment.) This exemption, if approved, would apply to all casks loaded under Certificate of Compliance Amendment No. 1. However, the exemption would not be required for future cask loadings following NRC approval and subsequent implementation at the McGuire Nuclear Station of the license amendment proposed by NAC (Reference 2), as supplemented (Reference 3).

2. Background

This exemption request consists of two elements, "exemption item 1" and "exemption item 2".

2.1 Exemption Item 1

The Certificate of Compliance conditions require the general licensee to meet the requirements of the Technical Specifications (TS) for the MAGNASTOR[®] System (Appendix A to the Certificate of Compliance).

Technical Specification 5.1, "Radioactive Effluent Control Program," Paragraph 5.1.2, requires that a program be established to monitor ISFSI effluents if established surface contamination limits exceed the values specified in Regulatory Guide (RG) 1.86 (Reference 4). RG 1.86 limits the acceptable surface contamination levels for removable contamination to 1,000 dpm/100 cm² from beta and gamma sources, and 20 dpm/100 cm² from alpha sources. Specifically, Duke Energy requests an exemption from TS 5.1.2. In lieu of this requirement, Duke Energy is requesting to apply the provisions of TS 5.1.2 and TS 5.1.3, and Limiting Condition for Operation (LCO) 3.3.2 and its associated Surveillance Requirement (SR) 3.3.2, as proposed in the license amendment request (Reference 2).

As shown in Attachment 2, LCO 3.3.2 allows removable contamination levels on the exterior surfaces of the TSC not to exceed:

¹ Under the 10 CFR Part 72 final rule effective May 17, 2011 (76 FR 8872), §72.212(b)(2)(i) will become §72.212(b)(5).

² Under the 10 CFR Part 72 final rule effective May 17, 2011 (76 FR 8872), §72.212(b)(7) will become §72.212(b)(11).

- a. 10,000 dpm/100 cm² from beta and gamma sources; and
- b. 100 dpm/100 cm² from alpha sources.

Consistent with SR 3.3.2, these limits may be verified by either direct or indirect methods. A "direct" method entails taking a smear from the exterior surface of the Transportable Storage Canister (TSC). An example of an "indirect" method is taking a smear from the interior surface of the transfer cask after the loaded TSC has been removed.

As also shown in Attachment 2, TS 5.1.2 notes that the MAGNASTOR[®] System does not create any radioactive materials or have any radioactive waste treatment systems; hence, specific operating procedures for the control of radioactive effluents are not required. TS 5.1.2 further states that LCO 3.3.2 provides assurance that excessive surface contamination is not available for release as a radioactive effluent. TS 5.1.3 states that each general licensee may incorporate MAGNASTOR[®] System operations into their environmental monitoring program for 10 CFR Part 50 operations.

A review of operating experience from two prior loading campaigns (16 casks total) at MNS using the NAC International UMS[®] System shows that removable surface contamination levels exceeded 1,000 dpm/100 cm² from beta and gamma sources for six casks, with a maximum level of 5,000 dpm/100 cm². Since the MAGNASTOR[®] System procedures and contamination minimization equipment will be similar to the UMS[®] System procedures and equipment, it is anticipated that removable surface contamination levels in excess of the current limits imposed by TS 5.1.2 will be experienced when using the MAGNASTOR[®] System. Hence, absent NRC approval of this exemption request, additional decontamination efforts would be necessary, resulting in additional occupational exposure and additional cask system handling operations, whereas, as shown in Section 3, the exemption item 1 introduces no undue risk to the public health and safety.

2.2 Exemption Item 2

Technical Specification 4.1.1.d of Reference 1 was issued with a minimum dimensional limitation applied to the fuel tube orthogonal (x, y) pitch. This TS requirement represents a measurement between two points in space within the TSC fuel basket. In lieu of this requirement, Duke Energy is requesting to apply the provisions of TS 4.1.1.d, as proposed in the Reference 3 supplement to the Reference 2 license amendment request. The applicable TS page is provided in Attachment 2. Specifically, in lieu of applying the minimum fuel tube orthogonal pitch limitation of 9.249 inches for the Pressurized Water Reactor (PWR) basket, Duke Energy would apply the more readily measurable and verifiable minimum fuel tube outer diagonal dimension of 13.08 inches for the PWR basket.

Detailed technical justification for the acceptability of measuring the fuel tube outer diagonal dimensions instead of the fuel tube orthogonal pitch is provided in the Reference 3 amendment supplement. The additional criticality analyses performed by NAC demonstrate that there is no significant impact on system criticality.

3. Justification for Granting the Exemptions

The specific requirements for granting exemptions to 10 CFR Part 72 licensing requirements are set forth in 10 CFR 72.7, "Specific Exemptions," which states: "The Commission may, upon application by any interested person or upon its own initiative, grant such exemptions from the requirements of the regulations in this part as it determines are authorized by law and will not endanger life or property or the common defense and security and are otherwise in the public interest." The following factors are relevant to this exemption request:

- A. The ISFSI regulations cited in this exemption request, 10 CFR 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214, are contained within 10 CFR Part 72 of the Commission's regulations. The Commission has the legal authority to issue exemptions for the MNS ISFSI as provided in §72.7.
- B. The requested exemption items introduce no undue risk to the public health and safety. Regarding exemption item 1, the MAGNASTOR[®] System Final Safety Analysis Report (FSAR), Revision 1 (Reference 5), provides an analysis in Section 5.6.5, "Surface Contamination Release," for the offsite release exposures from particulate contamination conservatively evaluated at a 100 m distance. The evaluation assumes residual removable contamination of 20,000 dpm/100 cm² from beta-gamma sources and 200 dpm/100 cm² from alpha sources. The levels of contamination assumed in this evaluation are a factor of two greater than the limits that would apply if the proposed exemption request were approved. The evaluation assumed that 100% of the surface area of a single TSC is covered with the stated removable contamination levels. A conservative release fraction of 1% was applied. The evaluation results, as presented in FSAR Table 5.6.5-3, "Dose Summary at 100 meters from TSC Surface Contamination Release," and projected for nine casks, are as follows:

Source	Organ/Whole Body	Exposure (mrem) per cask	Exposure (mrem) 9 casks *
β-γ	Skin Dose (β-γ)	1.33E-06	1.20E-05
	Lung Dose (β-γ)	8.03E-04	7.23E-03
	Whole Body Dose (β-γ)	1.38E-04	1.24E-03
α	Bone Surface Dose (α)	5.05E-02	4.55E-01
	Lung Dose (α)	7.52E-03	6.77E-02
	Whole Body Dose (α)	2.79E-03	2.51E-02
Total	Skin Dose (β-γ)	1.33E-06	1.20E-05
	Bone Surface Dose (α)	5.05E-02	4.55E-01
	Whole Body Dose (α + β-γ)	2.93E-03	2.64E-02
	Lung Dose (α + β-γ)	8.32E-03	7.49E-02

* It is anticipated that not more than three MAGNASTOR[®] System casks will be loaded prior to the anticipated effective date of Amendment No. 2. For conservatism, the final column of the table reflects nine casks.

It is concluded that the listed removable contamination levels do not represent a significant exposure contribution at the site boundary. The limits in LCO 3.3.2, as proposed in the Reference 2 license amendment request, would be bounded by these doses.

For exemption item 2, the additional criticality analyses performed by NAC validates that the dimensional measurement change has no significant impact on system criticality, and, hence, does not introduce undue risk to public health and safety. Criticality control continues to be maintained, as before.

- C. The requested exemption items are consistent with providing for the common defense and security. The MNS ISFSI will continue to be physically protected under Duke Energy's Physical Security Plan, and the exemption request does not affect the confinement of the spent fuel stored at the ISFSI facility.
- D. Duke Energy seeks exemption item 1 from the Commission's rules cited to allow the ability to load spent fuel into the MAGNASTOR[®] TSCs with a minimum radiological exposure to the workers handling, preparing, and transferring the TSCs. Based on calculated values of surface transfer cask dose rates, Duke Energy can project occupational exposures. To minimize such exposures, the transfer of the TSCs from the fuel pool to the MAGNASTOR[®] concrete cask must be performed in an expeditious manner with the minimum required personnel. Applying unnecessarily low removable contamination limits could result in the need to perform additional handling and decontamination efforts, resulting in increased personnel exposure. Requiring smears to be taken directly from the exterior surface of the TSC (rather than allowing indirect methods to verify that the contamination level is within limits) also has the potential to significantly increase personnel exposure.
- E. Duke Energy seeks exemption item 2 from the Commission's rules cited to allow an alternate dimensional measurement limitation to be used. As described above, the fuel tube outer diagonal dimension is readily measureable, whereas the fuel tube orthogonal pitch limitation represents a measurement between two points in space, which is inherently more difficult to accurately verify.

4. Conclusion

Duke Energy concludes that the requested exemption item 1 from certain requirements of the 10 CFR 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214 regulations, allowing the TSC contamination limits, as verified by either direct or indirect methods, to be established at 10,000 dpm/100 cm² from beta-gamma sources and 100 dpm/100 cm² from alpha sources, and allowing the use of the provisions of TS 5.1.2 and TS 5.1.3 of the proposed amendment to Certificate of Compliance No. 1031, are justified. Such an exemption meets the specific exemption requirements of 10 CFR 72.7. The requested exemption item is authorized by law, will not endanger life or property, and is consistent with the common defense and security. Furthermore, granting exemption item 1 is in the public interest in that the avoidance of potential

excessive radiological exposure to workers during upcoming cask loading campaigns could be achieved if the storage canisters were allowed to be stored with higher surface contamination, as verified by either direct or indirect methods.

Duke Energy concludes that the requested exemption item 2 from certain requirements of the 10 CFR 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214 regulations, allowing an alternate method for verifying fuel tube array configuration by measuring the fuel tube outer diagonal dimension versus orthogonal distances between fuel tubes and allowing the use of the provisions of TS 4.1.1.d of the proposed amendment (as supplemented) to Certificate of Compliance No. 1031, is justified. Such an exemption meets the specific exemption requirements of 10 CFR 72.7. The requested exemption item is authorized by law, will not endanger life or property, and is consistent with the common defense and security.

5. Environmental Consideration

Pursuant to the provisions of 10CFR 72.7, Duke Energy is requesting an exemption, consisting of two elements, from certain requirements under the 10 CFR 72.212(a)(2), 72.212(b)(2)(i), 72.212(b)(7) and 72.214 regulations. If the proposed exemption item 1 is approved, the allowable TSC surface contamination limits will be increased, but will remain below the limits assumed in the MAGNASTOR[®] FSAR. The evaluation described in the FSAR concludes that the removable contamination levels do not represent a significant exposure contribution at the site boundary. Hence, the proposed exemption item 1 will not significantly increase public radiation exposure. In addition, the proposed exemption item 1 does not increase occupational radiation exposure, and rather, under the circumstances discussed previously will reduce such exposure. Lastly, the proposed exemption item 1 does not affect the type of radioactive effluents or the quantity or type of nonradioactive effluents entering the environment. Therefore, there is no significant environmental effect associated with the proposed exemption item 1.

If the proposed exemption item 2 is approved, an alternate method of verifying the minimum fuel tube array dimensional configuration will be implemented. There is no environmental impact by implementing an alternate method of measuring the minimum fuel tube array configuration. The proposed exemption item 2 will not significantly increase public radiation exposure or occupational radiation exposure. Lastly, the proposed exemption item 2 does not affect the type of radioactive effluents or the quantity or type of nonradioactive effluents entering the environment. Therefore, there is no significant environmental effect associated with the proposed exemption item 2.

6. Precedent

An exemption similar to exemption item 1 was granted to Maine Yankee Atomic Power Company (References 6 and 7) for its NAC- UMS[®] loading campaign.

The surface contamination limits and radioactive effluent control program provisions that will be utilized if the proposed exemption is approved are consistent with similar limits and provisions for the NAC-UMS[®] System, Certificate of Compliance No. 1015, (Reference 8).

7. References

1. NRC Certificate of Compliance for Spent Fuel Storage Casks Issued to NAC International Inc. (NAC), Certificate No. 1031, MAGNASTOR[®], Amendment No. 1, Effective Date August 30, 2010
2. NAC International letter dated March 22, 2010, Request to Amend the U. S. Nuclear Regulatory Commission Certificate of Compliance No. 1031 for the NAC International MAGNASTOR[®] Cask System, NRC Docket No. 72-1031 (Resubmitted by letter dated March 30, 2010)
3. NAC International letter dated April 22, 2011, Submission of Supplemental Information to Amend the U. S. Nuclear Regulatory Commission Certificate of Compliance No. 1031 for the NAC International MAGNASTOR[®] Cask System, NRC Docket No. 72-1031
4. NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," June 1974
5. MAGNASTOR[®] Final Safety Analysis Report, Revision 1
6. Maine Yankee Atomic Power Company letters to the NRC dated October 30, 2001, November 29, 2001, and February 7, 2002
7. NRC letter to Maine Yankee Atomic Power Company dated July 5, 2002, "Exemption from 10 CFR 72.212 and 72.214 for Dry Spent Fuel Storage Activities"
8. NRC Certificate of Compliance for Spent Fuel Storage Casks Issued to NAC International Inc. (NAC), Certificate No. 1015, UMS[®] Universal Storage System, Amendment No. 4, Effective Date October 11, 2005

Pending Changes to MAGNASTOR[®] Certificate of Compliance
Appendix A
Technical Specifications

TSC Surface Contamination
 A 3.3.2

3.3 MAGNASTOR SYSTEM Radiation Protection

3.3.2 TSC Surface Contamination

LCO 3.3.2 Removable contamination on the exterior surfaces of the TSC shall not exceed:

- a. 10,000 dpm/100 cm² from beta and gamma sources; and
- b. 100 dpm/100 cm² from alpha sources.

APPLICABILITY: During LOADING OPERATIONS

ACTIONS

NOTE

Separate Condition entry is allowed for each MAGNASTOR SYSTEM.

CONDITION	REQUIRED ACTION	COMPLETION TIME
A. TSC removable surface contamination limits not met	A.1 Restore TSC removable surface contamination to within limits	Prior to TRANSPORT OPERATIONS

(continued)

TSC Surface Contamination
3.3.2

SURVEILLANCE REQUIREMENTS		
	SURVEILLANCE	FREQUENCY
SR 3.3.2	Verify by either direct or indirect methods that the removable contamination on the exterior surfaces of the TSC is within limits	Once, prior to TRANSPORT OPERATIONS

4.0 DESIGN FEATURES
 4.1 Design Features Significant to Safety

4.1.1 Criticality Control

a) Minimum ¹⁰B loading in the neutron absorber material:

Neutron Absorber Type	Required Minimum Effective Areal Density (¹⁰ B g/cm ²)		% Credit Used in Criticality Analyses	Required Minimum Actual Areal Density (¹⁰ B g/cm ²)	
	PWR Fuel	BWR Fuel		PWR Fuel	BWR Fuel
Borated Aluminum Alloy	0.036	0.027	90	0.04	0.03
	0.030	0.0225		0.334	0.025
	0.027	0.020		0.03	0.0223
Borated MMC	0.036	0.027	90	0.04	0.03
	0.030	0.0225		0.334	0.025
	0.027	0.020		0.03	0.0223
Boral	0.036	0.027	75	0.048	0.036
	0.030	0.0225		0.04	0.030
	0.027	0.020		0.036	0.0267

Enrichment/soluble boron limits for PWR systems and enrichment limits for BWR systems are incorporated in Appendix B Section 2.0.

- b) Acceptance and qualification testing of borated aluminum alloy and borated MMC neutron absorber material shall be in accordance with Sections 10.1.6.4.5, 10.1.6.4.6 and 10.1.6.4.7. Acceptance testing of Boral shall be in accordance with Section 10.1.6.4.8. These sections of the FSAR are hereby incorporated into the MAGNASTOR CoC.
- c) Soluble boron concentration in the PWR fuel pool and water in the TSC shall be in accordance with LCO 3.2.1, with a minimum water temperature 5-10°F higher than the minimum needed to ensure solubility.
- d) Minimum fuel tube outer diagonal dimension
- PWR basket — 13.08 inches
 BWR basket — 8.72 inches

4.1.2 Fuel Cladding Integrity

The licensee shall ensure that fuel oxidation and the resultant consequences are precluded during canister loading and unloading operations.

4.1.3 Transfer Cask Shielding

The nominal configuration transfer cask radial bulk shielding (i.e., shielding integral to the transfer cask; excludes supplemental shielding) must provide a

(continued)

ADMINISTRATIVE CONTROLS AND PROGRAMS
5.0

5.0 ADMINISTRATIVE CONTROLS AND PROGRAMS

The following programs shall be established, implemented and maintained.

5.1 Radioactive Effluent Control Program

5.1.1 A program shall be established and maintained to implement the requirements of 10 CFR 72.44 (d) or 10 CFR 72.126, as appropriate.

5.1.2 The MAGNASTOR SYSTEM does not create any radioactive materials or have any radioactive waste treatment systems. Therefore, specific operating procedures for the control of radioactive effluents are not required. LCO 3.3.2, TSC Surface Contamination, provides assurance that excessive surface contamination is not available for release as a radioactive effluent.

5.1.3 This program includes an environmental monitoring program. Each general license user may incorporate MAGNASTOR SYSTEM operations into their environmental monitoring program for 10 CFR Part 50 operations.

5.2 TSC Loading, Unloading, and Preparation Program

A program shall be established and maintained to implement the FSAR, Chapter 9 requirements for loading fuel and components into the TSC, unloading fuel and components from the TSC, and preparing the TSC and CONCRETE CASK for storage. The requirements of the program for loading and preparing the TSC shall be completed prior to removing the TSC from the 10 CFR 50 structure. The program shall provide for evaluation and control of the following FSAR requirements during the applicable operation:

- a. Verify that no TRANSFER CASK handling or CONCRETE CASK handling using the lifting lugs occurs when the ambient temperature is $< 0^{\circ}\text{F}$.
- b. The water temperature of a water-filled, or partially filled, loaded TSC shall be shown by analysis and/or measurement to be less than boiling at all times.
- c. Verify that the drying time, cavity vacuum pressure, and component and gas temperatures ensure that the fuel cladding temperature limit of 400°C is not exceeded during TSC preparation activities, and that the TSC is adequately dry. For fuel with burnup $> 45 \text{ GWd/MTU}$, limit cooling cycles to ≤ 10 for temperature changes greater than 65°C .
- d. Verify that the helium backfill purity and mass assure adequate heat transfer and preclude fuel cladding corrosion.
- e. The integrity of the inner port cover welds to the closure lid at the vent port and at the drain port shall be verified in accordance with the procedures in Section 9.1.1.

(continued)