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August 3, 2011

U.S. Nuclear Regulatory Commission
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Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station, Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287
Request for Exemption from Certain Requirements Contained in 10 CFR 50.61 and
10 CFR 50, Appendix G

In accordance with the provisions of 10 CFR 50.60(b) and 10 CFR 50.12, Duke Energy Carolinas, LLC (Duke Energy) requests exemption from certain requirements of 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Thermal Shock Events," and 10 CFR 50 Appendix G, "Fracture Toughness Requirements." The exemption would allow use of alternate initial RT_{NDT} (reference nil ductility temperature), as described in the NRC-approved topical report, BAW-2308, Revision 1-A and Revision 2-A, for determining the adjusted RT_{NDT} of Linde 80 weld materials present in the beltline region of the Oconee Nuclear Station Units 1, 2, and 3 reactor pressure vessels.

The Enclosure provides the justification for this exemption. The Attachment to the Enclosure provides the site-specific calculation incorporating the alternate methodology for determining the adjusted RT_{NDT} of the Linde 80 weld materials. It is included herein for information only to demonstrate use of the alternate methodology for the Oconee Nuclear Station.

There are no regulatory commitments associated with this request for exemption. Inquiries on this request for exemption should be directed to Boyd Shingleton of the Oconee Regulatory Compliance Group at (864) 873-4716.

Sincerely,


T. Preston Gillespie, Jr.
Vice President
Oconee Nuclear Station

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Attachment: Duke Calculation OSC-9863

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cc w/ enclosure and attachment:

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ENCLOSURE

EXEMPTION JUSTIFICATION

1.0 INTRODUCTION

In accordance with the provisions of 10 CFR 50.60(b) and 10 CFR 50.12, Duke Energy requests exemption from certain requirements of 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Thermal Shock Events," and 10 CFR 50, Appendix G, "Fracture Toughness Requirements." The exemption would allow use of alternate initial RT_{NDT} (reference nil ductility temperature), as described in AREVA NP Topical Report BAW-2308, Revision I-A and Revision 2-A, for determining the adjusted RT_{NDT} of the Linde 80 weld materials present in the beltline region of the Oconee Nuclear Station (ONS) Units 1, 2, and 3 reactor pressure vessels.

2.0 BACKGROUND

10 CFR 50.61 (a)(5) and 10 CFR 50, Appendix G (II)(D)(i), require that the pre-service or unirradiated condition RT_{NDT} be evaluated according to the procedures in the ASME Code, Section III, Paragraph NB-2331, from Charpy V-notch impact tests and drop weight tests.

AREVA NP Topical Report BAW-2308, Rev. 2-A provides an NRC-approved alternate initial RT_{NDT} and associated σ_1 values of the Linde 80 weld materials present in the beltline region of the reactor pressure vessels at Oconee Units 1, 2, and 3.

The following Condition and Limitation is stated in the NRC's Safety Evaluation for Topical Report BAW-2308, Rev. I-A:

"Any licensee who wants to utilize the methodology of TR BAW-2308, Revision 1 as outlined in items (1) through (3) above, must request an exemption, per 10 CFR 50.12, from the requirements of Appendix G to 10 CFR Part 50 and 10 CFR 50.61 to do so. "

In the above quotation, Condition and Limitation (1) pertains to NRC-accepted values of initial (unirradiated) reference temperature, IRT_{To} , and the corresponding uncertainty term, σ_1 , for Linde 80 weld materials based on the Master Curve methodology using direct testing of fracture toughness in accordance with ASTM Standard Test Method E-1921.

Condition and Limitation (2) requires that a minimum chemistry factor of 167.0°F be applied when the methodology of Regulatory Guide 1.99, Revision 2, and 10 CFR 50.61 is used to assess the shift in nil-ductility transition temperature due to irradiation.

Condition and Limitation (3) requires that a value of $\sigma_\Delta = 28.0^\circ\text{F}$ be used to determine the margin term, as defined in Topical Report BAW-2308, Revision 2-A, and Regulatory Guide 1.99, Revision 2.

3.0 PROPOSED EXEMPTION

The exemption requested by Duke Energy addresses portions of the following regulations:

(1) Appendix G to 10 CFR Part 50, which sets forth fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the system may be subjected over its service lifetime;

(2) 10 CFR 50.61, which sets forth fracture toughness requirements for protection against pressurized thermal shock (PTS).

The exemption from Appendix G to 10 CFR 50 is to replace the required use of the existing Charpy V-notch and drop-weight-based methodology with the use of an alternate methodology that incorporates the use of fracture toughness test data for evaluating the integrity of the Linde 80 weld materials present in the ONS Units 1, 2, and 3 reactor pressure vessel (RPV) beltline regions. The alternate methodology employs direct fracture toughness testing per the Master Curve methodology based on use of ASTM Standard Method E 1921 (1997 and 2002 editions) and ASME Code Case N-629. The exemption is required since Appendix G to 10 CFR 50 requires that for the pre-service or unirradiated condition, RT_{NDT} be evaluated by Charpy V-notch impact tests and drop weight tests according to the procedures in the ASME Code, Paragraph NB-2331.

The exemption from 10 CFR 50.61 is to use an alternate methodology to allow the use of direct fracture toughness test data for evaluating the integrity of the Linde 80 weld materials present in the ONS Units 1, 2, and 3 RPV beltline regions, based on the use of ASTM E 1921 (1997 and 2002 editions) and ASME Code Case N-629. The exemption is required because the methodology for evaluating RPV material fracture toughness in 10 CFR 50.61 requires that the pre-service or unirradiated condition be evaluated using Charpy V-notch impact tests and drop weight tests according to the procedures in the ASME Code, Paragraph NB-2331.

Additionally, the NRC's Safety Evaluation for Topical Report BAW-2308, Revision I-A, concludes that an exemption is required to address issues related to 10 CFR 50.61 inasmuch as the methodology presented in Topical Report BAW-2308, Revision I-A, as modified and approved by the NRC staff, represents a significant change to the methodology specified in 10 CFR 50.61 for determining the PTS reference temperature (RT_{PTS}) value for Linde 80 weld material. The changes in the methodology described in BAW-2308, Revision I-A, with respect to the methodology per 10 CFR 50.61, include the requirements for use of a minimum chemistry factor of 167°F and a value of $\sigma_{\Delta} = 28.0^{\circ}\text{F}$ for Linde 80 weld materials.

10 CFR 50.12 states that the Commission may grant an exemption from requirements contained in 10 CFR 50 provided that: 1) the exemption is authorized by law, 2) the exemption will not result in an undue risk to public health and safety, 3) the exemption is

consistent with the common defense and security, and 4) special circumstances, as defined in 10 CFR 50.1 2(a)(2) are present. The requested exemption to allow the use of Topical Report BAW-2308, Revision I-A and Revision 2-A (Revision 2-A is a supplement to Revision I-A), as the basis for the Linde 80 weld material initial properties at ONS Units 1, 2, and 3 satisfy these requirements as described below.

1. The requested exemption is authorized by law.

No law exists which precludes the activities covered by this exemption request. 10 CFR 50.60(b) allows the use of alternatives to 10 CFR 50, Appendix G when an exemption is granted by the Commission under 10 CFR 50.12.

In addition, 10 CFR 50.61 permits other methods for use in determining the initial material properties provided such methods are approved by the Director, Office of Nuclear Reactor Regulation.

2. The requested exemption does not present an undue risk to the public health and safety.

The proposed material initial properties basis described in Topical Report BAW-2308 Revision 2-A represents an NRC-approved methodology for establishing weld wire specific and generic IRT_{T_0} values for Linde 80 welds. Topical Report BA-2308, Revision 2-A, includes appropriate conservatisms to ensure that use of the proposed initial material properties basis does not increase the probability of occurrence or the consequences of an accident at ONS Units 1, 2, and 3, and will not create the possibility for a new or different type of accident that could pose a risk to public health and safety.

The use of this proposed approach ensures that the intent of the requirements specified in 10 CFR 50 Appendix G and 10 CFR 50.61 are satisfied.

The requested exemption is consistent with the NRC staff requirements specified in the Safety Evaluation for the approved Topical Report BAW-2308, Revision I-A and Revision 2-A; consequently, the exemption does not present an undue risk to the public health and safety.

3. The requested exemption will not endanger the common defense and security.

The requested exemption is specifically concerned with RPV material properties and is consistent with NRC staff requirements specified in the Safety Evaluation for approved Topical Report BAW-2308, Revision 2-A. Consequently, the requested exemption will not endanger the common defense and security.

4. Special circumstances are present which necessitate the request for an exemption to the regulations of 10 CFR 50.61 and 10 CFR 50 Appendix G.

Pursuant to 10 CFR 50.12 (a)(2), the NRC will not consider granting an exemption to the regulations unless special circumstances are present. The requested exemption meets the special circumstances of paragraph 10 CFR 50.12(a)(2)(ii) since application of the methodology in BAW -2308, Revision I-A and Revision 2-A, in this particular circumstance serves the underlying purpose of the regulations.

The underlying purpose of 10 CFR 50.61 and 10 CFR 50 Appendix G is to protect the integrity of the reactor coolant pressure boundary by ensuring that each reactor vessel material has adequate fracture toughness. Application of paragraph NB-2331 of ASME Section III in the determination of initial material properties was conservatively developed based on the level of knowledge existing in the early 1970s concerning RPV materials and the estimated effects of operation. Since the early 1970s, the level of knowledge concerning these topics has greatly expanded. This increased knowledge level permits relaxation of the ASME III NB-2331 requirements via application of Topical Report BAW-2308, Revision 2-A, while maintaining the underlying purpose of the ASME Code and NRC regulations to ensure an acceptable margin of safety is maintained.

The attachment to this enclosure presents the reactor vessel integrity assessments for ONS Units 1, 2, and 3 utilizing the methodology of Topical Report BAW-2308, Revision 2-A for Linde 80 weld materials. The assessment documents the integrity of the RPV for ONS Units 1, 2, and 3 relative to the requirements and underlying purpose of 10 CFR 50.61 and 10 CFR 50 Appendix G.

Therefore, the intent of 10 CFR 50.61 and 10 CFR 50 Appendix G will continue to be satisfied for the proposed change in reactor vessel material initial properties basis, thus justifying the exemption request. Issuance of an exemption from the criteria of these regulations to permit the use of Topical Report BAW-2308, Revision 2-A for ONS Units 1, 2, and 3 will not compromise the safe operation of the reactors, and will ensure that RPV integrity is maintained.

4.0 PRECEDENT

As further support for this requested exemption, Duke notes that relevant precedent exists for granting an exemption from certain requirements of 10 CFR 50.61, "Fracture Toughness Requirements for Protection Against Thermal Shock Events," and 10 CFR 50, Appendix G, "Fracture Toughness Requirements." The NRC has approved similar exemption requests for Surry, Turkey Point, and Davis-Besse Nuclear Power Stations. The exemption requests and NRC approvals are listed below.

1. Letter to NRC, "Virginia Electric and Power Company Surry Power Station Units 1 and 2 Update to NRC Reactor Vessel Integrity Database and Exemption Request for Alternate Material Properties Basis Per 10 CFR 50.60(b)," June 2006.
2. Letter from NRC, "Surry Power Station, Unit Nos. 1 and 2, Exemption from the Requirements of 10 CFR Part 50, Appendix G and 10 CFR Part 50, Section 50.61," June 2007.

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3. Letter to NRC, "Turkey Point, Units 3 and 4, Update to NRC Reactor Vessel Integrity Database and Exemption Request for Alternate Material Properties Bases Per 10 CFR 50.12 and 10 CFR 50.60 (b)," March 2009.
4. Letter from NRC, "Turkey Point, Units 3 and 4 - Exemption from the Requirements of 10 CFR Part 50, Appendix G and 10 CFR Part 50, Section 50.61," March 2010.
5. Letter to NRC, "Davis-Besse Nuclear Power Station, Unit No.1 Docket No. 50-346, License No. NPF-3 License Amendment Request to Incorporate the Use of Alternate Methodologies for the Development of Reactor Pressure Vessel Pressure-Temperature Limit Curves, and Request for Exemption From Certain Requirements Contained in 10 CFR 50.61 and 10 CFR 50, Appendix G," ML091130228, April 2009.
6. Letter from NRC, "Davis-Besse Nuclear Power Station, Unit 1 - Exemption from the Requirements of 10 CFR Part 50, Appendix G and 10 CFR Part 50, Section 50.61," December 2010.