



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

May 26, 2016

Mr. Scott Batson  
Site Vice President  
Oconee Nuclear Station  
Duke Energy Corporation  
7800 Rochester Highway  
Seneca, SC 29672-0752

SUBJECT: OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3 - RELIEF REQUEST  
SERIAL NO. 14-ON-001 ALTERNATIVE REQUIREMENTS FOR CLASS 2  
RESIDUAL HEAT REMOVAL HEAT EXCHANGER WELDS (CAC NOS.  
MF6290, MF6291, AND MF6292)

Dear Mr. Batson:

By letter dated May 4, 2015 (Agencywide Documents Access and Access Management System (ADAMS) Accession No. ML15132A279), as supplemented by letter dated April 22, 2016 (ADAMS Accession No. ML16147A107), Duke Energy Carolinas, LLC (the licensee) requested the U.S. Nuclear Regulatory Commission (NRC) to authorize relief from Section XI of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) related to inspection of the inside radius sections of the letdown cooler nozzles over the duration of the fifth (10-year) inservice inspection (ISI) interval. This relief request applies to the Oconee Nuclear Station (ONS), Units 1, 2 and 3. The licensee is requesting renewal of previously granted relief requests based on the impracticality of performing inspections in the specified areas.

The NRC staff has concluded that it is impractical for the licensee to comply with the requirements of the ASME Code, Section XI, in the examination of the inner radius section of the letdown cooler nozzles. As stated in the enclosed safety evaluation, the staff has determined that the licensee has adequately addressed all of the regulatory requirements set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(6)(i). Accordingly, the NRC staff has determined that the granting of relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC grants the use of Relief Request Serial No. 14-ON-001 at ONS, Units 1, 2, and 3, for the fifth ISI interval, which is scheduled to end on July 15, 2024.

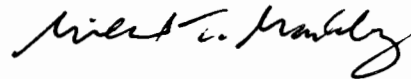
All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

S. Batson

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If you have any questions, please contact the ONS Senior Project Manager, Mr. James R. Hall, at [randy.hall@nrc.gov](mailto:randy.hall@nrc.gov) or 301-415-4032.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael T. Markley". The signature is fluid and cursive, written in a professional style.

Michael T. Markley, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure:  
Safety Evaluation

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UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING RELIEF REQUEST SERIAL NO. 14-ON-001

EXAMINATION OF INNER RADIUS SECTIONS OF LETDOWN COOLER NOZZLES

DUKE ENERGY CAROLINAS, LLC

OCONEE NUCLEAR STATION, UNITS 1, 2, AND 3

DOCKET NOS. 50-269, 50-270, AND 50-287

1.0 INTRODUCTION

By letter dated May 4, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15132A279), as supplemented by letter dated April 22, 2016 (ADAMS Accession No. ML16147A107), Duke Energy Carolinas, LLC (the licensee) requested the U.S. Nuclear Regulatory Commission (NRC or the Commission) to grant relief from Article IWB-2500, Section XI, of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code) for the examination of the inside radius sections of letdown cooler nozzles at the Oconee Nuclear Station (ONS), Units 1, 2, and 3.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g)(5)(iii), the licensee submitted Relief Request Serial No. 14-ON-001, asking for relief from inservice inspection (ISI) of the inner radius sections of the letdown cooler nozzles on the basis that the ASME Code requirement is impractical.

2.0 REGULATORY EVALUATION

The licensee requests relief from the requirements of Article IWB-2500, Section XI, of the ASME Code, pursuant to 10 CFR 50.55a(g)(5)(iii).

Paragraph 10 CFR 50.55a(g) requires that the ISI of ASME Code Class 1, 2, and 3 components be performed in accordance with the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," and applicable editions and addenda as required, except where specific written relief has been granted by the Commission.

Paragraph 10 CFR 50.55a(g)(4) mandates the use of the ASME Code, Section XI, which states, in part, that ASME Code Class 1, 2, and 3 components (including supports) will meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI.

Enclosure

Paragraph 10 CFR 50.55a(g)(5)(iii) requires that if a licensee has determined that conformance with certain Code requirements is impractical for its facility, the licensee shall notify the Commission and submit information to support the determinations.

Paragraph 10 CFR 50.55a(g)(5)(iv) requires that where an examination requirement by the Code or addenda is determined to be impractical by a licensee, and is not included in the revised ISI program as permitted by paragraph 10 CFR 50.55a(g)(4), the basis for this determination must be demonstrated to the satisfaction of the Commission not later than 12 months after the expiration of the initial 120-month period of operation, from the start of facility commercial operation, and each subsequent 120-month period of operation during which the examination is determined to be impractical.

Paragraph 10 CFR 50.55a(g)(6)(i) states, in part, that the Commission will evaluate determinations, under paragraph 10 CFR 50.55a(g)(5), that Code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines is authorized by law.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request the use of an alternative and the NRC to authorize the proposed alternative.

### 3.0 RELIEF REQUEST SERIAL NO. 14-ON-001

#### 3.1 ASME Code Component(s) Affected

The licensee stated that the affected components are the ASME Code ISI Class 1, inside radius sections of letdown cooler (heat exchanger) nozzles in the high pressure injection system in ONS, Units 1, 2, and 3.

ONS, Unit 1, has two letdown coolers, 1A and 1B. ONS, Unit 2, has two letdown coolers, 2A and 2B. ONS, Unit, 3 has two letdown coolers, 3A and 3B. Each letdown cooler typically has four welds and two nozzles. The licensee also has operationally-ready spare letdown coolers of similar design that are rotated into service to replace the installed coolers as required by maintenance. The licensee stated that the relief request is applicable to the inside radius sections of nozzles in the installed and spare letdown coolers.

The subject nozzles are made of stainless steel forged bar, T-316L, as shown in the relief request attachment, Sketch OM-201-3276 (Table items 3 and 4). The connecting process pipe is 3 inches, schedule 160, and made of SA182, Grade 316L, stainless steel, as shown in the relief request attachment, Sketch 1-N37804-2 (Table items A and B).

#### 3.2 Applicable Code Edition and Addenda

ASME Code, Section XI, 2007 Edition, with the 2008 Addenda.

#### 3.3 Applicable Requirements

Article IWB-2500, Table IWB-2500-1, Examination Category B-D, Full Penetration Welded Nozzles in Vessels, Item No. B3.160, Nozzle Inside Radius Section, requires a volumetric

examination of the inside radius section of the primary side nozzle of a heat exchanger during each 10-year ISI interval.

### 3.4 Reason for Request

The licensee stated that the size and geometry of the inside radius of the letdown cooler nozzles prevent a meaningful ultrasonic testing (UT) of the subject nozzles because ultrasound is not able to penetrate into the area of interest. The set-on nozzle is essentially a branch connection arrangement that is joined to the pipe with a full penetration butt weld. The licensee noted that the weld (ASME Code Item Number B3.150) is adjacent to the letdown cooler nozzle (ASME Code Item Number B3.160). The nozzle thickness prevents access to the examination volume of the inner radius sections. The licensee reported that the radiographic testing (RT) examination method has the same restrictions with nozzle geometry as UT and, therefore, is not a practical method to use either. In order to scan all of the required volume, the letdown cooler nozzles would have to be redesigned to allow scanning of the inner radius, which is impractical.

### 3.5 Proposed Alternative

The licensee does not propose any alternative examinations to satisfy the requirements of Item No. B3.160 of the ASME Code, Section XI, Table IWB-2500-1.

### 3.6 Basis for Request

The licensee stated that letdown is a continuous bleed of reactor coolant system (RCS) inventory for the purpose of chemistry control and purification. The design and operating parameters of the letdown nozzles correspond with RCS conditions. Design parameters are 2,500 pounds per square inch gauge (psig) and 600 degrees Fahrenheit (°F), and operating parameters are essentially 2,200 psig and 557 °F. RCS letdown flows through the tube side of the letdown coolers and is reduced in temperature by a closed loop cooling water system on the shell side. The subject inspection volume is only exposed to RCS coolant.

Although not examining the nozzle inside radius, the licensee stated that it will ultrasonically examine the weld adjacent to the nozzle in accordance with the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Item Number B3.150. The licensee stated that the adjacent weld is a critical location and will provide adequate assurance of the integrity of the welded connection that includes the subject nozzle. The licensee requested relief from the examination of Item Number B3.160, not B3.150.

The ASME Code, Table IWB-2500-1, Examination Category B-P, Item Number B15.10, requires that a system leakage test be performed after each refueling outage for Class 1 components. The system leakage test requires a VT-2 visual examination for evidence of leakage. The licensee stated that it will perform system leakage testing and VT-2 visual examination in accordance with the ASME Code to ensure nozzle integrity. The licensee stated that other activities provide a high level of confidence such that in the unlikely event leakage did occur through the nozzle inside radius sections, it would be detected. Specifically, potential leakage from these inside radius sections of the nozzles would be detected by monitoring of the RCS inventory, which is performed once each shift.

The licensee stated that the RCS leakage monitoring is a requirement of ONS Technical Specification (TS) 3.4.13, "RCS Operational Leakage." Any leakage is also evaluated in accordance with this TS.

According to the licensee, the potential leakage could also be detected through several other methods. One is the reactor building air particulate monitor, including the iodine monitor, gaseous monitor, and area monitor. These monitors are sensitive to low leak rates and are capable of detecting any fission products in the RCS coolant. A second leakage detection method is the level indicator in the reactor building normal sump. A third method is a loss of level in the letdown storage tank.

The licensee stated that it has not identified any leakage or degradation of this nozzle or nozzle weld during system leakage tests performed in the past in accordance with ASME Section XI, Table IWB-2500-1, Category B-P.

### 3.7 Duration of Proposed Alternative

The licensee proposed the relief request to be applicable for the fifth ISI interval at ONS, Units 1, 2, and 3, beginning on July 15, 2014, currently scheduled to end on July 15, 2024.

### 4.0 NRC STAFF EVALUATION

The 2007 Edition through the 2008 Addenda of the ASME Code, Section XI, Table IWB-2500-1, Examination Category B-D, Item No. B3.160, requires a volumetric examination of the inside radius section of the letdown cooler nozzle during each 10-year ISI interval.

The NRC staff reviewed the drawings of the letdown cooler nozzles and adjacent welds in the submittal and found that it is difficult to achieve the Code-required volumetric examination coverage of the nozzle inside radius sections. The NRC staff believes that ultrasound beam would not be able to cover (interrogate) the required volume of the inside radius region of the nozzle from the transducer located at the outside surface of the nozzle. The NRC staff has determined that a design change would be necessary in order to satisfy the ASME Code-required examination. As such, the NRC staff finds that a design modification to satisfy the required examination coverage would be a significant burden to the licensee.

The NRC staff notes that the licensee does ultrasonically examine the weld adjacent to the nozzle as required by ASME Section XI, Table IWB-2500-1, Examination Category B-D, Item Number B3.150. The NRC staff determines that UT of the weld that joins the subject nozzle with the pipe is more useful than UT of the inner radius section of the nozzle in monitoring the structural integrity and leak tightness of the letdown cooler nozzle.

The NRC staff notes that the licensee will be performing ASME Code-required system leakage testing and associated VT-2 visual examination during each refueling outage per the requirements of Table IWB-2500-1, Examination Category B-P, Item Number B15.10. The NRC staff finds that the system leakage testing and VT-2 visual examinations performed during every refueling outage will monitor the integrity of the letdown cooler nozzles.

The NRC staff finds that the RCS leakage detection systems could also detect potential leakage via reactor building air particulate monitors in case the subject nozzle degrades. The level

indicator in the reactor building normal sump could also detect potential leakage. The level indicator in the letdown storage tank is another method of detecting RCS leakage.

The NRC staff finds that should leakage from the inside radius section of the nozzle occur, it will be detected by the RCS inventory calculation, which is performed once each shift. The plant TS 3.4.13 has specific limits on the leak rate that require the licensee to take corrective actions to maintain plant safety.

The NRC staff noted that no leakage or degradation of this nozzle or nozzle weld has been identified in the past in accordance with the system leakage tests performed in accordance with the ASME Code, Section XI, Table IWB-2500-1, Category B-P.

With regard to the potential for a catastrophic failure as a result of foregoing the examination as specified in this relief request, the licensee stated that the examination volume that cannot be inspected is a small volume of nozzle base material, which is directly adjacent to the attachment weld examination volume. The licensee does periodically examine the adjacent weld in accordance with the ASME Code, Section XI. If degradation is postulated to occur in the subject nozzle inner radius, a flaw would have to migrate through the examination volume of the adjacent weld to produce a through-wall defect. The licensee stated that RCS leakage is closely monitored such that if a through-wall flaw were to occur, the source would be quickly detected and identified, as required by TSs. Therefore, the licensee stated that a catastrophic failure of the nozzle would not likely result from the granting of the relief request.

In summary, the NRC staff considers that it is impractical for the licensee to comply with the examination requirements of the ASME Code, Section XI, Table IWB-2500-1, for the subject nozzle inside radius sections. The NRC staff concludes that the licensee has established sufficient defense-in-depth measures to monitor the condition of the subject nozzles to provide reasonable assurance of their structural integrity and leak tightness.

## 5.0 CONCLUSION

As set forth above, the NRC staff concludes that it is impractical for the licensee to comply with the requirements of the ASME Code, Section XI, in the examination of the inner radius section of the letdown cooler nozzles at ONS, Units 1, 2, and 3. The NRC staff finds that requiring the licensee to perform a design modification to obtain ASME-required coverage would result in a significant burden. The NRC staff notes that ASME Code-required examinations of the welds adjacent to the subject nozzles and system leakage tests, coupled with RCS leakage detection systems, will provide reasonable assurance of the structural integrity and leak tightness of the letdown cooler nozzles.

The NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(g)(6)(i). Accordingly, the NRC staff has determined that the granting of relief pursuant to 10 CFR 50.55a(g)(6)(i) is authorized by law and will not endanger life or property or the common defense and security, and is otherwise in the public interest, giving due consideration to the burden upon the licensee that could result if the requirements were imposed on the facility. Therefore, the NRC grants the use of Relief Request Serial No. 14-ON-001 at ONS, Units 1, 2, and 3 for the fifth ISI interval which is scheduled to end on July 15, 2024.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved in this relief request remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: John Tsao

Date: May 26, 2016



S. Batson

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If you have any questions, please contact the ONS Senior Project Manager, Mr. James R. Hall, at [randy.hall@nrc.gov](mailto:randy.hall@nrc.gov) or 301-415-4032.

Sincerely,

*/RA/*

Michael T. Markley, Chief  
Plant Licensing Branch II-1  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-269, 50-270, and 50-287

Enclosure:  
Safety Evaluation

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**ADAMS Accession No.: ML16132A103**

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