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10 CFR 50.90

March 28, 2013

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington D. C. 20555-0001

Subject: Duke Energy Carolinas, LLC
Oconee Nuclear Station, Units 1, 2, and 3
Docket Numbers 50-269, 50-270, and 50-287
Proposed License Amendment Request for the Reactor Vessel Internals Inspection Plan; License Amendment Request Number 2010-06, Supplement 2

References:

1. Letter from T. Preston Gillespie, Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to the U.S. Nuclear Regulatory Commission, Oconee Nuclear Site, Units 1, 2, and 3, Docket Nos. 50-269, 50-270, and 50-287, Proposed License Amendment Request for the Reactor Vessel Internals Inspection Plan, License Amendment Request Number 2010-06, dated November 8, 2010.
2. Letter from T. Preston Gillespie, Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, to the U.S. Nuclear Regulatory Commission, Oconee Nuclear Site, Units 1, 2, and 3, Docket Nos. 50-269, 50-270, and 50-287, Proposed License Amendment Request for the Reactor Vessel Internals Inspection Plan (Supplement 1), dated June 28, 2012.
3. Letter from John Boska, Senior Project Manager, Division of Operating Reactor Licensing, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, to T. Preston Gillespie, Vice President, Oconee Nuclear Station, Duke Energy Carolinas, LLC, Request for Additional Information (RAI) Related to Reactor Vessel Internals Inspection Plan Based on MRP-227-A, dated February 11, 2013.

On November 8, 2010, Duke Energy Carolinas, LLC (Duke Energy) submitted License Amendment Request (LAR) 2010-06, to amend Renewed Facility Operating Licenses DPR-38, DPR-47, and DPR-55 for Oconee Nuclear Station (ONS), Units 1, 2, and 3. In that submittal, Duke Energy requested that the Nuclear Regulatory Commission (NRC) review and approve a Reactor Vessel (RV) Internals inspection plan based on "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-Rev.0)" published by the Electric Power Research Institute (EPRI) (Reference 1).

Following the original LAR submittal, Duke Energy submitted Supplement 1 on June 28, 2012, to incorporate changes resulting from the issuance of MRP-227-A and subsequent Revision 1 to the NRC Safety Evaluation Report (Reference 2).

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On February 11, 2013, the NRC requested Duke Energy to provide additional information related to LAR Supplement 1 (Reference 3). This submittal contains Duke Energy's RAI responses.

There are no new commitments contained in this document. Any inquiries on this submittal should be directed to Stephen C. Newman, Oconee Regulatory Affairs Group, at (864) 873-4388.

I declare under penalty of perjury that the foregoing is true and correct. Executed on March 28, 2013.

Sincerely,

Scott L. Batson
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Enclosure

cc: (w/enclosure)

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ENCLOSURE

RESPONSES TO REQUEST FOR ADDITIONAL INFORMATION

LAR SUPPLEMENT 2

RAI #1:

Topical Report Condition 7 of the NRC staff's safety evaluation (SE), Revision (Rev.) 1, dated December 16, 2011, on MRP-227 -A, "Material Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," states: "MRP-227, Appendix A shall be updated to include ... the Operating Experience Summary." Appendix A of MRP-227-A discussed operating experience under various degradation mechanisms for the reactor vessel internals (RVI) components of all nuclear steam supply system (NSSS) designs, including Babcock and Wilcox (B&W) plants. Please (1) identify the MRP-227-A, Appendix A experience which were contributed by the Oconee Nuclear Station (ONS), Units 1, 2, and 3 and (2) provide ONS experience on RVI degradations that were not discussed in Appendix A of MRP-227-A.

Duke Energy Response:

1) Operating Experience (OE) for B&W designed internals in Appendix A of MRP-227-A[1] includes the following:

- Cracking of thermal shield bolts, core barrel bolts, and surveillance specimen holder tube bolts
- Flow Induced Vibration of thermal shields
- Loss of Material (wear) from vent valve jackscrew locking devices (original design),
- Damage to vent valve jack screw locking cups,
- Unknown - Protruding baffle-baffle bolts.

ONS operating experience (failures) contained in this list include:

- Two Upper Core Barrel bolts failed repeated volumetric examination (UT) inspection at Oconee Nuclear Station Unit 3 (ONS-3) in 1984, 1985, 1987 and 2007,
- Three Lower Core Barrel (LCB) bolts failed UT inspection at ONS-3 in 1987,
- 94 Lower Thermal Shield (LTS) bolts failed UT inspection at Oconee Nuclear Station Unit 1 (ONS-1) in 1981,
- 24 LTS bolts failed UT inspection at Oconee Nuclear Station Unit 2 (ONS-2) in 1982,
- 53 LTS bolts failed UT inspection at ONS-3 in 1982,
- One Flow Distributor bolt failed UT inspection at ONS-3 in 1987,
- The original vent valve jackscrews and locking devices showed wear, prompting all three ONS units to replace four of the eight valves with a modified design in the early 1980s,
- Flow-induced vibration of the thermal shields during hot functional testing of the lead B&W unit (ONS-1).

2a) In addition to the ONS, OE contained in MRP-227-A (listed above), the following ONS OE was available but not included in MRP-227-A. These OE are not due to aging.

- One guide block at ONS-1 was determined missing during a video inspection conducted in July 1981. It was determined that that the guide block was most probably lost when the core support assembly was removed from the reactor vessel in 1976 for the surveillance specimen holder tube (SSHT) upgrade.

[1] MRP-227-A, "Material Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," EPRI, Palo Alto, CA: 2011.1022863.

- One vent valve was slightly damaged at ONS-2 in 1974, by an out of level plenum assembly.
- The attachment bolts for shock pad Y-2 at ONS-2 were identified as failed in 1982.

In support of License Renewal, an ONS-specific review of Licensee Event Reports (LERs) and Problem Investigation Process evaluations (PIPs) was conducted to ensure that the industry operating experience review reported in the generic reports bound the ONS specific operating experience. Three hundred (300) ONS LERS dating back to 1984 were reviewed, and approximately 740 PIPs that apply to the Reactor Coolant System (RCS) dating back to 1989 were reviewed. Both the LERs and PIPs were screened for aging effects or conditions that may have been caused by aging effects. No LERs and PIPs applicable to aging of the reactor vessel internals were found.

2b) ONS OE that has been obtained since the development of MRP-227-A, is recently available from the ONS-1 end of cycle 27 outage (Fall of 2012). A report was provided to EPRI as required by MRP-227-A. A brief discussion of the age-related conditions found during this inspection is summarized below.

- On vent valve ZW, there was a crack-like indication on one of the jack screws, and there were signs of mechanical damage on the vent valve. Vent valve ZW was replaced with a new vent valve.
- Five (5) LCB bolts had crack-like UT indications. An evaluation determined that the remaining bolts provided an acceptable joint for continued operation. As 5 indications is less than the 10% value that requires sample expansion per MRP-227-A, the inspection was not expanded to the Upper Thermal Shield (UTS) bolts or LTS studs/nuts.
- One (1) LCB bolt locking device had a missing weld on one side and an undersized weld on the other side. No action was taken. (These are not aging effects.)
- Four (4) baffle-to-former bolts were un-inspectable due to larger than anticipated welds on the locking bars.
- One (1) flow distributor (FD) bolt had a crack-like UT indication. As this is less than 10% of the bolts examined, no expansion to the UTS bolts or LTS studs/nuts was necessary.
- An unidentified piece of debris was lodged in one of the legs of an Incore Monitoring Instrumentation (IMI) guide tube spider. Analysis determined that continued operation with this small part (approximately ¼ inch diameter by 2 inches long) was acceptable.

RAI #2:

Historically, the following materials used in the pressurized water reactor (PWR) RVI components were known to be susceptible to some of the aging degradation mechanisms that are identified in MRP-227-A. In this context, the NRC staff requests that the licensee confirm that these materials are not currently used in the RVI components at ONS.

(1) Nickel base alloys -Inconel600; Weld Metals -Alloy 82 and 182 and Alloy X-750
(2) Stainless steel type 347 material (excluding baffle-former bolts)
(3) Precipitation hardened (PH) stainless steel materials -17-4 and 15-5
(4) Type 431 stainless steel material.

If one or more of these materials were used in the RVI components at ONS, provide information regarding their proposed inspections and basis to demonstrate that the proposed inspections are consistent with the intent of MRP-227-A

Duke Energy Response:

The subject materials are used in the ONS reactor vessel (RV) internals, including Alloy 82/182, Alloy X-750, Type 15-5 PH stainless steel, Type 17-4 PH stainless steel, and Type 431 stainless steel. There is no Type 347 stainless steel in the ONS internals.

A list of B&W-designed RV internals component items along with material specification and material type, grade, or class is found in MRP-189, Rev. 1, Table 3-2.

A list of B&W-designed RV internals welds along with the weld metal is found in MRP-189, Rev. 1, Table 3-3.

A comparison of the RV internals components in the scope of license renewal for ONS to the components in Tables 4-1 and 4-2 of MRP-189, Rev. 1, as required by applicant/licensee action item #2 in the SER for MRP-227-A, is found in ANP-3186[2].

The components at the Oconee units fabricated from the materials of interest in this RAI are listed in Table 2-1 below. The first 15 items were included in MRP-189 and these components were considered when developing the inspection requirements in MRP-227-A, and no further action is required. The remaining items were not included in MRP-189. Subsequently, these items have been screened in accordance with MRP-189 procedures in ANP-3186. Individual components were screened as either Category A or Category B, and all components were determined to be further categorized as "No Additional Measures." The vent valve locking devices are being recommended for future inclusion into MRP-227 as an Existing Programs component.

Table 2-1: ONS Reactor Vessel Internals Components made of the materials of interest to RAI-2

ONS RV Internals Component	Material	MRP-190 Identifier
Upper grid assembly fuel assembly support pad dowels	Alloy X-750	P.3.6
Core barrel-to-former plate dowels	Alloy X-750	B.21
Lower grid assembly fuel assembly support pad dowels	Alloy X-750	L.1.3
Lower grid assembly guide block dowels	Alloy X-750	L.1.15
Replacement Lower Thermal Shield (LTS) studs/nuts	Alloy X-750	L.1.11b

[2] ANP-3186, Revision 1, (AREVA Document 103-3186P-001),"ONS License Renewal Scope and MRP-189, Rev. 1 Comparison," March, 2013.

ONS RV Internals Component	Material	MRP-190 Identifier
Core Barrel dowel to top and bottom core barrel cylinders fillet weld (Weld ID WC-130)	Alloy 82	B.1
Core Barrel dowel to core barrel cylinder welds (both ends) (Weld ID WC-164)	Alloy 82	B.1
Flow Distributor X-750 dowel to flow distributor flange weld (Weld ID WC-58)	Alloy 82	L.2.2
Lower Grid Alloy X-750 dowel to lower grid rib section weld (Weld ID WC-98)	Alloy 69*	L.1.3 and L.1.1
Lower Grid Alloy X-750 dowel to lower fuel assembly pad weld (Weld ID WC-3)	Alloy 69*	L.1.2 and L.1.3
Lower Grid X-750 dowel to lower grid shell forging weld (Weld ID WC-4)	Alloy 82	L.1.10
Lower Grid X-750 dowel to guide block-A and guide block-B weld (Weld ID WC-104)	Alloy 82	L.1.13 and L.1.15
Plenum Cover dowels to plenum cover bottom flange weld (Weld ID WC-33)	Alloy 82	P.1.3
Upper Grid dowel to upper grid fuel assembly support pad weld (Weld ID WC-22)	Alloy 82	P.3.5 and P.3.6
Upper Grid dowel (for alignment) to upper grid rib section weld (Weld ID WC-96)	Alloy 82	P.3.1
Vent Valve Top and Bottom Retaining Rings	Type 15-5 PH	S.10
Vent Valve Disc Shaft (or Hinge Pin)**	Type 431 SS	S.14
Modified Vent Valve Locking Device Bolt Locking Cup Intermittent Fillet Weld	Alloy 182	Not Included
Modified Vent Valve Locking Device Locking Cup to Block Intermittent Fillet Weld	Alloy 182	Not Included
Modified Vent Valve Locking Device Bolted Block	Alloy 600	Not Included
Modified Vent Valve Locking Device Jack Screw Locking Cup	Alloy 600	Not Included
Modified Vent Valve Locking Device Bolt Locking Cup	Alloy 600	Not Included
Original Vent Valve Locking Device Key Ring	Type 431	Not Included
Plenum cover weldment rib pad dowels***	Alloy X-750	Not Included

ONS RV Internals Component	Material	MRP-190 Identifier
Special Hex Head screws in the Modified Vent Valve Locking Devices	Alloy 718****	Not Included
Bearing in the Remnant material of the Surveillance Specimen Holder Tube Assembly	Type 17-4 pH	Not Included
Dowels in the Remnant material of the Surveillance Specimen Holder Tube Assembly	Alloy X-750	Not Included
Alloy X-750 dowel to base plate locking weld in the Remnant material of the Surveillance Specimen Holder Tube Assembly	Alloy 69/82/182	Not Included

* Alloy 69 is a nickel-base weld alloy similar to Alloy 82 weld material.
** Note that this is an active component item and has subsequently been removed from MRP-227-A.
*** See RAI #10 and response.
**** Alloy 718 is an austenitic precipitation-hardened alloy in the same class as Alloy X-750.

RAI #3:

Section 4.1.3.1 of ANP-2951, Rev. 2, "Inspection Plan for the Oconee Nuclear Station Units 1, 2, and 3 Reactor Vessel Internals," in Attachment 1 of the June 28, 2012, submittal identified transient cycle count assumptions for the replacement bolting as a time-limited aging analysis (TLAA). Confirm whether the replacement bolts are the lower thermal shield (LTS) bolts. Regardless of the confirmation, will the MRP-227-A specified examination method, frequency, and coverage for this RVI component item coexist with the management of this TLAA? Identify all RVI component items which have plant-specific measures (e.g., TLAAs) to supplement or replace the MRP-227-A inspections. Provide justification if deviation from MRP-227-A is identified for some of these RVI component items.

Duke Energy Response:

1) Duke Energy confirms that that the replacement bolts are the LTS bolts.

2) In BAW-2248, for each utility, the number of transients accrued to date was conservatively extrapolated, and in all cases it was found that the number of design cycles would not be exceeded in the period of extended operation. The Babcock and Wilcox Owner's Group (B&WOG) reported that each of the participating utilities monitors occurrences of design transients and is thus managing the potential for cracking resulting from fatigue. Therefore, Duke Energy will continue to monitor and track occurrences of design transients for all three ONS units during the extended license period. The transient cycle count assumptions for the replacement bolting as a TLAA can co-exist with the MRP-227-A classification of the LTS bolts as an "Expansion" component.

3) While ONS has a number of programs and activities that support the aging management of the RV Internals (such as the ASME Boiler and Pressure Vessel (B&PV) Code Section XI Inservice Inspection (ISI) program, the primary water chemistry program, the vent valve in-

service test program, the thermal fatigue aging management program, and implementation of low-leakage cores), none of these plant-specific measures replace the MRP-227-A inspections or require a deviation from MRP-227-A.

RAI #4:

Section 4.1.3.2 of ANP-2951, Rev. 2 states: "Section 6.5 of this report describes the resolution to Applicant/Licensee Action Item 6 from the SER concerning the justification of acceptability of inaccessible components."

Applicant/Licensee Action Item 6 of the SE for MRP-227-A requires the applicant provide justification for the continued operability of each of the inaccessible components and, if necessary, provide a plan for the replacement of the components for NRC review and approval. To ensure that Applicant/Licensee Action Item 6 requirements will be completed in time to support the Oconee inspection plan, the NRC staff will impose Condition 1 to this SE requiring the licensee provide information requested in Applicant/Licensee Action Item 6 of the SE for MRP-227-A:

> This amendment requires the licensee provide the detailed analysis, replacement schedule, or justification for some other alternative process for:
>
> - the core barrel cylinder and welds,
> - the former plates, and
> - the bolting (core barrel-to-former bolts, internal and external baffle-to-baffle (88) bolts, and associated locking devices),
>
> by the end of one year from the initial inspection of the Primary or linked Primary component items if the inspection results indicate aging, which is the Implementation Date for this condition. Any "other alternative process" shall include justification of operation in the degraded condition on a generic or plant-specific basis.

In response to RAI-4, the licensee needs to indicate that it has reviewed Condition 1 and agrees with the imposition of it to the SE for this license amendment request (LAR).

Duke Energy Response:

Duke Energy has reviewed Condition 1 and agrees with the imposition of it to the Safety Evaluation (SE) for this License Amendment Request (LAR) when the expansion criteria for the linked Primary component from MRP-227-A, Table 5-1 are met.

RAI #5:

Section 4.1.3.2 of ANP-2951, Rev. 2 states, "Section 6.6 of this report describes the resolution to Applicant/Licensee Action Item 7 from the SER concerning plant-specific analyses to demonstrate RV Internals components fabricated from CASS, martensitic stainless steel, or precipitation-hardened stainless steel will maintain their functionality during the period of extended operation."

Commitment No.4 in Attachment 2 of the June 28, 2012, submittal specified the due date for addressing Action Item 7 as November 29, 2013. Instead of using the proposed Commitment No. 4, the NRC staff will impose Condition 2 to this SE requiring the licensee provide information requested in Applicant/Licensee Action Item 7 of the SE for MRP-227-A:

> This amendment requires the licensee provide the plant-specific analyses to demonstrate that B&W IMI guide tube assembly spiders and CRGT spacer castings will maintain their functionality during the period of extended operation by November 29, 2013, which is the Implementation Date for this condition. These analyses shall consider loss of fracture toughness due to thermal and irradiation embrittlement, and may also need to consider limitations on accessibility for inspection and the resolution/sensibility of the inspection techniques.

In response to RAI-5, the licensee needs to justify that the proposed date of November 29, 2013, is appropriate and to indicate that it has reviewed Condition 2 and agrees with the imposition of it to the SE for this LAR.

Duke Energy Response:

1) The proposed date of November 29, 2013, is justifiable based upon recent inspections and the results of analyses performed in preparation for the inspections. During the November, 2012, ONS-1 MRP-227-A inspections of IMI guide tube assembly spiders and control rod guide tube (CRGT) spacer castings, no indication of age-related degradation was observed. In addition, analyses performed in preparation for the MRP-227-A inspections of the IMI guide tube assembly spiders and CRGT spacer castings do not indicate imminent loss of functionality.

2) Duke Energy has reviewed Condition 2 and agrees with the imposition of it to the SE for this LAR.

RAI #6:

Section 4.1.6 of ANP-2951, Rev. 2 states that, "The "Primary" requirement from MRP-227-A for a one-time physical measurement of the interference fit between the plenum cover weldment rib pads and the RV flange was performed at ONS between 2006 and 2008 in order to provide data to the investigation." Discuss the impact of these measurements on the MRP-227-A specified subsequent visual (VT-3) examination on the 10-year InService inspection (ISI) interval for ONS, Units 1, 2, and 3.

Duke Energy Response:

As stated in Section 4.2.8 of ANP-2951[3], the core clamping measurements at ONS-1, 2, and 3 found no evidence of wear and there was no evidence that core clamping has been degraded.

The impact of the positive results (i.e., lack of aging effects) of the core clamping measurements is that ONS will continue to monitor potential wear of the core clamping items in the plenum

[3] ANP-2951, Revision 2, (AREVA Document ID 77-2951-002), "Inspection Plan for the Oconee Nuclear Station Units 1, 2, and 3 Reactor Vessel Internals," March, 2012.

cover assembly and CSS assembly via subsequent Visual Testing (VT)-3 examinations performed on the 10-year Inservice Inspection (ISI) interval per MRP-227-A requirements.

The ONS inspection plan for the reactor vessel internals ANP-2951, Section 5.6.1.1, states that "Any detected condition that does not satisfy these examination criteria must be dispositioned." Thus far, no indication of wear has found. As such, the inspections regiment found in Table 4-1 will continue to be followed.

RAI #7:

Section 4.2 of ANP-2951, Rev. 2 states that, "visual examination of baffle-to-baffle and baffle-to-former bolts at each RFO [refueling outage]." Confirm that Duke Energy will perform ultrasonic testing (UT) examinations for baffle-to-baffle and baffle-to-former bolts in accordance with Examination Method/Frequency of MRP-227 -A, and the stated visual examinations simply supplement the UT examinations. Justify if this is not the case.

Duke Energy Response:

1) MRP-227-A, Table 4-1, "B&W plants Primary components," specifies visual (VT-3) examination of the baffle-to-former bolt and internal baffle-to-baffle bolt locking devices, including locking welds. These VT-3 examinations will be performed in accordance with MRP-227-A, Table 4-1. Table 4-4, "B&W plants Expansion components," specifies "No examination requirements; Justify by evaluation or by replacement" for internal and external baffle-to-baffle bolts. An acceptable volumetric examination technique is not available for the internal baffle-to-baffle bolts, and the external baffle-to-baffle bolts are considered inaccessible.

2) The UT examination of baffle-to-former bolts will be performed in accordance with the Examination Method/Frequency of MRP-227-A, Table 4-1.

3) The visual examinations performed on the internal baffle-to-baffle bolts and the baffle-to-former bolts during refueling outages simply supplement the inspection requirements in MRP-227-A.

RAI #8:

Table 4-2 of ANP-2951, Rev. 2 defined "typical" ONS core support structure components for Examination Category B-N-3 of the American Society of Mechanical Engineers Boiler & Pressure Vessel Code (ASME Code), Section XI. Describe the process and effort in making Table 4-2 to ensure that Table 4-2 did not miss any important core support structure components. Identify the ONS core support structure components which were inspected as B-N-3 Examination Category in the past but are not included in Table 4-2 and provide justification, including past inspection results, for their exclusion.

Duke Energy Response:

1) Table 4-2 of ANP-2951 is based on an AREVA inspection matrix and Duke Energy engineering judgment. It includes accessible components that Duke Energy engineering considers to serve a core support function, as well as additional components that have potential to affect the functionality of the internals.

2) The word "typical" is used in Table 4-2, because some components are abbreviated, some non-core support components are included, and component nomenclature is subject to change. There is not a generic list of core support structures for B&W-designed internals. Table 4-2 includes all accessible core support components as determined by Duke Energy engineering judgment.

RAI #9:

Section 4.2.5 of ANP-2951, Rev. 2 states that, "Failure of the original Alloy A-286 L TS bolts in the 1980s led to the replacement of all the original L TS bolts with replacement studs/nuts at the three ONS units." The replacement studs/nuts are made from Alloy X-750 in the high temperature heat-treatment condition. Discuss the inspection results accumulated in the past 30 years at the three ONS units for the replacement L TS bolts to demonstrate that this operating experience supports the MRP-227 -A specified examination method/frequency/coverage for this RVI component item.

Duke Energy Response:

In 1981 and 1982, the originally installed LTS bolts at the ONS units were replaced by a stud/nut design fabricated from Alloy X-750 in the high temperature heat treated condition.

Limited UT inspection of the currently installed LTS closure designs has been performed.

- In 1983, 16 LTS Alloy X-750 studs/nuts were UT inspected at ONS-1 and no rejectable indications were found.
- In 1984, 96 LTS Alloy A-286 bolts were UT inspected at another B&W designed plant and no rejectable indications were found.
- In 1990, 24 LTS Alloy X-750 bolts were UT inspected at another B&W designed plant and no rejectable indications were found.
- None of the replacement Alloy X-750 stud/nuts at ONS Units 2 or 3 have been UT inspected.
- A VT-3 examination of the LTS closure mechanisms, including their locking mechanisms, is performed every 10-year InService Inspection interval.

The fact that there have been no failures in the new design LTS studs and nuts or bolts supports the "Expansion" category of these bolts in MRP-227-A.

RAI #10:

Section 4.2.6 of ANP-2951, Rev. 2 states that, "The Alloy X-750 dowels, Type 304 screws, and their locking welds [related to plenum cover ribs for ONS, Unit 1 only] were unknown and were not screened for aging degradation mechanisms, nor evaluated for inclusion in MRP-227." Confirm that this RVI component item is within the scope of the LR in accordance with 10 CFR

54.4 and will be included in your response to address Applicant/Licensee Action Item 2 of the SE for MRP-227-A regarding whether Tables 4-1 and 4-2 in MRP-189, Rev. 1 and Tables 4-4 and 4-5 in MRP-191 have missed any RVI component items that should be within the scope of the LR.

Duke Energy Response:

These component items are within the scope of LR in accordance with 10CFR54.4 and these component items are included in ANP-3186[4]. The following is extracted from Section 3.2 of ANP-3186.

Additionally, during a records search performed in 2009 and 2010, a feature unique to ONS-1 was identified for the plenum cover weldment rib pads. Each of the 32 plenum cover rib pads at ONS-1 is fastened to the plenum cover ribs with two Type 304 screws and one Alloy X-750 dowel. At the six other operating B&W units, the plenum cover rib pads are welded to the plenum cover weldment ribs. Since this unique feature was not known during the preparatory work leading up to MRP-227-A or the initial scope work performed for license renewal for the ONS units, the Alloy X-750 dowel and Type 304 screws and their locking welds at this location were not included in the ONS (License Renewal) scope nor evaluated in the MRP screening documents.

AREVA previously performed a screening for the Alloy X-750 dowel, Alloy X-750 dowel locking weld, Type 304 screws, and Type 304 screw locking welds. The screening was performed using the same screening process and criteria that was used for other locations and documented in MRP-189, Rev. 1. The Alloy X-750 dowel and the Type 304 screws and their locking welds were screened as Category "A" items. The Alloy X-750 dowel locking welds were screened as Category "Not A" due to being potentially susceptible to primary water stress corrosion cracking (PWSCC). However, a functionality assessment of the Alloy X-750 dowel locking weld categorized this component item as "No Additional Measures" per MRP-227-A. Therefore, no additional augmented inspection is required for this location.

RAI #11:

Section 4.2.7 of ANP-2951, Rev. 2 states that, "UT examinations for the LCB [lower core barrel] bolts are planned during the RV Internals inspections in 2012,2013, and 2014, in compliance with the MRP-227-A examinations requirement for the LCB bolts." Provide similar information on examinations of all kinds (i.e., visual or UT) for all other RVI component items to be performed before the end of the current 40-year license in compliance with the MRP-227 -A examinations requirement.

Duke Energy Response:

As noted in NUREG-1723[5], the SER for the ONS License Renewal, the Period of Extended Operation (PEO) for ONS Unit 1 starts at midnight, February 6, 2013; the PEO for Unit 2 starts at midnight, October 6, 2013; and the PEO for ONS Unit 3 starts at midnight, July 19, 2014.

[4] ANP-3186, Revision 1, (AREVA Document 103-3186P-001),"ONS License Renewal Scope and MRP-189, Rev. 1 Comparison," March, 2013.
[5] Safety Evaluation Report Related to the License Renewal of Oconee Nuclear Station, Units 1, 2, and 3, March 2000.

The inspections scheduled for each Oconee Unit have the same scope, as defined by the ONS RV Internals Inspection Plan[6]. These inspections have just been completed on ONS-1 in the fall of 2012, and will be completed on ONS-2 prior to October 6, 2013 and on ONS-3 prior to July 19, 2014. The inspections performed on ONS-1 are listed below; the resolution of unacceptable inspection results is discussed as ONS OE in response to RAI #1.

Most of the inspections described below were performed from 11/1/2012 to 11/12/2012 during the fall 2012 ONS-1 refueling outage. Some earlier inspection results are listed for completeness. The date of each inspection is stated in the text.

All inspections performed at ONS-1 were for Primary components in MRP-227-A. No Expansion components required inspection at ONS-1 based on the results of the Primary component inspections. Determination of whether or not Expansion components must be inspected at ONS-2 or ONS-3 will be based on the MRP-227-A criteria and the results of the Primary component inspections.

1. A one-time physical measurement (initial inspection) of the differential height of the top of the plenum rib pads to reactor vessel seating surface, with the plenum in the reactor vessel, was performed at ONS-1 in 2006 and no relevant indications (no evidence of wear) were noted. A VT-3 subsequent inspection of the plenum cover weldment rib pads, plenum cover support flange and core support structure (CSS) top flange was performed in 2012 and no relevant indications were noted.
2. A VT-3 inspection of accessible surfaces of 100% of the control rod guide tube (CRGT) spacer castings including each of the 4 screw locations (at every 90°) was performed at ONS-1 in 2012 and no relevant indications were noted.
3. A VT-3 inspection of accessible surfaces of the CSS vent valve top and bottom retaining rings was performed at ONS-1 in 2012. A verification of the operation of each vent valve was performed through manual actuation of the valve in 2012. The jack screws and jack screw locking devices, which are not included in MRP-227-A, also received a VT-3 inspection in 2012.

   Results: No relevant indications were noted on retaining rings or locking devices. On vent valve ZW, one jack screw was shorter than the other, there was a crack-like indication on one of the jack screws, and there were signs of mechanical damage on that vent valve. Vent valve ZW was replaced with a new vent valve.
4. Four of the 120 upper core barrel (UCB) bolts had been removed in the 1980s for testing and no indications were found. Volumetric examination (UT) of the remaining 116 UCB bolts was performed at ONS-1 in 2008 and no relevant indications were found. Visual (VT-3) examination of 116 UCB bolt locking devices was performed in 2012 and no relevant indications were found.
5. Volumetric examination (UT) of 108 lower core barrel (LCB) bolts was performed at ONS-1 in 2012 and 5 crack-like indications were found.

   Visual (VT-3) examination of 108 LCB bolt locking devices accessible surfaces was performed in 2012. (100% inspection was achieved on 101 locking devices while 40 to 50% inspection was achieved on the other 7 due to interferences.)

[6] "Duke Energy Carolinas, LLC, Oconee Nuclear Site, Units 1, 2, and 3, Docket Numbers 50-269, 50-270, and 50-287, Proposed License Amendment Request for the Reactor Vessel Internals Inspection Plan, License Amendment Request Number 2010-06 – Supplement 1," NRC ADAMS Accession Number ML12187A214, June 28, 2012 (Includes AREVA Document ANP-2951, Revision 2).

Results: one locking device had a missing weld on one side and an undersized weld on the other side.

6. Volumetric examination (UT) was performed on 860 (of 864) baffle-to-former bolts at ONS-1 in 2012. (Four bolts could not be inspected due to large welds on the locking bars.) No relevant indications were found.
7. Visual examination (VT-3) of 100% of the accessible surface within 1 inch around each flow and bolt hole in all baffle plates was performed in 2012 and no relevant indications were found.
8. Visual examination (VT-3) was performed on 864 baffle-to-former bolt locking devices and 272 internal baffle-to-baffle bolt locking devices in 2012 and no relevant indications were found.
9. One flow distributor (FD) bolt was removed at ONS-1 in 1981 and no indications were found. (A second bolt could not be removed due to high torque values.) Volumetric examination (UT) of the remaining 95 FD bolts was performed at ONS-1 in 2012. One flow distributor bolt had a crack-like indication in 2012.

   Two FD bolt locking devices were removed in 1981. Visual (VT-3) examination of the remaining 94 FD bolt locking devices was performed in 2012 and no relevant indications were found.
10. Previously one guide block was lost and its pair was removed (neither has been replaced.) Visual examination (VT-3) was performed on accessible surfaces of the 22 remaining lower grid assembly Alloy X-750 dowel-to-guide block welds at ONS-1 in 2012 and no relevant indications were found.
11. Visual examination (VT-3) was performed on 100% of the top surfaces of 52 Incore Monitoring Instrumentation Guide Tube Assembly spider castings and welds of the castings to the adjacent lower grid rib section (8 welds per casting) at ONS-1 in 2012 and no relevant indications were found. An unidentified loose part was identified under one spider casting.

RAI #12:

Section 5.1.1 of ANP-2951, Rev. 2 states that, "See Section 2.4 of this report for a discussion of the scope of the components considered for inspection for the program to manage the aging of the ONS RV Internals." The NRC staff reviewed Section 2.4 and did not find a clear definition of the scope of the components. Hence, the NRC staff requested the licensee confirm that the ONS RVI inspection plan includes all RVI component items listed in Tables 4-1 (Primary) and 4-4 (Expansion) of MRP-227-A and those listed in Table 4-2 (Existing) of ANP-2951, Rev. 2. If it is not confirmed, demonstrate that the ONS RVI inspection plan is still appropriate.

Duke Energy Response:

The ONS RV internals inspection plan (ANP-2951 as submitted to the NRC[7]) was developed considering all the RV internals component items listed in Tables 4-1 (Primary) and 4-4 (Expansion) of MRP-227-A and Table 4-2 of ANP-2951, and thus "includes" these components. The Primary components in Table 4-1 of MRP-227-A receive periodic inspections as specified by MRP-227-A. The Expansion components in Table 4-4 of MRP-227-A are inspected if acceptance criteria for their respective primary components are not met. The B-N-3 components in Table 4-2 of ANP-2951 are visually inspected every 10-year ISI interval. (See response to RAI #8 for additional information on B-N-3.) All inspections required by MRP-227-A are included in the ONS RV internals inspection plan.

As stated in the ONS RV internals inspection plan (ANP-2951, Section 5.3.1), "The inspections listed in MRP-227-A Tables 4-1 and 4-4 that are applicable to the ONS units are included as augmented InService inspections in the ONS ISI program."

Primary components and the type of examination performed in the ONS RV internals inspection plan from Table 4-1 of MRP-227-A are listed in Table 12-1. Applicable ONS components given in MRP-227-A, Table 4-1, have been included. Results of the ONS-1 inspection of these components in 2012 are summarized in the response to RAI #11, while disposition of unacceptable indications is discussed in the response to RAI #1.

Table 12-1: ONS Primary Components

Primary Component	Examination Type
Plenum Cover Weldment Rib Pads	Physical Measurement
Plenum Cover Weldment Rib Pads	VT-3
Plenum Cover Support Flange	Physical Measurement
Plenum Cover Support Flange	VT-3
CSS Top Flange	Physical Measurement
CSS Top Flange	VT-3

[7] "Duke Energy Carolinas, LLC, Oconee Nuclear Site, Units 1, 2, and 3, Docket Numbers 50-269, 50-270, and 50-287, Proposed License Amendment Request for the Reactor Vessel Internals Inspection Plan, License Amendment Request Number 2010-06 – Supplement 1," NRC ADAMS Accession Number ML12187A214, June 28, 2012 (Includes AREVA Document ANP-2951, Revision 2).

Primary Component	Examination Type
CRGT Spacer Castings	VT-3
CSS Vent Valve Top Retaining Ring	VT-3
CSS Vent Valve Bottom Retaining Ring	VT-3
UCB Bolts	UT
UCB Bolt Locking Devices	VT-3
LCB Bolts	UT
LCB Bolt Locking Devices	VT-3
Baffle-to-Former Bolts	UT
Baffle Plates	VT-3
Baffle-to-Former Bolt Locking Devices	VT-3
Internal Baffle-to-Baffle Bolt Locking Devices	VT-3
Flow Distributor (FD) Bolts	UT
FD Bolt Locking Devices	VT-3
Alloy X-750 Dowel-to-Guide Block Welds	VT-3
IMI Guide Tube Spiders	VT-3
IMI Guide Tube Spider-to-Lower Grid Rib Section Welds	VT-3

Expansion components and the type of examination performed, in the ONS RV internals inspection plan from Table 4-4 of MRP-227-A are listed in Table 12-2. There are two expansion components (surveillance specimen holder tubes and lower grid shock pad bolts) in MRP-227-A Table 4-4 that are not applicable to ONS and have not been included in the ONS RV internals inspection Plan. Note that the ONS-1 inspection of primary components in 2012 did not require expansion and thus none of these components were inspected.

Table 12-2: ONS Expansion Components

Expansion Component	Examination Type
Alloy X-750 Dowel-to-Upper Grid Fuel Assembly Support Pad Welds	VT-3
Upper Thermal Shield (UTS) Bolts	UT
UTS Bolt Locking Devices	VT-3
Core Barrel Cylinder (Including Seam Welds)	Evaluation
Former Plates	Evaluation
Baffle-to-Baffle Bolts (Internal)	Evaluation
Baffle-to-Baffle Bolts (External)	Evaluation

Expansion Component	Examination Type
Core Barrel-to-Former Bolts	Evaluation
External Baffle-to-Baffle Bolt Locking Devices	Evaluation
Core Barrel-to-Former Bolt Locking Devices	Evaluation
Lower Grid Fuel Assembly Support Pad	VT-3
Lower Grid Fuel Assembly Support Pad-to Rib Section Welds	VT-3
Lower Grid Fuel Assembly Support Pad Alloy X-750 Dowel	VT-3
Lower Grid FA Support Pad Cap Screws and their Locking Welds	VT-3
Alloy X-750 Dowel-to-Lower Grid FA Support Pad Welds	VT-3
Lower Thermal Shield (LTS) Studs/Nuts	UT
LTS Studs/Nuts Locking Devices	VT-3

RAI #13:

Section 6.3 of ANP-2951, Rev. 2 discussed Applicant/Licensee Action Item 2 of the SE for MRP-227-A regarding whether Tables 4-1 and 4-2 in MRP-189, Rev. 1 and Tables 4-4 and 4-5 in MRP-191 have missed any RVI components that should be within the scope of the LR to support the current review. Commitment No.1 in Attachment 2 of the June 28, 2012, submittal specified the due date for addressing Action Item 2 as May 31, 2013. Please provide this information in response to this RAI, as the NRC staff needs it in order to make a decision on this license amendment.

Duke Energy Response:

Duke Energy is expediting this response in order to deliver this information to the NRC prior to the May 31, 2013 commitment date. Because the information requested contains AREVA proprietary information requiring the inclusion of affidavits, it will be sent separately from this submittal.

RAI #14:

Section 6.4 of ANP-2951, Rev. 2 discussed Applicant/Licensee Action Item 4 of the SE for MRP-227-A regarding whether the core support structure upper flange weld was stress relieved during the original fabrication of the RV in order to determine whether this RVI component item should be revised from Expansion Category to Primary Category. Commitment No.2 specified the due date for addressing Action Item 4 as February 29, 2013. Please provide this information in response to this RAI, as the NRC staff needs it in order to make a decision on this license amendment.

Duke Energy Response:

Fabrication records have been reviewed, and the upper core support structure to flange weld was stress relieved on all three Oconee Nuclear Station Units[8].

> ONS-1 internals were manufactured by Babcock & Wilcox (B&W). The stress relief documentation for the ONS-1 core support structure to upper flange weld was found and it was a thermal stress relief heat treatment at 850 °F for 48 hours.
>
> ONS-2 and ONS-3 internals were manufactured by Allis Chalmers and these detailed fabrication records were not found. However, some alternative information (B&W QADPs {Quality Assurance Data Packages}), B&W Specifications, Allis-Chalmers document packages, and B&W approved Allis-Chalmers process outlines) was located and used to evaluate the stress relief performed for those units assembled by Allis-Chalmers. Based on these records the core support structure to upper flange welds for the ONS-2 and ONS-3 RV Internals were also thermally stress relieved at 850 °F for 48 hours during original fabrication.

This RAI response completes Applicant/Licensee Action Item 4 of the SE for MRP-227-A regarding whether the core support structure upper flange weld was stress relieved during the original fabrication of the RV internals. Commitment No. 2 is now complete.

[8] ANP-3208P, Revision 0, "Confirmation of Stress Relief for Select ONS-1, ONS-2, ONS-3 and CR3 Reactor Vessel Internals Welds," March 2013.

RAI #15:

Section 2.5 of Appendix 0 of ANP-2951, Rev. 2 indicated that an operability assessment considering UT results and future LCB bolt failure was performed for Arkansas Nuclear One, Unit 1 (ANO-1). This section also revealed the technical elements addressed in this ANO-1 operability assessment. Confirm that if relevant conditions have been identified in the UCB or LCB bolts at any of the ONS units, an operability evaluation required by WCAP-17096, Rev. 2 will be performed consistent with the ANO-1 operability assessment and provided to NRC for review. To support evaluation of this potential future operability assessment, Reference 14 regarding minimum number of bolts required for operation shall also be provided at that time.

Duke Energy Response:

If relevant conditions are identified in the UCB or LCB bolts at any of the ONS units, an operability evaluation required by WCAP-17096, Rev. 2 will be performed. The recent internals examination at ONS-1 discovered crack-like indications on five lower core barrel bolts (discussed in response to RAI#1). An operability assessment for the next fuel cycle was performed. An operability assessment for operation beyond the next fuel cycle (consistent with ANO-1 operability assessment) will be prepared in 2014. Once that operability assessment is complete it will be available for review on site or submittal for information.