



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

June 26, 2018

MEMORANDUM TO: Steve Ruffin, Branch Chief
Piping and Head Penetration Branch
Division of Materials and License Renewal
Office of Nuclear Reactor Regulation

FROM: Stephen Cumblidge, Materials Engineer */ra/*
Piping and Head Penetration Branch
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Office of Nuclear Reactor Regulation

SUBJECT: RESPONSE TO PUBLIC COMMENTS ON DRAFT REGULATORY
ISSUE SUMMARY 2018-XX, "CLARIFICATION OF THE
REQUIREMENTS FOR REACTOR PRESSURE VESSEL UPPER
HEAD BARE METAL VISUAL EXAMINATIONS"

A notice of opportunity for public comment on the subject regulatory issue summary was published in the *Federal Register* (83 FR 10407) on March 9, 2018. Comments were received from Paul Donavin, on behalf of the American Society of Mechanical Engineers (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18130A567), Glenn White on behalf of Dominion Engineering, Inc. (ADAMS Accession No. ML18130A569), Craig Harrington on behalf of the Electric Power Research Institute (ADAMS Accession No. ML18130A575), and David P. Helker on behalf of Exelon Generation Co, LLC (ADAMS Accession No. ML18144A789). Enclosed are the NRC responses to all public comments.

Enclosure:
Analysis of Comments on Draft NRC Regulatory
Issue Summary 2018-XX, "Clarification of the
Requirements for Reactor Pressure Vessel
Upper Head Bare Metal Visual Examinations"

SUBJECT: RESPONSE TO COMMENTS ON DRAFT REGULATORY ISSUE SUMMARY
 2018-XX, "CLARIFICATION OF THE REQUIREMENTS FOR REACTOR
 PRESSURE VESSEL UPPER HEAD BARE METAL VISUAL EXAMINATIONS,"
 Date: June 26, 2018

ADAMS Accession No.: ML18178A140

*email concurrence

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**Analysis of Public Comments on
DRAFT REGULATORY ISSUE SUMMARY 2018-XX, “CLARIFICATION OF THE
REQUIREMENTS FOR REACTOR PRESSURE VESSEL UPPER HEAD BARE METAL
VISUAL EXAMINATIONS”**

Comments on the subject draft regulatory issue summary (RIS) are available electronically at the U.S. Nuclear Regulatory Commission’s (NRC’s) electronic Reading Room at <http://www.nrc.gov/reading-rm/adams.html>. From this page, the public can gain entry into Agencywide Documents Access and Management System (ADAMS), which provides text and image files of NRC’s public documents. Comments were received from the following individuals or groups:

Letter No.	ADAMS Accession No.	Commenter Affiliation	Commenter Name
1	ML18130A567	ASME	Paul Donavin
2	ML18130A569	Dominion Engineering, Inc.	Glenn White
3	ML18130A575	EPRI	Craig Harrington
4	ML18144A789	Exelon Generation Co, LLC	David P. Helker

This document lists each public comment by letter number. For each comment, the NRC has repeated the comment as written by the commenter followed by the NRC’s response. In some instances, the comment was broken down into segments for clarity. Each comment is referred to by letter number listed above and each comment from the corresponding letter.

Comment No.1-1

1-1: The consensus of the TGHSNA is that the RIS 2018-38 does not reflect the scope of ASME Code Case N-729-4 with respect boric acid deposits found during general visual examinations performed such as part of the boric acid program. Leakage from sources other than the scope of the Case should be resolved by the corrective action program. The Code Case words direct the user to determine to source of leakage and remove extraneous boric acid. The RIS 2018-38 restricts cleaning until the source of the leakage has been confirmed not to be from the head penetrations. Boric acid deposits from other sources are not considered relevant indications under the scope of N-729-4.

NRC Response

The NRC agrees and disagrees, in part, with the comment.

The NRC agrees that this RIS covers VE examinations conducted as per ASME Code Case N-729-4, and not for general VT-2 examinations. The NRC also agrees that leakage from sources other than the nozzle need to be corrected, as per -3142.3(a).

The statement “Boric acid deposits from other sources are not considered relevant indications under the scope of N-729-4.” is incorrect, however. Paragraph -3141(c) states “Relevant conditions for the purposes of the VE shall include evidence of reactor coolant leakage, such as corrosion, boric acid deposits, and discoloration.” Leakage from any source can produce relevant indications that require further evaluation. If a subsequent evaluation using light

cleaning or chemical analysis can preclude the source as nozzle leakage, then the relevant indications can be shown not to be relevant conditions indicative of possible nozzle leakage as per -3142.1(2).

No changes were made to the RIS as a result of this comment.

Comment No. 2-1

The first sentence in the second paragraph under "Summary of Issue" as written implies that "relevant conditions" at or near a nozzle annulus necessarily must be concluded to trigger supplemental examination per 3142.2 or nozzle repair per 3142.3(b). Instead, as stated in the first sentence of the next paragraph, 3142.1(b)(1) requires further evaluation to determine the source of the leakage. I suggest clarifying the first sentence in the second paragraph under "Summary of Issue" as follows:

*Consistent with the definition of "relevant conditions," areas of corrosion, boric acid deposits, or discoloration at or near a nozzle annulus in all cases, and irrespective of the material from which the affected components are fabricated, are **potentially** "relevant conditions **indicative of possible nozzle leakage**" according to ASME Code Case N-729-4, Subsections 3142.1(b) **and (c)**.*

NRC Response

The NRC agrees with the comment.

The sentence was revised to the following:

Consistent with the definition of "relevant conditions," areas of corrosion, boric acid deposits, or discoloration at or near a nozzle annulus in all cases, and irrespective of the material from which the affected components are fabricated are relevant conditions and need to be assessed to determine if they are relevant conditions indicative of possible nozzle leakage according to ASME Code Case N-729-4, Subsections 3142.1(b) and (c).

Comment No. 2-2

The final sentence (beginning "If the source of relevant condition of possible nozzle leakage cannot be determined ... ") in the third paragraph under "Summary of Issue" is unclear as written and may lead to unnecessary confusion. For example, the sentence confuses "relevant conditions indicative of possible nozzle leakage" with "relevant conditions" as defined in 3140 of the code case. The purpose of the further evaluation of the source of the leakage is to determine whether there are "relevant conditions indicative of possible nozzle leakage." In addition, the sentence should specifically cite 3142.3(b) as 3142.3(a) is applicable only if the further evaluation shows "relevant conditions not indicative of possible nozzle leakage." I suggest clarifying the final sentence in the third paragraph under "Summary of Issue" as follows (with suggested deletions shown using strike throughs):

*If the source of ~~relevant condition of possible nozzle~~ leakage cannot be determined by **examining the as-found condition of the relevant conditions (e.g., by assessment of boron deposit tenacity** using light cleaning methods or by **boron deposit** chemical analysis), ~~either because the boric acid deposits were tightly adhered to the surface, or because evidence of the relevant condition was removed by aggressive cleaning methods,~~ the requirements of*

*ASME Code Case N-729-4, Subsection 3142.2 or Subsection 3142.3(b) must be met. **Tightly adherent boron deposits not removed using light cleaning methods are evidence that the deposits formed during plant operation. Removal of deposits using aggressive cleaning methods without first examining the as-found condition precludes a meaningful further evaluation of the source of the leakage.***

NRC Response

The NRC agrees with the comment.

The section was revised to the following:

If leakage through a nozzle cannot be excluded by examining the as-found condition of the relevant conditions at a nozzle annulus (e.g., by assessment of boron deposit tenacity using light cleaning methods or by boron deposit chemical analysis), the requirements of ASME Code Case N-729-4, Subsection 3142.1, Subsection 3142.2, or Subsection 3142.3(b) must be met. Tightly adherent boron deposits at or near the nozzle annulus not removed using light cleaning methods are evidence that the deposits formed during plant operation. Removal of deposits at or near the nozzle annulus using aggressive cleaning methods without first examining the as-found condition precludes a meaningful further evaluation of the source of the leakage.

Comment No. 3-1

This paragraph of the draft RIS references relevant sections in the ASME Code Case under 3141 and 3142.

Code Case Section 3140 broadly addresses Inservice Visual Examinations (VE) and Section 3142 provides Acceptance criteria for Visual Examination findings. Three acceptance approaches are identified:

- *3142.1 - Acceptance by VE*
- *3142.2 - Acceptance by Supplemental Examination*
- *3142.3 - Acceptance by Corrective Measures or Repair/Replacement Activity*

However, the subject paragraph of the draft RIS only addresses acceptance under 3142.2 and 3142.3. Excluding discussion of acceptance by visual examination from this paragraph seems to imply a Code Case interpretation that a "relevant condition" cannot be dispositioned as "not indicative of nozzle leakage" under 3142.1, without resorting to non-visual supplemental examinations.

Recommendation: *Revise the draft RIS to acknowledge all three acceptance methods for dispositioning "relevant conditions" which are addressed within the Code Case.*

NRC Response

The NRC agrees and disagrees, in part, with the comment.

The NRC agrees that the section 3142.1 is not specifically addressed in the paragraph, and for clarification, a sentence can be added below. The NRC disagrees with the comment in that the subject paragraph already assumes that there is a relevant condition, therefore the paragraph already begins under the Acceptance by VE paragraph -3142.1(b), "A component whose VE

detects a relevant condition shall be unacceptable for continued service until the requirements of 3142.1(b)(1), (b)(2) **AND** [emphasis added] (c) below are met. Completion of the VE in paragraph -3142.1(b)(2) does not alleviate the licensee from the requirements of paragraphs -3142.1(b)(1) and (c).

The following sentence was added to the first paragraph to enhance clarity:

Subsection 3142.1(b)(1) of ASME Code Case N 729-4 states "Components with relevant conditions require further evaluation. This evaluation shall include determination of the source of the leakage and correction of the source of leakage in accordance with -3142.3."

Comment No. 3-2

Code Case Section 3140 generally addresses Inservice Visual Examinations and 3141(c) defines "relevant conditions" that require further evaluation. The determination whether a "relevant condition" is or is not "indicative of nozzle leakage" is made in accordance with guidance in 3142.1(b). This section invokes 3142.3 regarding correcting the source of any leakage, requires cleaning to allow adequate examination and evaluation of degradation, and invokes 3142.2 Supplemental Exams IF the VE indicates the relevant condition is "indicative of possible nozzle leakage".

However, in the draft RIS, the first sentence of the subject paragraph appears to directly conclude that any areas meeting the 3141(c) definition of a "relevant condition" are "relevant conditions of possible nozzle leakage" with reference to 3142.1(b). As described above, 3142.1(b) prescribes an evaluation process, it does not specify or imply the conclusion that all "relevant conditions" are "relevant conditions of possible nozzle leakage." This portion of the draft RIS appears to overstate and very conservatively interpret the referenced portion of the Code Case.

Recommendation: *Revise the draft RIS to clearly acknowledge that "relevant conditions" must be evaluated in accordance with the guidance in Section 3142.1(b) to determine whether the condition is or is not "indicative of possible nozzle leakage."*

NRC Response

The NRC agrees with the comment.

The second paragraph under the "Summary of Issue," section was revised to the following:

Consistent with the definition of "relevant conditions," areas of corrosion, boric acid deposits, or discoloration at or near a nozzle annulus in all cases, and irrespective of the material from which the affected components are fabricated are relevant conditions and need to be assessed to determine if they are relevant conditions indicative of possible nozzle leakage. The affected components are unacceptable for continued service until the requirements of Subsections 3142.1(b)(1), (b)(2), and (c) are met. An indication that some leakage may have come from a source other than a control rod drive nozzle does not remove the possibility that some or all of the leakage possibly came from a nozzle.

Comment No. 4-1

Under the second paragraph in the Summary of Issue section, the NRC states the following:

"An indication that the leakage may have come from a component not subject to the visual examination does not remove the possibility that some or all of the leakage possibly came from a nozzle. If the licensee fully removes the deposits using aggressive cleaning methods, such as high-pressure water/steam or power washing, an adequate examination and evaluation to determine the source of leakage is no longer possible."

Exelon is requesting further clarification concerning the use of aggressive cleaning methods after determining the leakage source. The statement above, as written, indicates that it would not be acceptable to use aggressive cleaning on the head after the leakage source has been identified to preclude future corrosion and provide a cleaner surface free of obstructions for future examinations. Exelon believes that it should be acceptable to leave the head in as clean a condition as possible post examination.

NRC Response:

The NRC agrees with this comment

The last sentence from the selection was removed and replaced later by:

Tightly adherent boron deposits at or near the nozzle annulus not removed using light cleaning methods are evidence that the deposits formed during plant operation. Removal of deposits at or near the nozzle annulus using aggressive cleaning methods without first examining the as-found condition precludes a meaningful further evaluation of the source of the leakage.

As a reminder, ASME Code Case N-729-4, Paragraph –3142(b)(2), requires that sufficient cleaning methods need to be used so that:

The boric acid crystals and residue shall be removed to the extent necessary to allow adequate examinations and evaluation of degradation, and a subsequent VE of the previously obscured surfaces shall be performed, prior to return to service, and again in the subsequent refueling outage.

Comment No. 4-2

Exelon requests that the NRC define "light cleaning methods." The use of this term in the draft RIS seems to be rather vague. Does this mean dry air only? Can water be used to clean the surface?

NRC Response:

The NRC agrees with the comment.

While the NRC staff agrees that additional guidance on cleaning methods and techniques for determining the source of leakage would be very helpful, a detailed description of cleaning

methods is beyond the scope of a RIS. A detailed description of how to satisfy the requirements of N-729-4 would require a regulatory guide, an industry guidance document, or a clarifications in future revisions of ASME Code Case N-729.

No changes were made to the RIS as a result of this comment.

Comment No. 4-3

...Exelon recognizes that leakage from above the reactor head that collects in the Control Rod Drive Mechanism (CRDM) nozzle annulus region could mask a leak from the nozzle itself. However, if it is very clear that the leakage has come from sources other than the nozzle, regardless whether a sample could be obtained for chemical analysis or not, the requirements of the Code Case N-729-4 to perform a subsequent Visual Examination (VE) of previously obscured surfaces after cleaning prior to return to service and again in the subsequent refueling outage (ASME Code Subsection 3142.1 (b)(2)) should be adequate to validate that the external leakage did not mask a nozzle leak. Operating Experience (OE) through the numerous reactor head examinations throughout the industry over the years has shown that the likelihood of a CRDM nozzle leak progressing from initial leakage to a critical flaw size that could lead to possible nozzle ejection is extremely low...

NRC Response:

The NRC disagrees with this comment.

Even in cases where there is evidence that some of the leakage may have come from another source, the wording of N-729-4 paragraph -3142(b)(2) states that "A nozzle whose VE indicates relevant conditions indicative of possible nozzle leakage shall be unacceptable for continued service unless it meets the requirements of -3142.2 or -3142.3." CRDM nozzles with masked conditions, even if there is evidence of leakage from another source, may still have relevant conditions indicative of possible nozzle leakage. The NRC would take evidence of leakage from another source into account when evaluating a proposed alternative under 10CR50.55a(z)(2).

No changes were made to the RIS as a result of this comment.

Comment No. 4-4

The draft RIS does not allow alternatives for new replacement reactor heads that contain corrosion resistant material. Exelon considers this interpretation to be particularly over conservative for replaced reactor heads made from Pressurized Water Stress Corrosion Cracking (PWSCC) resistant material (e.g., Alloy 690 material) where the likelihood of cracking developing in the nozzles or attachment welds is extremely low.

NRC Response

The NRC disagrees with the comment.

The RIS discusses the requirements of ASME Code Case N-729-4. ASME Code Case N-729-4 does not differentiate between susceptible materials and corrosion resistant material with regards to VE acceptance criteria. The NRC would take the resistant material into account when evaluating a proposed alternative under 10CFR50.55a(z)(2).

No changes were made to the RIS as a result of this comment.