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T. Shapallen

61 FR 40253

Aug. 1, 1996

(12)

Amersbrook Technical Center
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VIRGINIA POWER

October 4, 1996

Chief, Rules Review and Directives Branch
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Serial No. 96-076

Gentlemen:

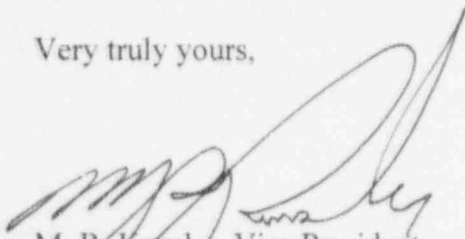
COMMENTS ON PROPOSED GENERIC LETTER:
PRIMARY WATER STRESS CORROSION CRACKING OF CONTROL ROD
DRIVE MECHANISMS AND OTHER VESSEL HEAD PENETRATIONS

On August 1, 1996, the NRC requested comments on the "Proposed Generic Communication; Primary Water Stress Corrosion Cracking of Control Rod Drive Mechanisms and Other Vessel Head Penetrations," (61 Fed. Reg. 40253, August 1, 1996).

We have reviewed the NRC proposed generic letter and fully endorse the Nuclear Energy Institute review comments provided in their letter dated September 30, 1996.

We appreciate the opportunity to make comments on this proposed generic letter. Should you have any additional questions, please feel free to contact us.

Very truly yours,


M. B. Kansler, Vice President
Nuclear Engineering & Services

Attachment

cc: Mr. Thomas E. Tipton
Vice President, Operations and Engineering
Nuclear Energy Institute
1776 Eye Street Suite 300
Washington, DC 20006-3706

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PDR I&E
MISC PDR

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(61FR40253)

October 3, 1996

Mr. David L. Meyer
Chief, Rules Review and Directives Branch
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Mr. Meyer:

Enclosed are Nuclear Energy Institute (NEI)¹ comments on the "Proposed Generic Communication; Primary Water Stress Corrosion Cracking of Control Rod Drive Mechanism and Other Vessel Head Penetrations," (61 Fed. Reg. 40253, August 1, 1996). These comments were developed by an NEI task force comprised of representatives from utilities, PWR Owners Groups and EPRI. Additionally, these comments were forwarded to the industry for consideration by individual utility licensees in developing plant-specific comments.

NEI will continue to coordinate industry activities in managing primary water stress corrosion cracking (PWSCC) of vessel head penetrations. This coordination will involve EPRI and the PWR Owners Groups to ensure that necessary information is evaluated and communicated to utilities to support their decisions to conduct inspections. NEI continues to believe that the decision to conduct inspections rests with individual utility management after due consideration of susceptibility, evidence of boric acid deposition and economic risk. As in the past, NEI will continue to meet with NRC staff to discuss inspection results as they relate to the Owners Group safety evaluations and inspection criteria, and the NRC's safety evaluation report. NEI believes this approach in managing this issue is appropriate and sufficient given the low safety concern. Therefore, NEI concludes that there is no technical or regulatory basis for this generic letter.

¹ NEI is the organization responsible for establishing unified nuclear industry policy on matters affecting the nuclear energy industry, including the regulatory aspects of generic operational and technical issues. NEI's members include all utilities licensed to operate commercial nuclear power plants in the United States, nuclear plant designers, major architect/engineering firms, fuel fabrication facilities, materials licensees, and other organizations and individuals involved in the nuclear energy industry.

Mr. David L. Meyer, Chief

October 3, 1996

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Comments relating to the general thrust of the draft generic letter are provided in Enclosure 1 and are summarized as follows:

- The draft generic letter essentially requests licensees to define and commit to an augmented inspection program. The stated purpose of the draft generic letter is to determine if augmented inspections are warranted. If augmented inspections are determined by NRC to be necessary, then such inspections should be based on the safety significance of the vessel head penetrations experiencing primary water stress corrosion cracking, not whether or not licensees are currently performing inspections.
- The NRC staff safety concerns have been addressed by the PWR Owners Groups' safety evaluations, which considered the possibility of through-wall cracks.
- The stated scope of the draft generic letter is primary water stress corrosion cracking. The resin intrusion at the Zorita Plant resulted in intergranular stress corrosion which is a different degradation mechanism. Since the Zorita resin intrusion was communicated to utility licensees by Information Notice 96-11, and new concerns have not been identified, it is not clear why the NRC staff is now requesting licensees to submit information on this topic.

Enclosure 2 provides detailed comments on the specific text of the proposed generic letter.

If you have questions concerning these comments, please contact Alex Marion (202-739-8080) or me.

Sincerely,

Ralph E. Beedle

TET/AM/ead

Enclosures

c: C. E. (Gene) Carpenter, C/NRR
Brian Sheron, NRC/NRR
Jack Strosnider, NRC/NRR

GENERAL COMMENTS ON THE DRAFT GENERIC LETTER

1. Items 1 and 2, in the Information Requested section, essentially requests licensees to define and commit to an augmented inspection program. The stated purpose of the draft regulatory guide is to evaluate whether or not an augmented inspection program is necessary. The justification for the augmented inspection should be based on the safety significance of the vessel head penetration's (VHP) experiencing primary water stress corrosion cracking, not if licensees are currently performing augmented inspections.
2. On Page 10 of NUREG/CR-6245, Assessment of Pressurized Water Reactor Control Rod Drive Mechanism Nozzle Cracking, it states, "There are two major safety concerns associated with CRDM nozzle cracking. First, a crack could eventually lead to a rupture of the nozzle and, if the nozzle is severed, to ejection of the connected CRDM housing. Second, a through-wall crack would allow the boric acid reactor coolant to come in contact with the vessel head and cause boric acid corrosion of the low-alloy steel base metal." In the NRC staff's safety evaluation dated November 19, 1993, it states, "The primary safety concern associated with stress corrosion cracking in Alloy 600 is the potential for circumferential cracks. Extensive circumferential cracking could lead to ejection of a CRDM." These safety concerns were considered by the PWR Owners Group safety evaluations submitted to and accepted by the NRC staff. The draft generic letter has not identified any safety concerns that were not previously evaluated and dispositioned. Summaries of these safety evaluations are contained in NUREG/CR-6245 and the NEI's white paper titled, "Alloy 600 RPV Head Penetration Primary Water Stress Corrosion Cracking."
3. The second paragraph of the Discussion section states that the goal of the draft generic letter is to "...verify that the margins required by the ASME Code as specified in § 50.55a of Title 10 of the Code of Federal Regulations (10 CFR 50.55a) are met, that the guidance of General Design Criterion 14 of Appendix A to 10 CFR Part 50 (10 CFR Par 50, Appendix A, GDC 14) is continued to be satisfied," These goals are unique and separate from the stated purpose of the first paragraph in the Required Information section which states; "The information requested in Items 1 and 2, below, is required to determine if the imposition of an augmented inspection program is required," Although not stated as such, the Discussions section appears to raise a question of compliance rather than determining if new regulatory requirements (augmented inspections per 10 CFR 50.55a(g)(6)(ii)) should be imposed. Utility licensees are presently in compliance with the requirements identified in the Discussion section based on the following:

- The design and fabrication of the reactor vessel heads satisfy all applicable ASME requirements.
- Only the welds that attach VHPs to the reactor head are within the scope of the inservice inspection requirements (ASME Section XI, Table IWB-2500-1, Examination Category B-E). As noted in NUREG/CR-6245, the VHP surface which could experience PWSCC is not expected to be within the scope of ASME inservice inspections. However, should inservice inspection identify indications, licensees will disposition them per the ASME Code.
- GDC-14 states, "The reactor coolant pressure boundary shall be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture."

Licensees are meeting GDC-14 because:

- The reactor vessel head was designed, fabricated, and erected to the ASME Code or other requirements approved by the NRC.
- The PWR Owners Group safety evaluations, accepted by the NRC staff (dated November 19, 1993), addressed the potential for rapid crack propagation, gross rupture and abnormal leakage. These evaluations determined that PWSCC would either be arrested or would grow very slowly requiring years to obtain a critical length. Axial cracks require many years to obtain critical length. Circumferential cracking requires through-wall leakage and will take significantly more time than the 40-year licensed operating period. One conservative circumferential cracking evaluation estimated that it would take in excess of 90 years before gross failure would occur.
- Licensees are presently performing GL 88-05 inspections to detect leakage that could occur during operation. If leakage is detected, repairs and corrective action will be performed. In addition, corrective action is required if leakage exceeds the Technical Specification criteria.
- This approach to GDC compliance is consistent with the leak-before-break criteria applied to other primary piping systems.

4. The Requested Information section asks licensees to summarize the inspections they have performed, define the inspections they plan to perform or justify why inspections are not being performed. The NRC staff witnessed the VHP inspections performed by licensees (five plants) and has received written reports on the results. Hence, this is a redundant request for those licensees who have already performed inspections and requests submittal of information that the NRC already has in its possession. In addition, the NEI white paper discussed the method by which licensees are managing this issue, i.e., future inspections will be performed based on information sharing, predictive methodologies and tools, inspection results, and development of mitigation and repair technologies.

5. The topic of the draft generic letter is "Primary Water Stress Corrosion Cracking of Control Rod Drive Mechanism and Other Vessel Head Penetrations." The inclusion of a different form of degradation (intergranular stress corrosion cracking due to resin intrusion) is not warranted. PWSCC of Alloy 600 is a time dependent degradation mechanism. Intergranular stress corrosion cracking due to resin intrusion is an abnormal operating event. Furthermore, of the over 5200 penetrations inspected worldwide, no evidence has been observed that suggests resin induced intergranular stress corrosion cracking has occurred in any reactor vessel other than Zorita. This is strong evidence that resin induced intergranular stress corrosion cracking is an outlier event that is not generic.
6. The NRC staff issued Information Notice (IN) 96-11, "Ingress of Demineralizer Resins Increases Potential for Stress Corrosion Cracking of Control Rod Drive Mechanism Penetrations," that advised licensees of the Zorita resin intrusion and potential intergranular stress corrosion cracking. It is unclear why the NRC has revised their position concerning a request for submitted information (Required Information, Item 3), since no additional resin intrusions concerns have occurred since IN 96-11 was issued. The extra burden on licensees to respond to Item 3 of the Required Information section is justified.

DETAILED COMMENTS ON THE DRAFT GENERIC LETTER

CMT #	SECTION	PARAGRAPH	COMMENT	CORRECTIONS
1.	General	--	It is unclear why the draft generic letter (GL) did not reference nor discuss in detail the evaluations and conclusions contained in NUREG/CR-6245. This document provides a balanced evaluation of the safety evaluations performed by the PWR Owners Groups.	It would be beneficial to contrast the conclusions of NUREG/CR-6245 to the draft GL's definition of "long-term safety concerns."
2.	General	--	The phrase "other vessel head penetrations" used throughout the draft generic letter should be clarified to read "other reactor vessel closure head penetrations".	Additional clarity may be gained if the phrase "other vessel head penetrations" is altered to read "other reactor vessel closure head penetrations."
3.	Background	1st	Figure 1 and text appear to only discuss CRDMs designed by Westinghouse.	A description of the CE and B&W penetration design features would be beneficial.
4.	Background	3rd	The first sentence states that in 1989 the emerging issue was identified, then the second sentence states leakage has occurred since 1986. This is not chronologically correct and is confusing.	A chronologically sequenced paragraph would be easier to understand.
5.	Background	4th	The Bugey-3 cracking was discovered in September 1991.	Proper dates should be used.
6.	Background	4th	In the second sentence, it states that the Japanese have "uncovered" VHPs with cracks. We are unaware of any available reference stating that the Japanese have detected PWSCC cracks in their VHPs. A source reference should be provided. It would be more precise to state that cracks were "detected" rather than "uncovered" in this paragraph and throughout the document's text.	Provide a reference or delete Japan from the list of countries which have identified PWSCC in their VHPs. Improved clarity would be achieved if the word "uncovered" is changed to "detected."
7.	Background	6th	Sub-item (3). NUREG/CR-6245 states that the leakage would be detected "long" before significant damage to the reactor vessel head would occur.	The draft GL and NUREG/CR-6245 would be consistent if the word "long" was added before the word "before."
8.	Background	6th	The last two sentences discuss manual NDE and do not relate to the remainder of the paragraph. The merits of manual NDE and automatic tooling are not the subject of the draft generic letter.	Delete the last two sentences from the paragraph.
9.	Background	7th	The purpose of the EPRI NDE demonstration was not to qualify tooling or operators, but was limited to the demonstration of an inspection system's ability to detect and size defects.	The EPRI activities would be better described if the term "qualification" was modified.
10.	Background	7th	This paragraph appears to justify the draft generic letter based on advances in inspection techniques rather than assess the safety significance of PWSCC. This implies that inspections	Delete this paragraph.

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CMT #	SECTION	PARAGRAPH	COMMENT	CORRECTIONS
			should be required because industry has voluntarily developed improved inspection methods. The paragraph should focus on safety concerns.	
11.	Background	8th	The description of the Zorita event could be more precise.	A more precise statement would be: "During the 1994 outage at Zorita (a Spanish reactor), visual inspection of the reactor vessel head discovered boron deposits on a single vessel head penetration. A more thorough inspection of this penetration detected a crack approximately two inches below the bimetallic weld. An extensive investigation and root cause evaluation were performed. It was determined that the indications were caused by intergranular stress corrosion cracking initiated by cation resin intrusion."
12.	Background	8th	The Zorita concern was primarily with the response of sensitized material attacked by reduced sulfur species.	It would be more precise to refer to "attack by sulfur species on sensitized materials."
13.	Background	8th	First sentence. Inspections at the Zorita Plant did not identify circumferential cracks in the J-groove weld, but found a through-wall crack at or near the bimetallic weld. In the third sentence, "resin bed" should be "resin bead." The text would be better understood if the measurements were provided in English as well as metric units, i.e., "liters" and "gallons."	These changes would provide factual clarity.
14.	Background	9th	It is our understanding that the NRC staff has Zorita resin intrusion reports and data that are not publicly available. It is difficult to assess the significance of the Zorita resin intrusion without all available information. In previous communications with the NRC staff, we have been told that these reports have been provided to all PWR Owners Groups. However, inquiries made to the PWR Owners Groups have not supported this. We request the NRC staff to place all information on the Zorita resin intrusion into the Public Document Room, and provide the opportunity for industry to evaluate.	Related reports and data should be made available.
15.	Background	9th and 10th	To maintain the chronological order of events, the 9th and 10th paragraphs should be switched.	Chronological order of these paragraphs would be beneficial.
16.	Background	10th	The draft generic letter does not discuss the recent VHPs re-inspections performed at Oconee and D.C. Cook, nor the VHP	It would be beneficial to document the most recent inspection activities and results.

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			repair at D.C. Cook.	
17.	Background	10th	The NRC states that they have not been provided with the WOG resin intrusion review. IN 96-11 does not require any specific action by licensees. Furthermore, Westinghouse NSAL-94-028 did not request licensees to provide a response back to Westinghouse and no WOG report has been prepared.	The statement in this paragraph should reflect the comment.
18.	Background	13th	The citation of Westinghouse, Framatome Technologies, and Combustion Engineering are incorrect. The citations should be the PWR Owners Groups; i.e., WOG, B&WOG, and the CEOG.	Use the correct citations.
19.	Background	14	This paragraph states that "(t)he program outlined in the NEI white paper is based on the assumption that the issue is an economic one rather than a safety issue,..." and that the NRC staff did not agree that the issue was only economic. This is not a correct interpretation of the NEI white paper. The white paper documents the extensive safety evaluations developed by the PWR Owners Groups which addressed all the safety concerns identified by the NRC staff. The method discussed in the white paper to manage RPV head penetration cracking acknowledges that the issue is not an immediate safety concern and that leak-before-break will occur. Using this knowledge, the management methodology discussed provides a four step approach; of which one step evaluates the economic considerations.	An appropriate statement would reflect the Section VII white paper text. It is the NRC staff's prerogative to disagree with positions taken in the white paper. However, the NRC staff should identify those safety concerns have not been addressed by the NRC approved PWR Owners Groups safety evaluations.
20.	Discussion	1st	The sentence starting, "Further, if any significant ..." is an absolute statement which has not been technically justified in this document nor the references. It would be technically correct if the sentence was revised to read, "Further, if any significant resin intrusions have occurred at U.S. plants such as occurred at Zorita, the resultant chemistry condition in combination with stress may be significant."	This change provides clarity.
21.	Discussion	2nd	The sentence which starts, "Cracking in the VHPs ..." is potentially misleading. While cracking has occurred in 116 of the 5146 penetrations inspected, it has not been observed in the large majority of VHPs. PWSCC is an age related degradation mechanism which could occur some time in the future, many years beyond the initial or renewed license or never.	A more precise statement would be "Cracking occurred in a few VHPs and could occur in others at some future time. An existing crack may continue to grow, but could stop."
22.	Discussion	2nd	The paragraph states that the NRC staff considers the cracking of VHPs to be a safety concern for the long-term based on the possibility of (1) exceeding the American Society of Mechanical Engineers (ASME) Code for margins if the cracks are sufficiently deep and continue to propagate during subsequent operating cycles, and (2) eliminating a layer of defense in depth	The PWR Owners Group safety evaluations addressed the safety concerns identified by NRC staff.

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			<p>for plant safety.</p> <p>These safety concerns are addressed by the PWR Owners Groups safety evaluations. These were summarized on Page 10 of NUREG/CR-6245, "Assessment of Pressurized Water Reactor Control Rod Drive Mechanism Nozzle Cracking," which states that "There are two major safety concerns associated with CRDM nozzle cracking. First, a crack could eventually lead to a rupture of the nozzle and, if the nozzle is severed, to ejection of the connected CRDM housing. Second, a through-wall crack would allow the borated reactor coolant to come in contact with the vessel head and cause boric acid corrosion of the low-alloy steel base metal..." In addition, the NRC staff's safety evaluation dated November 19, 1993, states that "The primary safety concern associated with stress corrosion cracking in Alloy 600 is the potential for circumferential cracks. Extensive circumferential cracking could lead to ejection of a CRDM..."</p> <p>Since the PWR Owners Groups safety evaluations evaluated a through-wall crack and ejection of the connected CRDM housing, it appears that the two long term concerns identified by the draft GL are less severe than those already evaluated.</p>	
23.	Required Information	1.2.a	The concept of scheduling augmented inspections is inconsistent with the concept of "long term safety concerns." Given that technical safety concerns have been addressed, requesting a "technical basis" for a schedule is unclear.	Provide clarity.
24.	Required Information	1.2.b	The required information is unnecessarily prescriptive (e.g., the direction of inspection (top or bottom) will not affect the quality of an inspection which a licensee may choose to perform, the presence of thermal sleeves, etc.)	Delete as this level of detail is not necessary.
25.	Required Information	2.	The first sentence states, "... include the susceptibility ranking of your plant and the factors used to determine this ranking." This phrase is redundant with the first part of the sentence which states, "A description of the evaluation methods and results used to assess the susceptibility of the CRDM and other VHPs in your plant to PWSCC, ..."	Delete the phrase "... include the susceptibility ranking of your plant and the factors used to determine this ranking."
26.	Required Information	2.	The susceptibility models were not used as input to the PWR Owners Groups safety evaluations that were submitted and approved by the NRC staff. The susceptibility models and subsequent rankings may be used by licensees to make economic	Since it is not possible to make a safety determination with the susceptibility rankings, this paragraph should be deleted.

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CMT #	SECTION	PARAGRAPH	COMMENT	CORRECTIONS
			evaluations, but are not sufficiently precise to be used in a safety assessment that may be submitted to the NRC staff. In addition, it is unclear how the NRC staff will use such models to evaluate a safety concern.	
27.	Required Information	2.	<p>This requested information implies that the GL 88-05 visual inspection is inadequate to detect boric acid deposits and which could be caused by PWSCC. This implication is not supported by operating history and safety evaluations:</p> <ul style="list-style-type: none"> • The only through-wall VHPs cracks (Bugey and Zorita) were detected by visual inspections. • GL 88-05 visual inspections are considered acceptable for detecting PWSCC in the remainder of the reactor coolant system. • A conservative definition for "long term safety concern" implied by NUREG-CR-6245 would infer a minimum of nine years after the initiation of a PWSCC through wall leak. Boric acid deposited over this time period would be readily observed using the GL 88-05 visual inspections. 	Boric acid deposits will be identified by the visual inspections recommended in Generic Letter 88-05.
28.	Required Information	3.	The intergranular stress corrosion cracking resulting from a Zorita type resin intrusion is a different mechanism than the primary water stress corrosion cracking (PWSCC). The resin intrusion cracking is a degradation mechanism caused by an abnormal operating event and is not a age-related degradation mechanism like PWSCC. Furthermore, the predictive tools for PWSCC are not capable of predicting resin intrusion. It is noted that the VHP inspections performed on over 5200 penetrations at 87 plants worldwide did not identify any other plant that exhibited intergranular stress corrosion cracking similar to that exhibited at Zorita.	The resin induced intergranular stress corrosion cracking is different than the stated scope and should be deleted.
29.	Required Information	3.4	The draft generic letter has not provided a basis for supplying information on chlorides, fluorides, oxygen, boron, or lithium. The Zorita experience has been linked to the sulfates, but to our knowledge the other chemistry species have not been linked.	Delete.