PUBLIC SUBMISSION

As of: May 20, 2014
Received: May 19, 2014
Status: Pending_Post
Tracking No. 1jy-8c6l-z3dp
Comments Due: May 19, 2014
Submission Type: Web

Docket: NRC-2014-0085
Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components

Comment On: NRC-2014-0085-0001
Licensing Applications: Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components

Document: NRC-2014-0085-DRAFT-0002
Comment on FR Doc # 2014-08794

Submitter Information

4/17/2014
79FR 21812
(2)

Name: Tim Hardin
Submitter's Representative: Anne Demma
Organization: Electric Power Research Institute

General Comment

See attached file(s)

Attachments

MRP 2014-015

EPRI | ELECTRIC POWER RESEARCH INSTITUTE

MRP Materials Reliability Program MRP 2014-015

May 19, 2014

Cindy Bladey
Chief, Rules, Announcements, and Directives Branch (RADB)
Office of Administration
Mail Stop: 3WFN, 06-44M
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: EPRI Comments Pertaining to DRAFT NRC Regulatory Issue Summary 2014-XX, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," April 10, 2014, Docket ID NRC-2014-0085

Reference: Federal Register Number 2014-08794.

In the referenced document, the U.S. Nuclear Regulatory Commission (U.S. NRC) requested public comment on the subject DRAFT NRC Regulatory Issue Summary 2014-XX, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," April 10, 2014. The comments in the Attachment have been prepared by the Electric Power Research Institute.

Thank you for the opportunity to comment on the draft RIS 2014-XX. If you should have any questions concerning this letter, please contact Tim Hardin (thardin@epri.com).

Sincerely,

Anne Demma
Program Manager, MRP
Electric Power Research Institute
ademma@epri.com

Attachment: EPRI Comments on DRAFT NRC Regulatory Issue Summary 2014-XX, "Information on Licensing Applications for Fracture Toughness Requirements for Ferritic Reactor Coolant Pressure Boundary Components," April 10, 2014

cc: Tim Hardin, EPRI
Robert G. Carter, EPRI
Mark Richter, NEI

ATTACHMENT

EPRI COMMENTS ON
DRAFT NRC REGULATORY ISSUE SUMMARY 2014-XX, "INFORMATION ON LICENSING APPLICATIONS FOR FRACTURE TOUGHNESS REQUIREMENTS FOR FERRITIC REACTOR COOLANT PRESSURE BOUNDARY COMPONENTS," APRIL 10, 2014

NON-PROPRIETARY

1. "Background Information," third sentence: "Reactor vessel material toughness is monitored using P-T limits and Charpy upper shelf energy."

   EPRI COMMENT #1: Reactor vessel material toughness is not "monitored" using P-T curves. Reactor vessel material toughness is monitored by the reactor vessel material surveillance program required by 10CFR50 Appendix H. The results of the surveillance program are used in the determination of the P-T curves. The purpose of the P-T curves is to limit vessel pressure at any given temperature, not to monitor toughness. Recommend revising this sentence as follows: "Reactor vessel material toughness is monitored using Charpy transition temperature shift and Charpy upper shelf energy."

2. Page 2 of 5, last paragraph[1], beginning "10 CFR Part 50, Appendix H, ...", last sentence, "Therefore, the fracture toughness requirements of 10 CFR Part 50 Appendix G for the reactor vessel beltline are applicable to the reactor vessel materials with projected neutron fluence values greater than 1 x 10^{17} n/cm^2 (E > 1 MeV) at the end of the operating period."

   EPRI COMMENT #2.a: This statement is inaccurate. The fracture toughness requirements of 10 CFR Part 50 Appendix G are applicable to all ferritic components of the reactor coolant pressure boundary; fluence is not a criteria. Therefore the fracture toughness requirements of 10 CFR Part 50 Appendix G would be applicable to the reactor vessel beltline even if the projected neutron fluence were less than 1 x 10^{17} n/cm^2 (E > 1 MeV) at the end of the operating period.

   EPRI COMMENT #2.b: The paragraph that culminates with this statement attempts to establish that the regulations (10 CFR 50 Appendices G and H) define the beltline as materials with projected neutron fluence values greater than 1 x 10^{17} n/cm^2 (E > 1 MeV) at the end of the operating period . The logic used to reach this conclusion is not supported by the regulations. The fact that 10 CFR 50 Appendix H does not require a surveillance program for vessels in which the peak neutron fluence at the end of the design life of the vessel will not exceed 10^{17} n/cm^2 (E > 1 MeV) does not constitute a definition of beltline; it is simply the threshold criteria for requiring a surveillance program. 10 CFR 50 Appendix H does not define beltline at all; instead, Appendix H Para. II, "Definitions", states,

[1] In these comments, all descriptions of text locations in the draft RIS (e.g., page numbers, paragraph numbers) reference the version of the draft RIS provided as ML13301A188.

"All terms used in this Appendix have the same meaning as in Appendix G." Therefore, Appendix H adopts the same definition of beltline as Appendix G, which is,

> "Beltline or Beltline region of reactor vessel means the region of the reactor vessel (shell material including welds, heat affected zones, and plates or forgings) that directly surrounds the effective height of the active core and adjacent regions of the reactor vessel that are predicted to experience sufficient neutron radiation damage to be considered in the selection of the most limiting material with regard to radiation damage."

There is no stipulation of fluence level in that definition. RECOMMENDATION: Change the last sentence on page 2 of 5 to the following: "Therefore, the NRC Staff have traditionally interpreted the regulations as implying that the fracture toughness requirements of 10 CFR Part 50 Appendix G for the reactor vessel beltline are applicable to the reactor vessel materials with projected neutron fluence values greater than 1×10^{17} n/cm^2 (E > 1 MeV) at the end of the operating period."

3. Page 3 of 5, third paragraph, second sentence, "Nevertheless, addressees must still be able to demonstrate that the P-T limits in license amendment requests and PTLRs developed for the plant do, in fact, bound all ferritic components of the reactor coolant pressure boundary as required by section I of 10 CFR Part 50, Appendix G."

EPRI COMMENT #3: Here and throughout the RIS, the assertion is made that 10 CFR 50 Appendix G requires P-T limits to bound all ferritic components of the reactor coolant pressure boundary, but 10 CFR 50 Appendix G establishes no such requirement. Therefore, these statements, where they appear throughout the RIS, should be revised.

As noted in the RIS, 10 CFR 50 Appendix G, Section I, states that the appendix "...specifies fracture toughness requirements for ferritic materials of pressure-retaining components of the reactor coolant pressure boundary of light water nuclear power reactors to provide adequate margins of safety during any condition of normal operation, including anticipated operational occurrences and system hydrostatic tests, to which the pressure boundary may be subjected over its service lifetime." Section I does not define what the fracture toughness requirements are; those are defined in Section IV, Fracture Toughness Requirements, which states, "The pressure-retaining components of the reactor coolant pressure boundary that are made of ferritic materials must meet the requirements of the ASME Code, supplemented by the additional requirements

set forth below, for fracture toughness during system hydrostatic tests and any condition of normal operation, including anticipated operational occurrences." Therefore, all pressure-retaining components of the reactor coolant pressure boundary (RCPB) must (1) meet the requirements of the ASME Code and (2) the additional requirements below. Those "additional requirements set forth below" are:

1. Reactor Vessel Charpy Upper-Shelf Energy Requirements, and
2. Pressure-Temperature Limits and Minimum Temperature Limits.

It should be noted that the ASME Code does not require P-T limits for the entire ferritic RCPB. Therefore, for the RIS to be correct, the requirement for P-T curves to bound the entire ferritic RCPB must be embedded in one of the two additional requirements. However, both of the additional requirements listed above are specific requirements for the pressure vessel. The Charpy upper-shelf energy requirements are specific for the vessel beltline materials. The scope of the second requirement (P-T limits and minimum temperature requirements) is likewise established in the first sentence IV.A.2.a: "Pressure-temperature limits and minimum temperature requirements for the reactor vessel are given in table 1, and are defined by the operating condition (i.e., hydrostatic pressure and leak tests, or normal operation including anticipated operational occurrences), the vessel pressure, whether or not fuel is in the vessel, and whether the core is critical." Table 1 is entitled "Pressure and Temperature Requirements **for the Reactor Vessel**" [emphasis added]. All discussion in 10 CFR 50 Appendix G, IV.A.2, "Pressure-Temperature Limits and Minimum Temperature Requirements" is specific to the vessel; there exists no statement extending those requirements to the entire ferritic RCPB.

There is no basis in regulation for the RIS statements that P-T limits must bound all ferritic components of the RCPB. Saying that Section I of 10 CFR 50 Appendix G extends the requirement for P-T to the entire ferritic RCPB is as inaccurate as saying that Section I extends the requirement for minimum 102 J Charpy upper shelf energy to the entire ferritic RCPB.

4. Page 3 of 5, last paragraph

EPRI COMMENT #4: The RIS states the expectation that components other than the reactor vessel should be accounted for in P-T curves but provides insufficient insight on how this is demonstrated for ferritic components outside the reactor vessel. The example (ML120820510) cited in the RIS does not provide any insight for how a plant which has ferritic piping components can satisfy the perceived requirements; nor, more specifically, how a plant which has ferritic piping components that were designed, specified, or fabricated prior to the

adoption of the ASME III and 10 CFR 50 Appendix G rules introduced in 1972-73 can satisfy the perceived requirement.

5. Page 3 of 5, last paragraph, last sentence: "Such responses are consistent with licensees' understanding that has been communicated to NRC in the past (e.g., refer to page 5-8 of EPRI Report No. NP-5172-SR, Revision 1, "Primer: Fracture Mechanics in the Nuclear Power Industry," May 1991[3])."

   EPRI COMMENT #5a: The purpose of the reference to the EPRI report, page 5-8, is unclear. Page 5-8 discusses P-T limits for the vessel only and does not appear to support the contention in the RIS that 10 CFR 50 Appendix G P-T limits apply to the entire ferritic RCPB.

   EPRI COMMENT #5b: The EPRI report number is incorrect. The correct report number which will locate the report on the EPRI website is NP-5792-SRR1.

6. Page 4 of 5: "Summary of Issue", first sentence: "Some recent licensee submittals pertaining to **reactor vessel P-T limits** [emphasis added] have lacked sufficient demonstration that all ferritic materials of the reactor coolant pressure boundary were addressed in accordance with the requirements of 10 CFR Part 50 Appendix G."

   EPRI COMMENT #6: There is no requirement in 10 CFR 50 Appendix G or ASME Section XI Appendix G that P-T limits for the reactor vessel must bound all ferritic components of the reactor coolant pressure boundary (RCPB). Neither 10 CFR 50 Appendix G nor the RIS provide any guidance on how a licensee can address the Staff's desire that P-T limits address the entire ferritic RCPB. These observations suggest that major revisions to this draft RIS are necessary.