

From: [Brian Smith - NRR](#)
To: [David Rudland](#)
Cc: [Bernie Thomson](#); [Sunil Weerakkody](#); [Matthew Leech](#); [Matthew Mitchell](#); [Mike Franovich](#); [Meena Khanna \(She/Her/Hers\)](#)
Subject: RE: LIC-504, French PWR ECCS Cracking - No immediate action required
Date: Monday, May 29, 2023 2:31:06 PM

Thanks for the information. I agree with your determination and look forward to seeing the final report.

From: David Rudland <David.Rudland@nrc.gov>
Sent: Friday, May 26, 2023 12:22 PM
To: Brian Smith - NRR <Brian.Smith@nrc.gov>
Cc: Bernie Thomson <Bernie.Thomson@nrc.gov>; Sunil Weerakkody <Sunil.Weerakkody@nrc.gov>; Matthew Leech <Matthew.Leech@nrc.gov>; Matthew Mitchell <Matthew.Mitchell@nrc.gov>
Subject: FW: LIC-504, French PWR ECCS Cracking - No immediate action required

Brian

As part of the LIC-504 process, a determination if immediate regulatory action is needed was made by the team. DRA staff provided the initial analysis below and determined no immediate action is required. This is my formal communication to you on this determination. I will upload this email chain to ADAMS and will reference it in the final LIC-504 report.

Just for your info, the team is still working on the analyses to determine recommended actions in response to this OE. Our plan is still to have the analyses and recommendation finalized by the end of July.

Let me know if you have any questions.

Thanks
Dave

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From: Matthew Leech <Matthew.Leech@nrc.gov>
Sent: Friday, May 26, 2023 11:51 AM
To: David Rudland <David.Rudland@nrc.gov>
Subject: LIC-504, French PWR ECCS Cracking - No immediate action required

David,

Guidelines contained in NRR Office Instruction, LIC-504, revision 5 (ML19253D401) mention that the basis for deciding whether immediate regulatory action is needed or not should be documented within one month and placed ADAMS. LIC-504 mentions that the determination should be made with quantitative or qualitative information that demonstrates that the issue does not reach the thresholds contained in LIC-504 for immediate action (which is a CCDF of 1×10^{-3} /year or CLERF does not exceed 1×10^{-4} /year).

The PRA Operations Branch (APOB) of the Division of Risk Assessment has evaluated the issue of stress corrosion cracking (SCC) found in welds of the safety injection systems of French reactors. It is our conclusion that the risk significance does not justify any immediate action at this time. This conclusion was made qualitatively based on the best available information to us at this time. At this point in the process APOB has not been provided with information from engineering that would help inform how to adjust the initiating event frequencies for loss of coolant accidents (LOCA) for this issue, which is why this evaluation was based on qualitative considerations. The basis for the conclusion is summarized below.

- Although the French have found significant cracking in some of their Emergency Core Cooling Systems (ECCS), no similar issues have been found in U.S. reactors at this point.
- The French reactor designs in which SCC has been found are predominantly in French PWR designs modified by Framatome, that are not the same design as U.S. reactors and are of higher power/MWe.
- Only limited SCC has been found in designs similar to 4 loop Westinghouse PWRs. These French reactors are rated at about 1300 MWe (U.S. 4 loop reactors are of a lower power) and the French have determined these reactor designs are not highly sensitive to inter-granular SCC in their ECCS. The smaller MW French reactors (900 Mwe) that are based on Westinghouse 3 loop designs have been found to not be

sensitive to inter granular SCC.

- Operating experience from U.S. pressurized water reactors has shown that SSC of 316 stainless steel is unlikely without significant abnormal conditions.
- The staff has not identified specific instances of similar cracks at these locations in the U.S. and has found limited cracking in stainless steels in pressurized water reactor environments.
- Per ASME Section XI, as incorporated by reference in 10 CFR 50.55a, these piping locations in the U.S. are typically inspected on a 10-year in-service inspection interval with a 25% sampling per interval. If a licensee has an approved risk-informed inspection program, these welds may be part of a 10% sampling program.
- APOB considered the redundancy of ECCS design as part of our determination. Although the flaws found in French reactors have been found in un-isolable locations of the ECCS, there is redundancy since the ECCS systems have multiple injection lines and multiple system trains. A plant can experience a LOCA in one of the ECCS lines and still receive adequate core cooling from other loops.
- From a containment or LERF standpoint, there would not be a specific concern since the initiating event of concern is LOCAs in PWRs with robust containments. IMC 0609, Appendix H, Containment Integrity Significance Determination Process, normally would screen issues related to LOCAs as low risk in regards to containment integrity / LERF.

Please let me know if you have any questions. As you know, the LIC-504 for this issue is continuing.

Matthew Leech
Reliability and Risk Analyst
NRR/DRA/APOB