

MRP-227, Rev. 1 Core Barrel Weld Coverage NRC Concerns

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Background

- In MRP-227, Rev. 1, visual (EVT-1) examination coverage requirement has been reduced from 100% of accessible (75% minimum accessible + inaccessible) to 25% of weld length (RAI 5)
- MRP-227, Rev. 1 also recategorized several core barrel girth welds from Primary to Expansion.
- EPRI provided additional information to support this change in January 30 RAI response and May 31 supplemental response.

Technical Justification Elements

- Using a simple calculation of probability, EPRI showed:
 - High probability of detecting either multiple, evenly distributed cracks in a single weld or single cracks in multiple weld examinations.
- OE showed no evidence of cracking in core barrel welds, prior to Spring 2018 CE plant.
- Design of RVI maintains capability for safe shutdown even with complete core barrel girth weld failure.

NRC Concern: Likelihood of Missing Flaw

- Critical flaw sizes for highly irradiated girth welds are small, and could easily be missed on a plant-specific weld examination.
- It is difficult to ensure that the most likely location(s) to have cracking would be in a 25% sample, due to uncertainties regarding stresses and repair locations.
- In neutron panel plants, panels are located in highest fluence areas and block access to regions where flaws may be most likely.

NRC Concern: Functionality

- Functionality discussion assumes RVI components other than the core barrel welds remain intact in a design basis event.
- Aging of other components relied upon to maintain core barrel alignment could make these more likely to fail in a DBA
- This could lead to a higher degree of misalignment than was simulated in the rod drop tests.
- Although functionality description is convincing, for defense in depth staff would prefer not to depend on a system that has never been tested in a full-scale test.

NRC Concern: Large Reduction in Weld Length Examined

- Considering both the reclassification of welds and the reduction in coverage, total weld length examined decreases by a factor of 6.
 - $75\% \text{ of } 4 \text{ welds} / 25\% \text{ of } 2 \text{ welds} = 6$

Summary: Remaining NRC Concerns

- Recent OE has shown cracking of core barrel/core support barrel welds is plausible, rather than just hypothetical;
- The rod drop tests may not be bounding considering the potential for failure of RVI components in addition to the core barrel during a DBA;
- It is difficult to ensure the 25% sample would include the most likely regions of the girth weld to have cracking, considering uncertainties in stresses, repair locations, and the inaccessibility of the highest fluence regions for neutron panel plants;
- On a plant-specific basis, there is a high probability that a structurally significant flaw (for faulted conditions) could be missed by a 25% examination.

Summary

- NRC is considering a condition in the SE to require coverage $> 25\%$ for the initial (baseline) core barrel girth weld examination.
- NRC is less concerned about subsequent examinations because cracking is more likely to initiate earlier in life, plus additional OE will be accumulated by the subsequent examination date.