Supporting Extended Fleet Life Through Integrated Surveillance Programs

Summary

Material surveillance programs can provide the data and information to satisfy aging management commitments during license renewal periods. Initial emphasis has been in the United States and has focused on boiling water reactor life extension beyond 60 years, but the concept could be extended to other reactor types, to other countries, and conceptually to operation beyond 80 years.

Example – Member Application

A U.S. utility offered a BWR plant to be the host plant for installation of a surveillance capsule to obtain accelerated fluence exposure. This is a key element of a plan that EPRI developed and gained regulator approval to extend BWR reactor vessel radiation embrittlement surveillance and address aging management commitments related to subsequent license renewal. The surveillance capsule will be irradiated for 12 years and withdrawn in fall 2035 followed by sample preparation (reconstitution), testing and evaluation of the high radiation effects on the embrittlement of the RPV steel specimens.

Background

The BWRVIP integrated surveillance program has been implemented by all U.S. BWRs to meet the requirements of 10 CFR 50 Appendix H and the Generic Aging Lessons Learned (GALL) report NUREG-1800 for license renewal and the GALL-SLR report NUREG-2191 for subsequent license renewal. As BWR plants consider license extension beyond 60 years (subsequent license renewal), additional surveillance data is needed to demonstrate that these plants will continue to be able to meet these requirements. The same approach may be applicable to other reactor types and in other regulatory jurisdictions.

APPLICABILITY

U.S. boiling water reactor plants initially, but could be extended

VALUE

Regulator-approved approach for aging management that **enables subsequent license renewal**.

EPRI PROGRAM

BWRVIP

EPRI's Role

EPRI developed and obtained NRC approval for the plan to extend the Integrated Surveillance Program (ISP) into the subsequent license renewal period of extended operation. Further, EPRI funded and provided overall project management for all aspects of this nuclear quality assurance (NQA) project, including conceptual design, testing, final design and fabrication of the specimen inserts, packets, and packet holder, which were performed by multiple qualified contractors. EPRI was also involved in the qualification of the surveillance capsule final configuration, processes, procedures, training, final assembly and installation at Constellation's Peach Bottom station.

A specially designed surveillance capsule was installed in the site RPV by attaching it directly to the core shroud outer surface to obtain accelerated fluence exposure (compared to the RPV). Installation of the surveillance capsule was the key element of an NRC-approved plan to extend the BWRVIP reactor vessel radiation embrittlement surveillance plan to address subsequent license renewal, as detailed in EPRI report BWRVIP-321, Revision 1-A (3002026169).

Value

Installation of the surveillance capsule was a key milestone for extending the BWRVIP ISP to address subsequent license renewal and saves plants from needing to conduct their own, plant-specific surveillance capsule testing or provide data using alternative approaches. With the approved extension of licenses for SLR, and the successful installation of the surveillance capsule in the host BWR, U.S. BWR plants can credit the BWRVIP ISP in their SLR application to demonstrate continued compliance with 10 CFR 50 Appendix H and for addressing the GALL-SLR report (NUREG-2191).

The methodology could potentially be duplicated in other countries to satisfy regulatory commitments and support license extension.

Resources

- 3002026169, *BWRVIP-321, Revision 1-A, BWR Vessel and Internals Project: Plan for Extension of the BWR Integrated Surveillance Program (ISP) Through the Second License Renewal (SLR)*
- 1025144, *BWRVIP-86, Revision 1-A: BWR Vessel and Internals Project, Updated BWR Integrated Surveillance Program (ISP) Implementation Plan*
- Support from EPRI subject matter experts

IMPLEMENTATION GUIDANCE

U.S. BWR plants can credit the BWRVIP ISP in their SLR application to demonstrate continued compliance with 10 CFR 50 Appendix H and for addressing the GALL-SLR report (NUREG-2191). BWR owners/operators in other countries may want to assess their approach for assessing material behavior under high radiation conditions (simulating life extension) and whether their regulator would be open to an integrated surveillance approach.

EPRI is available to support discussions if necessary. The approach also may be applicable to support life extension for PWRs and other reactor types, although additional evaluation would be needed.

To support more effective technology transfer, EPRI is tracking implementation of key R&D activities.

Please access this link to provide input on your company's use of this particular research:

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