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R-336

PRECONDITIONING OF PWR STEAM GENERATORS TO REDUCE RADIATION BUILDUP

Keywords: CONTAMINATION PREVENTION; STEAM GENERATOR;
RADIATION BUILDUP; REACTOR MATERIAL; INCONEL

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Objectives: Examine potential passivation (preconditioning) techniques to determine which form the most stable oxides on alloys used in PWR replacement steam generators, thus reducing corrosion-product rates to the primary coolant.

Comments: Inconel 600 and Inconel 690, the most common steam generator tubing alloys, were chosen for the study along with type 316 stainless steel. Samples were preoxidized under a variety of conditions thought to form adherent, stable oxides. They were then activated and placed in an experimental water-circulating loop. The test facility simulates PWR primary conditions within well-controlled chemistry limits. On-line instrumentation, filters, and resin (ion-exchange) columns collected corrosion products or detected their movement as a function of running time and other key parameters.

Study results were disappointing. At the start of the tests, corrosion release rates differed for samples preoxidized under different conditions. But after 2,000 hours, release rates were reduced, and there were no discernible differences among samples. Preoxidized specimens released more corrosion products than those tested in the unpassivated condition, indicating that reducing conditions should be used. In all cases with Inconel 690, release rates were lowest at pH 7.2-7.4

Remarks/Potential for dose limitation: This study relates only to release of corrosion products, and its results apply only to PWR chemistry. Studies of the effects of preoxidation on deposition of activated corrosion products are described in EPRI reports NP-6616 and TR-100059. Prefilming replacement components for BWRs is more beneficial because deposition is reduced under oxidizing chemistry.

The results do support experience in other countries showing that for PWR startups -- which include hot functional tests and the presence of normal reactor coolant chemicals (LiOH and boric acid) -- the coolant must be deaerated and hydrogen added as early as possible.

References: EPRI TR-100217, Final Report, August 1992, 60 pages.

Duration: from: 1991 to: 1992

Funding: N/A

Status: Completed

Last Update: October 28, 1992