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EFFECT ON ZIRCALOY CLAD CORROSION OF ELEVATED LITHIUM OPERATION AT THE MILLSTONE 3 PWR

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Principal Investigator:

M. Polley
Nuclear Electric
Barnett Way
GLOUCESTER GL4 3RS
UNITED KINGDOM
Phone: 1452 653874

Project Manager:

H. Ocken
EPRI
3412 Hillview Ave.
P.O.Box 10412
Palo Alto, CA 94303
Phone: (415) 855-2000

Objectives: To investigate the effect of elevated lithium operation on zircaloy cladding. Laboratory tests show that high concentration of lithium in the primary coolant increases cladding corrosion. As more PWR plants move to higher burn-ups and extended 18 and 24 month cycles, there is continuing interest in determining whether operation above 2.2 ppm lithium leads to lithium enhancement of oxide thicknesses on Zircaloy-4 fuel cladding.

Comments: Four methods of analyzing oxide thickness data have been employed. Three methods involved comparing oxide thickness during different periods of Millstone 3 operation (coordinated or elevated lithium regimes). One of these involved graphical comparisons of oxide thicknesses versus burn-up, and the other two involved comparing measured/predicted oxide thickness ratios using predications from two different corrosion models, neither of which include lithium effects. Rationing measurements to predictions factors out, as far as possible, the major dependencies on clad wall temperature, heat flux and exposure time, enabling any other effect to be revealed more clearly. The fourth method was a comparison of measured/predicted oxide thicknesses at Millstone 3 with those from coordinated chemistry operation at the North Anna 1 PWR.

Remarks: From all four methods no significant increase in oxide thickness, from operating elevated lithium chemistry at Millstone 3, can be concluded. From all four methods mean oxide thickness on Millstone 3 exposed to elevated lithium chemistry were lower on average than oxide thickness exposed to coordinated chemistry or mixed chemistry at Millstone 3. It was concluded that this difference was not due to coolant chemistry but to some other factors.

References: Polley, M.V., "Update on Effect on Zircaloy Clad Corrosion of Elevated Lithium Operation at the Millstone 3 PWR," Proceedings, EPRI Radiation Field Control and Chemical Decontamination Seminar, Tampa, Florida, November 1995, EPRI Distribution Center, P.O.Box 23205, Pleasant Hill, CA 94532.

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