

Challenges in Achieving Extended Lifetimes of Structural Materials in Commercial Nuclear Power Plants

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ABSTRACT

This talk summarizes light water reactors (LWRs) structural materials, their historical degradation evolution vs. time, improvements and subsequent vulnerabilities identified, and possible future degradation phenomena over extended operating times. 50+ years ago, not much was understood about degradation in high temperature water, and reasonable but inadequate judgments were made on structural materials based partly on simple, short term tests and partly on intuition of low temperature corrosion phenomena. Steady improvements in structural materials occurred, especially over the first twenty years of LWR experience, but degradation continues and is managed by inspection, mitigation and replacement. There are concerns for new forms of degradation and aging synergies that accelerate the kinetics of known degradation phenomena. There is also a decline in expertise, funding and historical conservatism that may challenge the ability to manage and mitigate degradation.