

## ***EPR Releases Coordinated Updates to its Chemistry and Fuel Reliability Guidelines***

***The coordinated effort promises to drive improved nuclear plant performance because of the unique interrelationship between fuel and water chemistry.***

Nuclear plants around the world rely on EPR's water chemistry and fuel reliability guidelines to inform safe, reliable operation. These guidelines are periodically reviewed to address operating experience and the results of ongoing research. Because many chemistry-related requirements are contained in the fuel reliability guidelines, it became clear that consolidation of these requirements into the appropriate chemistry guideline was needed. In 2012, therefore, EPR began a concerted effort to coordinate efforts by multiple review committees to revise five EPR guidelines and publish them in unison.

**PWR Primary Water Chemistry Guidelines, Revision 7 (3002000505):** The revision effort began in 2012 with recognition that consolidation of the chemistry requirements in the PWR Fuel Cladding Corrosion and Crud Guidelines should be a priority. Since the fuel requirements are based upon preservation of fuel integrity, integration with existing and potentially new chemistry requirements took some effort. Members of the fuel community – including EPR personnel, utility members and vendors – actively participated on the revision committee, presenting the technical bases for the chemistry requirements contained in the fuel guideline. An example is the integration from the PWR Fuel Cladding Corrosion and Crud Guidelines to sample and analyze the reactor coolant during shutdown and startup chemistry evolutions at a frequency that allows reasonable estimates of nickel, iron, and <sup>58</sup>Co releases and removal. After review of the technical basis for this requirement, the chemistry revision committee agreed to add this requirement to the start-up chemistry requirements table.

**PWR Fuel Cladding Corrosion and Crud Guidelines, Revision 1 (3002002795):** Since publication of Revision 0 of this guideline, there has been conflicting guidance between it and the PWR Primary Water Chemistry Guidelines, Revision 6, including the guidance related to target pH. Through the coordinated review process, the chemistry committee accepted the technical basis from the fuels committee and the inclusion of all target chemistry values to the Primary Water Chemistry Guidelines, Revision 7. Revision 1 also streamlines guidance related to



crud-related problems that can lead to fuel cladding degradation/failure and to power shifts that erode shutdown margin and reduce operational flexibility. Guidance on these topics previously was found in two fuel guidelines. In the new revision, all guidance previously in the Axial Offset Anomaly (AOA) Guidelines, Revision 1 has been combined with the guidance in the PWR Fuel Cladding Corrosion and Crud Guideline, resulting in one updated guideline related to crudding issues. The technical bases in this document have also expanded to address quantitative assessment triggers that were previously qualitative.

**Fuel Surveillance and Inspection Guidelines, Revision 2 (3002002877):** This revision supports continued implementation of lessons learned from fuel inspections conducted since the issuance of the original guidelines report in early 2008. Revision 2 primarily aligns the inspection guidelines with recent updates to the fuel reliability guidelines for BWR and PWR Fuel Cladding Corrosion and Crud (EPRI reports 3002002720 and 3002002795) by synchronizing technical content and inspection triggers for corrosion- and crud-driven inspections. Revision 2 of the Fuel Surveillance and Inspection Guidelines also reinforces the two principal changes from Revision 1. The first is a new inspection strategy using a formal, technical assessment process for each plant, which can be based on plant-specific fuel inspections or a combination of applicable industry inspections, including those conducted on bounding or sister plants. The second is the addition of non-intrusive visual fuel inspection programs to monitor for margin impact of cumulative small changes and to help ensure that applicable margins are maintained.

**BWR Fuel Cladding Corrosion and Crud Guidelines, Revision 1 (3002002720):** The main objectives of this revision were to align the BWR Fuel Cladding Corrosion and Crud Guidelines with the BWR Water Chemistry Guidelines and to develop a standard fuel cladding corrosion and crud risk assessment process. The 2008 version of the BWR Fuel Cladding Corrosion and Crud Guidelines provided water chemistry guidance to avoid crud and corrosion induced fuel performance issues. That guidance was adopted by the BWR Water Chemistry Guidelines in 2008. Through the revision process, the fuel cladding corrosion and crud-related water chemistry guidance is placed only in the BWR Water Chemistry Guidelines, but the technical basis of the guidance is described in the BWR Fuel Cladding Corrosion and Crud Guidelines.

**BWR Water Chemistry Guidelines, Revision 1 (3002002623):** This revision reinforces the importance of environmentally assisted cracking (EAC)—encompassing stress corrosion cracking and environmentally assisted fatigue—both of which can limit the service life of susceptible materials and components in BWR water environments. The BWR Water Chemistry Guidelines also emphasize fuel performance concerns to continue driving fuel failures to zero and reducing radiation fields. This document addresses issues with EAC mitigation, fuel performance, flow-accelerated corrosion, and radiation fields. The collaboration between the water chemistry and fuel reliability committees also resulted in a number of changes to

chemistry control and diagnostic parameters to minimize the potential for fuel cladding corrosion associated with crud deposition and ingress of chemical impurities.

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