

### 3483. Operating Limits for Silica, Calcium, Aluminum, and Magnesium in PWRs

Model calculations suggest that raising silica concentration in the coolant above the EPRI PWR Primary Water Chemistry Guidelines (Revision 3) limit of 1 ppm may not substantially increase silicate deposit formation. The reasons include (1) RCS aluminum will form soluble hydroxide complexes regardless of silica concentration, which will be removed by the primary circuit purification system; (2) soluble calcium will precipitate with boron when boron is present in the coolant and with silica when boron concentration drops below 1 ppm; (3) soluble magnesium also will precipitate with boron early in the operating cycle and with silica near the end of the cycle; and (4) SiO<sub>2</sub> will precipitate when the concentration in the coolant exceeds roughly 16 ppm, assuming a concentrating mechanism exists that increases silica concentration near the clad surface. To obtain the amount of silica-based deposit material returned to the bulk coolant from the fuel clad during cooldown, the study developed a mass balance approach similar to current practice for steam generator hideout return. Actual shutdown hideout return data at one plant was qualitatively consistent with model calculations, although an excess of silica return over the equivalents to combine with observed cations in the coolant was documented. This observation suggests a need to examine silica adsorption characteristics under primary system conditions.

*For more information see: TR407992, Final Report, August 1997, 148 pages.*

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