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Neutron Absorber Criticality Safety Concern

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The Regulations

- 10CFR50 Appendix A GDC
  - 2: Design Bases for Protection Against Natural Phenomena
  - 4: Environmental and Dynamic Effects Design Bases
  - 5: Sharing of Structures, Systems, and Components
  - 61: Fuel Storage, Handling, & Radioactivity
  - 62: Prevention of Criticality
- 10CFR50.68
  - No Boron; keff ≤ 0.95 at 95/95
  - Boron: keff < 1.0 w/o & ≤ 0.95 w/ at 95/95

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The Neutron Absorbers

- Neutron Absorbers
  - Boraflex
    - Silicone rubber matrix with B4C
  - Carborundum
    - Phenolic resin with B4C
  - Boral
    - Al & B4C center in Al clad
  - Metal Matrix Composites
    - Al & B4C composite
  - Borated Stainless Steel

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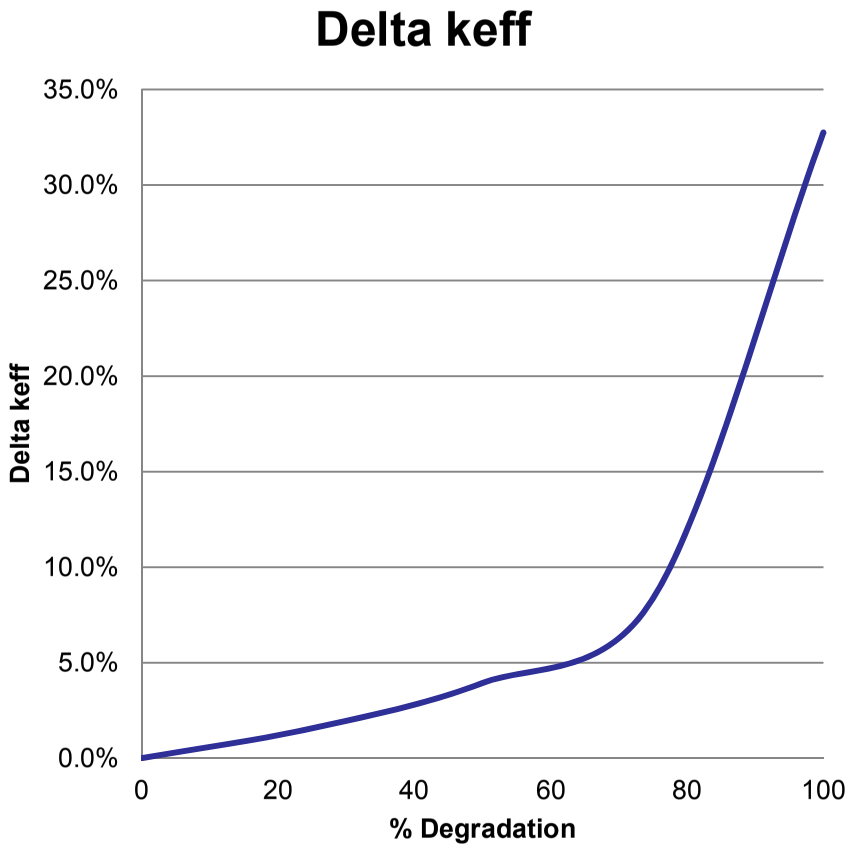
The Effect

- Below ~50% relatively small reactivity change rate
- About 60% reactivity change rate starts increasing
- Above 70% significant reactivity change rate



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The NRC Questions

- How well do licensees know the condition of their neutron absorbers?
- To what extent is the condition of the neutron absorber considered in the nuclear criticality safety analysis?
- How well do degraded neutron absorbers perform during accident scenarios?

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Context

- One of several related activities currently underway at the NRC

- Must be reviewed with the requisite safety significance and consistent with other agency activities/timelines.

- Welcome and desire stakeholder input on this and related subjects.