

**U.S. NRC**

UNITED STATES NUCLEAR REGULATORY COMMISSION

*Protecting People and the Environment*

# **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;  $k_{eff} \leq 0.95$  at 95/95
  - Boron:  $k_{eff} < 1.0$  w/o &  $\leq 0.95$  w/ at 95/95



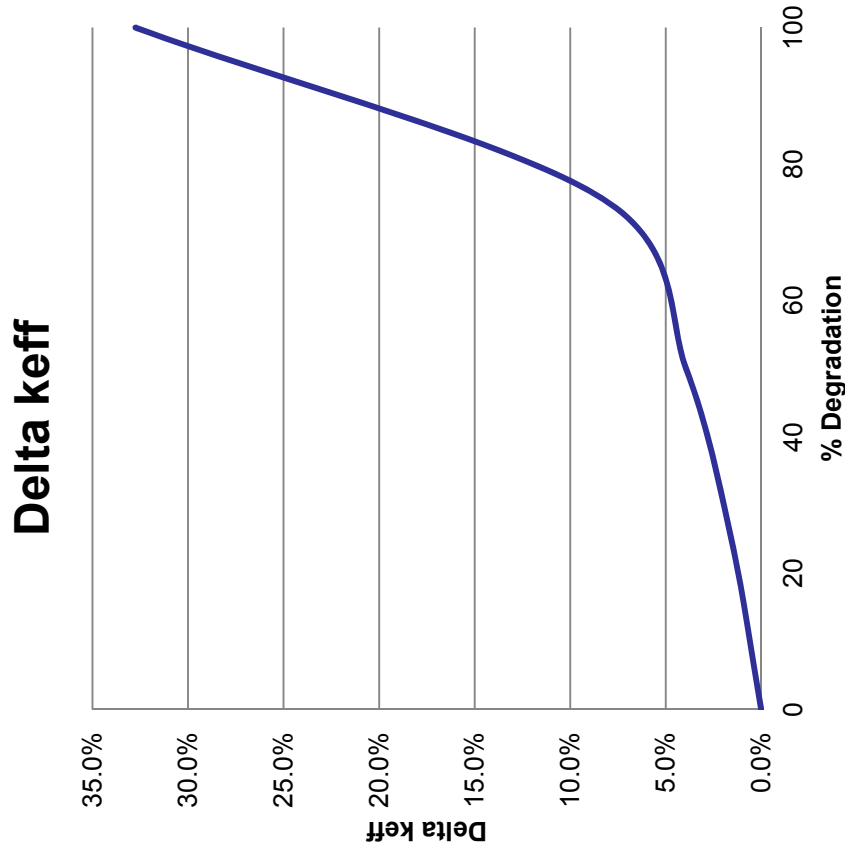
## The Neutron Absorbers

- 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



# The Effect

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





## 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?



## **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.