

Illustration of Neutronic Decoupling in Fresh Fuel Storage Environments

April 28, 2022

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SCALE Users Group Workshop
April 27-29, 2022

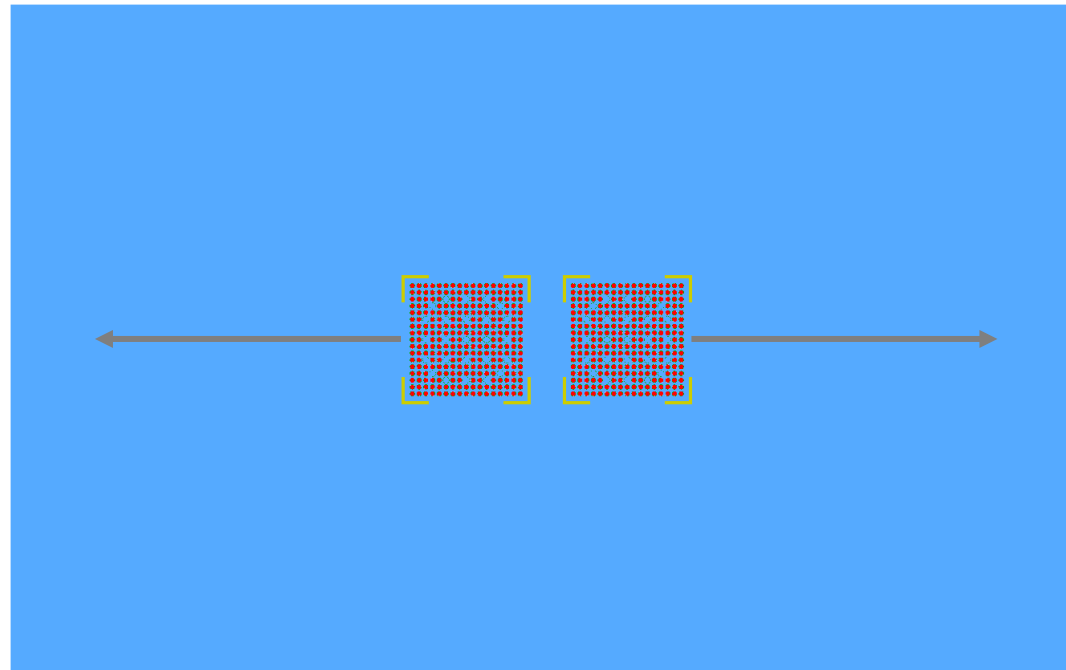


Neutronic Decoupling

- Operations beyond static storage of fuel assemblies occur in SFPs (moving around the pool, inspection, etc.)
- These assemblies are assumed suitably distanced at 30 cm
 - When assemblies are separated by enough water, the neutrons from one cannot cause fission in another: neutronic decoupling
- This assumption was investigated for PWR and BWR assemblies as part of ORNL-TM/2021/2330
 - Sensitivity of the neutronic decoupling distance to LEU+ enrichments

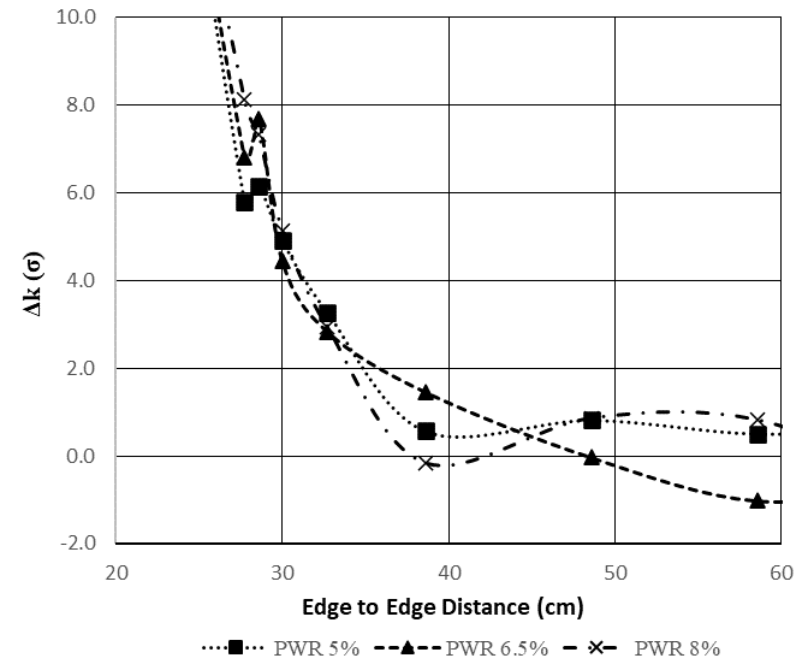
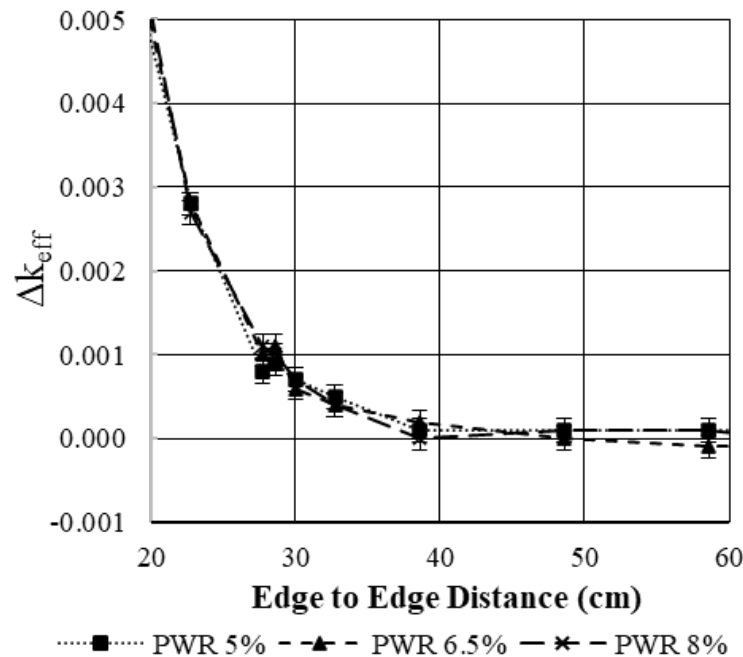
Implementation

- Two same-type assemblies were placed at incremental distances apart in infinite pool
- CSAS5 calculation performed for both PWR and BWR
 - Westinghouse 17x17, GE Atrium 10



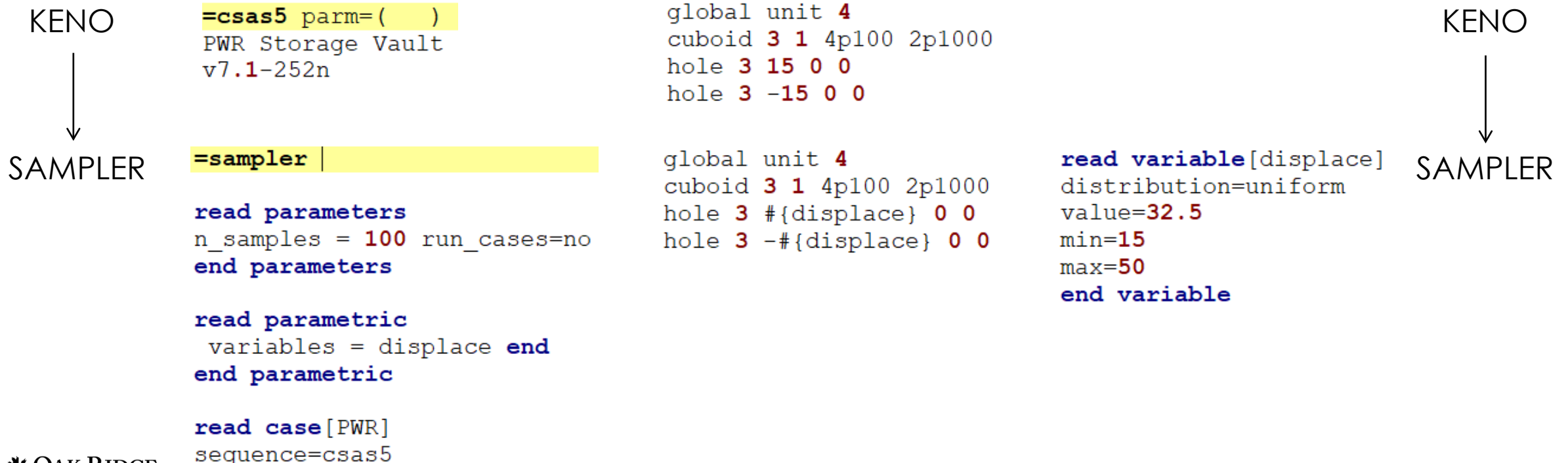
k_{eff} Asymptote

- Δk_{eff} taken in reference to 100 cm separation
- Nominal enrichment assemblies at 30 cm separation have less than 0.00075 difference in k_{eff} from the maximum separation
 - This is replicated with LEU+ enrichments



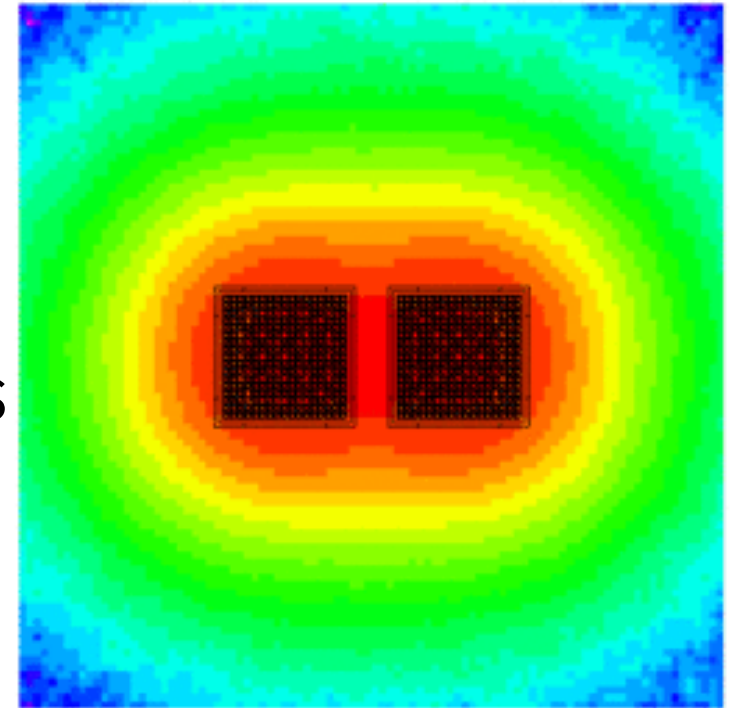
Use of Tallies and SAMPLER

- Input was adjusted for SAMPLER parametric mode
- Imposed a grid for tallying flux (gfx=1 in parameter block, read grid 1 ... end grid)



Flux Mapping

- This GIF demonstrates ~8-43 cm edge to edge separation
 - Logarithmic scale in flux
- At 30 cm: Flux at center has fallen 8x
- At 43 cm: Flux at center has fallen 35x
- Notably, assemblies develop isolated regions



Discussion

