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Reduction of radiotoxic lifetime of spent nuclear fuel to produce energy

Thursday, 23 May 2024 16:00 (2 hours)

We describe how the Mu*STAR system uses a superconducting proton accelerator produces a proton beam powerful enough to drive several subcritical small modular reactors (SMRs). Each SMR is a graphite-moderated molten salt (MS) fueled reactor with an internal spallation target to generate source neutrons. These source neutrons initiate fission chains that die out, producing energy in a subcritical core. The MS core remains far enough below criticality (which depends on materials and geometry but not the beam), to be incapable of self-generated critical operation, and is thus immune to criticality accidents. The MS fuel in the core is continuously purged of volatile fission products such that the potential offsite doses associated with the core volatile source term can be reduced by at least three orders of magnitude. The combination of subcriticality, the small source term, and additional safety innovations will deliver deployment flexibility and should simplify regulatory approval.

Footnotes

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North America

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