3D SIMULATION OF MANUFACTURING PROCESSES FOR TRANSMUTER FUEL FABRICATION

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The elimination of certain radionuclides from commercial spent nuclear fuel (CSNF) intended for disposal at the proposed mined geologic repository for high-level nuclear wastes, Yucca Mountain, would have significant advantages toward the long-term performance of the site. Of the overall volume of waste intended for Yucca Mountain, only approximately one percent of the CNSF contains long-lived fission products, which have a direct effect on the long-term performance of the repository.

A proposed method of converting these long-lived radionuclides into shorter-lived radionuclides is known as transmutation. These hazardous elements can be separated and transmuted in power-producing reactors and accelerator-driven systems. Transmutation cannot replace the current need for a national repository, but a successful transmutation program will significantly reduce the requirement and burden of disposal of nuclear wastes. As a result, transmutation could remove the waste management issue as a barrier to expanded use of nuclear power to address environmental and economic issues faced by the United States and the world.

As part of the overall viability of transmutation, the process of manufacturing individual fuel elements must be studied and optimized, not only for production rates and throughput but also for safety. Due to the high radiation level and generally high throughput rates required, automated fuel manufacturing must be employed. Albeit in early conceptual form, this paper will present the automated process steps required to receive sintered transmuter fuel pellets and assemble them into fuel assemblies for transmutation.