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Applications in Nuclear Energy Security

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A key roadblock to development of additional nuclear power capacity is a concern over management of nuclear waste. Nuclear waste is predominantly comprised of used fuel discharged from operating nuclear reactors. The roughly 100 operating US reactors currently produce about 20% of the US electricity and will create about 87,000 tons of such discharged or "spent" fuel over the course of their lifetimes. The long-term radioactivity of the spent fuel drives the need for deep geologic storage that remains stable for millions of years. Nearly all issues related to risks to future generations arising from long-term disposal of such spent nuclear fuel is attributable to approximately the 1% made up primarily of minor actinides. If we can reduce or eliminate this 1% of the spent fuel, then within a few hundred years the toxic nature of the spent fuel drops below that of the natural uranium ore that was originally mined for nuclear fuel. The minor actinides can be efficiently eliminated through nuclear transmutation using as a driver fast-neutrons produced by a spallation process initiated with a high-energy proton beam. This presentation will cover the system design considerations and issues of an accelerator driven transmutation system.