# TRANSMUTATION OF AMERICIUM IN CRITICAL REACTORS

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## Abstract

Already in 1974, a Los Alamos report suggested that the recycling of higher actinides would be detrimental for the safety of critical reactors. Later investigations confirmed this understanding, and stringent limits on the fraction of minor actinides allowed to be present in the fuel of fast neutron reactors were established.

In recent years, and in particular in connection with the generation IV initiative, it has been advocated that recycling of americium in critical reactors is not only feasible, but also a recommendable approach. In the present contribution, it is shown, to the contrary, that introduction of americium into reactors with uranium based fuels deteriorates the safety margin of these reactors to a degree that will not allow consumption of the americium sources present in any economically competitive nuclear fuel cycle.

Further, it is shown that uranium and thorium free cores with plutonium based fuels may be designed, that features excellent safety characteristics, as long as americium is not present in the feed.

Hence, a closed fuel cycle is suggested, that consists of commercial power production in light water reactors, plutonium burning in uranium and thorium free fast neutron critical reactors, and higher actinide consumption in accelerator driven systems with inert matrix fuel. It is argued that such a fuel cycle (being a refinement of the Double Strata fuel cycle proposed by JAERI and further developed by M. Salvatores) provides a minimum cost penalty for implementing P&T under realistic boundary conditions.