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The Future of Nuclear Energy; Chemistry is the Problem, Accelerators the Solution

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Throughout mankind's existence it has been impossible to mine nuclear weapons material directly from the earth. Although natural uranium can be mined, separating the 235 U still requires difficult and expensive technology and time. And even if 235 U is obtained by isotopic enrichment, it can be rendered useless for weapons simply by mixing it with natural uranium and returning it to the earth.
Plutonium is another matter as there is no natural plutonium with which to dilute it. If weapons plutonium (W-Pu) is returned to the earth, it can be dug up quickly and cheaply. It is commonly claimed that commercial reactor waste containing plutonium (C-Pu) containing large amounts of 240 Pu is not weapons useful and therefore need only be made unavailable by burial. However 239 Pu lives about three times as long as 240 Pu, so the 240 Pu decays away leaving W-Pu after one 239 Pu half life. Yucca Mountain as planned therefore would eventually contain about 350 tons of W-Pu that need only be dug up and chemically separated⋯sufficient for about 70,000 nuclear weapons from this one site. Worldwide nuclear would eventually enable millions from many sites⋯.an absurd legacy to permit from today's nuclear technology.
The world cannot leave underground weapons plutonium or these dangerous commercial isotopic mixtures of plutonium. These remnants must be burned in reactors optimized for this purpose. That will happen only if burning is cost competitive with present reactors, but such waste-burning critical reactors after sixty years still do not exist. The ideal reactors are GEM*STAR reactors based on accelerator-driven molten-salt thermal-spectrum systems. GEM*STAR reactors are advantageous for many reasons, but mostly because they require no chemical/isotopic separation for fuel, no chemistry for solid fuel preparation, and no chemical reprocessing, and because they eliminate the chemical overhead of fission product and higher actinide waste streams and chemistry-driven nuclear weapon proliferation. The implementation of accelerators displaces expensive chemistry thereby enabling nuclear energy cheaper than any other system. GEM*STAR can, without chemistry, burn safely and economically both W-Pu and C-Pu into isotopic mixtures that cannot decay to W-Pu. Nuclear energy has no long term future without eliminating the long-term legacy of mining nuclear weapons material from today's critical reactors.

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