

# GFA and SwissFEL Accelerator Seminar

## Accelerator-Driven Thorium-Cycle Fission: Green Nuclear Power for the New Millennium

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In thorium-cycle fission, fast neutrons are used to transmute thorium into fissionable  $^{232}\text{U}$  and then stimulate fission. In accelerator-driven thorium-cycle fission (ADTC) the fast neutrons are produced by injecting a symmetric pattern of seven energetic proton beams into Pb spallation zones in the core. The fast neutrons are adiabatically moderated by the Pb so that they capture efficiently on  $^{232}\text{Th}$ , and fission heat is transferred via a convective Pb column above the core. The 7 proton beams are generated by a flux-coupled stack of isochronous cyclotrons. ADTC offers a green solution to the Earth's energy needs: the core operates as a sub-critical pile and cannot melt down; it eats its own long-lived fission products; a GW ADTC core can operate with uniform power density for a 7-year fuel cycle without shuffling fuel pins, and there are sufficient thorium reserves to run man's energy needs for the next 2000 years.

