Fusion-triggered Liquid-phased Transmutator Monitored and Controlled Real-time by CAN Laser and Gamma beams

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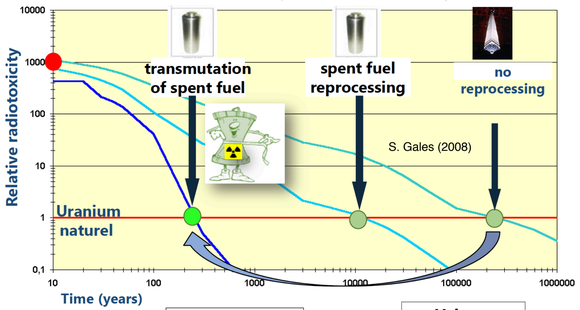
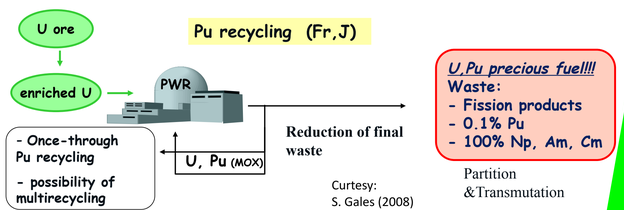
Motivation

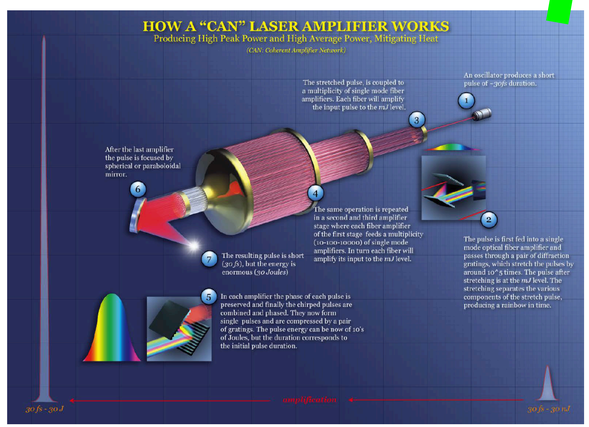
Nuclear Spent Fuel Radiotoxicity

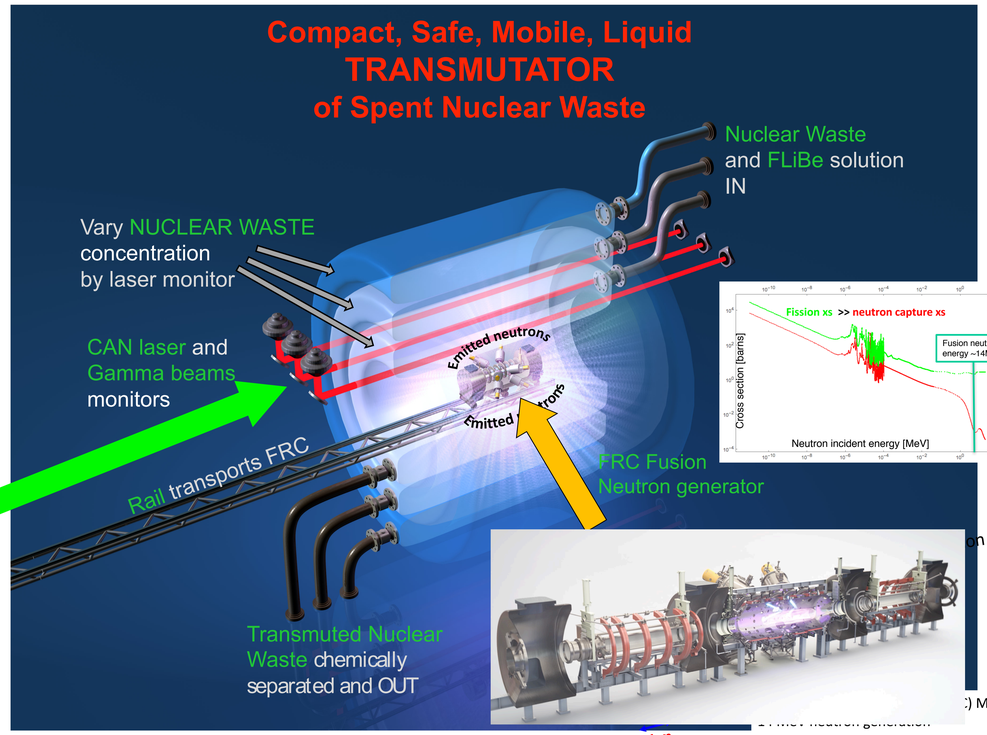


Once-through case (US,Sw): No Recycling, geological repository

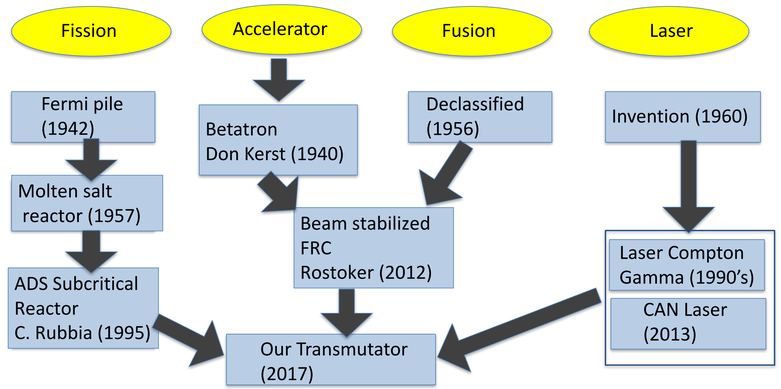


Transmutation reduces radiotoxicity and heat

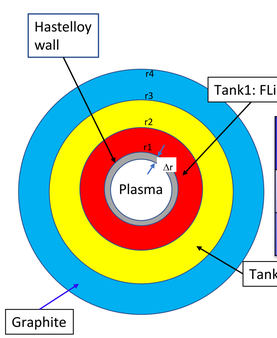




Historical Flow and Confluence



Simulating Our Transmutator



GEOMETRY
Δr=5 cm
r1=60 cm
r2=75 cm
r3=90 cm
r4=115 cm
Tank axial length=10 m

NEUTRON SOURCE
Plasma
Axial length=8 m
Radius=0.45 m
Energy = 14 MeV
Source @ t=0

	% by volume		Initial Molar %			
	Cm-243	Am-241	LiF	BeF_2	CmF_3	AmF_3
Tank 1	2%	0	63.2%	35.9%	0.9%	0.0
Tank 2	0	1%	63.5%	36.1%	0.0%	0.4%

Thermal Power Generated by burning actinides =100 MW

Our Transmutator (our "toilet science") : Conceptual Design

- **MA Fission xs >> neutron capture xs for neutron energy**
- **Safe by Liquid solution-FLiBe** (molten salt with very high boiling pt; passive safety valve)
- **Safe by real-time monitor and control** (by laser and laser Compton gamma)
- **Operation close to overall criticality and yet safe** (criticality varied radially by segmented tanks)
- **Light burden on Fusion Trigger** (flexibility, safety, compact, mobile, inexpensive)
- **Low energy accelerator for Fusion trigger** (compact and cheap)
- **Fusion FRC stabilized by accelerator**
- → **Confluence of many technologies :** low-energy accelerator-driven Fusion; fusion-triggered fission; safe liquid-phased MSR ; liquid MA monitored / controlled realtime by laser; realtime chemical separation in liquid

Burnup Results using MCNP/CINDER90 and MCNP/MURE