

# TRANSMUTATION OF NUCLEAR MATERIALS USING HIGH-POWER LASERS – POTENTIAL APPLICATIONS FOR RADIOACTIVE WASTES TREATMENT AT ELI-NP RESEARCH FACILITY

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**Abstract.** *The paper presents the current status of the international state-of-the-art research regarding the transmutation of nuclear materials by using high intensity lasers. The potential applications for radioactive wastes and spent nuclear fuel treatment at Extreme European Light Infrastructure – Nuclear Physics (ELI-NP) from Magurele-Bucharest are briefly investigated.*

**Keywords:** transmutation, applications for radioactive wastes and spent nuclear fuel

## 1. Introduction

Power generation via nuclear fission results in the production of dangerous, long lived radioactive isotopes. Current protocol for handling this waste is typically long term storage in deep geologic repositories or shallow storage facilities, depending on the specific isotope [1].

However, accounting for the extreme half lives of some of these elements in the storage and disposal problem is not an easy task and requires strong consideration when discussing nuclear power as an option for the world's energy needs [1].

Table 1 lists some of the isotopes that are produced and/or utilized in the nuclear fuel process of <sup>235</sup>U. [1]

**Table 1.** Some important components of nuclear waste. [1]

Radionuclide	Half life (yr)	Type
<sup>126</sup> Sn	230,200	Long lived fission product
<sup>99</sup> Tc	211,250	Long lived fission product
<sup>129</sup> I	15,700,000	Long lived fission product
<sup>238</sup> U	4,471,000	Actinide source
<sup>241</sup> Am	430	Actinide
<sup>237</sup> Np	2,145,500	Actinide
<sup>239</sup> Pu	24,000	Actinide

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