

ADVANTAGES OF A CENTRALIZED FACILITY FOR SPENT FUEL AND WASTE MANAGEMENT

JOSÉ MANUEL VERA VALVERDE *, SERGIO MARTÍN PERAL, KHAOUA KHARAZ CHIHAB, GENÍS GUILLEM MIMÓ, WILLIAM RICARDO VARGAS ACERO AND ALEX DUMONT

Polytechnic University of Catalonia, Av. Diagonal 647, 08028, Barcelona, Spain

* Corresponding author email: jose.manuel.vera.valverde@estudiantat.upc.edu

For the next decade the deployment of nuclear facilities in Europe is going to require planning, financial and technological investment. In this study, different strategies to address the reprocessing of the spent fuel in Molten Salt Reactors (MSRs) will be presented. Specifically, an on-site chemical reprocessing facility will be evaluated as one of the possible strategies alongside a centralized facility for spent fuel reprocessing. The need of additional supporting facilities with the on-site strategy will be evaluated, addressing the challenges of liquid fluoride-based salts used as both fuel and coolant. Unlike conventional reactors, in MSRs continuous online processing could be a viable strategy to recycle valuable isotopes and remove fission products that could affect reactor efficiency. An on-site chemical reprocessing plant can integrate advanced fluorination, reduction, and distillation techniques to extract uranium and transuranic elements while isolating long-lived fission products such as caesium and strontium for effective waste management. The highly reactive and corrosive nature of molten salts demands the use of robust materials and engineering solutions to ensure safe and reliable operations. On the other hand, centralized reprocessing can offer a scalable approach to handle spent salt from multiple MSR installations, reducing environmental impacts while adhering to International Atomic Energy Agency (IAEA) safety standards and European regulatory frameworks. The facility would also support advanced waste disposal strategies, including the use of geological repositories for residual waste, aligning with Europe's goals for sustainable and responsible nuclear energy. Effective siting, incorporating geological stability, hydrological safety, and infrastructure access, together with proactive public and stakeholder engagement, is essential to address societal concerns and secure acceptance. A centralized facility could be the key for the widespread adoption of MSR technology, advancing Europe's leadership in next-generation nuclear energy. In this case the site can be located anywhere in Europe that fulfils the criteria imposed by the IAEA: France, Finland and Poland, among other countries could be viable locations.

117_abstract_yg