

GENIORS, a European Project on Advanced Fuel Recycling Strategies — Consolidating the Outcome of Preceding Projects

Stéphane BOURG,¹ Andreas GEIST,² Jean-Marc ADNET,¹ Chris RHODES,³ Bruce HANSON⁴

¹Research Department on Mining and Fuel Recycling Processes, French Alternative Energies and Atomic Energy Commission, Bagnols Sur Cèze, France

²Karlsruhe Institute of Technology (KIT), Institute for Nuclear Waste Disposal (INE), Karlsruhe, Germany

³National Nuclear Laboratory, Central Laboratory, Sellafield, Seascale, United Kingdom

⁴University of Leeds, School of Chemical & Process Engineering, Leeds, United Kingdom

The current open nuclear fuel cycle utilises only approximately one percent of the energy contained in natural uranium. Spent fuel recycling (as done e. g. in France) results in significantly increased fuel efficiency. Future multi-recycling strategies to be deployed in fast reactors will lead to further improvement, eventually rendering further uranium mining unnecessary if depleted uranium stockpile is available.

In this context and in the continuity of previous EURATOM projects (NEWPART, PARTNEW, EUROPART, ACSEPT, SACSESS), GENIORS addresses research and innovation in fuel cycle chemistry and physics. More specifically, GENIORS carries out research and innovation for developing compatible techniques for dissolution, reprocessing and manufacturing of innovative oxide fuels, potentially containing minor actinides, in a “fuel to fuel” approach, taking into account safety issues under normal and mal-operation. The most promising options developed in prior EURATOM projects are further developed to address the challenges specific to GEN IV. To deliver the full picture of a MOX fuel cycle, GENIORS works in close collaboration with the INSPYRE project on oxide fuels performance.

By implementing a three-step approach (reinforcement of the scientific knowledge — process development and testing — system studies, safety and integration), GENIORS contributes to the provision of more science-based strategies for nuclear fuel management in the EU. It will support nuclear energy to contribute significantly and sustainably to EU energy independence. In the longer term, it will facilitate the management of ultimate radioactive waste by reducing its volume and radiotoxicity.

This project receives funding from the European Research Council (ERC) under the European Union's Horizon 2020 research and innovation programme (grant agreement n° 755171).