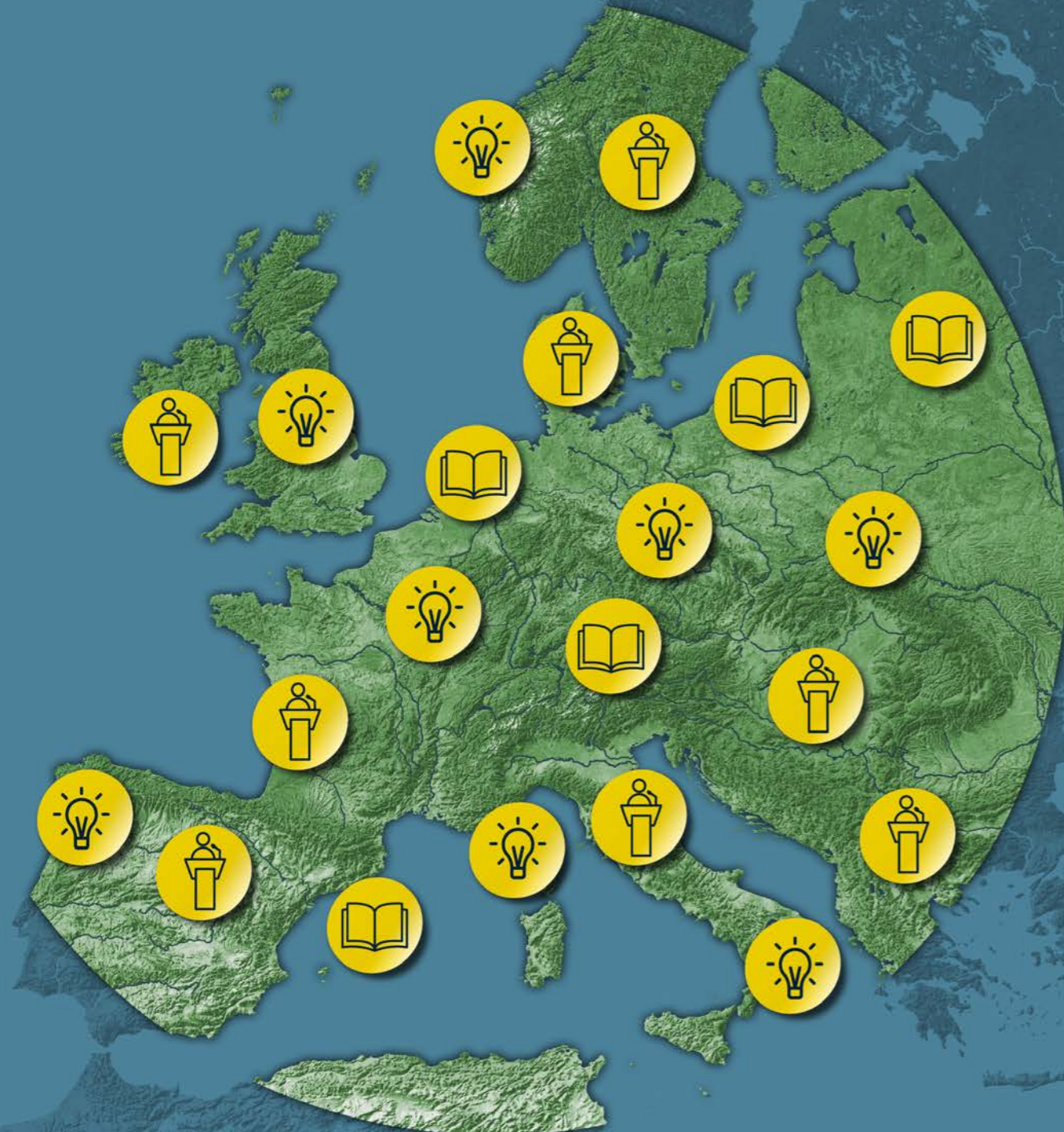


5 | Strategic research

Collaborating on European Commission research to **drive innovation**



Research programmes initiated by the European Commission enable collaborative work that has significant impact internationally. NNL's involvement in multiple projects demonstrates the value NNL scientists add to these collaborative programmes. To accelerate nuclear research and innovation, the Euratom Research and Training Programme complements projects funded by Horizon Europe.

NNL has a long-standing history of collaborating with European colleagues. European research programmes enable this collaboration, strengthening the impact of research.

They also enable effective dissemination of expert knowledge and vital technologies. Continued engagement in these programmes recognises the value of collaboration in advancing nuclear science and technology.

NNL's involvement in multiple projects, spanning the breadth of the nuclear fuel cycle, demonstrates the value NNL puts on these programmes and the value NNL scientists add to these collaborations. One of the most significant projects for NNL this year is PREDIS, which focuses on the pre-disposal management of radioactive waste. [●](#)

Quality

World-leading science driven by the greatest minds

NNL has participated in over one hundred European Commission-funded programmes spanning all aspects of the nuclear fuel cycle, from fuel manufacture to reactor operation and design, recycling and disposal of used materials. The PREDIS programme – funded by Euratom – is one of the largest, involving 47 partners across 18 nations. As the programme, initiated in 2020, draws to a close, much has been learned that can support management practices for radioactive waste.

Many types of used nuclear material are well understood and have well-defined management solutions. The PREDIS programme focuses on those that require additional research so that they can be conditioned into a form suitable for disposal. NNL has led on a key milestone to define the future Strategic Research Agenda for essential waste management research and development activities across Europe. This will inform future European collaboration opportunities.


Working in partnership with The University of Manchester, we have applied life cycle assessment (LCA) and life cycle costing (LCC) approaches to evaluate the sustainability of waste management technology options. The tools produced by the project will guide future decision-making and the detailed assessment will soon be published as a series in scientific journals.

Other key outcomes are

development and implementation of holistic lifecycle assessment approaches to evaluate the environmental benefits of different technologies

advances in technologies for treatment and immobilisation of certain types of waste, including solid and liquid organic wastes

innovation and optimisation of novel decontamination technologies to reduce the volumes of radioactive waste from decommissioning

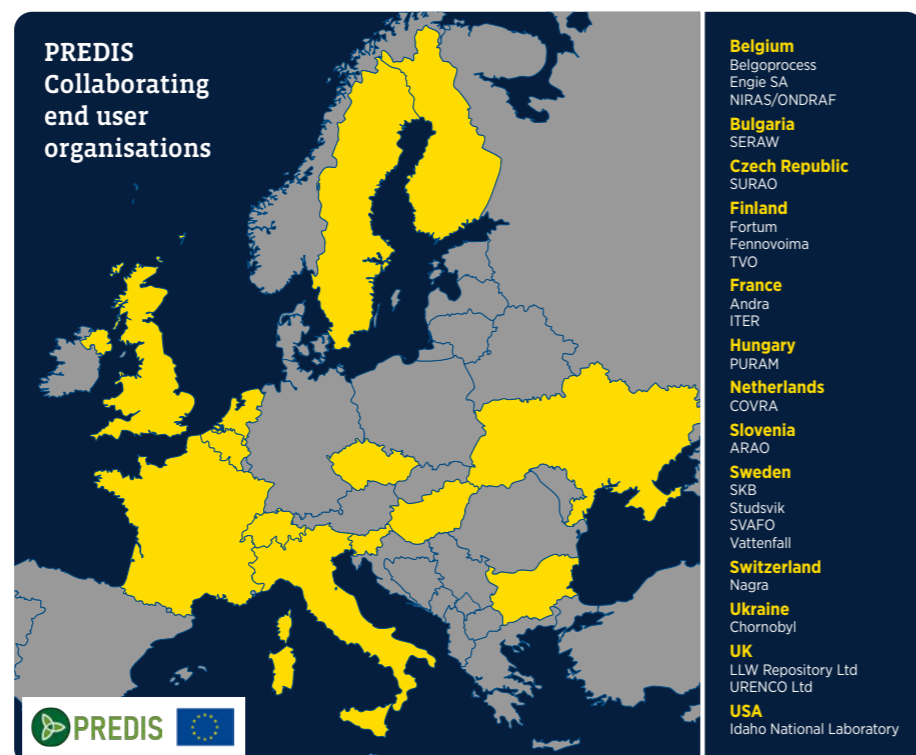
digitalisation solutions for improved performance and efficiency in handling and assessing cemented waste packages. 

“ International collaboration is critical to deliver solutions to sector-wide challenges, helping NNL to deliver to UK national needs but also contribute to solutions to global challenges.”



Anthony Banford
Chief Technologist for NNL

Collaborating end user organisations in the PREDIS programme. This project has received funding from the Euratom research and training programme 2019–2020 under grant agreement No. 945098.

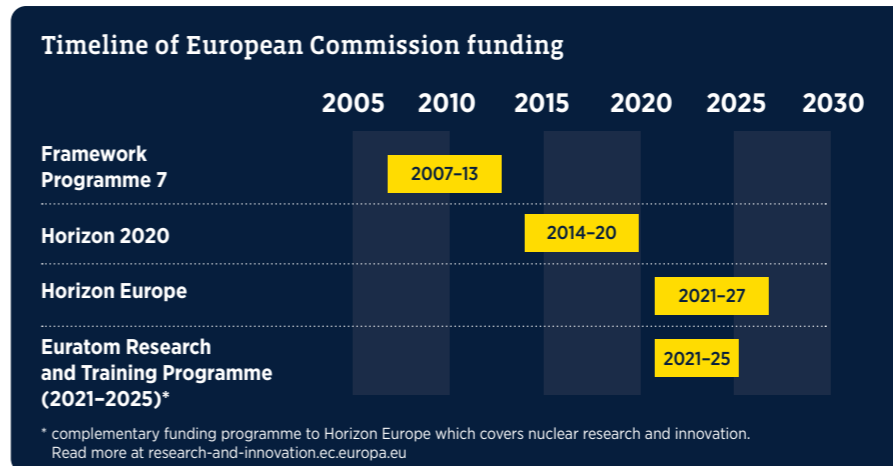


“ NNL’s deep involvement in PREDIS, including the leadership on the Strategic Work Package and expert contributions to the Technical Work Packages, has been pivotal to ensure the success of the project.”

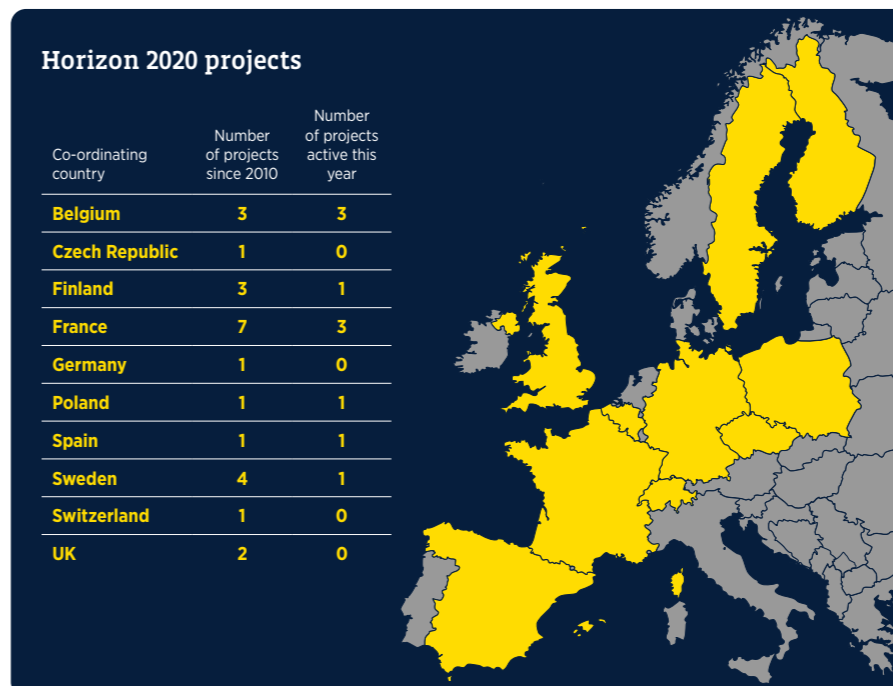


Maria Oksa
Co-ordinator of the PREDIS project and Research Team Leader at VTT, Finland

Timeline of European Commission funding between 2005 and 2030.



Location of lead organisation of Horizon 2020 projects that NNL has been involved in over the last ten years.



Partnerships

Collaboration leads to greater insight

Working with other experts from around the world leads to a mutual understanding. Expertise can be rapidly shared and results quickly disseminated, to drive research programmes forward at a faster rate. It also leads to access to a much wider range of resources. A prime example of this in the PREDIS project has been the close co-operation between multiple international research laboratories in the development of novel formulations for the encapsulation of certain types of wastes.

Encapsulation is the method used to immobilise legacy wastes which are derived from historic operations, thereby enabling them to be stored. Currently, a specifically formulated cement is used but some types of waste are not chemically compatible with the cement. A new type of encapsulant known as a geopolymer is being developed to improve chemical compatibility with these types of waste. Advances were rapidly made because of the combined experience and knowledge of multiple organisations and an international team of leading scientists. These advances in geopolymer technology directly feed into our UK programmes for Sellafield and the Nuclear Decommissioning Authority (NDA) estate.

More widely, since our initial involvement in European Commission-funded research almost 20 years ago, beginning with Framework Programme 7, we have built over 200 collaborations with dozens of partners to leverage significant research investment. Within the Horizon 2020 and Horizon Europe frameworks alone, we have been involved in 24 projects led by organisations in ten different nations, which have leveraged €128 million. This year, including the PREDIS project, we are involved in ten Horizon 2020 projects totalling €65.4 million. 

Talent

Expanding the horizons for research

Working with leading organisations across Europe broadens the horizons of NNL researchers. The Euratom Research and Training Programme draws on cutting-edge, international research collaborations to attract and retain talent in the nuclear industry and enables cross-fertilisation of ideas and knowledge from world experts. This ethos is reflected in all our European research projects.

The PREDIS programme has given researchers the opportunity to travel to partner locations and work alongside their experts, to gain first-hand expertise relating to the latest advanced techniques. Drawing on the experience of almost 100 scientists, engineers and technicians from NNL, approximately half of this technical work has been delivered by researchers who are in the early stages of their career, providing them with opportunities to expand their skill set. In addition, five PhD students across British universities, co-supervised by NNL's experts, have been trained. These experiences have given these researchers unique insight into international collaboration.

NNL scientists and engineers have benefitted from collaborating with organisations from the European Union and bringing specialists skills and knowledge to the UK. Several

“ I came into NNL’s Decontamination team 3.5 years ago, relatively new to the technical field. Being part of the PREDIS project has allowed me to adapt my knowledge and skill set from nuclear materials to tackle challenges in decontamination – which has resulted in new science.”



Anne Callow
Research Technologist for NNL

specialists from NNL have travelled to collaborators, including Subatech and La Hague in France, to learn the latest techniques in sample preparation and analysis. These activities have led to presentations at conferences such as the International Conference on Environmental Remediation and Radioactive Waste Management (ICEM) along with several publications in scientific journals. Not only do these experiences help safeguard the skills of a British workforce, but they also position our researchers as subject matter experts. ●

Impact

Science drives sustainable development forward

The United Nations' Sustainable Development Goals focus on global peace and prosperity, encompassing social value and environmental improvement. The European programmes demonstrate how nuclear technology can play a significant role in meeting these goals.

In the PREDIS programme, our research directly aligns with our partnerships with Sellafield Limited and the NDA to work towards their goals for environmental restoration. Collaborative work around the development of novel methods for the immobilisation of challenging waste types supports long-running work with Sellafield Limited. Meanwhile, work on robotics supports Sellafield Limited to progress plans for the automation of stores, enhancing

safety and increasing efficiency.

Overall, the European research programmes bring together the best scientists, engineers and facilities across geographical Europe to accelerate research and development and reduce costs, as we pursue our sustainable development goals. For PREDIS, this has focused on the development of more sustainable solutions to some of the most challenging radioactive waste management issues, while striving to reduce waste and enable a circular economy.

Funding provided by UK government ensures that we will continue to participate in these vital programmes so that we can maintain our ongoing commitment to contributing to international research, growing the skills and expertise of our scientists and making scientific discoveries to benefit society. ●



Anthony Banford and PREDIS project co-ordinator and Principal Research Scientist at VTT, Finland, Erika Holt, presenting at the International Atomic Energy Agency.

Members of PREDIS taking part in an international conference panel session.

