

# DELIVERABLE REPORT



## Thermal treatment for radioactive waste minimisation and hazard reduction

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This report reflects the authors' views and the European Commission is not responsible for any use that may be made of it.

**APPROVED FOR SUBMISSION:**

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## ThERAMIN Project Partners

Andra	Agence nationale pour la gestion des déchets radioactifs – France
CEA	Commissariat à l'énergie atomique et aux énergies alternatives – France
GSL	Galson Sciences Limited – UK
FZJ	Forschungszentrum Juelich GmbH – Germany
LEI	Lithuanian Energy Institute – Lithuania
NNL	National Nuclear Laboratory – UK
ONDRAF/NIRAS	Organisme National des Déchets RAdioactifs et des matières Fissiles enrichies – Belgium
ORA	Orano - France
SCK•CEN	The Belgian Nuclear Research Centre – Belgium
USFD	University of Sheffield – UK
VTT	Teknologian Tutkimuskeskus VTT Oy (VTT Technical Research Centre of Finland Ltd)
VUJE	VUJE a.s. – Slovakia



## THERAMIN End User Group

Andra	Agence nationale pour la gestion des déchets radioactifs – France
CEA	Commissariat à l'énergie atomique et aux énergies alternatives – France
EDF	Electricité de France – France
Fortum	Fortum Oyj – Finland
IGD-TP	Implementing Geological Disposal of Radioactive Waste Technology Platform
INL	Idaho National Laboratory – USA
JAVYS	Jadrová a vyraďovacia spoločnosť – Slovakia
Nagra	Die Nationale Genossenschaft für die Lagerung Radioaktiver Abfälle – Switzerland
ONDRAF/NIRAS	Organisme National des Déchets RAdioactifs et des matières Fissiles enrichies – Belgium
RWM	Radioactive Waste Management Ltd – UK
Sellafield	Sellafield Ltd – UK
TVO	Teollisuuden Voima Oyj – Finland



## List of acronyms

EC	European Commission
ILW	Intermediate Level Waste
LLW	Low Level Waste
WP	Work Package
TRL	Technology Readiness Level
WMO	Waste Management Organisation



# 1 Introduction

## 1.1 Background to THERAMIN

The **T**hermal treatment for **r**adioactive waste **m**inimisation and hazard reduction (THERAMIN) project was a European Commission (EC) programme of work partly funded by the Horizon 2020 Euratom research and innovation programme. The THERAMIN project ran from June 2017 to May 2020. Twelve European WMOs and research and consultancy institutions from seven European countries participated in the project.

The overall objective of THERAMIN was to provide improved safe long-term storage and disposal of intermediate-level wastes (ILW) and low-level wastes (LLW) suitable for thermal processing. The work programme provided a vehicle for coordinated EU-wide research and technology demonstration, designed to provide improved understanding and optimisation of the application of thermal treatment in radioactive waste management programmes across Europe, and to move technologies higher up the Technology Readiness Level (TRL) scale.

The THERAMIN project was carried out in five work packages (WPs).

- **WP1: Co-ordination.** This WP included project management and coordination and was led by VTT.
- **WP2: Strategic review of radioactive waste streams.** This WP evaluated the opportunities for thermal treatment of particular waste streams across Europe; this WP was led by GSL.
- **WP3: Viability of treatment routes for selected waste stream/technology combinations.** In this WP, the application of selected thermal treatment technologies to radioactive waste management was demonstrated and evaluated; this WP was led by NNL.
- **WP4: Disposability of waste products.** In this WP, the disposability of the thermally treated radioactive waste products was assessed; this WP was led by Andra.
- **WP5: Synthesis, Dissemination and Training.** This WP was led by GSL and enabled synthesis of the project outcomes and their dissemination to other interested organisations.

## 1.2 Scope of Work Package 5

The scope of WP5 included the development of synthesis and summary reports for the THERAMIN project (Deliverables D5.4 and D5.5). Other objectives of WP5 were to disseminate the knowledge and outcomes from the THERAMIN project, including communication with external stakeholders. This was achieved during the project by the following mechanisms:

- Development of a THERAMIN project website, hosted by VTT (Deliverable 5.8), which was used to share the scope of the project, contact details for the WP Leads and organisers of the Training School and Conference, Public Deliverables and other outputs, described below.



- Developing THERAMIN project newsletters for dissemination of key results from WPs 2, 3 and 4 and publicising training opportunities to project Partners and End Users, and more widely via the IGD-TP website (Milestones MS16, MS19 and MS21).
- Printing a poster describing the scope of the project for use by Partners during the project and, nearing the end of the project, to summarise the key outcomes for presentation at the THERAMIN conference and WM'2020 (Milestones MS15 and MS23).
- Holding training placements for early career researchers and individuals from countries without active thermal treatment plants, hosted by VTT, USFD and CEA (Milestones MS17 and MS18).
- Developing and delivering a technical training school for 20 early career researchers and students at the CEA's Le Visiatome Centre in Marcoule in June 2019 (Deliverable D5.2).
- Holding a final THERAMIN project conference (Milestone MS22) in Manchester in February 2020.
- Developing an Exploitation Plan (D5.6) and Preliminary Business Plan (D5.7) to evaluate the utilisation and commercialisation of the THERAMIN project results.

### **1.3 Objective of this Report**

The objective of the THERAMIN summary report is to summarise the outcomes of the THERAMIN project for a wider readership than the full Synthesis report.





## 2 Summary Report

The summary report of the THERAMIN project was published as a paper within the proceedings of the THERAMIN 2020 conference. These proceedings were published in an open-access journal, IOP Conference Series: Materials Science and Engineering, on 22<sup>nd</sup> April 2020.

The paper is available to download here:

<https://iopscience.iop.org/article/10.1088/1757-899X/818/1/012001>