PREDIS

Newsletter #2 April 2021

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The PREDIS (Predisposal Management of Radioactive Waste)

project is off to a flying start, thanks to the high level of activity and engagement of the 47 consortium partners. In this second newsletter we will present the PREDIS End User Group (EUG), provide some updates on the achievements of the work packages, look at the four technical webinars held over the past few months, introduce some more of our consortium members and of course let you know what we have planned for the future.

Work during the first seven months of the project focused on collecting information on existing radioactive waste inventories and practices in predisposal management, understanding the most urgent needs and challenges of the industry, interacting with end users and stakeholders to ensure that the most important research and development topics are addressed and laying the groundwork for experimental and state-of-knowledge activities. Cooperation with industry, other EU projects and international organisations has been quite considerable as evidenced by the participation and interaction in the four webinars held so far. We are pleased to note that two additional webinars on waste acceptance criteria issues will be held this spring. Also, a Memorandum of Understanding (MoU) between PREDIS and other EU projects, which will better facilitate open sharing and establishing synergies for greater collective impact of our projects, is under preparation.

The second PREDIS workshop is scheduled to take place (online) from May 4 to 6 and will feature presentations on the progress of the project, highlights of the technical developments and work on the Strategic Research Agenda (SRA) and, in particular, the gap analysis. This workshop includes a dedicated session for End User Group members on May 6. Future annual workshops will be completely open to all interested stakeholders.

-Maria Oksa (VTT), Project Coordinator

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End User Engagement

The PREDIS End User Group (EUG) is comprised of entities (waste producers, waste owners, waste management organisations) that can directly benefit from the project's achievements. 20 potential EUG members from 12 countries were listed in the original proposal (September 2019). New members are welcome to join throughout the project's 4-year duration. The current composition of the EUG includes 22 members from 14 countries (see Table below).

EUG members can expect to benefit from project involvement by having close access to innovative work on waste treatment, conditioning and performance assessment and by providing insights and feedback about their needs and challenges directly into plans for technology development and implementation of project outcomes.

PREDIS EUG membership is purely voluntary; no financial or technical reporting expectations exist.

PREDIS Project End User Group

Country	Organisation	Role	WP Interest Areas	Primary Contact
Belgium	Belgoprocess	Operator, Waste Processor	WP7	Carlot Valgaeren
Belgium	ENGIE SA	Operator	WP4-7	Kim Schildermans
Belgium	NIRAS/ONDRAF	WMO	WP4-6	Maarten Van Geet
Bulgaria	SERAW	WMO	WP2-7	Svetlozar Trayanov
Czech Republic	SURAO	WMO	WP2-7	Martina Macelova
Finland	Fennovoima	Operator	WP4-6	Tuire Haavisto
Finland	Fortum	Operator	WP4, WP7	Maria Leikola
Finland	Posiva	WMO	WP4-7	Petteri Vuorio
Finland	TVO	Operator	WP6-7	Annukka Laitonen
France	Andra	WMO	WP3-6	Frederic Plas
France	EDF	Operator	WP2, WP4, WP7	Nicolas Malleron
Hungary	PURAM	WMO	WP2, WP5, WP6	Bálint NŐS
Italy	Campoverde srl	Waste Owner, Producer	WP4-7	Simona Manenti
Netherlands	COVRA	WMO	WP5, WP6	Jeroen Bartol
Slovenia	ARAO	WMO	WP2, WP4-6	Leon Kegel
Sweden	SKB	WMO	WP4-7	Jan Rosdahl
Sweden	SVAFO	Waste Owner		Anders Puranen
Sweden	Vattenfall	Operator	WP1-4, WP7	Simon Carroll
Switzerland	Nagra	WMO	WP1-2, WP4, WP7	Susanne Pudollek
Ukraine	Chornobyl NPP	Operator	WP4, WP5, WP7	Oleksandr Skomarokhov
United Kingdom	URENCO Ltd	Waste Owner	WP1-7	Alys Devine
United States	Idaho National Laboratory	Operator	WP1-4, WP6	Robert Miklos

To become an End User Group member, interested parties must complete an Application Form and Commitment document covering confidentiality issues. The PREDIS consortium reviews and votes on approval to the EUG membership during General Assemblies a few times per year. A more general Stakeholders Group includes other interested parties who would like to follow the project's activities through newsletters and public events. The Stakeholders Group includes, e.g., supply chain companies (such as waste treatment or equipment suppliers), research institutes, universities, regulators and civil society. Registration to the End User Group or Stakeholders Group can be done via the PREDIS web page. Welcome!

Some End User Observations

"With respect to the industry expectations to PREDIS project outcomes, inputs from end users are needed so that the project is focused on delivering realistic solutions for relevant volumes of waste, beyond artificial laboratory tests. End users can help the project identify which techniques and solutions address existing gaps in waste conditioning and point out how various parties will benefit from such solutions developed in PREDIS."

Irina Gaus, Head of Research & Development at Nagra (Switzerland) and Chair of the Technology Platform IGD-TP

"The fruitful communication and open dialog is a concrete first step in the cooperation between EURAD and PREDIS. Common activities already took place and a large number are maturing and will be a great added value for both communities."

Frédéric Plas, Research and Development Director, ANDRA (France)

Work Package Updates

WP2: Strategic Implementation

Since the last newsletter the Work Package 2 team have been hard at work on our strategic tasks. The project is keen to engage with as many relevant stakeholders as possible and our work in WP2 has helped to build the end user and stakeholder groups. Broader engagement has also been established through the PREDIS webinar series (please visit the PREDIS Events page to find presentation materials and summaries from past webinars). We have had many positive interactions including with other Euratom projects, the IAEA and the Sustainable Nuclear Energy Technology Platform (SNETP), to share awareness of the PREDIS project goals and activities and to ensure that we understand end user needs and the relevant work that is ongoing elsewhere.

We are in the first stage of our work to develop the PREDIS Strategic Research Agenda (SRA). Indeed, the focus over the past couple of months has been on developing a baseline consolidated PREDIS SRA, drawing on existing SRAs, strategic roadmaps and similar 'needs' documents from a range of sources. This task is a shared effort across the PREDIS partner organisations and thanks are extended to all those involved for making this a smooth and successful process. The process of drafting the PREDIS SRA is ongoing with subsequent review activities scheduled.

The Gap Analysis (GA) task is also proceeding at pace. Input on industry needs and priorities has been collected through various surveys and questionnaires to the EUG, the PREDIS webinar series which included EUG member presentations and discussion sessions involving EUG members (see Technical Webinar Section, p 10), state-of-the-art reviews as well as direct interaction between the technical work packages and the EUG. This task has indicated that the PREDIS project goals and objectives are well within the scope of industry needs and priorities. Additionally, future R&D topics, that will be integrated into the SRA, were also identified. A GA report public deliverable will be available in June. Summaries of the findings of the GA task will be presented at the upcoming PREDIS workshop.

On Waste Acceptance Systems, we have completed an analysis of about 30 national approaches. Two webinars have now been scheduled to support our work and foster collaboration. Register to attend here!

Finally, an important element of WP2 is the Life Cycle Analysis approach for assessing predisposal treatment options and I am pleased to say that we have now identified two PhD candidates who will work closely with WP2 and the technical work packages 4 to 7 to deliver PREDIS LCA case studies.

WP2 lead: Anthony BANFORD, Matthew RANDALL and Naomi ALLEYNE, National Nuclear Laboratory (NNL), UK

WP3: Knowledge Management

WP3 is focused on the development and transfer of knowledge and competence in predisposal management of radioactive waste. This work-package is progressing as expected and the development of the PREDIS state-of-knowledge documentation and the training and mobility programmes are well underway.

The PREDIS project integrates well into the overall EURAD Project Roadmap as Pre-disposal has been identified as one of the seven EURAD Roadmap Themes (see Figure 1). The EURAD Roadmap is a generic framework that organises scientific and technical knowledge areas (themes) against different phases of a radioactive waste management programme. Each theme is programmatically further sub-divided into domains and sub-domains with their own goals and objectives. PREDIS is contributing to the EURAD Roadmap document which will be published in summer 2021.

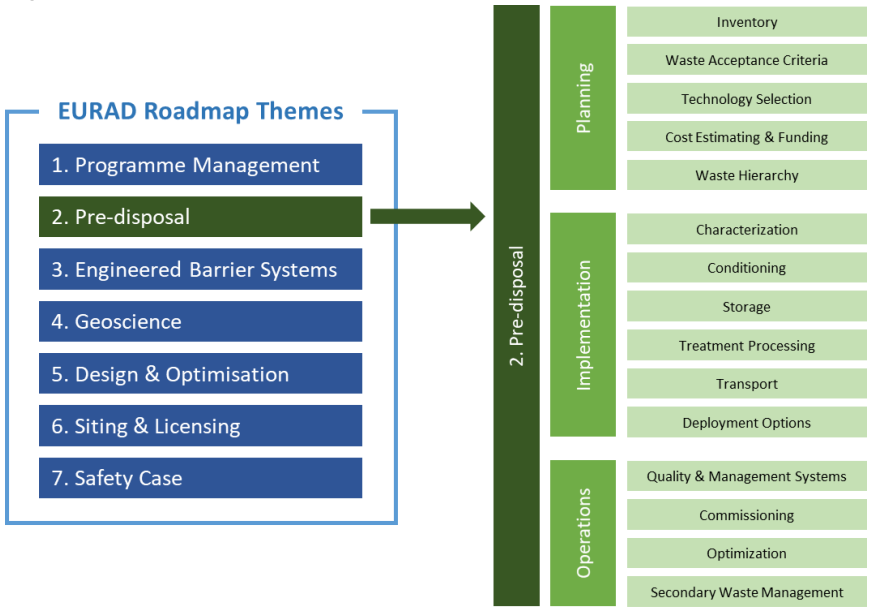


Figure 1. *Topical breakdown of the Pre-disposal theme in the EURAD Project Roadmap.*

The PREDIS training programme aims to identify and fill training gaps within the entire pre-disposal community. To this end, PREDIS launched a survey to organisations both internal and external to the project to identify unfilled training needs and to find candidate organisations willing and able to provide training covering the scope of predisposal management topics. The survey takes about 10-20 minutes to complete and it will provide crucial information to aid Work Package 3 in meetings its goals of preparing and organising training activities in line with the needs of the pre-disposal community. There is still time to take the survey and share your opinions with us.

The PREDIS mobility programme will facilitate cooperation between partners and Member States in the acquisition of knowledge needed for professional development and continuing education in the field of predisposal management of radioactive waste. The PREDIS mobility programme is primarily (but not exclusively) targeted towards young professionals (including PhDs/PostDocs and trainees) associated with organisations participating in PREDIS. Although travel remains temporarily discouraged due to COVID-19 restrictions, PREDIS will have its mobility web portal ready in early summer 2021 for the entire PREDIS partner community. Application instructions and eligibility requirements are provided in the Mobility manual, which will be available in May 2021. It is hoped that successful candidates can be sent to their destinations still this year. The mobility programme will continue with at least twice-yearly application periods until 2024.

WP3 leads: Paul CARBOL, Joint Research Centre (JRC), DE, Lara DURO, Amphos21, ES and Vaclava HAVLOVA, UJV Rez, CZ

WP4: Innovations in metallic material treatment and conditioning

Experimental work and literature studies have been moving forward with real progress being made in the past months. The scientific and technical approach to innovations in metallic waste management was refined and consolidated based on input from end-users. This input concerns both waste stream and treatment process data as well as better accounting for information on the R&D carried out by industry.

In the domain of metallic waste decontamination, surrogate specimens have been prepared using high temperature steam oxidation to form oxidation layers on steel surfaces. A chemical decontamination process based on oxidation-dissolution of the oxidation layer was selected with the help of end-users. This process was selected due to its potential treatment efficiency as well as the possibilities for recycling of reactants and minimizing the volume of the secondary waste effluents.

A semi-empirical technique for optimizing the determination of surface contamination and activation of metallic wastes is now under active development. This technique combines gamma spectrometry measurements and Monte Carlo simulations and should find application in selecting appropriate decontamination techniques in cases where metallic wastes are slightly activated and/or contaminated. Radioactive volume sources for validation of simulation models were prepared by using spent resins with different nominal activities of Ag-108m, Cs-137 and Co-60. For improving procedures for waste minimisation and recycling, suggestions from end-users were considered. The validation of neutron activation calculations by in-situ gamma spectrometry is an issue that will also be addressed.

The composition of the magnesium phosphate cement (MPC) for encapsulation of reactive metallic waste (Al, Al-Alloy, Be) has been optimized based on workability, setting time and mineralogy. Experimental conditions have been selected for Al corrosion studies including the nature of the solid suspensions, water composition and pH. Additionally, an electrochemical set-up to analyse the corrosion of steel drums in MPC has been designed.

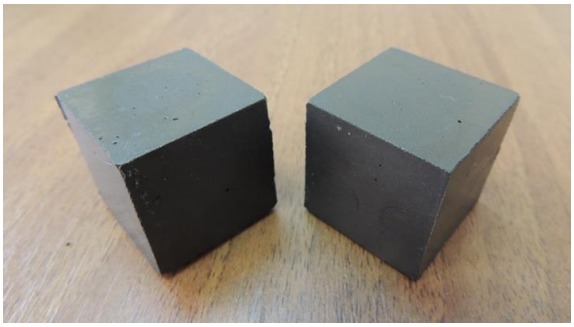
Applicable methodologies for the experimental determination of Be corrosion (H_2 release, mass loss determination, optical microscopy, SEM, XRD) have been considered in detail. Preparatory work for the handling of Be in a controlled area and the adaptation of respective workflows has also started. Leak-tight containers are being constructed to allow H_2 release measurements during the corrosion tests.

WP4 lead: Bernd GRAMBOW and Abdesselam ABDELOUAS, Institut Mines Télécom Nantes Atlantique (IMT), FR

WP5: Innovations in liquid organic waste treatment and conditioning

The first months of effort in WP5 were dedicated to collecting input data on the radioactive liquid organic wastes (RLOWs) of interest for direct conditioning (according to the needs of the European stakeholders, PREDIS End-User Group and partners) and to define the possible conditioning options to be investigated within the project (according to the those proposed by the WP5 partners). The most commonly encountered RLOWs are oils, TBP-Dodecane type solvents and scintillation cocktails. To a lesser extent, decontamination and cleaning liquids and other organic effluents are also mentioned in RLOW inventories. The WP5 Team decided to focus its work on a set of reference surrogates for the common oil, solvent and cocktail wastes in order to provide continuity to the project and permit direct comparison of results. Naturally, partners are also free to study other wastes, which may be more complex and of direct interest to their own national context.

To allow the most optimal assessment of the results obtained by WP5 partners, a guidance document has been developed to harmonise the test protocols for wasteform characterization.



Geopolymer wasteforms composed of fly ash, slag and sand incorporating 30% Shell Spirax oil (KIPT).

From an experimental point of view, the partners have started to test innovative matrix formulations based on locally sourced metakaolins, blast furnace slags, volcanic tuffs (each in isolation or as mixtures) and polymers. High waste loading rates around 30% by volume are targeted. This first screening step, which will continue for a few months, will result in the selection of the most promising options to be studied in more detail. Future studies will include durability under various conditions, tests in active and inactive conditions, and upscaling, etc. These are just some of the many exciting prospects that will be the subject of our future communications!

Zeotilized volcanic tuff from Italy for geopolymer matrix formulation (POLIMI).

WP5 lead: Maxime FOURNIER and David LAMBERTIN, Commissariat à l'énergie atomique et aux énergies alternatives (CEA), FR

WP6: Innovations in solid organic waste treatment and conditioning

WP6 partners have been working on the selection of the most appropriate surrogates for the development of treatment and conditioning processes for radioactive solid organic wastes. Because of restricted access to laboratories and shared workspaces due to the Covid-19 pandemic, work on treatment and immobilization steps have been delayed. However, other tasks are progressing as planned.

A questionnaire was sent to the End User community involved in PREDIS at the end of 2020 in order to establish waste inventory profiles, highlight priorities in the predisposal management of radioactive wastes and identify the most challenging aspects that the project should consider. WP6 would be interested to make full use of such information and therefore seeks to broaden the level of participation even further. So, if your organisation owns, manages or produces radioactive wastes, please take the time to fill out the questionnaire and share your information with us.

Molten salt oxidation processing at CVRez (Czech Republic).

Collaborative efforts between partners is being promoted through sharing knowhow and experience and also by investigating different immobilization processes with a shared batches of sample material. For example, the University of Sheffield (UK) received ashes from CEA (France) produced from the incineration of ion exchange resins. This material will be immobilized using Hot Isostatic Pressing (HIP) and the stability and durability of the end product will be tested. Additionally, a batch fraction of product residues from the Molten Salt Oxidation (MSO) process developed by CVRez (Czech Republic) was shipped to SCK CEN (Belgium) for immobilization using both cementitious materials and geopolymer matrices for comparison. Complementary tests will be performed by each organization.

Collaborations are also being pursued with other PREDIS work packages and End Users. Indeed, to establish experimental protocols, WP6 is taking into account experimental conditions currently used by the partners at their 'national' levels and the proposition made in the EURAD-ACED program to have a consistency at the European level. It was also strongly recommended by End Users to perform tests as close as possible to the expected conditions of final disposal. It is clear that high pH conditions (pH > 12) will be absolutely required, but the composition of leachate solutions will be a compromise to satisfy the variety of the disposal concepts and environmental conditions.

WP6 lead: Thierry MENNECART, Studiecentrum voor Kernenergie / Centre d'Etude de l'Energie Nucléaire (SCK CEN), BE

WP7: Innovations in cemented waste monitoring

In the past months WP7 has been focused on preparing the state-of-the-art report (SOTA) on the monitoring of cemented waste (during preparation, handling and long-term storage), collecting input and feedback from end users and identifying gaps in its objectives relative to end user needs. It is clear from these exercises that the process of establishing effective dialogue with end users will take real commitment.

Under the lead of Stefania Uras (SOGIN, Italy), the WP7 SOTA state was compiled, written and submitted to the EC as our first public deliverable (Deliverable 7.1, State of the art in packaging, storage and monitoring of cemented wastes). The report is based on information collected through the administration of a questionnaire answered by PREDIS end users. On balance, immobilization in cement matrices is the preferred conditioning pathway for a variety of waste streams. A significant amount of cemented waste is classified as intermediate level waste implying that long-term storage will be required before geologic disposal is available. Although many industry respondents reported observing cemented wasteform package degradation, such assessments are primarily confirmed by visual inspection, i.e., after package failure. It is the aim of WP7 to develop innovative monitoring technologies which will identify problematic waste packages before they fail or can be detected by observation with the naked eye, allowing for safer and more cost-effective intervention.

The process of identifying gaps in the goals and objectives of WP7 activities has not led to any conclusions that required significant changes to our detailed project/task plans. One new refinement, emphasized in the WP7 webinar breakout room discussions, will be the addition of internal pressure measurement capabilities to the development of the RFID sensors for real time package monitoring. This capability would allow the detection of wasteform swelling prior to the package suffering any permanent damage.

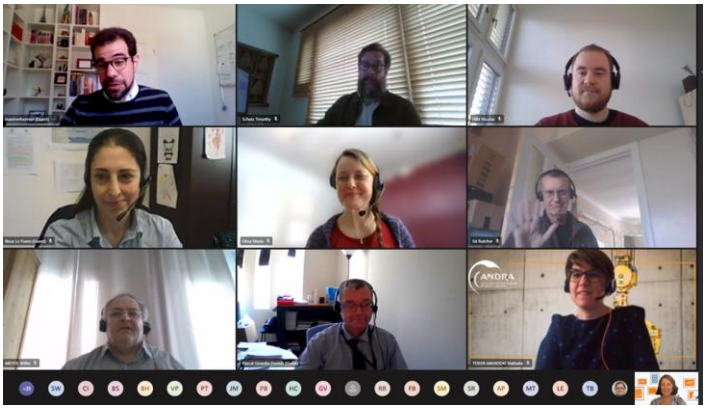
WP7 has also been making progress on producing the mockups and selecting the test specimens that will be used to evaluate the monitoring methods and digital simulations being developed by the partners.WP7 lead: Ernst NIEDERLEITHINGER and Christian KÖPP, Bundesanstalt Für Materialforschung und Prüfung (BAM), DE

Technical Webinars

The PREDIS project held four technical webinars over the first three months of 2021 in order to share insights on technical innovation plans from the work packages, hear case studies and discuss industry needs, challenges and priorities. A further objective of the webinars was to inform the PREDIS project gap analysis.

- January 19, 13-16 CET: WP7 - Innovations in cemented waste package monitoring and storage
- February 16, 13-16 CET: WP4 - Innovations in metallic material treatment and conditioning
- March 9, 13-16 CET: WP6 - Innovations in solid organic waste treatment and conditioning
- March 30, 13-16 CET: WP5 - Innovations in liquid organic waste treatment and conditioning

These webinars were individually focussed on the goals, objectives and innovation opportunities of each work package. Work package leaders composed programs consisting of invited speakers and partners presenting 1) end user perspectives on the topic at hand, 2) the scope and objectives of the work packages, 3) survey results on the state of the art in waste package and waste facility monitoring activities or radioactive waste inventories across Europe, 4) views and information from IAEA and potential opportunities for cooperation, 5) cross-cutting R&D results from other EU projects and 6) introductions to specific work package topics and themes.

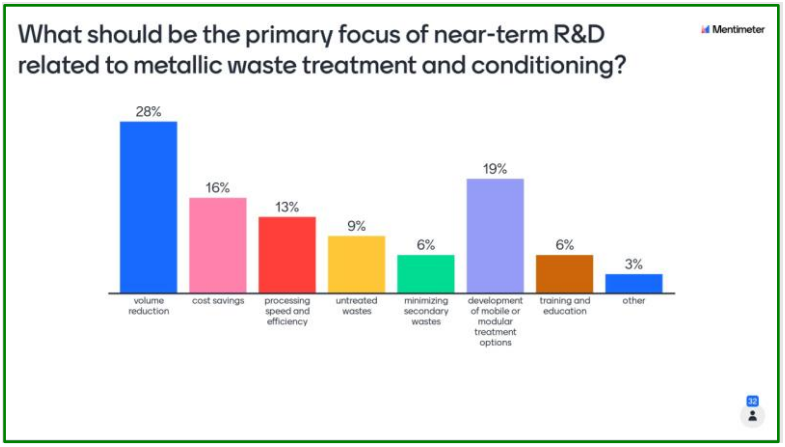


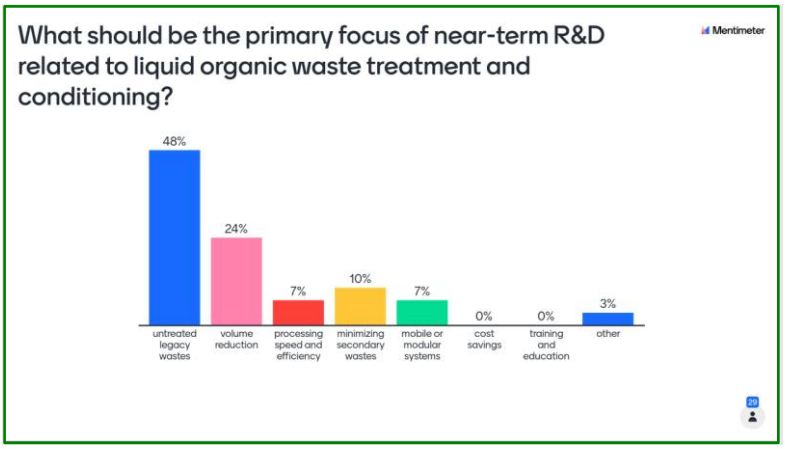
Each webinar consisted of two sessions of presentations followed by smaller group discussions to explore issues raised in the formal presentations and to gather end user (and broader) information on future objectives in predisposal waste management, potential barriers standing in the way of meeting those objectives and input on the technologies being developed in the PREDIS work packages. The deliberations of the discussion sessions provide direct feedback to the work packages and valuable input to the gap analysis.

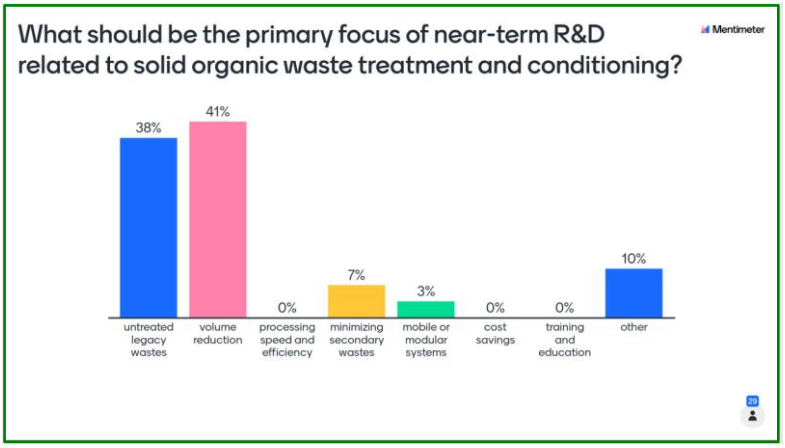
The presentations and summaries from these webinars are available on the PREDIS website (https://predis-h2020.eu/events/).

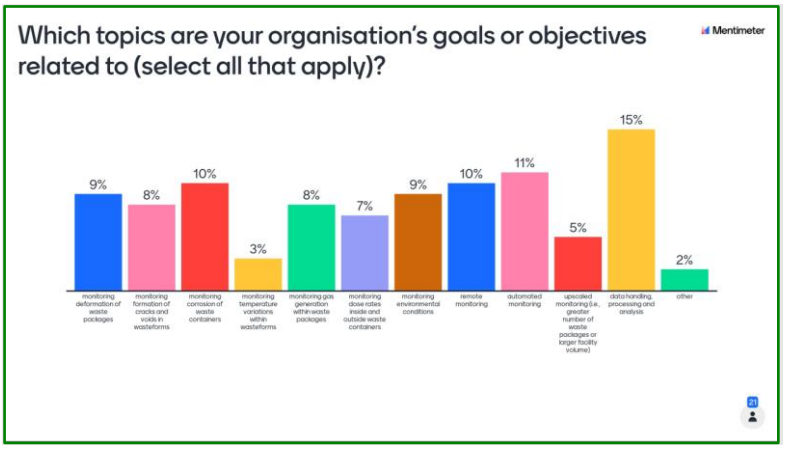
There was significant interest in these webinars with signups ranging from more than 120 to over 200 registrants per event, from over 20 countries including some outside Europe. Representation was generally split between end user group members + general stakeholders and consortium partners at roughly 55% to 45%, respectively, for each webinar. The PREDIS management team feels the webinars have been a great success and therefore we will continue to identify topics for future webinars throughout the course of our project. We have received positive feedback from participants (average score of 4.4 out of 5.0 on 6 questions) as well as ideas for improvements. The wider international predisposal waste management community also seems to appreciate having such forums for sharing and discussions, especially while travel is restricted.

some live polling from the webinars









Partner Spotlights

In our 2nd newsletter we take a closer look at our partners from Italy and Belgium. Future newsletters will highlight other partners.

Ansaldo Nucleare S.p.A (ANN, Italy) is the leading Italian company in the civil nuclear sector. It has developed relevant technical knowledge and expertise to deliver innovative products in the nuclear market related to EPC services and nuclear new build, service to operating plant and decommissioning and waste management of nuclear plants and facilities. ANN's waste management expertise involves all the activities from radioactive waste retrieval to conditioning and final packaging. It has performed significant project work on the design, construction and commissioning of complex radioactive waste retrieval and waste treatment solutions for solid, liquid and sludge in harsh environments, the design, construction and qualification of containers for the temporary storage of radioactive wastes and the design of interim storage facilities for LILW including handling systems, radiation monitoring, I&C, HVAC and safety analysis. More recently, ANN has been working to develop innovative treatment options for different types of radioactive waste. It was responsible for the design, procurement and construction of a wet oxidation facility for organic waste treatment of spent resins stored at Trino NPP. ANN was also in charge of the design and construction of a phosphoric acid decontamination plant for metallic scraps aimed at decontaminating the carbon and stainless-steel materials produced during the dismantling of the Caorso NPP. Ansaldo Nucleare will contribute to WP5 and WP7.

Agenzia nazionale per le nuove tecnologie, l'energia e lo sviluppo economico sostenibile / National Agency for New Technologies, Energy and Sustainable Economic Development (ENEA, Italy) is a public body aimed at research, technological innovation and the provision of advanced services to enterprises, public administration and citizens in the sectors of energy, the environment and sustainable economic development. ENEA has more than 2500 highly qualified employees, state-of-the-art laboratories, experimental facilities and instruments for carrying out research projects, studies, analyses and training services, with particular reference to product and process innovation to contribute to the development and competitiveness of the national economic system. Within the Department of Fusion and Technology for Nuclear Safety and Security (Dipartimento Fusione e Technologie per la Sicurezza Nucleare, FSN), the Nuclear Material Characterization and Nuclear Waste Management Laboratory (FSN-FISS-CRGR) carries out radiological characterization of radioactive and nuclear materials by means of both destructive and non-destructive techniques and has expertise in the qualification of matrices for radioactive waste conditioning. ENEA (through FSN-FISS-CRGR) is one of the founding members of the European network of testing facilities for the quality checking of radioactive waste packages (ENTRAP). The laboratory under the guidance M. Letizia Cozzella and Giuseppe A. Marzo will contribute to WP5. In particular, efforts will be dedicated to Task 5.4 "Study of conditioning matrix performances" by carrying out studies and experiments regarding immobilization matrix durability under endogenous, aerated, acidic and alkaline conditions.

Istituto Nazionale di Fisica Nucleare / National Institute for Nuclear Physics (INFN, Italy) is a research agency, under the supervision of the Ministry of Education, Universities and Research (MIUR) of the Italian Government, dedicated to the study of the fundamental constituents of matter and the laws that govern them. It conducts theoretical and experimental research in the fields of subnuclear, nuclear and astroparticle physics. All INFN research activities are undertaken within an international framework. The technologies and instruments required are developed in its own laboratories and in collaboration with industry. INFN counts 25 departments, 4 national laboratories, more than 1800 employees, more than 4000 collaborators and about 1300 undergraduate, fellows and PHD students in its ranks. Through its expertise in particle and radiation detectors development, in read-out electronics design and in the construction of complex scientific equipment, INFN will contribute to WP7 (specifically, subtasks 7.3.1, 7.6.1 and 7.6.2). Activities will be focused on three topics: 1) the use of muon tomography to study and potentially validate the properties of concrete waste packaging including density analysis, 2) the development of new gamma and neutron detectors, based on scintillating fibers and solid-state detectors respectively, for concrete waste package monitoring and 3) the design of smart read-out electronic interfaces for these new detectors featuring wired and wireless connection for remote control and data transmission, very low power consumption and power from long-lived rechargeable batteries. INFN activity is coordinated by Mauro Romoli (INFN Naples), Paolo Checchia (INFN Padua) for the muon tomography and Paolo Finocchiaro (INFN-LNS, Catania) for the radiation detectors. The Università degli Studi della Campania "L. Vanvitelli" (UNICAMPANIA, Italy), with Carlo Sabbarese as contact person, will contribute to the PREDIS project as a linked third party to INFN.

Nucleco SpA (Nucleco, Italy), established in 1981, is the leading company in Italy in the field of radiological services, management of radioactive waste and in the decontamination and remediation of nuclear plants and industrial sites. Nucleco's research and development activities are focussed on radiological characterization, qualification of conditioning processes, development of chemical and radiochemical methods, advanced technologies for decommissioning and the treatment and conditioning of radioactive waste. Nucleco will contribute to WP4 and WP5 by applying its expertise in analysis using non-destructive (gamma/tomography scanning, active and passive neutron analysis, X-ray) and destructive techniques (alpha, beta and gamma spectrometry, chemical analysis), sampling and analysis of hard-to-detect radionuclides and the qualification of cement grout for the conditioning of radioactive waste. The working group will include Fabiana Gentile (Laboratory Manager), Davide Cori (Qualification Process Laboratory), Filippo Gagliardi (Non-destructive characterization systems), and Giulia Colavolpe (Chemical Laboratory).

Politecnico di Milano (POLIMI, Italy), established in 1863, is the largest Italian university for Engineering, Architecture, and Industrial Design with more than 42 000 enrolled students, 6 campuses and 12 Research Departments. POLIMI's activities in PREDIS will be carried out by the Radiochemistry and Radiation Chemistry Lab in the Department of Energy. The laboratory features modern and fully equipped facilities and well-established expertise due to participation in several International (IAEA CRPs), European (EURATOM JRPs) and National collaborative Research Projects. POLIMI closely collaborates with EC-JRC-Ispra, SOGIN, NUCLECO, and ANN. Research activities in the laboratory are focused on the fields of nuclear- and radiochemistry, radiation chemistry, dosimetry, nuclear decommissioning and waste management. The laboratory is supervised by Prof. Mario Mariani. Dr. Eros Mossini is the PREDIS PI with

essential contributions coming from Dr. Elena Macerata, Mr. Marco Giola as well as postdoctoral researchers, Ph.D. candidates and M.Sc. students in the Nuclear Engineering program. POLIMI's contributions to the PREDIS project are aimed at developing and optimizing pre-conditioning treatments on solid organic waste surrogates (WP6), developing, optimizing, and characterizing innovative geopolymer-based conditioning matrices for liquid and solid organic waste surrogates and real wastes (WP5 and WP6) and demonstrating the radiation stability and long-term durability of conditioned waste forms containing reactive metals (WP4) or liquid and solid organic wastes (WP5 and WP6).

Società Gestione Impianti Nucleari (SOGIN, Italy) is the Italian state-owned company responsible for the decommissioning of Italian nuclear power plants, the management of radioactive waste and the siting, designing, building and operating of the National Repository for the disposal of very low- and low-level radioactive wastes (VLLW/LLW) and the long-term storage of intermediate- and high-level radioactive wastes (ILW/HLW). SOGIN has been operating since 2001. The more than 1,000 employees of the SOGIN Group constitute the most highly skilled team of professional experts in management of radioactive wastes and decommissioning of nuclear plants in Italy. SOGIN will actively take part in the PREDIS project as an End User. In addition, SOGIN will contribute to the project in different Work Packages. Angelo Paratore leads SOGIN's WP2 activities on the development of the predisposal management strategic research agenda and the compilation of guidance on waste acceptance criteria. Federica Pancotti leads SOGINS's WP5 work on coordinating Task 5.3 for the study of direct conditioning processes (SOGIN will also make available its radioactive liquid organic waste as a real case to be addressed by the research activities), the disposability assessment of such conditioned wastes and the preliminary technical, economic and environmental analyses of these conditioning schemes. Stefania Uras leads SOGIN's WP7 work on coordinating Task 7.2.1 for the state-of-the-art report and on the demonstration and implementation tasks.

The University of Pisa (UniPi, Italy), founded in 1343, is one of the most ancient and prestigious universities in Europe. UniPi is organized into twenty large departments covering all major disciplinary areas with high level research centres in the sectors of physics, computer science, engineering, mathematics, among others. The academic staff numbers around 1400 professors and researchers and more than 50 000 (B.Sc. plus M.Sc.) students are enrolled with over 700 PhD students. Il Dipartimento di Ingegneria Civile e Industriale / The Department of Civil and industrial Engineering (DICI) at the University of Pisa participates in WP3, WP5 and WP7 of PREDIS. DICI strongly orients its activities towards collaborations with Italian and European industries in research projects with wide scientific and technological significance. In particular, the nuclear engineering group of DICI has a long tradition (since the 1970s) in the qualification of packaging systems, waste management and decommissioning. Rosa Lo Frano is the

PREDIS PI at UniPi, working on the development and implementation of training and mobility programmes and the thermal behaviour and associated fire hazards of waste conditioning matrices. Professors Riccardo Ciolini and Francesco D'Errico work on applying and optimizing an original and innovative system for the remote identification and monitoring of radioactive waste. Other members of the research group include several Ph.D. students and postdoctoral researchers. Staff experience and infrastructure at UniPi is ideally suited to contributing to WP5 and WP7. UniPi works closely with the Italian University Ministry (MUR), European Commission, ENEA, ANN, SOGIN, ITER etc. on different aspects of nuclear power plant safety and radioactive waste management.

SCK CEN (SCK CEN, Belgium) is one of Belgium's largest research centres. It has more than 850 employees who devote themselves every day to developing peaceful applications of nuclear energy. The research activities at SCK CEN relate to three main themes: the safety of nuclear facilities, the development of nuclear medicine and protecting the population and the environment from ionising radiation. SCK CEN is recognised worldwide and shares its knowledge through numerous publications and training courses. SCK CEN began RD&D on geological disposal in deep clay formations in 1974 and since then has been an active participant in all EC FP's and the RD&D programs of ONDRAF/NIRAS, the Belgian waste management organization. This work has included performing RD&D on many aspects of near-field and far-field processes including laboratory (glove box and hot cell) experiments, state of the art modelling, *in situ* tests in the URL HADES and safety evaluation/performance assessment. For more than 5 years, activities at SCK CEN have included the pre-treatment and immobilization of problematic waste streams in different matrices. Under the direction of Dr. Christophe Bruggeman (Head of the Waste & Disposal Expert Group), SCK CEN is engaged in all PREDIS WPs. SCK CEN actively contributes to WP2 leading the task on establishing a pre-disposal stakeholder community and to WP3 for aligning the PREDIS Training and Mobility programme with the School of Radioactive Waste Management under EURAD. In WP4, SCK CEN studies the corrosion of Be in magnesium phosphate cement and in WP5 it focuses on implementing geopolymers and related alkali-activated materials as mineral binders for liquid organic waste conditioning. Dr. Thierry Mennecart is the leader of WP6, in which different binder materials for the immobilization of thermally treated solid organic wastes are investigated. SCK CEN contributes to this WP by comparing the potential of geopolymers and related alkali-activated materials versus OPC as mineral binders for incineration residues and with the characterisation of plasma slags and HIP samples. In WP7, SCK CEN develops a digital model for the evolution of cemented radioactive waste and the potential of machine learning, including real scale testing.

MAGICS Instruments NV (MAGICS®, Belgium) is a technology company specialized in the design of semiconductor chips and machine learning based smart sensors. It is a spin-off company from KU Leuven and SCK CEN. The company's core mission is developing technologies for a sustainable world. MAGICS achieves this goal by leveraging its expertise in both integrated circuits and machine learning to create intelligent and reliable machines. MAGICS' also utilizes its expertise with regards to innovative wireless sensing solutions for nuclear waste management. More specifically, in the development of wireless platforms and trained machine learning algorithms for nuclear waste and low power sensing technologies. MAGICS will contribute to WP7.

Upcoming Events

PREDIS 2nd Workshop (May 4 - 6, 2021)

The PREDIS 2nd Workshop will be held virtually and will cover the achievements of the first 9 months of the project. There will be a half-day session dedicated to industry End User participation. The technical proceedings of the workshop will be published on the PREDIS website. Please register here and download the preliminary agenda. Our first workshop in October 2020 was described in the previous newsletter and summaries are available on the PREDIS web page Events section. Future workshops scheduled for spring 2022-2024 are intended to be face-to-face and will include public stakeholder participation.

The PREDIS Project Live Webinar Series continues…

In April and May 2021, the PREDIS project will host two more webinars in its series of free technical webinars. These two webinars will both focus on issues related to waste acceptance criteria.

Register here!

- April 21, 09-12 CET: Waste Acceptance Criteria: Information and Resources
- May 20, 09-12 CET: Waste Acceptance Criteria: Needs, Challenges and Opportunities

We anticipate having additional webinars on topical areas in autumn, so please stay tuned to the PREDIS web page for details and a full listing of project related events.

European Nuclear Young Generation Forum (September 27 – 30, 2021)

The 2021 edition of the ENYGF is targeting four hot topics that will shape the future of nuclear energy. One of these topics is radioactive management and attendees are invited to present their work on the challenges and strategies dealing with radioactive waste management in its different areas of study with special focus on the most advanced techniques. The forum will be held in a hybrid format with both in-person (in Tarragona, Spain at reduced capacity) and virtual attendance.

IAEA International Conference on Radioactive Waste Management: Solutions for a Sustainable Future (November 1 - 5 ,2021)

The purpose of the event is to share experiences in the management of radioactive waste, with the aim of increasing the visibility of progress, good practice and effective solutions. The conference will address national programmatic perspectives, implementation of waste management strategies, solutions for specific wastes, integrated waste management and multinational cooperation in radioactive waste management.

Other

Please see our website for events of interest to the PREDIS community.

Newsletter #2

Be on the lookout for PREDIS Newsletter #3 next autumn.