



Characterization of Conditioned Nuclear Waste
for its Safe Disposal in Europe

End-User Group Meeting #1

Stéphane Plumeri

On behalf of the CHANCE Consortium



- 10:30-11:00 Welcome and introduction
 - General information about CHANCE Project
 - Purpose of the meeting and expected outcomes
- 11:00-12:45 CHANCE Work Plan
 - WP2 - Methodology for conditioned radioactive waste characterization: Problematic wastes and R&D proposal - Stéphane Plumeri (Andra)
 - WP3 - Calorimetry associated with non-destructive assay (NDA) techniques and uncertainties study – Christophe Mathonat (KEP Nuclear)
 - WP4 - Muon imaging for innovative tomography of large volume and heterogeneous cemented waste packages - Jaap Velthuis (University of Bristol)
 - WP5 - Innovative gas and outgassing analysis and monitoring - Guillaume Genoud (VTT)
- 12:45 – 13:45 Lunch Break

- 13:45 -15:00 Role of End-Users in CHANCE
 - General aspects - Stéphane Plumeri (Andra)
 - Role in WP2 Task 1: "End-Users requirements & Methodology for conditioned waste characterization" 60' - Crina Bucur (Raten)
- 15:00 – 15:20 *Coffee Break*
- 15:20 – 16:00 Open discussion on expected impact & outcomes of CHANCE project- All

General presentation of the CHANCE project

Stéphane Plumeri

On behalf of the CHANCE Consortium

- CHANCE: “Characterization of conditioned nuclear waste for its safe disposal in Europe”
- Funded by Euratom research and training programme 2014-2018 under grant agreement N° 755371
- Within the NFRP 7-2016-2017 topic “Research and innovation on the overall management of radioactive waste other than geological disposal”
- Duration of 4 years; start date June 1, 2017; end date: 31 May, 2021
- Kick-off meeting hosted by SCK•CEN on June 12-13, 2017
- Total CHANCE budget: 4,25 M€
- EC contribution: 3,98 M€
- Consortium: 12 partners from 8 European countries
- Supported by IGD-TP
- CHANCE aims to address the characterization of conditioned radioactive waste

CHANCE

Characterization of Conditioned Nuclear Waste
for its Safe Disposal in Europe

- Andra (FRA)
- CEA (FRA)
- ENEA (ITA)
- FZJ (GER)
- KEP Nuclear (FRA)
- SCK•CEN (BEL)
- University of Bristol (UK)
- University of Sheffield (UK)
- VTT (FIN)
- RATEN (ROM)
- WUT (POL)
- INCT (POL)



Consortium

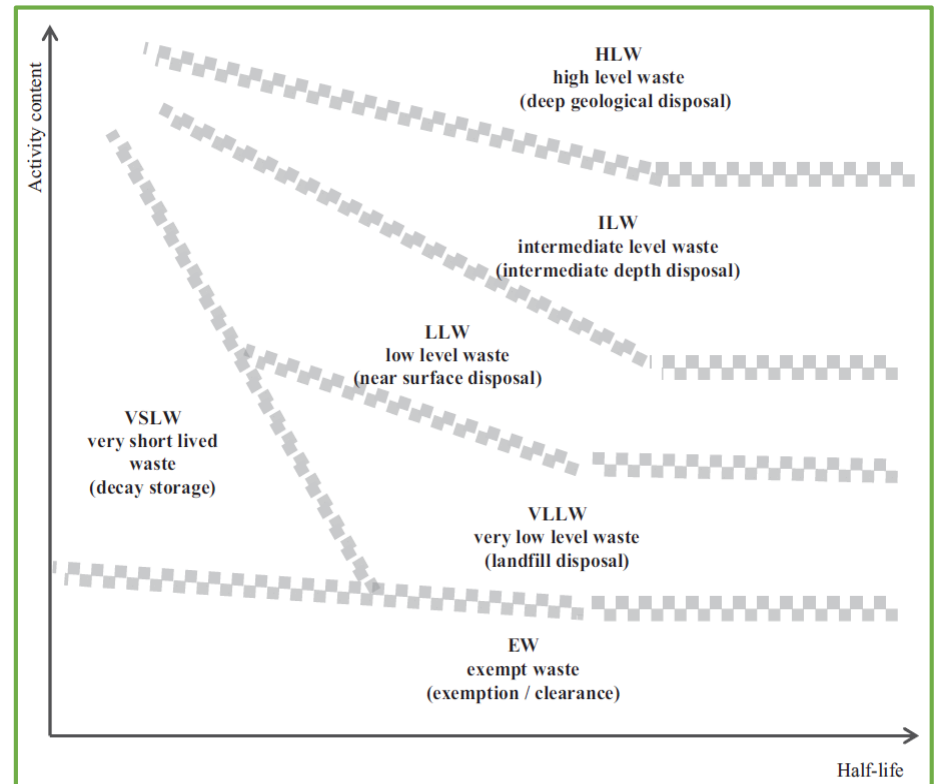
- **To establish at the European level a comprehensive understanding of current conditioned radioactive waste characterization and quality control schemes across the variety of different national radioactive waste management programmes**
 - Based on inputs from end-users such as Waste Management Organisations, regulators, waste producers and repository operators

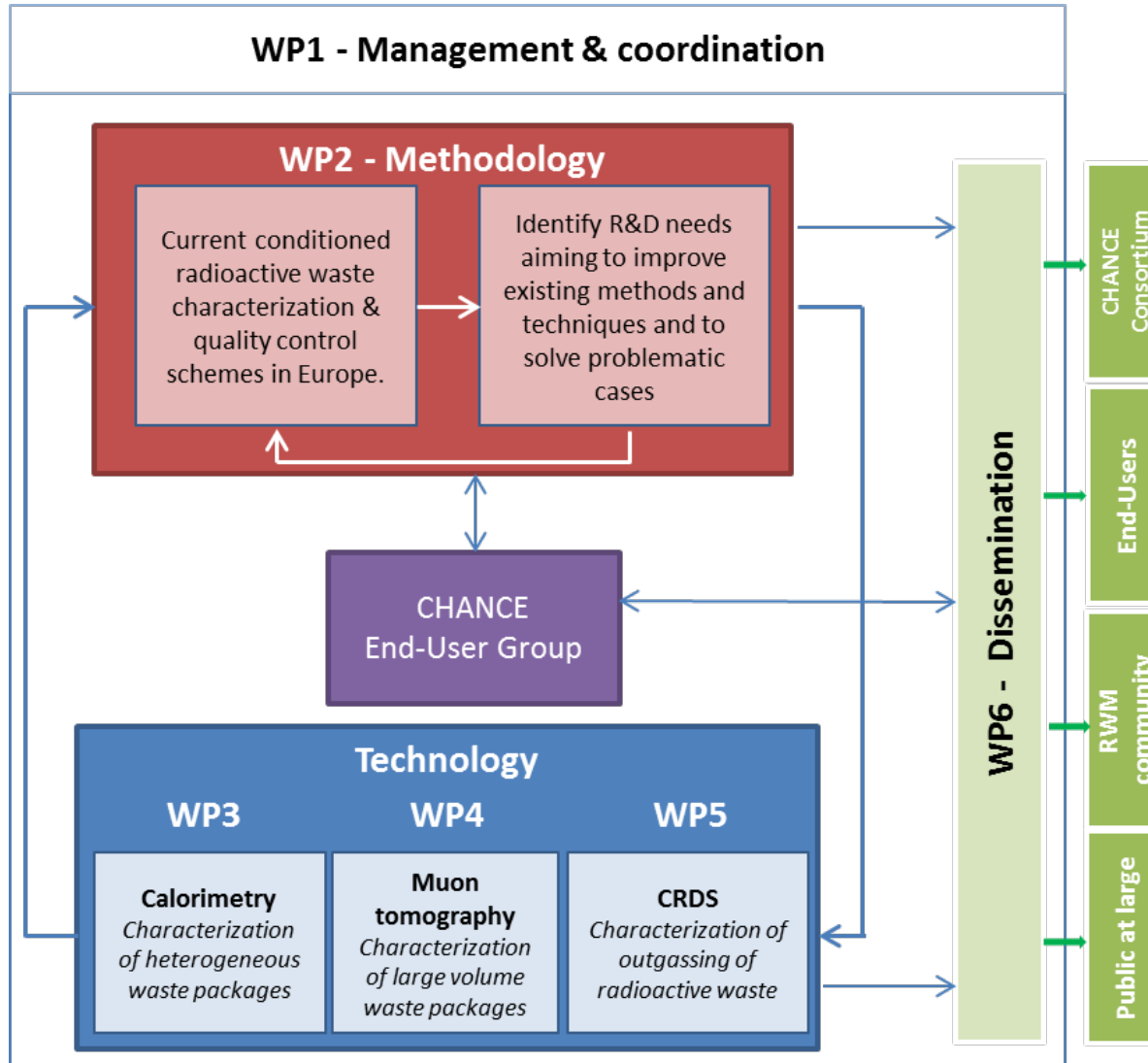
- To further develop, test and validate non-destructive techniques that will improve the characterization of conditioned radioactive waste (CRW) and complement current methodology while particularly targeting large and heterogeneous waste compounds
 - Calorimetry
 - Muon Tomography
 - CRDS

Comment

Destructive technologies followed by chemical or radiological analyses are commonly used techniques for radioactive waste characterization but are **not addressed in CHANCE**, since these techniques are applied to the raw waste itself, this is not in the scope of this project.

- CHANCE will focus on the following waste forms (IAEA classification):
 - Very Low Level Waste (VLLW)
 - Low Level Waste (LLW)
 - Intermediate Level Waste (ILW)
 - High Level Waste (HLW)
- Very Short Lived Waste and Exempt Waste are beyond the scope of CHANCE as these kinds of waste are not destined for a specific radioactive waste disposal





To identify current methodologies and shortcomings of current characterization and metrology of CRW in Europe

- Key parameters that need characterization and uncertainties assessment
- Technologies commonly used for conditioned waste characterization
- Specific problematic issues for the characterization of CRW
- Knowledge and technology gaps for radioactive waste package characterization methodologies
 - Driven by the end-user requirements for the characterization of radioactive waste
 - Waste Management Organizations (WMOs), regulators, disposal operators, waste producers...
 - A specific End-Users Group (EUG)

Leader: Andra – Contributors: CEA, ENEA, FZJ, SCK•CEN, RATEN, INCT

Technology (WP3 – WP4 – WP5): to carry out research and development on specific characterization technologies

- Several specific issues already been identified:
 - Characterization of historical and orphaned waste content
 - Characterization of large volume radioactive waste packages ($> 1 \text{ m}^3$)
 - Characterization of package outgassing (isotopic flow rates)
 - Reduction of uncertainties on radionuclide content, especially for heterogeneous waste

To develop R&D on 3 innovative technologies for CRW

- Calorimetry as a non-destructive technique to reduce uncertainties on the inventory of radionuclides (WP3) mainly on hidden or difficult-to-measure radionuclides that are important for disposal declaration and safety analysis
- Muon Tomography as a non-destructive technique to control the content of large volume **and heterogeneous** nuclear waste packages (WP4)
- Cavity Ring-Down Spectroscopy to characterize outgassing of radioactive waste (WP5) **at an unprecedented low detection level**

WP3 Leader: KEP Nuclear – Contributors: CEA, FZJ, SCK•CEN, WUT

Objectives:

- To test and evaluate the performance of calorimetry as a non-destructive technique for inventory of radionuclides
- To identify how calorimetry can complement existing, widely-used techniques (gamma spectrometry and neutron passive measurement for instance)
- To carry out an exhaustive study of uncertainties assessment related to calorimetry and its coupling to other non-destructive techniques

A dedicated calorimeter (200 litres) will be designed and built by KEP Nuclear

A dedicated experimental program will be carried out with mock-up drums, and possibly real drums (@CEA and SCK•CEN)



WP4 Leader: University of Bristol – Contributors: FZJ, SCK•CEN, University of Sheffield, WUT

To develop mobile muon tomography instrumentation to address imaging of large volume and heterogeneous nuclear waste packages.

Objectives:

- To build a suitable mobile muon detection system
- To assemble test drum for non-active and active qualification experiments and commissioning
- To demonstrate real waste drum muon tomography
- To evaluate performances of the technic

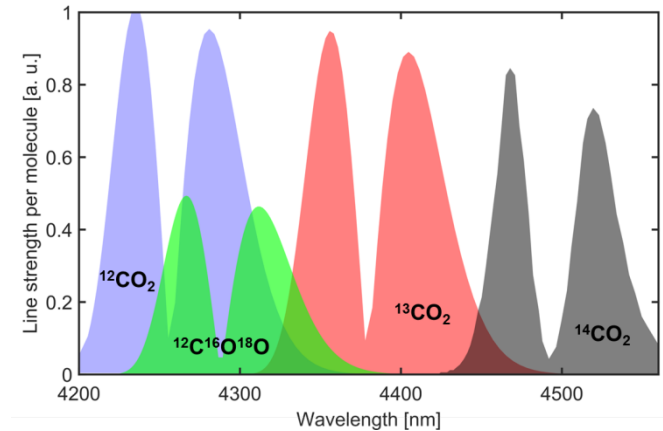
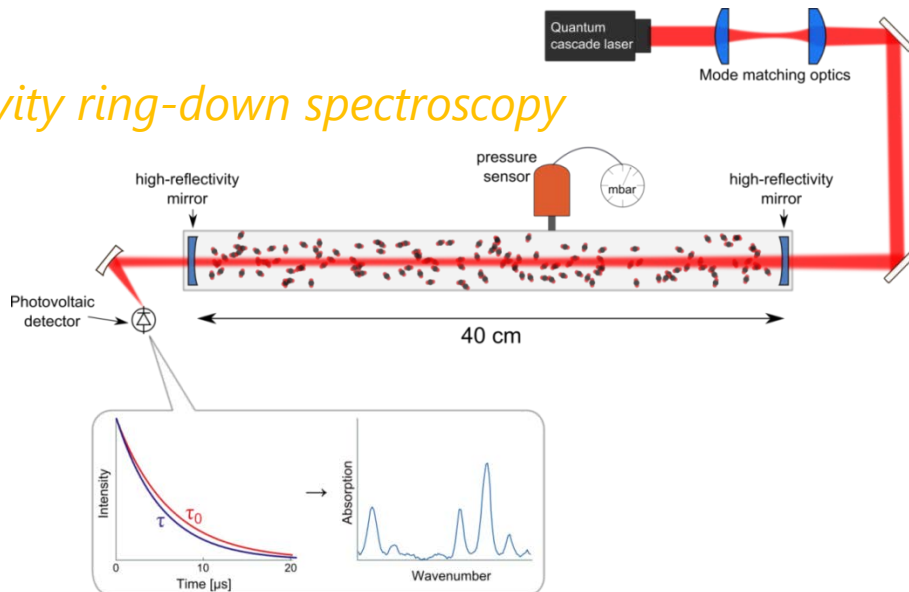
WP5 – outgassing analysis and monitoring

WP5 Leader: VTT – Contributors: CEA, ENEA, FZJ

Objective:

- Advance the use of Cavity Ring-Down Spectroscopy (CRDS)
 - Develop new instrumentation for $H^{36}Cl$
 - Demonstrate an application of the technique to the monitoring of ^{14}C outgassing

Cavity ring-down spectroscopy



Optical IR-absorption spectrum
of CO₂ isotopes

WP6 – dissemination and training

WP6 Leader: SCK•CEN – Contributors: Andra, ENEA, FZJ, INCT

To integrate, communicate and disseminate CHANCE results within the European community involved in radioactive waste management

- Communication to broader European community involved in radioactive waste disposal
- Study on social and ethical concerns associated to the innovative methods for the characterization of radioactive waste
- Training and education of young professionals
- Synthesis report integrating all CHANCE results

Communication tools

- Public website → www.chance-h2020.eu
- Participation to national and international events (conferences, workshops,...)
- Specific communication through IGD-TP (website, newsletter,...)
- Topical day on conditioned radioactive waste characterization
- Training course

CHANCE EUG will gather experts from European (WMOs, regulators, repository operators including waste producers, TSOs...)

➤ EUG will remain open for new participants during the project life

EUG has a key role in the project

- Participate in EUG meetings organized by the CHANCE consortium
 - At least 3 meetings are foreseen (at month 6, 18 and 48)
- Answer a specific questionnaire related to WP2 & WP6, and review the some related deliverables
- Be regularly informed about the project progress

Current members

Organisation	Country	Role
Andra	France	WMO
ANDR	Roumanie	WMO
Areva	France	Nuclear Facility Operator
CEA	France	Nuclear Facility Operator
DMT	Allemagne	IAEA Technical Expert Consulting Group
EDF	France	Nuclear Facility Operator
Enresa	Espagne	WMO
IRSN	France	TSO
NCSR Demokritos	Grèce	Nuclear Facility Operator
NRG	Pays-Bas	Nuclear Facility Operator
Nucleco	Italie	WMO
RWM	Royaume-Uni	WMO
SCK-CEN	Belgique	Nuclear Facility Operator
SKB	Suède	WMO
SOGIN	Italie	Nuclear Facility Operator
ZUOP	Pologne	WMO

- To develop **new solutions** for the characterization of conditioned radioactive waste to solve specific issues
- To **improve** radioactive waste **classification**
- To **improve the global safety** of the whole chain of radioactive waste management
- To contribute to an **European homogenized approach** for the characterization of conditioned radioactive waste
- To **improve common practice** in terms of conditioned radioactive waste characterization
- To **maintain and enhance knowledge and competences**
- To **improve public confidence**

Purpose of the meeting and expected outcomes

EUG meeting #1

- First contact between CHANCE partners & EUG members
 - Presentation of CHANCE work plan
- Role of EUG in the project
 - Mainly in WP2 & WP6
- Interactions between EUG and CHANCE members during the life of the project
 - EUG meetings
 - Survey for WP2 & WP6

CHANCE Work Plan

WP2 - Methodology for conditioned radioactive waste characterization: Problematic wastes and R&D proposal

WP Leader: Andra

Contributors: CEA, ENEA, FZJ, SCK•CEN, RATEN, INCT

WP2 main objective is to identify current methodologies and shortcomings of characterization and metrology of conditioned radioactive waste in Europe

More precisely WP2 objectives are to

- Collect end-users requirements in terms of characterization, especially links and overlaps between these requirements and waste specifications for different national disposals
- Identify critical parameters to be measured for each waste type and their final disposal solutions and the commonly used evaluation techniques and problematic cases for radioactive waste package characterization
- Identify R&D needs to develop and evaluate innovative technologies complementing current characterization techniques

Reminder: CHANCE will focus on CRW from the following waste activity levels (IAEA classification):

- Very Low Level Waste (VLLW)
- Low Level Waste (LLW)
- Intermediate Level Waste (ILW)
- High Level Waste (HLW)

WP2 – Year 1 – Important dates & actions

- WP2 Workshop n°1- June 13th 2017
 - Objective will be to launch the activities of WP2 and more specifically to discuss and prepare the production of the questionnaire
 - Preparation of the questionnaire for EUG members - From June to November 2017 (M6)
- **EUG meeting n°1 – November 2017 (M6)**
 - Objectives will be to present to the EUG the CHANCE project, its objectives and expected outcomes, as well as the modalities of the implication of the EUG in the project.
- Start of EUG answers analysis & WP2 Workshop n°2 – May 2018 (M12)
 - Analyse the responses of the questionnaires and start the drafting of the synthesis report

WP2 – Year 2 – Important dates & actions

- EUG meeting n°2 – November 2018 (M18)
 - Present and discuss the progress of the project
- WP2 Workshop n°3– November 2018 (M18)
 - Finalize the work of task 2.1 and prepare the work of task 2.2 on the basis of the synthesis report
- D2.2 Synthesis of commonly used methodology for conditioned radioactive characterization – February 2019 (M21)

WP2 – Year 3 – Important dates & actions

- D2.3 R&D requests in the field of conditioned radioactive characterization – November 2019 (M30)

End of WP2

- EUG meeting n°3 – May 2021 (M48)
 - Give an overview of the project activities, the main results achieved, as well as the impacts of the project

Synthesis of commonly used methodology for conditioned radioactive characterization

- Due date: February 2019

R&D requests in the field of conditioned radioactive characterization

- Due date: November 2019
- Potential link with European Joint Programme on Radioactive Waste Management and Disposal

Input of End-User Group

- A questionnaire will be transmitted to EUG members (Crina Bucur presentation this afternoon)
- Opportunity to review two related deliverables

CHANCE Work Plan

WP3 – WP4 – WP5

CHANCE EUG General aspects

Members

- Experts Waste Management Organisations, repository operators, waste producers, Technical Support Organisations, research entities involved in CRW characterization
- Open to non-EU members
- The End-User Group will remain open for new participants during the project life

Role

- Engagement form to fill and return to CHANCE coordinator
- Input for WP2 & WP6 (task 2)
 - Answer to dedicated questionnaire
- Review of linked deliverables (D2.2 & D2.3 & D6.3)
- Review of the project progress through dedicated meetings

CHANCE EUG – Engagement form

Form to express commitment into participating to CHANCE End-User Group

- It will be sent after this meeting
- This document has not a legally binding character
- It includes a detailed description of CHANCE EUG members role

Participation to 3 EUG meetings

- **EUG meeting n°1** will be held in November 2017
 - Presentation of the CHANCE project
 - Modalities of the implication of the EUG in the project
- EUG meeting n°2 will be held at the mid-term of the project (November 2018)
 - Present and discuss the progress of the project
 - Orientation of the work plan for the second part of the project
- EUG meeting n°3 will be held at the end of the project (May 2021)
 - Give an overview of the project activities, the main results achieved, as well as the impacts of the project.

Regular information will be given to CHANCE EUG Group members (website, dedicated mailing)

EUG Role in WP2 & WP6