European Joint Programme
on Radioactive Waste Management

VISION DOCUMENT

A step change in European collaboration towards safe radioactive waste management.

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FOREWORD

All EU Member States generate radioactive waste, with national inventories ranging from single sources or small inventories, up to large and high activity inventories from those member states with extensive nuclear programmes, some of them including spent nuclear fuel or large stockpiles of nuclear material from reprocessing activities. Regardless of size they all have to manage radioactive waste safely in the long term. As some of the wastes will have a significant level of radioactivity for a very long time, many countries have decided to adopt the option of disposing of waste deep underground, a practice referred to as "geological disposal". Deep geological disposal is recognised by participating Member countries of the NEA Radioactive Waste Management Committee (RWMC), as well as the European Commission and the IAEA, as the most safe and secure long-term solution, even though some countries wish to postpone implementation of disposal or to evaluate other options in parallel. Geological disposal of higher activity radioactive waste involves constructing an engineered facility, typically between 200 and 1,000 metres underground to isolate the wastes from the environment and to ensure the radioactivity is sufficiently contained so that it will not be released back to the surface (including surface groundwaters), in unacceptable amounts that may cause harm to humans and the environment.

Implementing disposal at a national level presents many technical, scientific, social, economic and environmental responsibilities, including a large research, development and demonstration (RD&D) effort required to understand overall safety and feasibility for the implementation of the required facilities, and to address the remaining challenges. In radioactive waste management, and especially in relation to disposal, the European Commission has been funding research and development for over 40 years, fostering what is today a strong cooperation between European laboratories, institutions and implementers. With Europe on the verge of operation of its first geological repositories for disposal of spent fuel and other long-lived radioactive wastes, a step-change in joint programming between Member States is timely to take advantage of the experience gathered by different Member States over the past decades. This also supports Member States in implementing the Council Directive (2011/70/Euratom) and the recently established common legal framework across Europe for the safe management of radioactive waste.

The EU Member States, through the EU's Competitiveness Council and research and higher education ministers endorsed, in December 2008, a new concept of research collaboration: Joint Programming. This was defined as a process by which countries would develop common visions and strategic research agendas in order to address major societal but also scientific-technical challenges. The EU Joint Programme on Radioactive Waste Management (EURAD), which includes disposal, has been established to complement the national efforts and enables effective use of resources by fostering and strengthening RD&D collaboration. As of today, 51 organisations and 23 countries have come together to develop and implement this new approach. It comprises the implementer, the regulatory expertise function, and those with scientific and technical responsibilities and a national mandate for research and development in radioactive waste management in their respective countries.

Building on the initial preparatory work of the EC JOPRAD project to identify remaining research priorities of common interest across Europe, the very first achievement of the EURAD has now been delivered by this document. This common Vision, Strategic Research Agenda (including Knowledge Management), Roadmap, Implementation Plan and Governance Scheme will guide cooperative research and investments in the field of radioactive waste management over the coming decades in Europe. The fruit of a tremendous amount of work and determination, this holistic, multi-generational and multi-disciplinary view is now a reality. This strategic approach will foster scientific capability and enhance the knowledge-base needed to implement the safe management, including disposal, of radioactive waste, promoting European research and delivering beneficial societal and economic impact for EU citizens.

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OUR VISION

A step change in European collaboration towards safe radioactive waste management (RWM), including disposal, through the development of a robust and sustained science, technology and knowledge management programme that supports timely implementation of RWM activities and serves to foster mutual understanding and trust between Joint Programme participants.

By step-change we mean a new era via a more effective and efficient public RD&D funding in Europe, and a deepening of research-cooperation between Member States. The aim is to implement a joint Strategic Programme of research and knowledge management activities at the European level, bringing together and complementing EU Member State programmes in order to ensure cutting edge knowledge creation and preservation in view of delivering safe, sustainable and publicly acceptable solutions for the management of radioactive waste across Europe now and in the future.

OUR GOALS

EURAD will support the implementation of the Waste Directive in EU Member-States, taking into account the various stages of advancement of national programmes. Our Goals are to:

- Support Member-States in developing and implementing their national RD&D programmes for the safe long-term management of their full range of different types of radioactive waste through participation in the RWM Joint Programme;
- Develop and consolidate existing knowledge for the safe start of operation of the first geological disposal facilities for spent fuel, high-level waste, and other long-lived radioactive waste, and supporting optimization linked with the stepwise implementation of geological disposal;
- Enhance knowledge management and transfer between organisations, Member States and generations.

JOINT PROGRAMME GOVERNING PRINCIPLES

EURAD shall respect the following principles:

- **Positive Participation –** Contributors will work positively towards achievement of EURAD Vision. All contributions will be valued. Work will be carried out considerately and respectfully by all, maintaining relationships that respect diversity, different roles and boundaries, and respect the knowledge, insight, experience and expertise of others.

- **Maintenance of Independence** – It is possible for different organisations with different roles in their national programme to work together, without prejudice to their own role in the national implementation process. Most important is the independence between the "expertise function" (fulfilled by TSOs and by some Research Entities) and the "implementer function" (fulfilled by WMOs). Different parties (WMOs and TSOs in particular) can have common agreement of what RD&D should be done and how, and Research Entities have a long term vision of research needs. All can collaborate in the oversight of that research, however,

developing their own views on the interpretation of the research results and data that are generated is essential;

- **Transparent Governance** – A transparent, balanced and efficient mode of governance, taking into account Joint Programme participants with a national mandate for research in radioactive waste management;

- **Scientific Excellence** – RD&D activities shall focus on achieving passive safety (safety of a disposal facility is provided for by means of passive features inherent in the characteristics of the site and the facility and the characteristics of the waste packages, together with certain institutional controls, particularly for surface facilities) and reducing uncertainties through excellence in science.

- **Balanced Programme** – Recognising that different Member States have a wide variance in the status of their National Programme, the scope should support programmes at all stages of advancement;

- **Added Value** – Ensuring that Joint Programming provides real added value (e.g. improved financial arrangements, improved stakeholder acceptance of outputs, more robust RD&D outputs, etc.). Administration costs should represent a small proportion (including ongoing legal, EC admin., etc.) versus money spent on the technical and scientific scope;

- **Inclusiveness** – Ensuring that the different categories of actors and groups of interest are involved in the definition and implementation of EURAD;

- **Equitable Financing** – Financial costs (financial/in-kind) should be equitable; participants should contribute what they can afford, or what they consider matches their interest in a project;

- **Complementary Participation** – Participation in Joint Programme is complementary to RD&D activities which will continue to be undertaken nationally or jointly outside of the auspices of EURAD where required; and

- **Tangible Results** – The scope is appropriately prioritised and focused on the objective to achieve tangible results within a reasonable timeframe. A key aspect is that participants recognise that EURAD is a distinct change from past work (and other collaborative working) on radioactive waste management. Translating the societal challenge of radioactive waste management (including disposal) into operational reality requires the generation of new knowledge, combined with the consolidation, maintenance and transfer of existing knowledge.

JOINT PROGRAMME SCOPE AND OBJECTIVES

Develop, maintain and consolidate the scientific and technical basis of radioactive waste management

The research, development and demonstration (RD&D) carried out in support of safe radioactive waste management (RWM), including disposal, is considered a key component of each national programme. Given the long timescales and socio-political dimension, RD&D provides primarily the scientific basis for implementing safe RWM solutions, whilst also contributing to building stakeholder trust, public acceptance, and training and education for generations of the workforce.

EURAD consists of collaboratively developing, maintaining and consolidating at the European level the scientific and technical basis of RWM, including disposal.

The scope of EURAD includes scientific and technical activities on RWM from cradle to grave:

- Radioactive waste characterisation & processing (incl. treatment, conditioning, packaging);
- Interim storage of radioactive waste; and
- Disposal solutions – Mainly geological disposal of spent fuel, high-level waste (HLW) and long-lived intermediate level waste (ILW).

Specific RD&D required for near-surface or surface disposal and low-level waste (LLW), will be addressed, and is encompassed within the RD&D needs identified for waste characterisation and processing, interim storage and geological disposal of radioactive waste. Nuclear facility dismantling and decommissioning activities are however excluded, although interfaces, and particularly aspects that impacts final disposal will be considered.

EURAD scope is organised at a strategic level by 7 scientific themes. Each theme is further split into a list of topics and sub-topics (mostly collaborative RD&D, and relevant strategic studies or knowledge management activities), that in-part, or in-full, contribute to the overall European effort to address remaining challenges of RWM, including disposal.

EURAD implements in a collaborative way those aspects of RD&D activities required within national research RWM programmes as well as associated activities where synergy from Joint Programming at European level has been identified. The prioritised scope identified is described more fully in the Strategic Research Agenda and will support achievement of EURAD Vision.

Address important & complex issues and enable expert networking

Complementary to RD&D and in support to the implementation of the Member States' national programmes, EURAD shall give the opportunity to participants and expert contributors to network on methodological and strategic issues and challenges that are common to various national programmes and in direct links with scientific and technical issues:

- Share knowledge and discuss common methodological/strategical challenging issues (strategic studies) that are in close link with scientific, technical and societal aspects on RWM and that are common to various national programmes;
- Identify the contribution of past/on-going RD&D projects to the resolution of these issues;
- Identify any emerging topics for collaboration that could be addressed within EURAD;
- Take into account emerging science and technology as well as research priorities originating from other programmes (e.g. results from H2020 projects or IAEA outputs).

Enhance knowledge management and transfer between organisations, Member States and generations

It is essential to implement an efficient and integrated Knowledge Management programme at the EU level in order to establish, capitalize and transfer the state of scientific and technical knowledge in the field of RWM. Objectives are to:

- Develop an approach to ensure preservation and accessibility of publicly financed knowledge generated over the past, ongoing and future RD&D activities. **Preservation / capitalisation of generated knowledge**
- Make sure that Member-States with national programmes at an early-stage of implementation can take advantage of existing knowledge and know-how from the Member-States with advanced national programmes, primarily to access state of the art, and second to ease access to knowledge developed during previous EC supported RD&D projects. **Transfer of knowledge towards MS with early-stage RWM programmes**
- In view of the long lead-times and operational time-spans for RWM, provide support to ensuring that the necessary expertise and skills are maintained through generations of experts for ongoing and future projects. **Transfer of knowledge between generations**
- Disseminate and demonstrate progress, results and added-value of the European Joint Programme to a wider audience. **Dissemination of knowledge**

Engage with Civil Society

The successful implementation of RWM National Programmes relies on both scientific and technical aspects for a sound safety strategy and scientific and engineering excellence and societal (social, legal, ethical, political) aspects.

Civil Society Organisations (CSOs) are not research organisations but have a specific concern on RWM safety and are involved in the perspective of the implementation of the UNECE Aarhus Convention which reinforces the requirements of access to information, public participation in decision-making and access to justice in environmental matters. European programmes therefore undertake work to address these requirements through local and national stakeholder engagement activities to enable Civil Society (representative organisations, e.g. Non-Government Organizations, Local Community Partnerships, etc.) to participate in defining their national RD&D programmes and the evaluation of RD&D results in the perspective of safety.

Interacting with Civil Society is important in this perspective and therefore one objective of EURAD is to allow interactions between WMOs, TSOs, REs and Civil Society Organisations. These interactions will facilitate the translation of scientific/technical results and create the conditions for Civil Society Organisations to express their expectations and views. Such interactions shall improve the mutual understanding on RD&D performed to support the development of safe solutions of processing and disposal of radioactive waste. It shall also contribute to developing ideas, propositions and methodologies on how to interact with Civil Society on scientific and technical results uncertainties (inherently linked to the long timeframes and numerous processes considered for geological disposal), and on how to interact with Civil Society stakeholders in order to promote mutual benefit of the available knowledge, based on cooperation and sharing.

HOW EURAD WILL COMPLEMENT NATIONAL PROGRAMMES

EURAD is not intended to replace National Programmes, rather it complements the national efforts and enables effective use of resources by sharing RD&D efforts and by making existing knowledge easily available to end users. Member States' National Programmes are organised and funded independently, and their participation in EURAD is the responsibility, and at the sole discretion, of each national programme owner. By mandating organisations to participate, Member States demonstrate that the European Joint Programme has an EU-added value beyond their National Programme.

EURAD will generate and manage knowledge to support EU Member-States with their implementation of the Directive 2011/70/Euratom (Waste Directive), and more specifically with the development and implementation of their national RD&D programmes for the safe long-term management (including disposal) of their full range of different types of radioactive waste. More specifically, EURAD will:

1. **Support compliance with European regulations** – by supporting Member-States in implementing RD&D, developing skills and providing for transparency in order to develop solutions for their radioactive waste (see, Waste Directive articles 8, 10 and 12.1(f));
2. **Support passive safety of radioactive waste** – by contributing to the responsible and safe management of radioactive waste in Europe, including the safe start of operation of the first geological disposal facilities for high-level and long-lived radioactive waste / spent nuclear fuel as well as improvement, innovation and development of science and technology for the management and disposal of other radioactive waste categories;
3. **Help to gain or maintain public confidence and awareness** in radioactive waste management - by fostering transparency, credibility and scientific excellence;
4. **Support radioactive waste management innovation and optimisation** – by supporting the development of solutions for different waste streams and types and continuously improving and optimising waste management routes and disposal solutions, including identifying needs specific to small inventory programmes with their particular challenges with respect to access to critical mass of expertise in developing appropriate disposal options;
5. **Contribute to addressing scientific/technical challenges and evolving regulatory concerns** – by prioritising activities of high common interest, and creating conditions for cross fertilization, interaction and mutual understanding between different Joint Programme contributors and participants;
6. **Enhance knowledge transfer to early stage programmes** – by providing an opportunity for less advanced programmes, and in particular those in an early stage of geological disposal programme implementation, to benefit from the cross-European fertilisation in radioactive waste management;
7. **Foster efficient use of the RD&D resources at the EU level** - by sharing and advancing existing knowledge, facilities and infrastructure rather than repeating and duplicating efforts; and
8. **Foster a better transfer of knowledge across generations of experts** – by helping to bridge the risk of shortage of the skilled, multidisciplinary human resources and critical infrastructure needed to develop, assess, license and operate RWM facilities, in view of the long lead-times and the intergenerational operational time-spans.

JOINT PROGRAMME ENDORSEMENT

All Joint Programme participants, through their participation in EURAD, endorse the Vision and positively support the content and implementation of the EURAD Founding Documents.