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EURADWASTE '19

9th European Commission Conference on EURATOM Research and Training in Radioactive Waste Management

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Pitesti, Romania

EURADWASTE ´19
Key messages and future perspectives

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Main messages

- Euratom R&T programme in RWM remains very important, in spite that more than 90 % of the R&D funding is national. It helps to coordinate R&D and to transfer knowledge and experiences and foster cross-fertilisation between the front runner countries and the countries with a longer time scale.
- The landscape is changing as several GDR are being implementing, but this doesn´t stop development of science and all countries need to keep abreast of knowledge development. Recurrent safety assessment will continue to be made.
- At the same time this development could provide more opportunities for cross-fertilisation including transfer of knowledge and know-how to countries with longer time scales.
- The long time schedules for construction and operation of disposal facilities (> 100 years) puts important strains on knowledge management and to ensure the availability of capable people in the long future.
- One has to distinguish between information (IT) and know how (people).
- The Euratom programme has an important role in this regard, both to support stimulating R&D, collect information and to transfer of know how through networking and mobility schemes.

Main messages (2)

- A step change has been introduced in the management of the Euratom R&T programme in RWM.
- As of today a European Joint Programming project EURAD has become active. This project involves all actors concerned in RW R&D, i.e. WMOs, TSOs, Research Entities and representatives from the civil society. EURAD will propose, plan and manage all EU funded projects.
- The development of EURAD has a long history starting with the co-operation between WMO s through IGD-TP, followed by similar cooperation between TSOs in SITEX. Both projects, which were originally supported with Euratom funding, are now self-sustaining organisations.
- IGD-TP, SITEX and the Research Entities have developed their own Strategic Research Agendas, which have been introduced into EURAD. Input has also been given by civil society groups.
- In a first round EURAD will run 7 collaborative R&D projects, 2 strategic studies and 3 knowledge management projects.

Main messages (3)

- The latest Euratom R&T programmes have mostly dealt with issues connected to deep geological disposal. Taking into account interest expressed from several actors the programme is now being widened to also include pre-disposal RW management, decommissioning and legacy waste.

- In addition to discussions on EURAD, the results from several recently finished and on-going research projects were presented orally and in posters.
- Especially encouraging was the many good quality PhD-posters that were presented, not least in view to ensure human capacity for the future.

What is new since EURADWASTE 2013?

- The Euratom Directive on responsible and safe management of spent fuel and radioactive waste has become operational. First EC report in 2017.
- IAEA ARTEMIS Peer review services used by a number of MS.
- Construction licence for a DGR in Finland and good progress towards licensing in Sweden and France. Some progress on siting programmes in other countries.
- Several reactors finally shut down – Earlier decommissioning
- Good progress towards European Joint Programming involving WMOs, TSOs, REs and representatives from the civil society.
- Launch of the EURAD project for the implementation of a European Joint Programme on radioactive waste management based on a SRA and roadmap.

Status of Radioactive Waste Management – Key note speech

- LLW is adequately disposed in many existing facilities throughout the world.
- HLW, ILW and SNF can be disposed in DGRs. The knowledge exists and the development of these is progressing . 3 MS plan for operation around 2025/2030. Other MSs have a longer time scale and are still in the siting or pre-siting phase.
- Large volumes of VLLW and LLW will come from decommissioning and will require an efficient system for characterisation and treatment to optimize the waste routes.
- Long-lived waste with low activity, but large volumes (e.g. graphite, depleted uranium and NORM), will require new appropriate disposal routes.
- Radioactive sources in non-nuclear countries will require appropriate solutions.

EURADWASTE´19 Sessions

EURADWASTE included four oral sessions:

- Overview: International/EU/EURATOM Status
- Technology: Predisposal and disposal technology
- Science: Radioactive waste source term and science for disposal safety
- Organisation: Networking of research communities, Joint Programming of national programmes and Integration of Radioactive Waste Producers

In addition there was a continuous poster session with about 50 posters

Session on organisation of future work

The session called *Networking of research communites, Joint Programming of national programmes and Integration of radioactive waste producers* mainly dealt with how the different actors have prepared to join forces in the European Joint Programme on RWM (EURAD) and the remaining issue to also integrate the waste producers.

Presentations were made by IGD-TP, representing the WMOs, SITEX, representing the TSOs and EURADSCIENCE, representing the Research Establishments.

Presentations were also made on the possible interaction with IAEA and OECD/NEA and on the interests and needs from countries with longer time scales for implementation.

Finally a keynote speech was given from EdF on how to include the pre-disposal activities in the Joint Programme and in particular to ensure harmonization of standards in Europe to allow cross-country activities.

Session on organisation of future work (2)

Some highlights and messages:

- EURAD is a step change in the implementation of Euratom R&T programme in radioactive waste management. Instead of many smaller R&D projects the Commission is now funding a large project that will be based on an European Joint Programming (EJP).

- EURAD involves all actors concerned in RW R&D, i.e. WMOs, TSOs, Research Entities and representatives from the civil society. EURAD will propose, plan and manage all EU funded projects. In a second step also waste producers will be included.

- The development of EURAD has a long history starting with the co-operation between WMO s through IGD-TP, followed by similar cooperation between TSOs in SITEX. Both projects, which were originally supported with Euratom funding, are now self-sustaining organisations. The creation of EURAD is an achievement and has been successful thanks to the continuous support of the Euratom programme over a decade.

- IGD-TP, SITEX and the Research Entities have developed their own Strategic Research Agendas, which have been introduced into EURAD as a basis for EURADs SRA. Input has also been given by civil society groups.

- In a first round EURAD will run 7 collaborative R&D projects, 2 strategic studies and 3 knowledge management projects.

Session on organisation of future work (3)

Some highlights and messages (continued):

- For WMOs focus remains on geological disposal, but the missions are to be expanded to also accommodate more upstream interests and a wider inventory coverage (e.g. sealed sources and borehole disposal). However, it is important to recognise that WMO RD&D programmes have a much wider scope of activities than the commonly-agreed EURAD strategic research agenda will address.

- For TSO/SITEX community, the condition for participating to an EJP is to develop the high quality expertise function independent from WMOs as well as expanding interaction with Civil Society towards integration in R&D projects, meaning that CS may have a role on design of shared experiments.

- The European research organisations involved in RWM have organised themselves in a network, called EURADScience, with the vision of acting as an independent, cross-disciplinary, inclusive network providing scientific excellence and credibility to national radioactive waste management programmes.

- An important component of EURAD is knowledge management. These parts should lead to attract and train new competencies and new high level researchers to allow a cross fertilization of ideas and ensure that the competences will be present all along the duration of the disposal operation.

Session on organisation of future work (4) Involvement of civil society

- The involvement of representatives from the civil society is very important in programming projects for radioactive disposal.
- The Euratom programme has a long history of funding social research projects in the area.
- Civil society organizations are involved in the preparations and implementation of EURAD, primarily through SITEX and the TSOs, but also in an advisory role to the project.
- The role of these organizations need to be clearly defined.
- Primarily they have a role to influence the Strategic Research Agenda and to make their own evaluation of the results. They can also assist in making the R&D results understandable by the public at large
- In certain projects with a social impact direct participation can also be considered.

Technology session

The session on *Predisposal and disposal technology* included one keynote on the role of Research Entities in advancing knowledge, solutions and technologies for the management and disposal of RAW seen from the Czech perspective and five presentations, three on pre-disposal and two on disposal technology:

- Nuclear site characterization for radioactive waste minimization. INSIDER
- Characterization of conditioned nuclear waste. CHANCE
- Thermal treatment for radioactive waste minimization. THERAMIN

- Tunnel plugs and shaft seals demonstrations. DOPAS
- Monitoring strategies & technologies for geological disposal. Modern2020

The session was concluded with a panel discussion on remaining research needs in pre-disposal

Technology session (2)

Highlights and messages:

- Pre-disposal is becoming a new pillar in the Euratom programme. The results achieved in the pre-disposal project are promising and shows that further improvements in characterization, minimization and treatment of waste can be achieved. This might lead to even more safety and have commercial benefits.
- Waste Acceptance Criteria are important and should be developed in dialogue between all concerned parties (WMOs, waste producers, regulatory bodies and other stakeholders). Thus, a category of unacceptable waste can be avoided.
- Specific waste streams, like bituminized waste, graphite and powder waste from the back-end require further investigations with regard of their disposability and long-term behaviour.

- The activities performed during construction and operation of a DGR will have an important impact on the long term safety, e.g. plugs for tunnels and drifts as investigated in DOPAS.
- It is also important to be able to monitor the function of the disposal activities. As was shown in Modern 2020 this is not only a technical issue. Here the involvement of the representatives of the civil society has been very useful. Thus, it could be assessed if it does make sense to consider the implementation of R&D activity with regard to further and more intensive participation of stakeholders from civil society in set-ting up a monitoring programme.

Science session

The session on *Radioactive waste source term and science for disposal safety* included one keynote on the role of science for the safety case now and in the future and how to maintain knowledge and competence until final closure seen from the Swedish perspective and five presentations on R&D projects:

- Spent fuel dissolution. REDUPP and DISCO
- Carbon-14 source term generation and release from irradiated metals, ion-exchange resins and graphite. CAST
- R&I action on cement-based materials, properties, evolution and barrier functions. CEBAMA
- Bentonite erosion and Bentonite mechanical evolution. BELBAR and BEACON
- Microbiology in nuclear waste disposal. MIND

The session was concluded with a panel discussion on remaining challenges in science for the safety case of geological disposal.

Science session (2)

Highlights and main messages:

- The development of the safety case provides the platform to integrate the scientific and technical knowledge in a systematic and traceable manner to show the long term safety of a repository. For licensing a DGR a sound scientific and technological basis and the ability to compile a convincing post-closure safety case is needed.

- Also after receiving licenses and starting operation safety analyses will continue to be needed for periodic updates based on latest state of knowledge.

- The work done in the projects increases the knowledge (both scientific and technical)to be used for the licensing of the first HLW/SNF repositories in the advanced MS. This knowledge will also support the other MS in advancing their national programmes as rapidly as possible.

- All projects could to some extent build upon available experience and results from earlier projects. None of the projects did fundamentally change earlier understanding, but refinements have been made in all projects.

Science session (3)

Highlights and main messages (continued):

- Most projects include experimental work and modelling activities. This is important as adequate models help to transfer the evidence from experiments to the in-situ conditions of the repository analysed. The models also support the extrapolations for long-term evolution if needed and can provide information for sensitivity studies as part of the post-closure safety case.
- After completion of the reported projects some uncertainties will remain and should be specified. Whether these are acceptable or not, needs to be analysed within specific performance assessments and post-closure safety cases as the importance of remaining uncertainties depends upon the whole repository system and cannot be judged for one process alone in isolation.

- As science will to some extent continue also after the start of operation of a repository, there is a need to maintain oversight and knowledge in those areas of science that are important to post-closure safety until closure of the repository. This also includes the capability to compile a safety case. This are issues where future cooperative activities can play an important role.

Science session (4) – Knowledge management

- The time schedule from the start of a GDR project until the closing of the repository could be 100 years or more.
- Knowledge management was thus a key topic brought up during the science session. Knowledge management is also an important component in the new EURAD project.
- The difference between information and knowledge how to use the information should be recognised.
- For preservation of information different IT tools can be utilised.
- For preserving the knowledge how to use the information, active involvement in the work is needed. Here the recurrent safety assessments foreseen are key.
- The challenge to engage young people in R&D on RWM in the future remains. Challenging tasks are needed to attract young researchers and engineers.

Overview session

Covered several topics:

- Implementation of the different EU/EURATOM Directives
- EU R&T programme in nuclear area and in particular on radioactive waste
- The view of the STC, and
- A keynote speech on European and International status on RW management and disposal and challenges ahead.

Some highlights and messages were:

- Purpose of the Waste Directive is to ensure appropriate national arrangements for a high level of safety and to avoid imposing undue burdens on future generations. It should also ensure public information and participation.
- Each MS shall have a national programme for the management and disposal of all types of spent fuel and radioactive waste.
- The first report on the implementation of the Directive was presented to the Council and European Parliament in 2017 and a new report is due this year.
- Together with the EC, the IAEA has developed a peer review service, ARTEMIS, which has been used already by several States as required in the Directive.

Overview session (2)

Highlights and messages (continued):

- Since its start in 1975 the Euratom R&T programme on radioactive waste management progressed from a large number of uncoordinated projects to the call for one European Joint Programme in 2018, which brings together WMOs, TSOs, REs and representatives from the Civil Society.
- This closer cooperation has developed successively over a long period, starting in the early 2000s between WMOs and then through platforms and networks like the IGD-TP for the WMOs, SITEX for TSOs and recently EURADSCIENCE for the REs.
- Advanced programmes will be able to address specific cutting-edge science, while less advanced programmes will be able to plan, structure and implement the necessary R&D, with guidance, training and transfer of competence and knowledge from advanced programmes.

Overview session (3)

Highlights and messages (continued):

- In its opinion in 2018 the STC advocated for an increased budget for nuclear R&D given the need to maintain capability in the nuclear field to ensure that nuclear gets an important role in the road-map to a zero carbon society.
- In its proposal for the next FP the Commission is proposing a doubling of the funding.
- In addition to describing the status of radioactive waste management, the key note highlighted the usefulness of international cooperation through IAEA, NEA and EC.
- In particular as concerns RD&D the support by the EC is positive and the developments towards a European Joint Programming are very good and the efforts of the EC in this to promote the sharing of ideas and plans between all actors concerned is commendable.

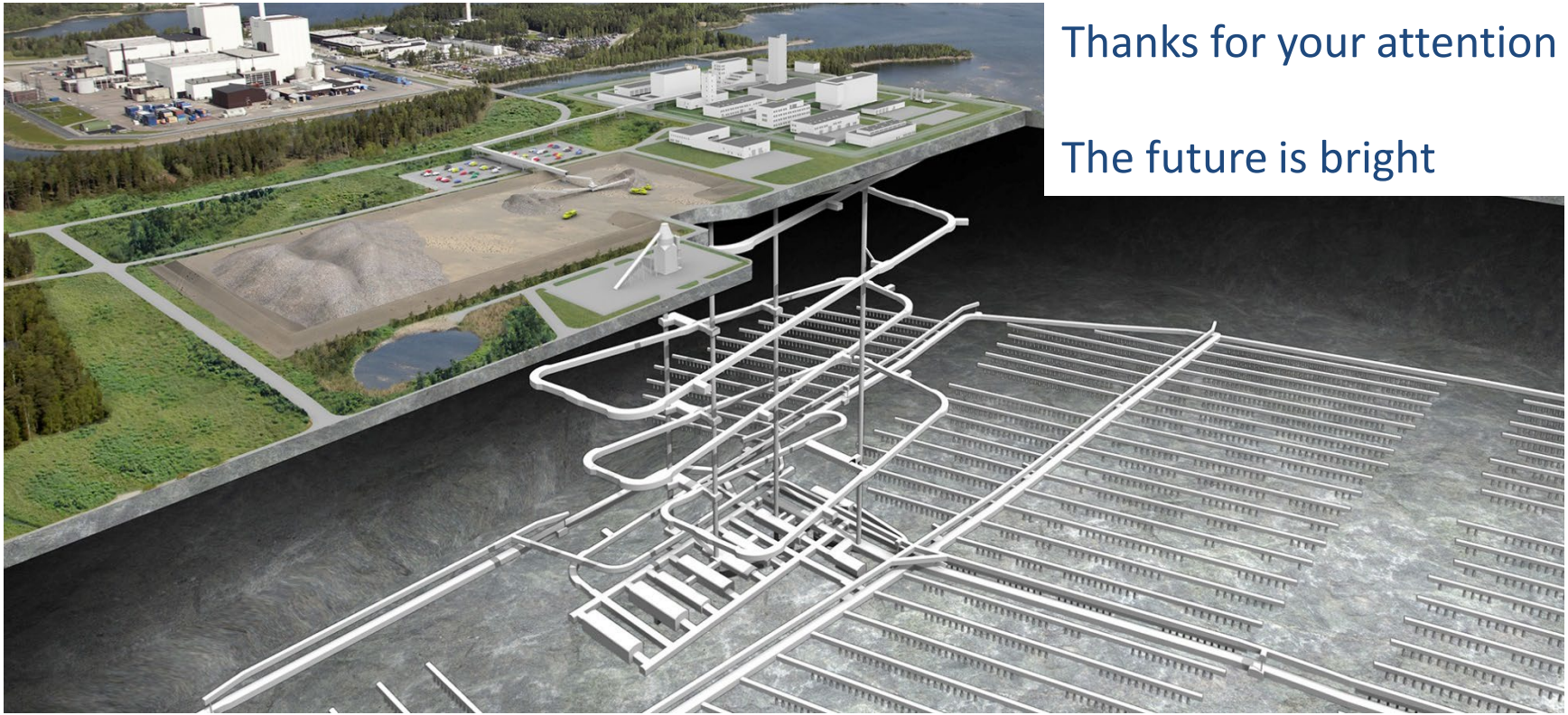
Poster session and PhD presentations

In the poster session 38 posters were presented belonging to the EU-funded projects or responding to an open call.

In addition 10 PhD posters were presented, which were generally of very high quality. One observation from talking to the students was that there is often a need for the WMOs and the professors to better explain the context of the work being performed.

Summing up

- EURADWASTE 2019 has been very successful with very high quality and interesting presentations and quite vivid panel discussions.
- The organization has been excellent and the venue of the theatre very interesting.
- Good progress is being made towards an efficient continued implementation involving all important stakeholders through the EURAD European Joint Planning project.



Thanks for your attention

The future is bright