



EURADWASTE '19

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

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European Joint Programme on Radioactive Waste Management

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Background – European RD&D

- For more than 40 years, considerable **scientific and technical knowledge** has been acquired in Europe in the field of radioactive waste management (RWM).
- Through **EURATOM**, EC has supported **EU collaborative RD&D ad-hoc projects** and enhanced coordination by supporting **IGD-TP** platform and **SITEX** network.



- **Leap forward:** EC Policy & Strategy for **integration of EU Member-States R&D programmes**
 - Replace EU competitive calls for projects by **inclusive European Joint Programmes (EJP)**
- In 2014, EC called for a **feasibility study** of creating such an EJP in RWM field: **JOPRAD (2015-2017)**
 - **identified those actors** with key responsibility for directing RD&D on safe RWM; and
 - engaged them in the development of a **shared Vision** and the basis for a **shared Strategic Research Agenda**

JOPRAD Feasibility study – 2015 -2017



WMOs identified the aspects of the IGD-TP SRA that could be included in an European Joint Programme



TSOs identified the aspects of the SITEM SRA that could be included in an European Joint Programme

Nationally funded Research Entities identified the aspects of their SRA that could be included in an European Joint Programme

Programme Document

Scientific and technical basis (incl. knowledge management) for a potential EJP.

Scope originally focused on deep geological disposal for spent fuel and high level waste.

Prioritisation according to High, Medium or Low level of Common Interest

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- In 2017, **H2020 EURATOM WP2018** – EC called for the establishment of an **EJP** on RWM (NFRP6)
 - 2017 – 2018: Further development of the founding documents of the EJP on RWM
 - A proposal submitted to EC in September 2018 ; positively evaluated in Feb. 2019
 - **Official launch**: June 2019 !

eurad

**European Joint Programme
on Radioactive Waste Management**



The project leading to this application has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 847593.



EURAD Vision and goals

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 participants.

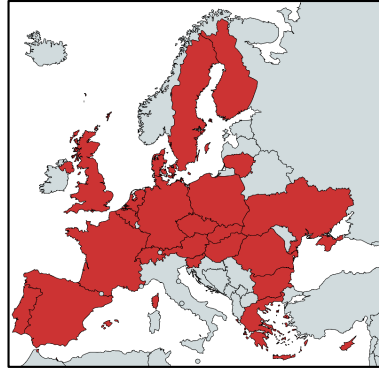
Goals

Support the implementation of the [Waste Directive](#) in EU Member-States (MS), taking into account the various stages of advancement of national programmes:

- Support MS 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**;
- **Develop and consolidate existing knowledge** for the safe start of operation of the first geological disposal facilities for spent fuel, HLW, and other long-lived radioactive waste, and **supporting optimization linked with the stepwise implementation of disposal**;
- **Enhance knowledge management and transfer between organisations, MS and generations.**

EURAD Mandated Actors (Beneficiaries)

Ministries from **23 European countries** (21 Member-States, 2 Associated countries) provided **mandates to 52 organisations** acting as **Beneficiary** within EURAD, recognising their role of directing RD&D at national level, as:



- Waste Management Organisation (**WMO**);
- Technical Support Organisation (**TSO**); or
- Research Entity (**RE**).

National RWM programmes in Europe cover a broad spectrum of stages of development and level of advancement depending on:

– **National waste inventory**

- Relatively small inventories (medical/research reactor-derived wastes)
- Large and /or complex inventories derived from large nuclear power (and fuel reprocessing) and defence programmes

– **national policy and socio-political landscape with respect to long-term management of RW**

- particularly with respect to plans and national policy towards implementing geological disposal for Spent Fuel, High-level Waste and long-lived intermediate level waste



20 Waste Management Organisations Whose mission covers the management and disposal of radioactive waste



13 regulatory Technical Support Organisations Providing S/T basis for supporting regulators' decisions



20 nationally funded Research Entities Working on the RWM challenges under the responsibility of MS

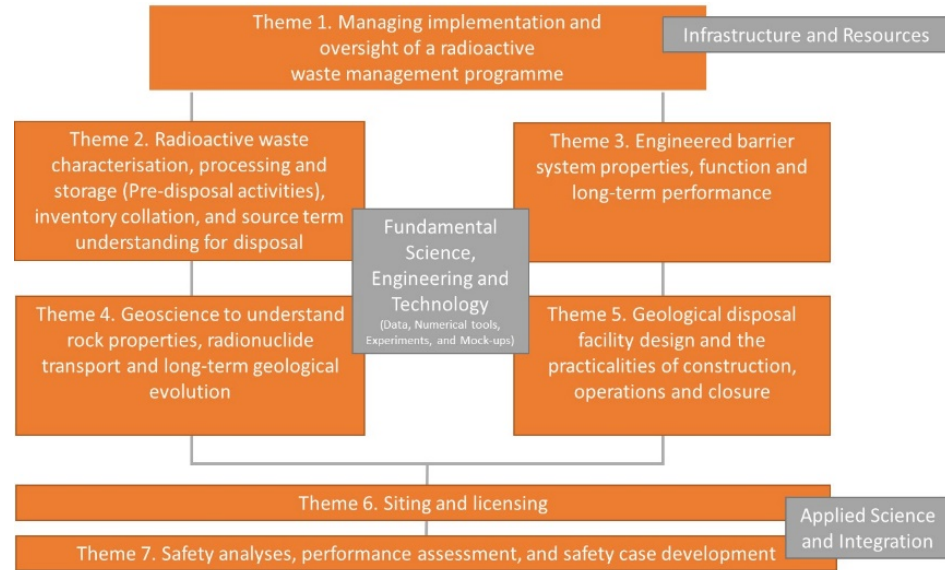
EURAD other participants

- 53 additional organisations (mostly universities and research centres) will also be involved in the implementation of tasks as third parties with a legal link to a Beneficiary (**Linked Third Parties**).
- **Group of Civil Society organisations** such as local communities having interest in RWM (local association, local Committee of Information, local partnership), national or European CS Organisations taking part in interactions in the field of RWM.
- **Waste Producers** and those with a pre-disposal waste management remit are engaged via the NUGENIA association.
 - Although not direct contributors or participants of EURAD yet, continued engagement via dissemination and consultation with NUGENIA will set a foundation for future collaboration in projects influencing the waste form for final disposal.
- **International Organisations**
 - Already EURAD has established close links with IAEA from inception to avoid duplication of effort and resources. Such co-operation will continue, e.g. with the establishment of a Memorandum of Understanding;
 - and extend to other organisations, including OECD-NEA, to strategically direct and offer clear added-value to EURAD objectives.

EURAD Strategic Research Agenda

Scope

- EURAD SRA is a **shared SRA** building on the SRAs of the three colleges of Actors:
 - IGD-TP SRA for WMOs;
 - SITEX SRA for TSOs;
 - RE (EURADSciences) SRA for REs.
- It covers:
 - **All waste types**;
 - **Pre-disposal** - waste characterisation and processing (incl. treatment/conditioning/packaging) and interim storage;
 - **Disposal** - primarily geological disposal, and also other types of disposal
- It does not cover decommissioning
- It is split into **7 scientific themes** (see next slide)
- It is a dynamic and living document that will be regularly updated



EURAD Roadmap

EURAD SRA Themes

Theme 1 - Managing implementation and oversight of a RWM programme

Theme 2 - Waste characterisation, processing & storage and source term understanding for disposal

Theme 3 - EBS properties, function and long-term performance.

Theme 4 - Geoscience to understand rock properties, radionuclide transport and long-term geological evolution.

Theme 5 - Facility design and the practicalities of construction, operations and closure.

Theme 6 - Siting and licensing.

Theme 7 - Performance assessment, safety analyses and safety case development

Phase 0: Policy, framework and programme establishment

Includes conceptual design and preliminary safety analyses

Phase 1: Site evaluation and site selection

Includes preliminary site(s) design and generic safety case(s)/analyses

Phase 2: Site characterisation

Includes detailed design and site safety case/analyses for construction license

Phase 3: Facility construction;

Includes final design and site safety case/ analyses for operational license

Phase 4: Facility operation and closure

Includes maintenance/ update of license documentation, as required

Different phases of a RWM programme

SRA themes and sub-themes

EURAD Roadmap

Past/ongoing activities at European level

EURAD Roadmap (illustration)

Roadmap Theme 2: JP Priorities and Activities of Common Interest that relate to Radioactive waste characterisation, processing and storage (Pre-disposal activities), and source term understanding for disposal

	Phase 0: Policy, Framework & Programme Establishment	Phase 1: Site Evaluation & Selection	Phase 2: Site Characterisation	Phase 3: Facility Construction	Phase 4: Facility Operation and Closure
Theme 2 Radioactive waste characterisation, processing and storage (Pre-disposal activities), and source term understanding for disposal topics	<p>Includes conceptual design and preliminary qualitative safety analyses</p> <ul style="list-style-type: none"> Develop, and maintain national waste inventory (characterization, documentation of waste being produced and estimates for future arisings). Provide input to evaluation of disposal options (waste inventory for planning purposes and to scope preliminary design options and safety analyses). Develop guidance for waste treatment (preliminary waste acceptance criteria) for the different waste disposal routes. Where necessary, develop new waste treatment methods and input to the development of the corresponding waste treatment facilities. 	<p>Includes preliminary site(s) design and generic safety case(s) / analyses</p> <ul style="list-style-type: none"> Adjust waste treatment guidance (preliminary waste acceptance criteria) according to new findings, taking results from site evaluation into account (optimization for safety and other issues (incl. cost)). Refine radionuclide source term treatment and understanding of waste package performance to account for understanding of a prospective/selected site. Provide inventory and source term understanding for construction license. Develop waste acceptance criteria for construction license. 	<p>Includes detailed design and site safety case / analyses for construction license</p>	<p>Includes final design and site safety case / analyses for operational license</p> <ul style="list-style-type: none"> Transform waste treatment guidance into draft waste acceptance criteria and adjust them according to detailed repository layout (optimization for safety and other issues (incl. cost)). Provide inventory and source term understanding for operational license. 	<p>Includes maintenance and update of license documentation, as required</p> <ul style="list-style-type: none"> Organize logistics (delivery of waste to repository) and enforce compliance of waste accepted for disposal with waste acceptance criteria in force Ensure compliance with safeguards Maintain national waste inventory and maintain detailed documentation on wastes employed in the repository Modify waste acceptance criteria when appropriate to take optimization for safety and other issues (incl. cost) into account. Provide detailed information (incl. documentation) for closure license.
Waste handling, characterisation, treatment and packaging	<p>1.2.4 Management of damaged waste packages H2020 Project DISCO</p> <p>3.7 Links between waste producers & implementers</p> <p>J1.1.3 Novel conditioning methods for problematic wastes. H2020 Project THERMIN</p> <p>Waste management routes across Europe EUP1 WP ROUTES</p>		<p>J1.1.7 Improved understanding of the nature and quantities of the likely chemotoxic component of common decommissioning wastes.</p> <p>J1.1.2 Technology for characterisation & segregation of historical wastes. H2020 Projects CHANGE, INSIDER & THERMIN</p> <p>J1.1.8 Optimisation of novel waste treatment techniques. EUP1 Project SFC</p>		
Interim storage	<p>3.10 Long-term storage for disused seals radioactive sources</p> <p>2.4.5 Operational lifespan of interim storage</p>				
Transportation between facilities					
Radionuclide inventory and source term	<p>3.6 Methodologies applied to refine inventory</p> <p>3.5 Inventory collation</p> <p>J1.1.1 Inventory data and uncertainty treatment. EUP1 WP SFC</p> <p>J1.1.10 Quantification of fission content of spent fuels.</p>		<p>J1.2.2 Improved understanding of the performance of the final waste package (including the waste form) during prolonged storage prior to its transport and disposal.</p> <p>J1.1.3 Improved understanding of radionuclide release from wasteforms other than spent fuel.</p> <p>J1.1.4 Improved understanding of radionuclide release from spent fuel, inc. fire and impact. H2020 Project DISCO & EUP1 WP SFC</p> <p>J1.1.5 Demonstration of geopolymer performance in representative disposal conditions.</p> <p>J1.1.6 Fourth generation (Gen/IV) wastes</p>		
Waste acceptance criteria			<p>1.4.2 Improved understanding of the generation and release of radioactive trace gases and bulk gases from wasteforms and waste packages.</p> <p>2.1.6 Waste acceptance criteria</p>		

Programme Objectives

Collaborative RD&D

Strategic Studies

Knowledge Management Activities

H High Priority

M Medium Priority

L Low Priority



Future



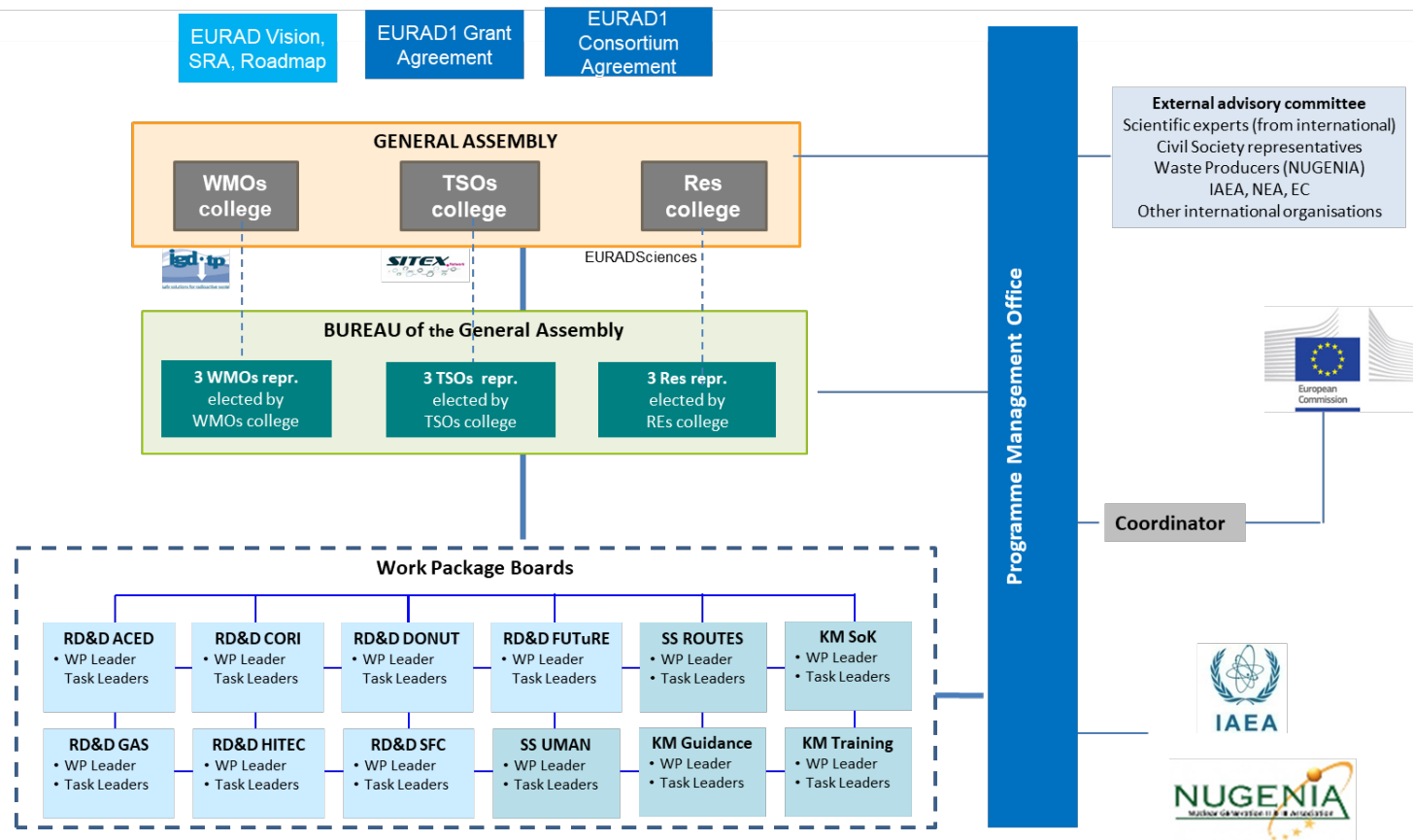
Currently In Progress

EURAD Deployment Mechanisms

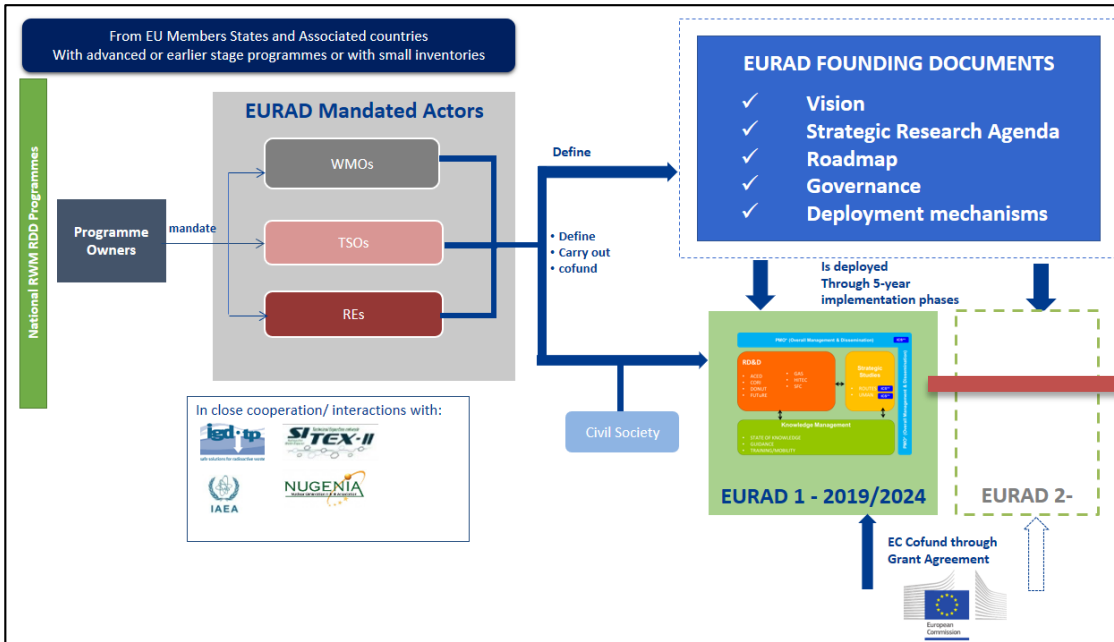
Type of activity	Type of actions	Type of deliverables
Collaborative RD&D	Activities aiming at developing and consolidating scientific and technical knowledge. Activities shall be a balance between those with a direct link to operational RD&D (direct links with implementation and safety of RWM) and prospective RD&D (to demonstrate the robustness of RWM and to maintain scientific excellence and competences).	State-of-the-art (initial and update), S/T deliverables, reports, demonstrator, pilot, prototype, plan designs, software, technical diagram...
Strategic Studies	Actions consisting of enabling experts and specialists to network on methodological/ strategical issues and advance significant challenges that are common to various National Programmes and that are in direct link with scientific and technical issues.	Position paper (e.g. emerging needs for future RD&D/Strategic Studies/KM activities), report on generic methodologies, best practices...
Knowledge Management	Actions consisting of developing State of Knowledge; developing descriptive methodological guidance and developing/delivering Training modules and mobility measure.	State-of-knowledge documents; Guidance documents, Training delivery and materials...
Programme Management	Day-to-day administrative, financial and legal management, reporting, interactions with EC, communication and dissemination activities, Scientific and technical coordination/integration of the overall JP	Management tools, Periodic reports, financial statements, website, platforms...

Cross-cutting component Actions consisting of implementing EURAD proposed framework for interaction with CS

EURAD Governance



First implementation phase (2019-2024) – EURAD-1

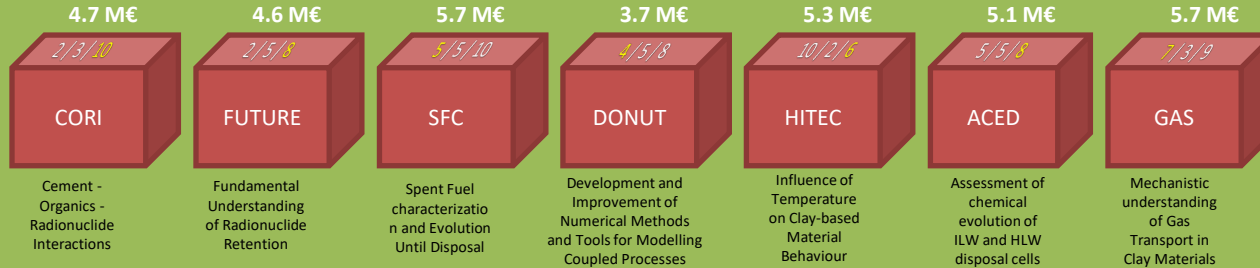


- **Launch:** June, 1st 2019
- **Duration:** 5 years (2019-2024)
- **Resources:**
 - EC EURATOM cofunding: 32,5M€ (Total costs: 59M€)
 - 23,1M€ of EC grant is allocated for a “first wave” of activities 5000 man-months (415 FTE)
 - 9,4M€ of EC grant remains not allocated for a “second wave” of activities (2021)
 - EURAD 52 Mandated organisations embarking 56 Linked Third Parties
 - Total: 108 organisations

First implementation phase (2019-2024) – EURAD-1

Programme Management office (2.5 M€)

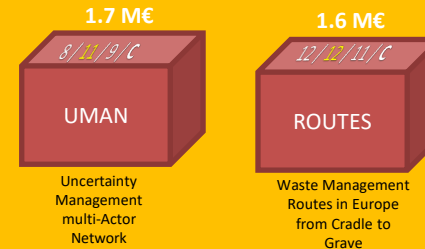
Collaborative RD&D



Knowledge Management



Strategic Studies



Conclusion – Ambition (1/3)

- Fruit of determination, tremendous amount of work from European RWM R&D actors since 2013;
- Establish a **sustainable, inclusive, transparent, leading-edge scientific and goal-oriented, entirely new approach on European collaboration towards safe RWM**
 - Sustainable approach particularly pertinent in view of long lead-times & operational time-spans
- **Holistic and multi-disciplinary programme between generations** that shall guide cooperative research and investments in the RWM field over the coming decades in Europe;
 - Predisposal and disposal activities, full range of waste, during all phases of a disposal programme
- Gather **organisations in Europe with key responsibility for directing RD&D on safe RWM irrespective of the stages of development of their national programmes.**
 - Small and early stage programmes are especially strongly involved in the Strategic Studies WP ROUTES and will also benefit from the Knowledge Management programme

Conclusion – Ambition (2/3)

- Implement a **robust & sustained state-of-the-art science & technology programme** established to :
 - complement national R&D programmes for safe long-term management of their full range of radioactive waste,
 - carry out activities of high common interest between the actors where there is added-value at European level.
 - Support research needs of advanced and early stage programmes
- **Elaborate upon complex issues and identify emerging ones** by bringing together all interested actors to jointly conduct Strategic Studies.
 - May be referred to as ‘think-tank’ activities to determine if there is a RD&D need on an emerging issue, if there is a need of a position paper or if it is considered mature and suitable for knowledge management activities.
- Foster **mutual understanding/trust** between participants and other stakeholders, incl. from Civil Society.

Conclusion – Ambition (3/3)

- **Consolidate efforts across Member-States on Knowledge Management** – this includes:
 - access to existing Knowledge (State-of-Knowledge);
 - guiding the development of capability in line with core competencies (Guidance and Training);
 - improving access to quality tools, resources and communities of practice to share and learn from each other.
- **Deepen the interaction/cooperation** that have been established since JOPRAD with:
 - **Waste Producers** to set the foundation for future collaboration in **predisposal activities** (link with EURATOM Call NFRP10);
 - **IAEA** to avoid duplication of effort/resources and identify possible joint development and implementation of actions
 - Such co-operation shall extend to other organisations, including **OECD-NEA** to strategically direct and offer clear added-value to EURAD.

EURAD – Challenges for Year 1

- **Launch EURAD** and experiment initial learning phase with respect to the governing bodies and mechanisms which may require some fine-tuning.
- **Extend the Roadmap** to support identification of the key need-gaps, which will then be used to prioritise the scope of KM activities:
 - Competency Matrix to identify necessary competencies against Roadmap themes and phases;
 - Mapping of existing/available state-of-knowledge, training, guidances, etc.;
 - Identification of subject matter Experts against each of the Roadmap topics.
- Establish **SOTA reports** of the 7 **RD&D projects** and start implementing the R&D work.
- Initiate the **two Strategic Studies** and start implementing planned work
- **Set the scene** for the launch of the **Knowledge Management** Activities

Thanks for your attention!

Contact:

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