

## WP15 DITOCO2030

Next-generation **D**igital **T**wins to support **O**ptimisation, **C**onstruction and **O**peration of surface and subsurface radioactive waste management facilities



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# OUTLINE

- ❑ Objectives
- ❑ WP Leads & Responsibilities & Partners
- ❑ Tasks
- ❑ Deliverables & Milestones & Risks
- ❑ Map of Synergies & Collaboration
- ❑ Next steps
- ❑ Questions

## OBJECTIVES

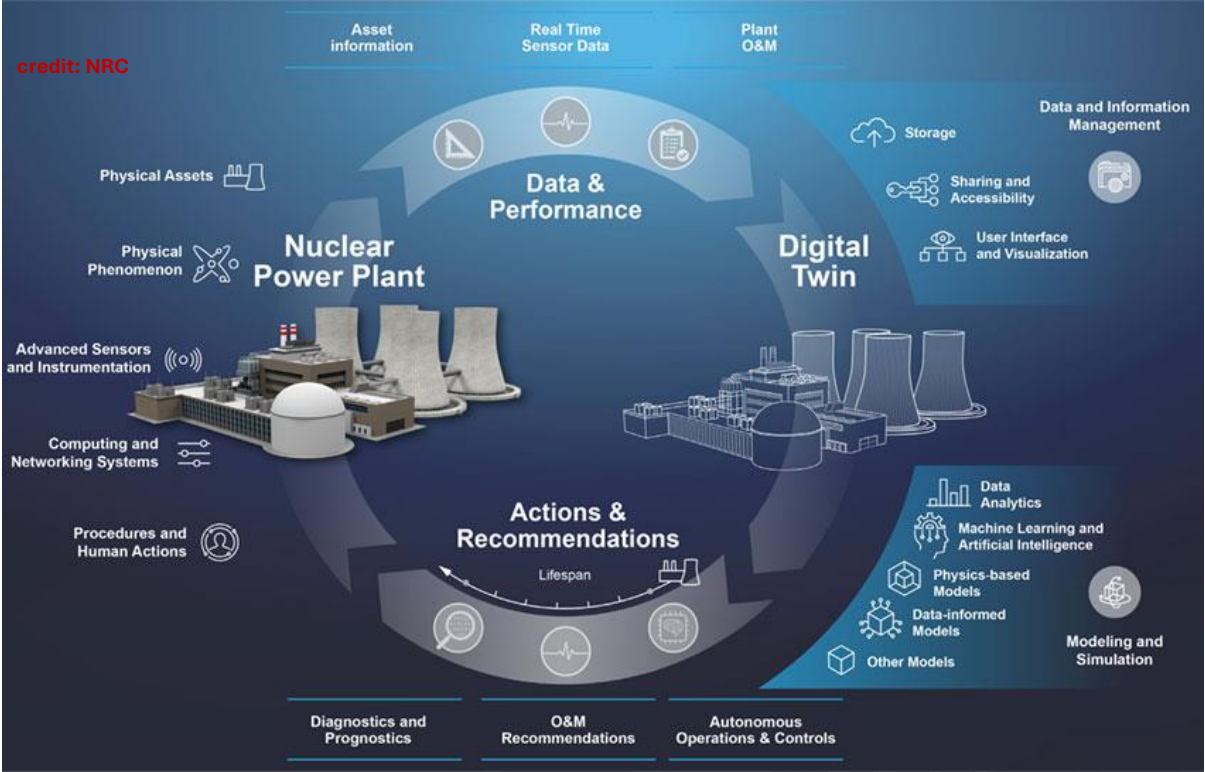
Lay-out the path on **how to close the R&D gap** between the currently fragmented digital twins (DT) of individual disciplines, common data environments and decision-making platforms **to better understand the opportunities & limitations** of DT in their **deployment in whole life cycle of waste management.**

DT is a relatively new technology and could be considered disruptive from a regulatory perspective. Its novelty nature challenges existing frameworks and standards, which may not be fully equipped to address the unique aspects and implications of DT.

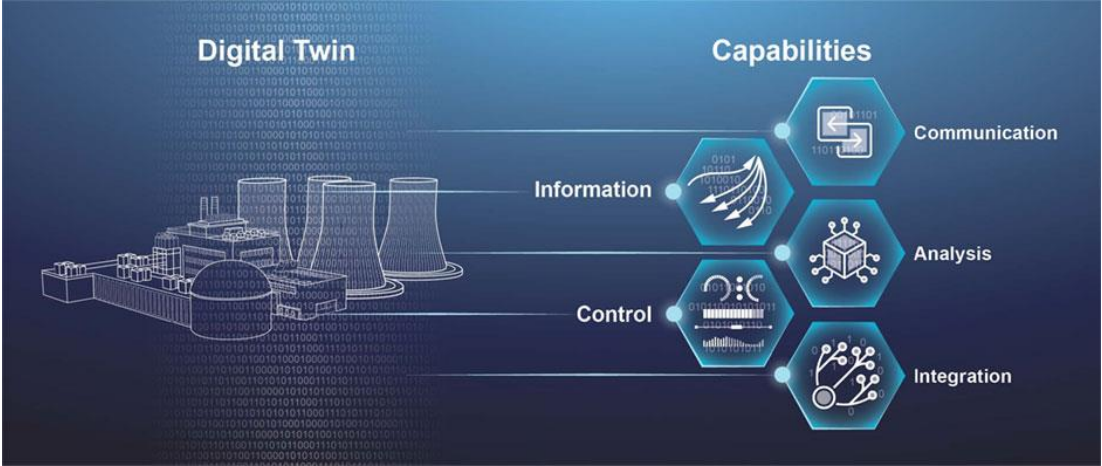
**Duration: 24 month**

Start: Month 1 End: Month 24 (strategic study)

# What is a Digital Twin?



Digital Twins (DT) are anticipated to significantly enhance multiple capabilities. These improvements are especially crucial for regulated activities. The key capabilities, broadly classified, include: (i) Information, (ii) Communication, (iii) Analysis, (iv) Integration, (v) Control



## What is the Digital Twin for Eurad-2?

# WP LEAD, TASK LEADS & RESPONSIBILITIES

## PARTNERS

The **coordination** will be performed by the WP Leader [IFE] and WP Co-lead [TS ENERCON] in collaboration with the Task Leaders [Amphos 21, VTT, SCK CEN, INGENICID & NAGRA] constituting the WP Board.

- The **WP Board** will ensure that the WP is progressing according to the agreed planning, milestones & deliverables. The WP Board will also be responsible for communicating with other WPs stakeholders in EURAD and beyond (IAEA, OECD NEA, EURATOM DORADO, EURATOM HARPERS ...).
- The **WP Leader** is responsible for reporting the work progress, the WP deliverables and any modifications of the WP work plan to the PMO. *This will be done in close consultation with the WP Board.*

# WP LEADS & RESPONSIBILITIES PARTNERS

## EURATOM associated countries

ANDRA, BRGM, BGE, UCLM, TUL, UNIPI, Ingecid, FTCEM, HZDR, UFZ, IRSN, EIMV, A21, GRS, TRACTEBEL, SCK CEN, SOGIN, SURAO, TS ENERCON, WSP, TUS, MITTA, UTARTU, VTT

## non-EURATOM associated countries

IFE, NAGRA, PSI

Total Person-Months 43.80



# TASKS

To assist the task leaders in coordinating their efforts effectively, it was request to identify individuals from each organization who will contribute to specific tasks within DITOCO2030, specifying the expected level of effort for each task.

tasks	name	Lead	Total pm	Partners
<b>Task 1</b> M1 to M24	Management / Coordination of the WP	IFE & TS Enercon	3,5	task leads
<b>Task 2</b> M1 to M24	Knowledge Management	IRSN	to be defined by KM WP	VTT, POLIMI, CEA, AMPHOS 21, ANDRA, SURO, EIMV, UTARTU
<b>Task 3</b> M1 to M20	Current practices of digital twins (DT)	VTT	15,7	VTT, SURAO, Amphos 21, SCK CEN, BRGM, IRSN, UniPI, UCLM, ANDRA, EGIS, SOGIN, UFZ, UTARTU, Nagra, IFE.
<b>Task 4</b> M1 to M12	Gap analyses	SCK CEN	14	Amphos 21, SCK CEN, TS ENERCON, GRS, TUS, UFZ, HZDR, BGE, FTMC, Tractebel, WSP, Nagra, IFE.
<b>Task 5</b> M1 to M22	Strategic recommendation of the common approaches and standards in the design of digital twins	INGECID	7,4	INGECID, UFZ, UTARTU, Tractebel, SURAO, Mitta. Also, AE: Nagra.
<b>Task 6</b> M1 to M24	Stakeholder Engagement and Dissemination	Amphos 21	4	Amphos 21, EIMV

# TASKS 2 KNOWLEDGE MANAGEMENT

DEBAYLE CHRISTOPHE (IRSN)

Currently, the **Task 2 budget** is on account of WP2 KM. A data management under responsibility of PMO, that will have to spread and implemented by all WPs through T2L will be developed.

The **Task 2 leader** is considered by WP2 KM as a **knowledge management 'ambassador'** and will be the contact point between StSt/R&D WP and WP2 KM.

- IRSN will organize cooperation between the WP and all relevant parties involved in KM activities (representatives of KM WP(s), Task Leaders of current WP, other WPs, etc.).

The **main goal** is to **make knowledge gathered within this WP accessible & applicable** for the EURAD-2 KM system.

- The list of specific knowledge management activities, participants and terms will be identified in collaboration with WP2 KM at the beginning of EURAD-2.

The knowledge consolidated or generated through know-how sharing and discussions of common challenging issues will constitute a valuable input to EURAD KM activities.



# TASKS 3 CURRENT PRACTICES OF DIGITAL TWINS

## ARTO LAIKARI (VTT) SUPPORT FROM SURAO

### Objective

- The aim of the task is to identify and compile information of existing and emerging technologies and methods used and applicable for DT solutions used in nuclear industry and other demanding domains.

### Subtasks:

- T3.1 Identification of nuclear sector drivers for Digital Twins
- T3.2 Compilation of current Digital Twin use cases within nuclear sector and other industries
- T3.3 Identification and comparison of international standards
- *T3.4 Compilation and review of regulatory requirements (subtask is not active in the 1st year of the project!)*

*WP6 HARPERS*

**Work methodology:** Literature reviews, relevant stakeholder interviews, utilisation of information from ongoing and past project experience of the partner organisations.

**Duration : 20 Months (1-20)**

**Partners involved:** VTT, SURAO, A21, SCK CEN, BRGM, IRSN, UniPI, UCLM, ANDRA, EGIS, SOGIN, UFZ, UTARTU.

\*Task is also supported by Nagra and IFE (13 +2 partners)

## OUTCOMES: MILESTONES AND DELIVERABLES

### Milestone: Workplan for T3 – MS10: due M3

- Workplan for the task will be defined at project start and updated by M3. (to be discussed at the kick-off)

### Deliverable: D15.1 Green paper: Current practices of digital twins. M6 & M19

- Comprehensive overview and analysis of the current state of the art on the technology (latest development), industry best practices and market trends.
- Deliverable will be re-evaluated and revisited based on outcomes of T4 and T5 and potential other EURAD-2 WPs.
- Dissemination level PU
- 1st version due M6 and 2nd version due M19 (planned).

### Joint webinars (M3-M12)

- Between M3 and M12, three (3) webinars to engage potential end-users of DT.

# TASKS 4 GAP ANALYSES

## VANESSA MONTOYA (SCK CEN) SUPPORT FROM PSI

### Objective

- The main objective of this task is to identify the **major challenges** that need to be tackled to close the R&D gap between. The gap analysis will be used to **identify the areas where standardization is needed** ([link to HARPERS T5.2.c and XS-ABILITY](#)) by comparing the current state of DT development with the desired state that meets the needs and drivers identified in Task 3.

### Subtasks:

- T4.1 Identification of gaps that need to be addressed to meet the high priority needs and drivers by the end-users (cross- industrial view)
- T4.2 Compilation of technical solutions, methodologies and collaboration aids needed to address the gaps identified
- T4.3 Qualitative and quantitative performance indicators, human and technical competences

**Work methodology:** Literature reviews, relevant stakeholder interviews, utilisation of information from ongoing and past project experience of the partner organisations

**Duration : 20 Months (1-20)**

**Partners involved:** **SCK CEN**, Amphos21, SCK CEN, TS ENERCON, GRS, TUS, UFZ, HZDR, BGE, FTMC, Tractabel, Golder WSP \*The Task will be also supported by Nagra and IFE.

## OUTCOMES: MILESTONES AND DELIVERABLES

### Milestone: Workplan for T4 – MS10: due M3

- Workplan for the task will be defined at project start and updated by M3.

### Deliverable: D15.2 Green paper: Gap analysis report. M12

- will identify the needs and gaps, discrepancies between the current state and the desired maturity state 1<sup>st</sup> version due **M6**,
- These gaps could relate to performance, compliance with regulations, technology maturity and compatibility 2<sup>nd</sup> version due **M12** (planned).
- Dissemination level PU

### Joint webinars (M3-M12)

- Between M3 and M12, three (3) webinars to engage potential end-users of DT will be organised.

# TASKS 5 STRATEGIC RECOMMENDATION OF THE COMMON APPROACHES AND STANDARDS IN THE DESIGN OF DIGITAL TWINS

## PABLO CAYÓN (INGECID) SUPPORT FROM NAGRA

The results of Task 3 & Task 4 will be closely followed in year 1.

The major activity will be completed in year 2:

- as the green papers (D15.1 and D15.2) mature in the respective tasks, major topics for the white papers can be identified,
- the outcome of Year 1 will be a broad Outline of the white paper and the identification of the major inputs.

**Work methodology:** Supporting Task 3 & 4 in the literature reviews, relevant stakeholder interviews, survey development, utilisation of information from ongoing and past project experience of the partner organisations

**Duration : 14 Months (6-22)**

**Partners involved:** INGECID, UFZ, UTARTU, Tractebel, SURAO, Mitta. \*The Task will be also supported by Nagra and IFE.

# TASKS 6 STAKEHOLDER ENGAGEMENT AND DISSEMINATION

## GABRIELA ROMAN ROSS (A21) SUPPORT FROM EIMV

The aim of this task is to capitalize on prior cross-sector expertise in applying digital technologies (builds on projects like HARPERS, DORADO ...)

A pivotal aspect of this endeavor involves identifying existing knowledge that can be transferred to the nuclear waste management community.

This approach will benefit the project in two ways, economically by reducing the cost as the activities will start with a sound basis, and technically by including experts from other fields.

**Duration : 24 Months (1-24)**

**Partners involved: A21, EIMV** – support from Task leaders and WPL

## METHODOLOGICAL APPROACH

**Stakeholder Mapping:** Identify all key stakeholders and categorize them based on their influence and interest in the project. This helps prioritize engagement strategies.

**Participation:** Invite stakeholders to participate in decision-making processes, which can be through structured workshops, feedback sessions, or advisory committees.

**Feedback Mechanisms:** Establish regular channels (e.g., surveys, meetings, or online platforms) to gather ongoing input and ensure stakeholders feel heard throughout the process.

**Co-Creation:** Involve stakeholders directly in shaping outcomes, which fosters stronger commitment and more practical solutions.

### Dissemination

- Publications, [conferences](#) and reports
- Workshops and training sessions
- Media Outreach
- Digital Platforms

DigiDECOM2024



# DELIVERABLES & MILESTONES & RISKS

- D15.1** – Green paper: Current practices of digital twins (Task 3)
- D15.2** – Green paper: Gap analysis report (Task 4)
- D15.3** – White paper: Position paper (Task5)
- D15.4** – Outcome/impacts report to Member States and End Users

## Milestones

- Kick-off meeting (IFE) Participation by partners, presentation material (November 6)
- Workplans for T3, T4, T5 (VTT) Milestone document (M3)
- Stakeholder engagement plan and template (Amphos 21) memo (M3)
- Stakeholder group engagement events held (Amphos 21) Workshops and memo (M6)
- 1<sup>st</sup> and 2<sup>nd</sup> Annual Workshop (IFE) Participation by partners, presentation material (M12)



## DELIVERABLES & MILESTONES & RISKS

### **Delay in getting high quality information from Task contributors** (internal contributions)

Monthly meeting with WP Leaders, clear Quality Management Plan and follow good practice with respect to project management and progress reporting.

### **Lack of support from Task contributors due to illness/holidays/competing requirements**

Regular dialogue across EURAD-2 teams, including PMO representative.

### **Lack of understanding of contractual agreements, liabilities, roles, responsibilities (Beneficiaries /Affiliated Entities)**

Clear Consortium Agreement, reporting procedures (in accordance with good practices for procurement and financial project management) and publication of factsheets/continuous procedures.

### **Insufficient involvement of end-users. Results are not utilized by Member States Stronger role of EUG.**

Direct contact and regular meetings planned with end-users Use of NDA with EUG.

....

### **The topic area is rapidly developing and there is a risk that the recommendations in the white papers are outdated due to the fact that consensus finding takes considerable time**

Identify & engage key stakeholders to ensure that the proposed work remains relevant when the results are published.  
Formulate the white papers such that they are high level, describe the broader vision, avoided shorter term tech. detail.

### **Acquisition of regulatory requirements concerning DTs is limited, because the requirements are still in early phase or non-existing**

Contact several regulators. Try to get draft versions of documents, in case final ones doesn't exist.

# MAP OF SYNERGIES

## Synergies within WP15

- Subtask 1.2:** Dissemination/outreach/impact
- Subtask 2.2:** Knowledge transfer
- Subtask 4.1:** Identification of gaps
- Task 5:** Strategic recommendations
- Task 6:** Stakeholder Engagement and Dissemination

## Exploring synergies within EURAD

- WP2:** Knowledge Management
- WP4:** FORSAFF - WM for SMRs and future fuels
- WP6:** STREAM - Sustainable treatment and immobilisation of challenging waste
- Others?

## External synergies

### DORADO project

Digital twins and Ontology for Robot Assisted Decommissioning Operations

Key research goals of DORADO

- Demonstrate utilization of emerging digitalization technologies in decommissioning planning.
- Improve data transfer using standardized ontology and open protocols.
- Combine 3D/BIM with AI, mission planning, robotics or voice recognition to improve decommissioning planning.

Others?

HARPERS

HARMONISED PRACTICES, REGULATIONS AND STANDARDS IN WASTE MANAGEMENT AND DECOMMISSIONING

Stakeholder engagement

Are you part of the stakeholder community? Would you like to be informed or actively involved in the HARPERS project?

JOIN US!

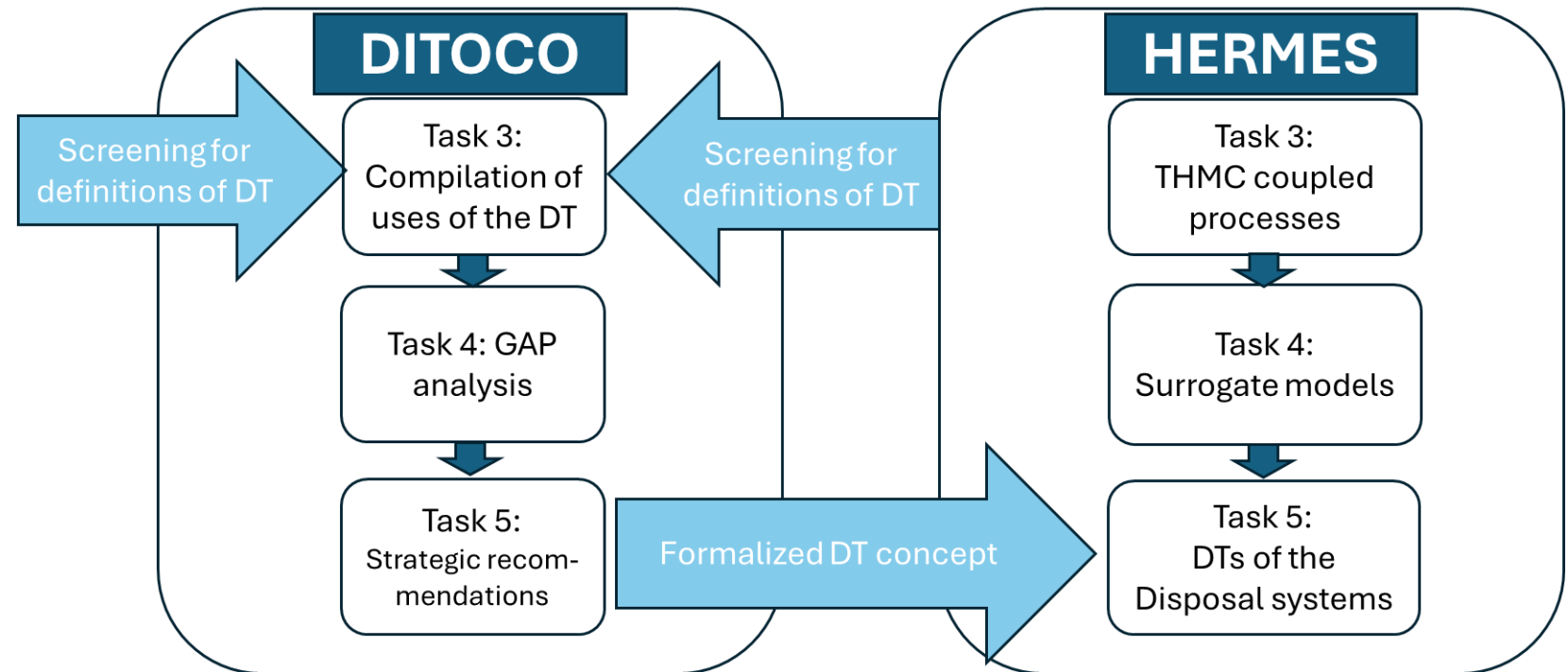
## WP16 HERMES CONNECTION

In HERMES, Task 5 ( Tailored models for SA/PA and field scale mock-ups) is dealing with the DTs

- Subtask 5.3: Dedicated models for optimization and repository design and integration of the models into Digital Twin concepts to be formalized in WP 15

Aim of HERMES Subtask 5.3:

- ...to consolidate the models created in the work package into tools capable of performing analyses that can be used in the design and optimization of the radioactive waste disposal system.
- The resulting models are digital twins of the disposal systems, the formalism of which is described in DITOCO.





# NEXT STEPS

## November 6 kick-off

*The objective of the meeting is to establish a shared understanding and commitment, have detailed discussions regarding the goals & objectives at both the work package and tasks level, including the*

- *work plan, timeline, expected deliverables,*
- *potential collaborations with other EURATOM projects or initiatives,*
- *clarifying roles and responsibilities for all involved partners to align expectations and address any ambiguities.*

To assist the task leaders in coordinating their efforts effectively, it was request to **identify individuals from each organization** (on-going) who will contribute to specific tasks within DITOCO2030, specifying the expected level of effort for each task.

**Access to Project Place** to all Partners

