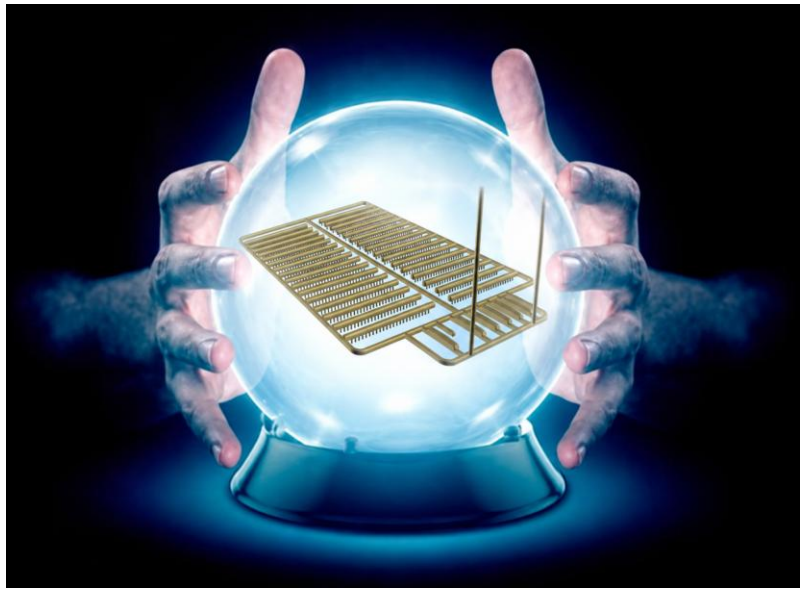
Topical session 7: Repository Digital Twin concepts and developments



or: How to build a crystal ball?

Co-funded by the European Union under Grant Agreement n° 101166718

10-09- 2026

PROGRAM

- DITOCO2030 / HERMES: Project aims and major achievements – Réka Szőke, Sergey Churakov
- DITOCO2030 White Paper recommendations and outlook – Pablo Cayon, Xavier Pintado
- Surrogate models for acceleration of coupled codes – Nikolaos Prasianakis
- Interactive session – Arto Laikari

Audience:

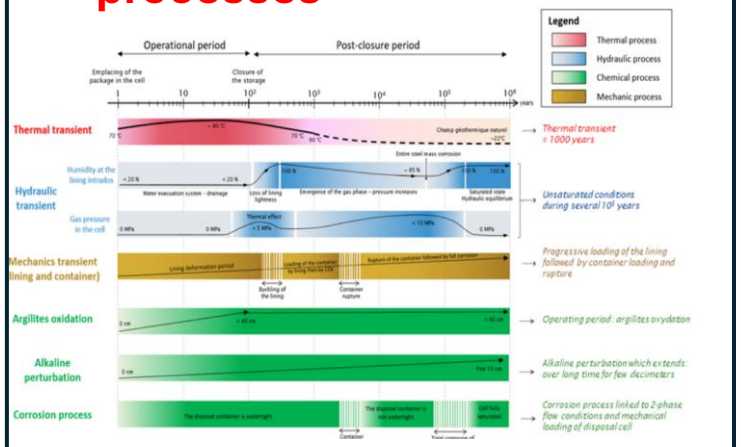
- Member of DITOCO: 11
- Member of HERMES: 12
- End User: 8
- Never heard about DT: 5

DITOCO2030 – KEY TECHNICAL INSIGHTS & LESSONS LEARNED

- **Vision**
  - Build a federated, governed Digital Twin ecosystem creating a continuous digital thread across design → construction → operation → closure.
- **Key challenges**
  - Fragmented tools and data silos • inconsistent DT terminology and scope • weak feedback loops between models and field reality • difficult evidence traceability • need to build regulatory and societal trust progressively.
- **Recommended approach**
  - Develop an interoperable, modular and technology-agnostic ecosystem connecting BIM/GIS, monitoring data and multi-physics models through open interfaces and shared semantics. Embed governance, cybersecurity, provenance, versioning and traceability from the start, and focus on decision-critical use cases rather than technology itself.
- **Implementation pathway**
  - Now: select high-value use cases → define common governance and architecture → launch an auditable MVP → involve TSOs/regulators from day one. Long term: scale toward a Living Safety Case Digital Twin, continuously integrating monitoring data, validated models and evidence for assessment, reporting and stakeholder communication.

OVERVIEW OF THE HERMES WP

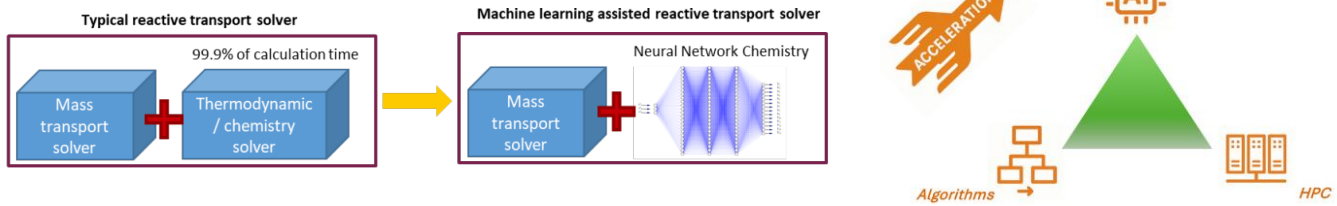
THMC coupled processes



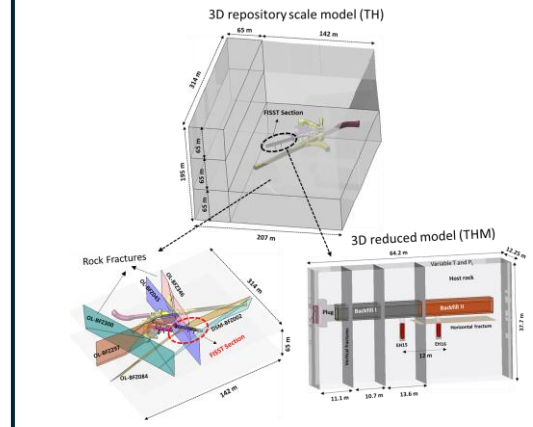
Data hub

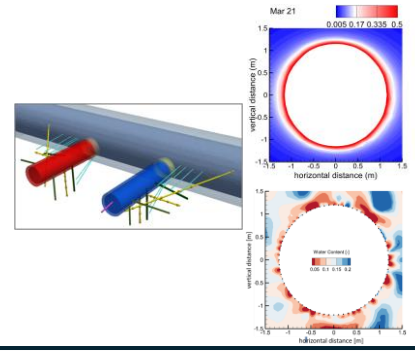
Building high fidelity models

Surrogate modells, AI / ML / ROM



DT for real field scale experiments





TAKE HOME MESSAGES

- Start small, govern from day one, demonstrate value through auditable use cases, and scale toward a trusted Living Safety Case Digital Twin.

- AI/ML-based surrogate models can make high-fidelity simulations fast enough for Digital Twin applications, provided that accuracy and reliability are demonstrated through validation and benchmarking.

- End-user involvement is essential to ensure that AI/ML surrogate models address real needs and deliver trustworthy, usable Digital Twin solutions.