

Towards End-to-End Modelling and Decision Support for Nuclear and Radiological Emergencies



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IFE Institute for Energy Technology

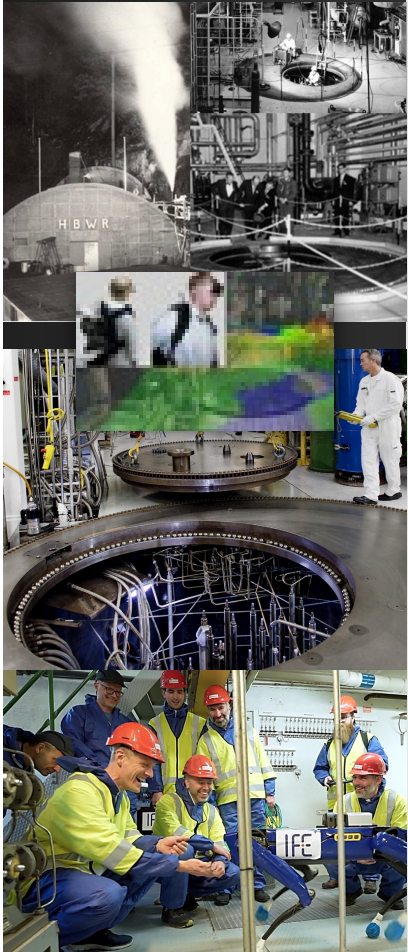
- safe operation of nuclear power plants
- forward-thinking energy systems
- development of radiopharma

IFE Nuclear

Safeguarding People and Operations
Through Human Centred Technology

APS Applied Physical Sciences R&D&I

- AI, nuclear physics & robotics
powered Digital Twins
- Continuing the HRP legacy

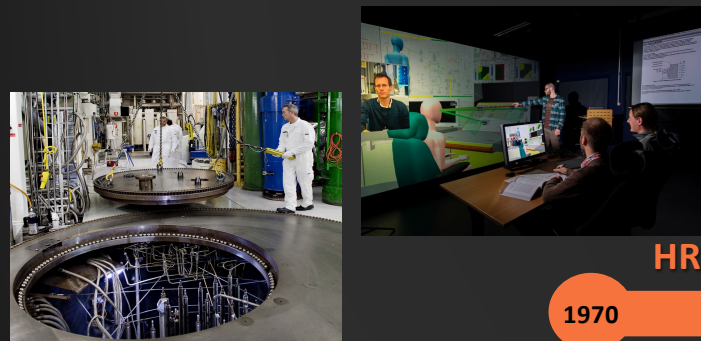


DigiDECOM

HADRON



History



1948



OECD Halden Ractor Project

HRP Fuels & Materials

1970

HRP Man Technology Organisation

1999

Support projects – nuclear safety

Fugen, Chernobyl, NW Russia (stopped), ... NND (Norway), Blykalla, ...

2017

DigiDECOM

2019

EU & National
R&D



HADRON
2018 IAEA Centre



SMR Industry Alliance

- Nuclear safety
- Competence
- Back-end

Nuclear
Centre



2023

IFE



2021

2026

AI, physics & robotics powered Digital Twins

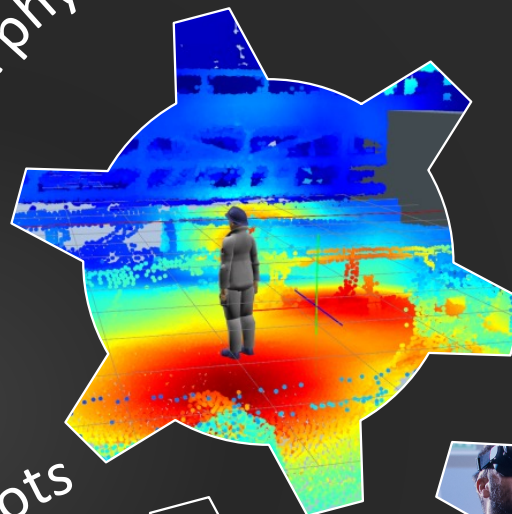
IFE

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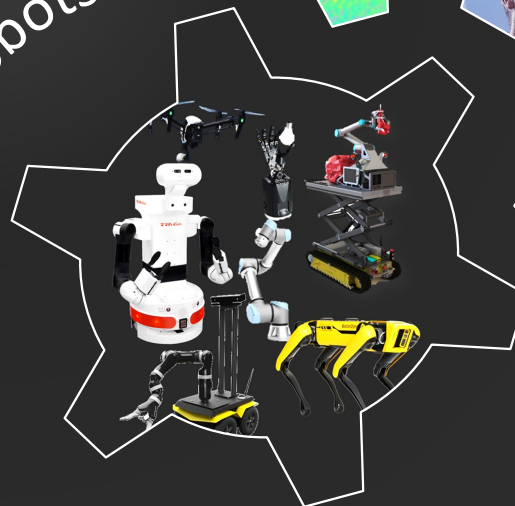
Hazard
Aware

Digitalisation &
Robotics in
Nuclear & other
domains

AI & physics models



mobile robots



3D Digital Twin





IAEA
International Atomic Energy Agency

Institute for Energy Technology (IFE)

IAEA Collaborating Centre

HADRON

IFE

robots &
sensors

physics & AI powered Digital Twin



Schedules, breakdowns & floorplans

3D job plans & safety
analysis

BIM

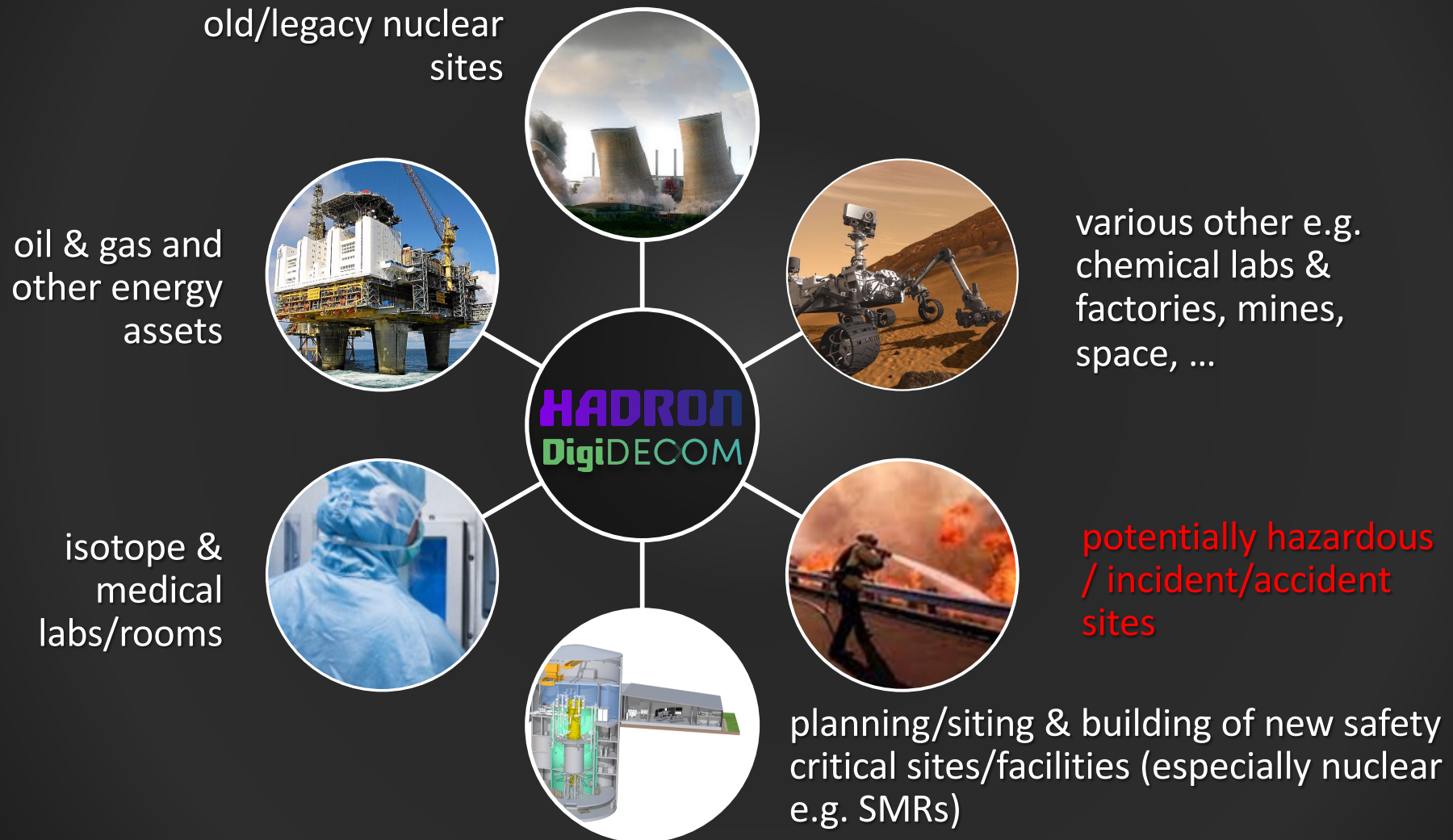


Info portal

Hazards, Risks & Requirements

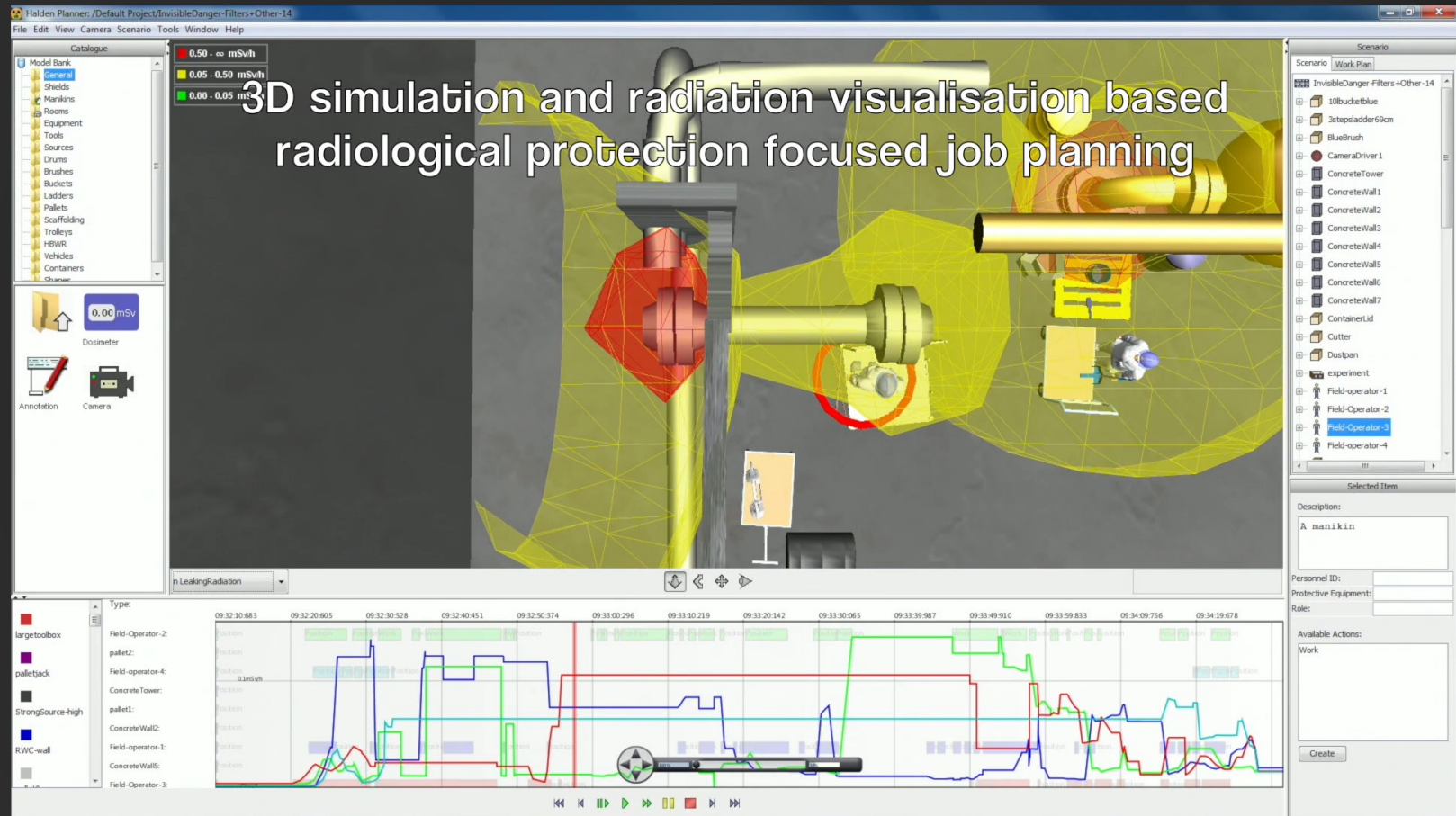
Characteristics & Costs

Application areas

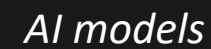


3D safety Planning, Briefing & Training

VRdose®



vrdose-support@ife.no

[illegible]

Robots

UAVs taking
sensors (etc.) high
(indoor/outdoor)



Small **UGVs**
carrying sensors and
small grippers



Larger modular systems
with high reach and
good payload capacity
(can operate machines)



UGVs climbing stairs and
navigate difficult terrain e.g.
quadrupeds



Small specialized robots
crawling into narrow
spaces, e.g. inside pipes,
adhere onto walls, ...



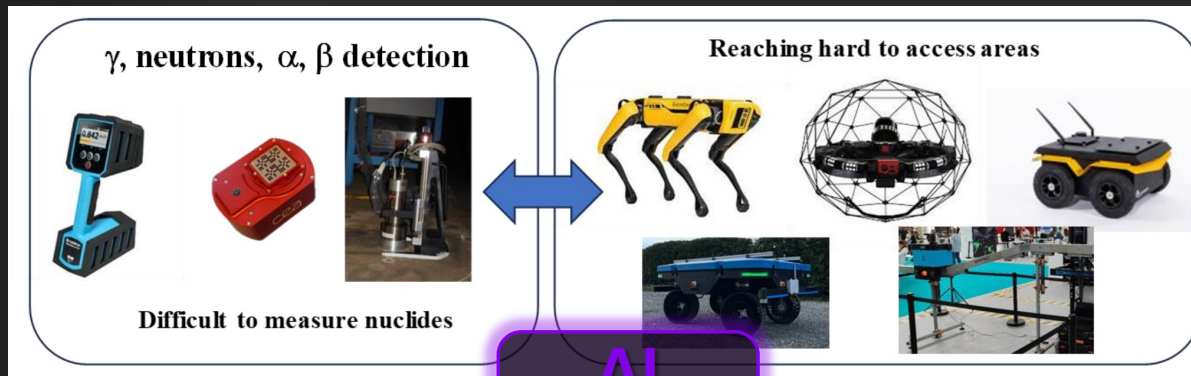
Maritime & Other
robots

Humanoids taking
advantage of ergonomics
designed for humans +
natural telepresence

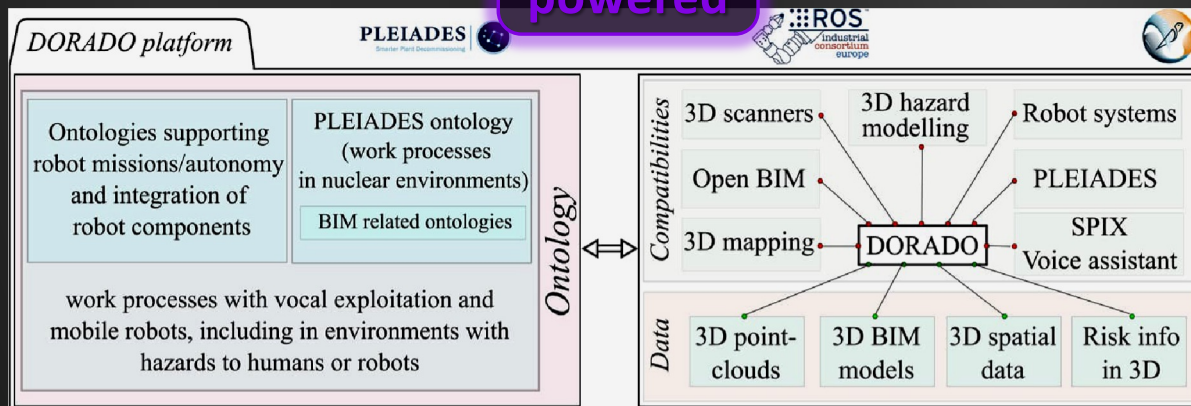




Euratom and HEU



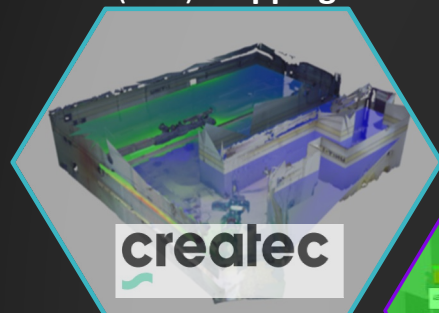
XS-ABILITY: Modular robots with sensors to minimize human intervention in harsh environments.



DORADO: Data-driven digital platform compatible with platforms/data in XS-Ability

HEU GUARDIANS

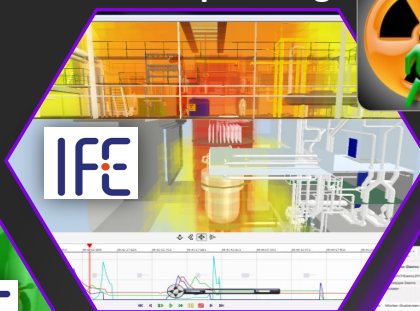
3D scanning /
(rad.) mapping



Facility/site
Characterisation



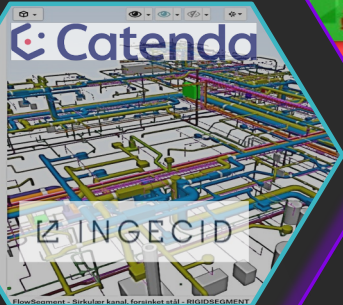
Work planning



Risk
management



Other compliant tools
asset management
resource management
scheduling
project management
....



BIM

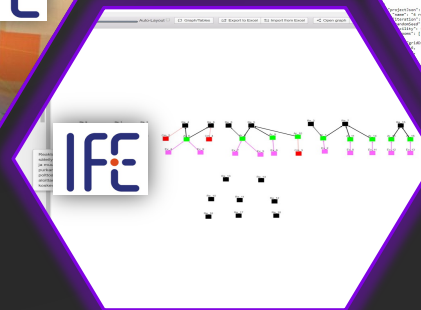


instrumented
mobile robots

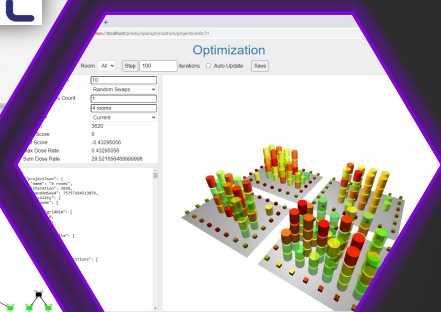
Training &
in-situ info



Compliance
management



Waste management

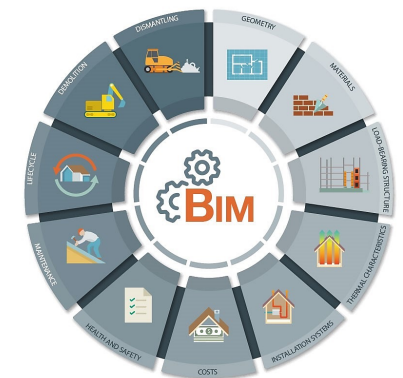
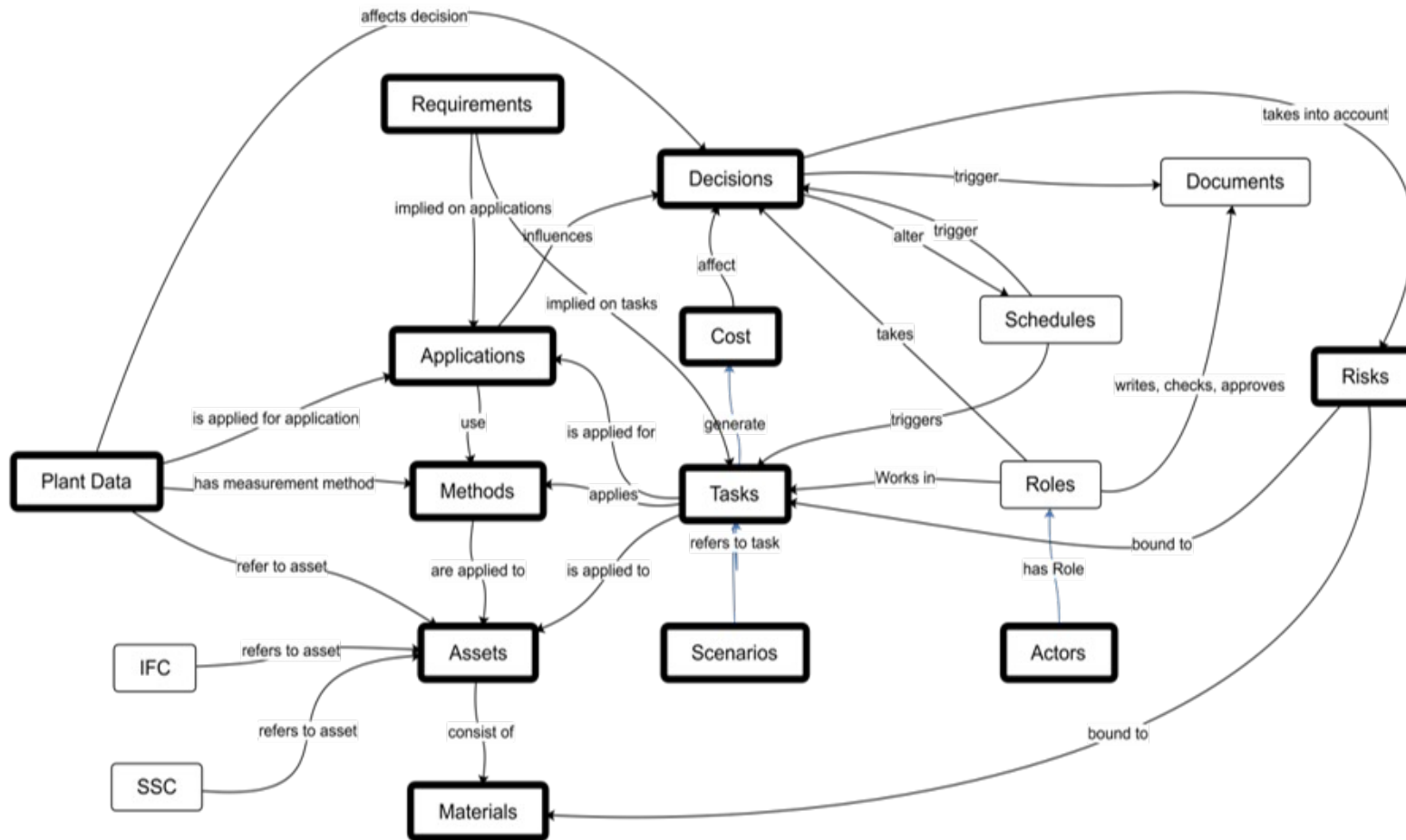


Open BIM
Compliant!

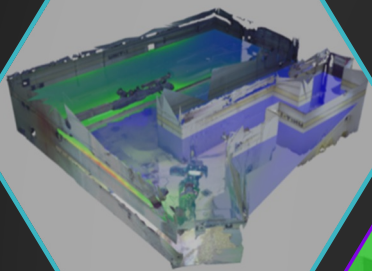
AI
powered

Otology:

PLEIADES → EURATOM DORADO & EJP EURAD-2 DITOCO20230



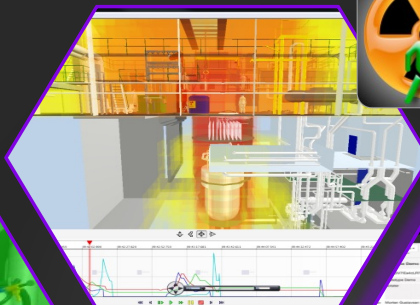
3D scanning /
(rad.) mapping



Facility/site
Mapping



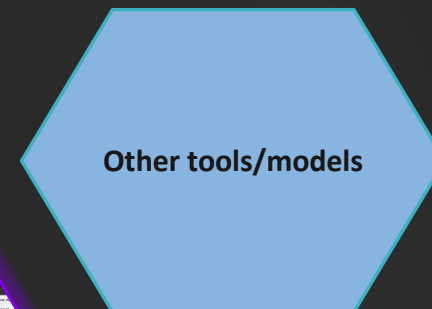
Response
planning



Risk
management

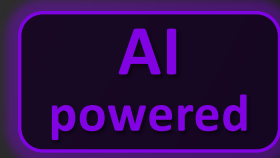


Other tools/models



Environmental
impact

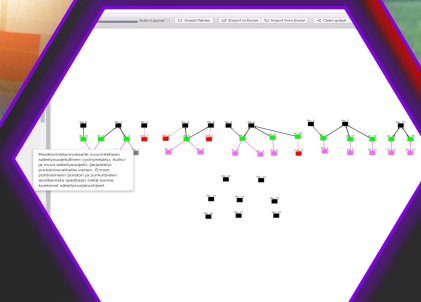
AI
powered



Training &
in-situ info



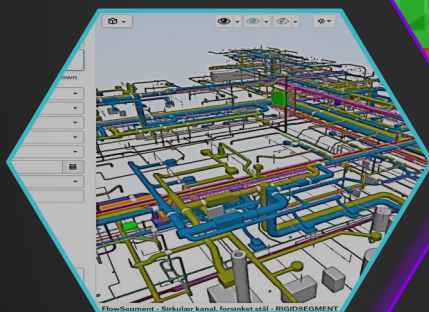
Compliance
management



instrumented
mobile robots



BIM

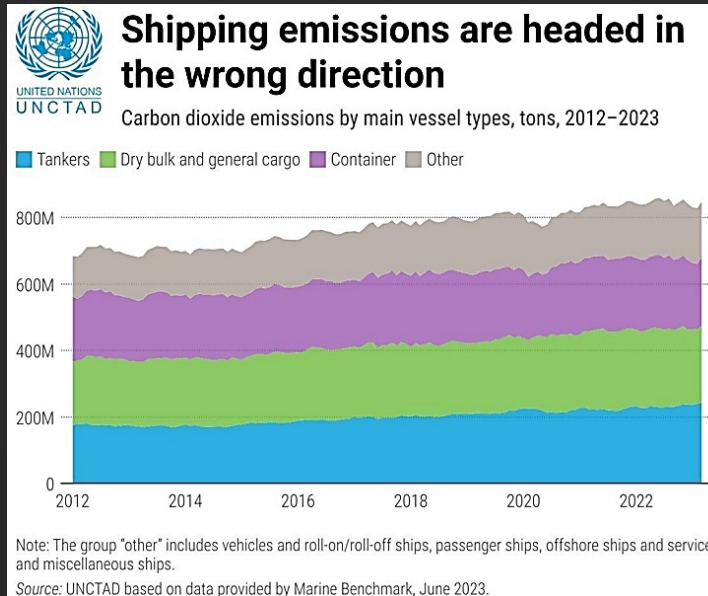


Open BIM
Compliant!

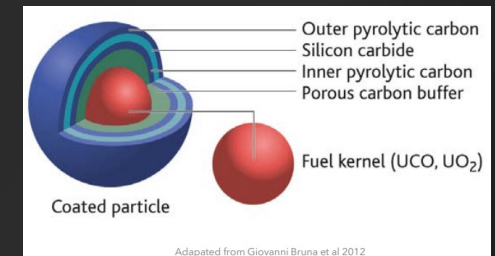
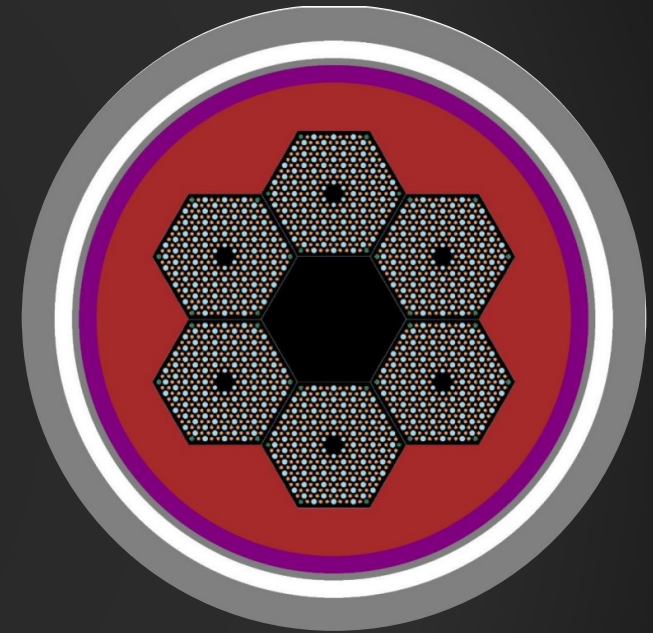


Nuclear Ships

Dan Cisne, Knutsen Group, 2025



- **Compact, motion-tolerant systems** required, with safe operation under vibration and fast power swings.
- **Maritime accident cases** differ from land events, for example **water ingress after capsizing** and **confined-space emergency response**.



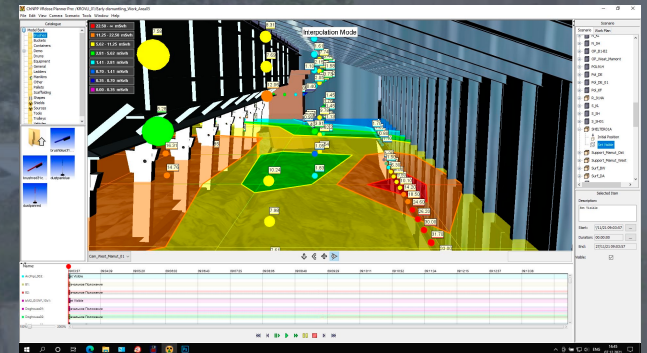
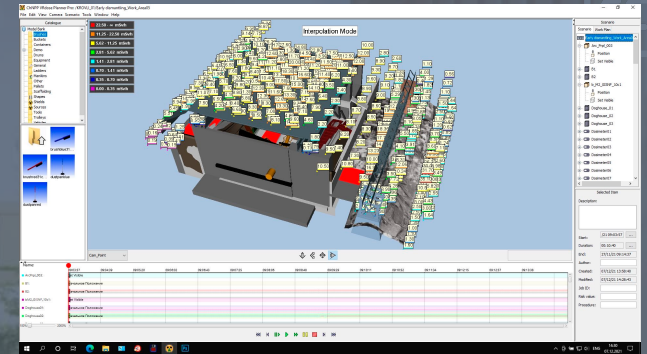


Cooperation between IFE and Energoatom under the Norwegian Government's Action Plan for Nuclear Safety & Security in Ukraine



Norwegian Ministry of Foreign Affairs

 **NUCLEAR SAFETY AND SECURITY**
The Norwegian Government's Action Plan
2018–2022





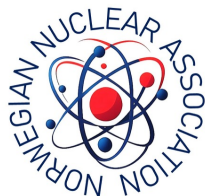
DigiDECOM 2026

 17 September 21-25
 Halden, Norway



NuclearNEXT Deep Dive Workshop

NuclearSweden



HALDEN
KOMMUNE

