SCIENTIFIC FORUM
NUCLEAR ENERGY FOR CLIMATE

Emerging Technologies to support decommissioning

Federica Pancotti

Sogin, Italy

SOGIN

2023

Sogin at Glance

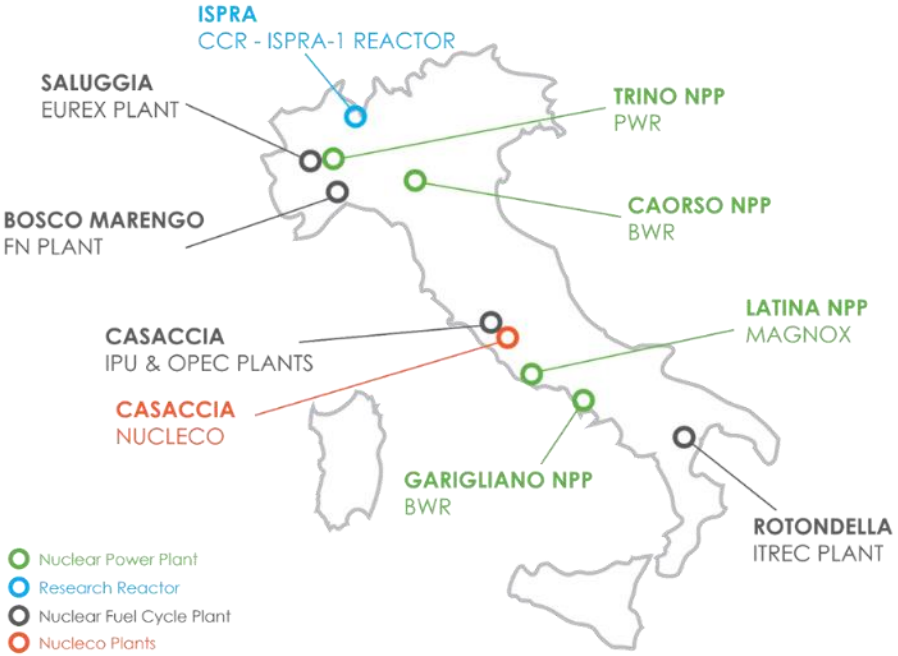
Sogin is the Italian State owned company responsible for the **decommissioning of Italian nuclear plants** and for the **management of radioactive waste**

The Company is involved in the siting, designing, building and operating of the **National Repository** and the Technology Park for radioactive waste

Italian **nuclear facilities in decommissioning**, managed by Sogin, include:

- 4 NPPs (2 BWRs, 1 PWR and 1 Magnox)
- 1 research reactor
- 1 nuclear fuel fabrication plant
- 4 nuclear fuel cycle research plants

Sogin, founded in 1999, became a Group in 2004 through the acquisition of the majority stake of **Nucleco**



IAEA International Atomic Energy Agency

COLLABORATING CENTER
Training and Knowledge Transfer in Decommissioning

Main decommissioning projects

The full-life master plan reports **all the projects** to be developed up to the green field.
The main of those relating to the next five years to reach the brown field on different plants concern:

Nuclear Island – Large Components Removal and Dismantling

Radioactive waste treatment and conditioning

Encapsulation and dry storage of spent fuel and nuclear materials

Environmental remediations

Temporary Storage Buildings

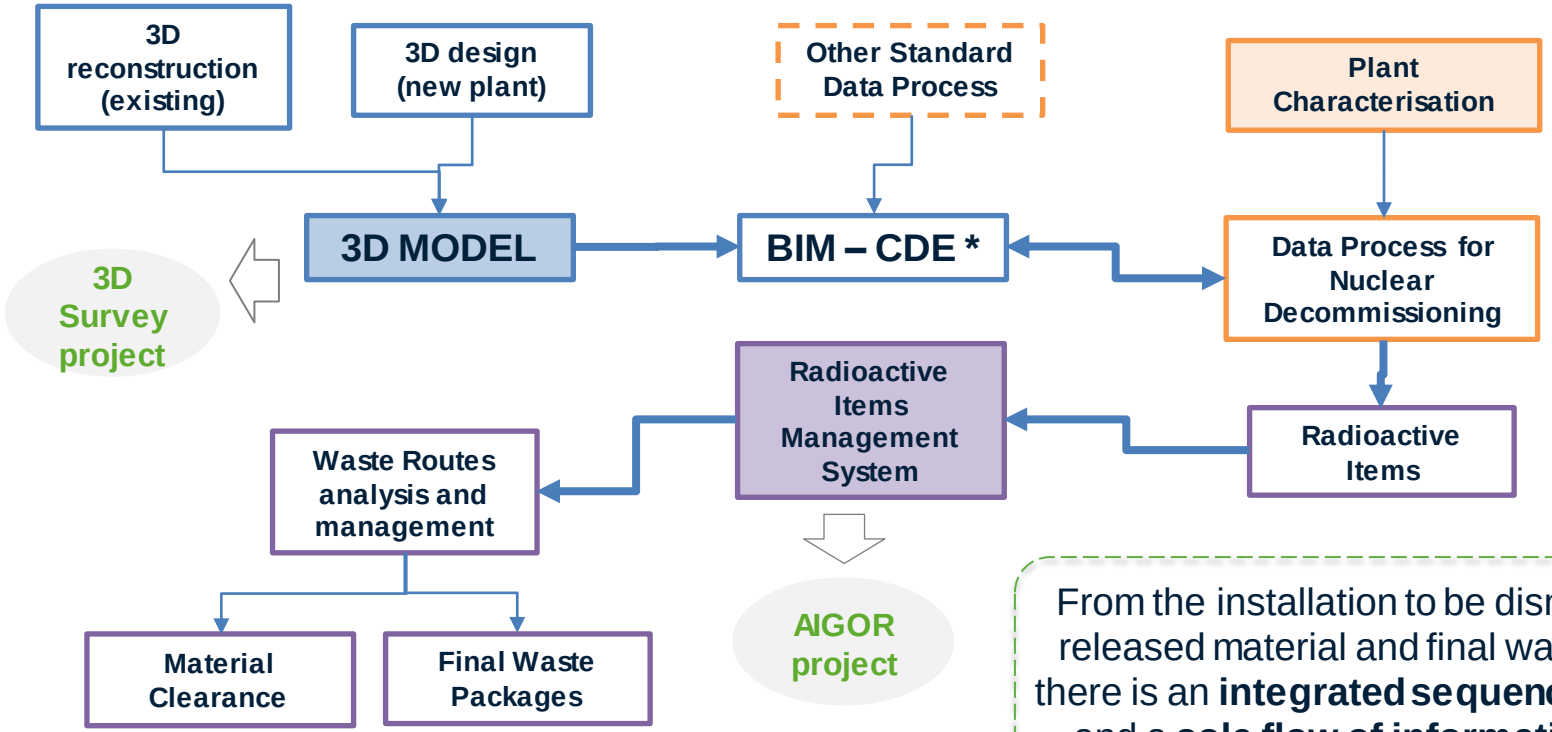
Decommissioning and digital technologies

- **Most of nuclear facilities were built before the digital age**: available data and records are old, sometimes incomplete, and they don't accurately reflect the reality of the facility as it is today
- **Understanding the scope of the work** is of primary importance to make nuclear decommissioning safe and successful: D&D strategies depend on characteristics of the SSCs, level of contamination, type of processing required, and how much it's likely to cost
- **Decommissioning produce wastes** that need to be properly managed: need for a unique and traceable flow of information and data from the installation to be dismantled to the released material and final waste package

Digital technologies can help to provide a better, more quantifiable understanding of what is involved and to optimize the integrated flow of information and data management

Sogin develops innovative technological solutions in nuclear decommissioning and radioactive waste management, with the objectives of improving safety and minimize environmental impact

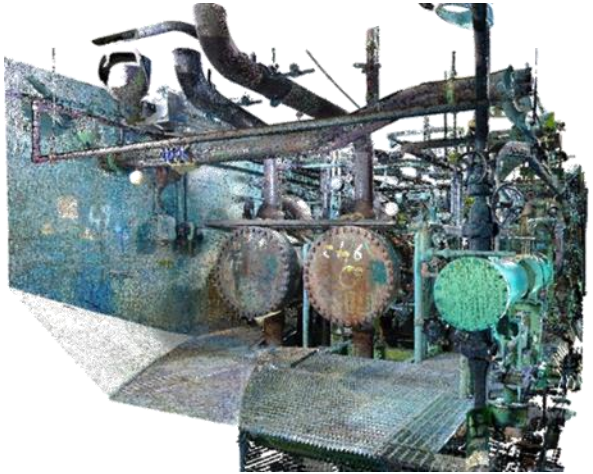
Integrated digital approach

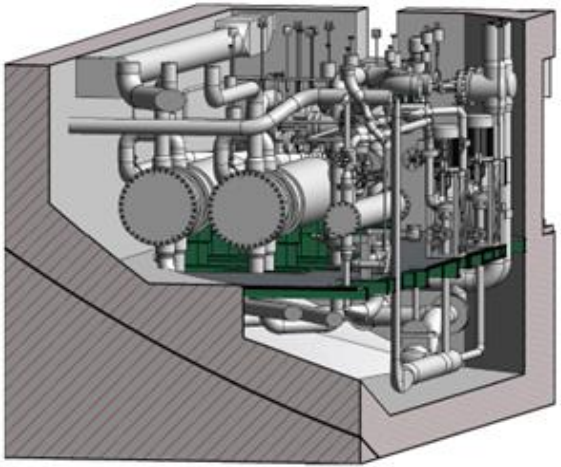


From the installation to be dismantled to the released material and final waste packages there is an **integrated sequence of activities** and a **sole flow of information and data**

* BIM: Building Information Modeling – CDE: Common Data Environment

3D Model Generation





BENEFIT AREAS

- Scenario Planning
- Waste inventory
- Cost estimation
- Interface management
- Training Operators
- Documentation – licensing
- Provide detailed information for supply chain
- Visualization – Stakeholders

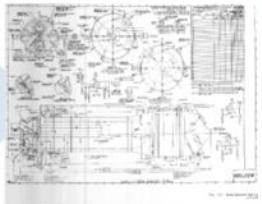
CHALLENGES

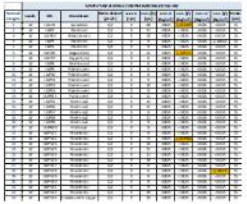
- Generating a detail model is expensive and time consuming
- Scanning can provide surfaces and snapshot of reality
- Significant manual processing can be required to model features, thickness and internals

Digital models have different level of details for different uses

3D Model Generation – 3D Survey

Historical Information





Plant's Metadata

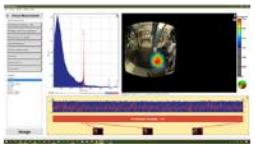
Data Analisys Of Plant

Point Clouds

Nuclear Plant: Point Cloud

Reference system

Imaging System

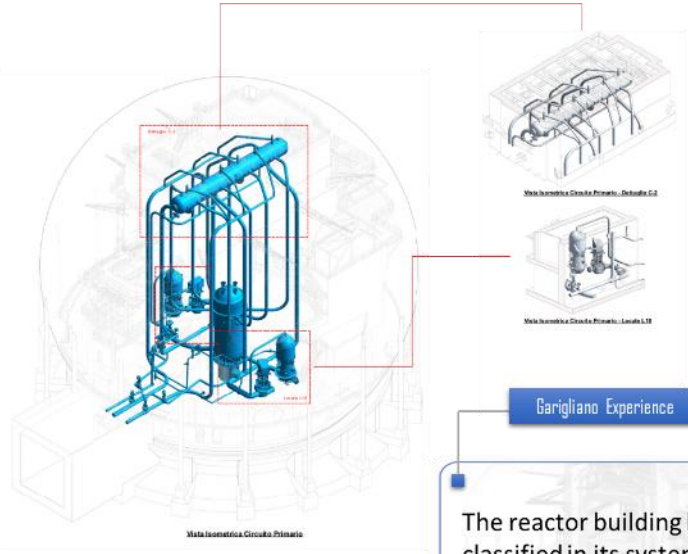


Acquisitions w/h imaging

Integration w/h other sensors

Data INPUT

3D Model Generation – 3D Survey



Garigliano Experience

The reactor building has been classified in its systems and main components.

- ✓ Full 3D parametric model
- ✓ BIM-CDE *
- ✓ Dismantling activities design and waste inventory

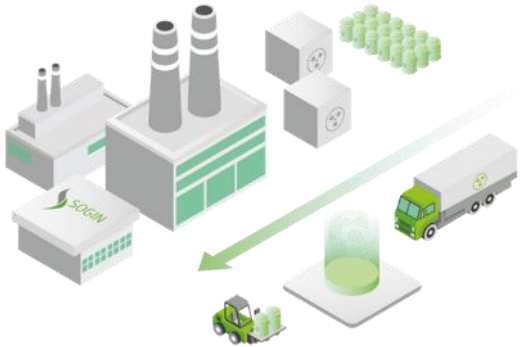
- ✓ Virtual reality experience
- ✓ Only visualization
- ✓ Plant Inspection and training

* BIM: Building Information Modeling – CDE: Common Data Environment

RW management – AIGOR project

AIGOR
A SOGIN PRODUCT

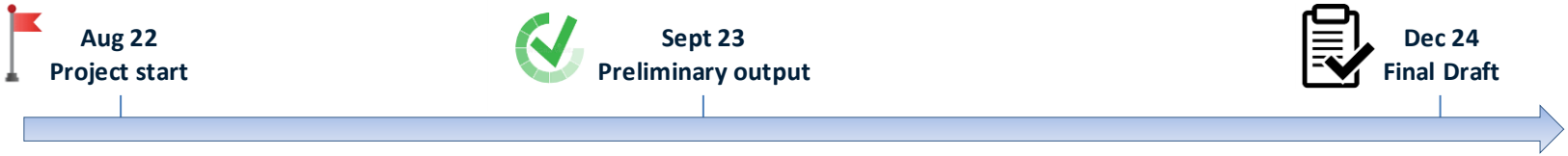
AIGOR (Radioactive Items Management System), aims to **optimize RWM *** by a multi criteria analysis, to select the most appropriate waste process route for a defined waste stream, and to manage data and information in a flexible and reliable way



- ✓ **Traceability**: ensure the connection with the historical data of a radioactive item for the purpose of reconstructing the processes to which it has been subjected over time
- ✓ **Uniqueness**: constitute a center (at a national level) for collecting and archiving quantitative and qualitative data and information on all radioactive items managed by Sogin
- ✓ **Homogeneity**: guarantee homogeneous application of terminologies, classifications, treatment processes, etc. for similar types of radioactive items in all decommissioning sites

* RWM: Radioactive Waste Management

IAEA Collaborative project – NET4D



Objective:

To work collaboratively to provide information on **new and emerging digital tools and technologies** being used in **data management, planning, and implementation** of decommissioning

Methodology and Outcome:

The project will deliver a report that provides analysis of the **challenges, benefits, and limitations** for the utilization of new and emerging technologies that are applicable to different levels of information and decommissioning challenge complexity

3 Working Group	**Group 1**: Technologies for conversion of **unstructured legacy data into a structured format** **Group 2**: Emerging technologies for the generation of **detailed digital models from Point Cloud data** including the use of automated digital tools **Group 3**: **Digital Model selection** for variety of different decommissioning challenges during planning and implementation

Conclusions

Optimisation

The use of **digital technologies and the integrated approach** for decommissioning and waste management is a key point to optimize the overall sequence of activities and flow of information and data

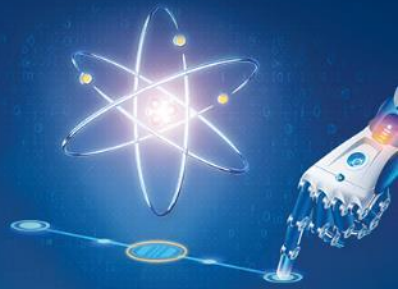
Challenges vs Benefits

Generating a 3D model of a legacy facility is an expensive and time-consuming activity. **Different levels of detail** are needed **for different decommissioning phases or tasks**

Innovation

Innovation on technologies and approaches can further **improve the efficiency and effectiveness** of decommissioning activities starting from planning up to waste management

SCIENTIFIC FORUM
NUCLEAR ENERGY FOR CLIMATE



Thank You

2023