SOGIN
a qualyfied partner !

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SOGIN PRESENTATION ROADMAP

- COMPANY PROFILE
- MANAGEMENT AND ORGANIZATION OF DECOMMISSIONING PROJECTS
- DECOMMISSIONING WORLDWIDE
- DECOMMISSIONING OF NUCLEAR SITES IN ITALY
- GRAPHITE DECOMMISSIONIG STRATEGY

COMPANY PROFILE

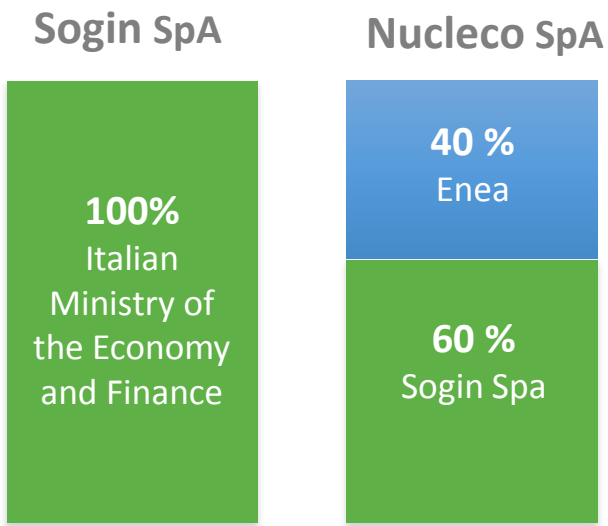
SOGIN

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

- Sogin is involved in the siting, designing, building and operating of the National Repository and the Technology Park for radioactive waste

NUCLECO

Sogin has been operating since 2001. It became a Group in 2004 through the acquisition of the majority stake (60%) of Nucleco SpA, the national operator responsible for collecting, treating, conditioning, temporary storage of radioactive waste and nuclear sources from medicine and scientific and technological research activities



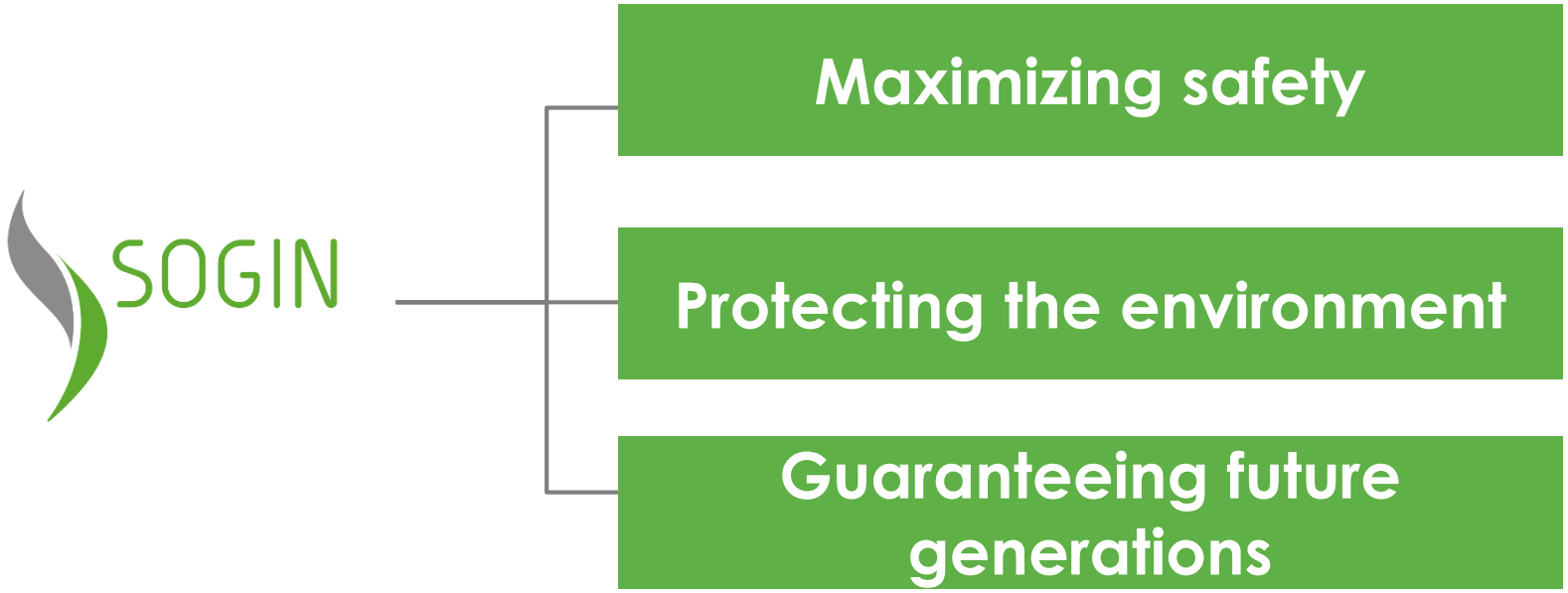
COMPANY PROFILE

PEOPLE

- The over 1,000 employees of the Group are selected and trained according to levels of excellence. They include nuclear, civil, mechanical, chemical and environmental engineers, physicists, geologists, radiation protection and materials science experts, biologists

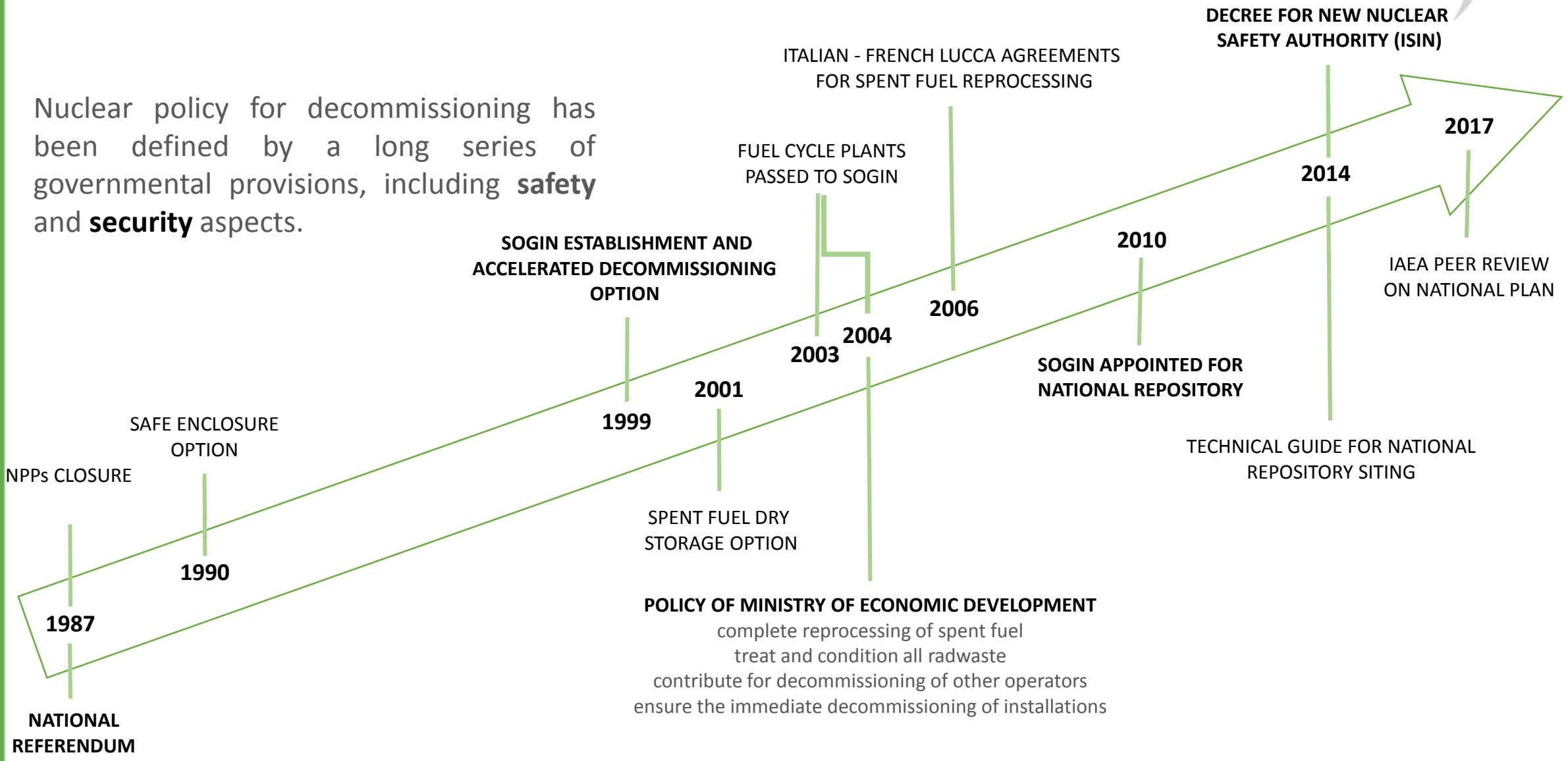
- They constitute the most highly skilled source of professional expertise in the management of radioactive waste and decommissioning of nuclear power plants in Italy

VISION



NUCLEAR POLICY MILESTONES

Nuclear policy for decommissioning has been defined by a long series of governmental provisions, including **safety** and **security** aspects.



SOGIN CORPORATE PROFILE

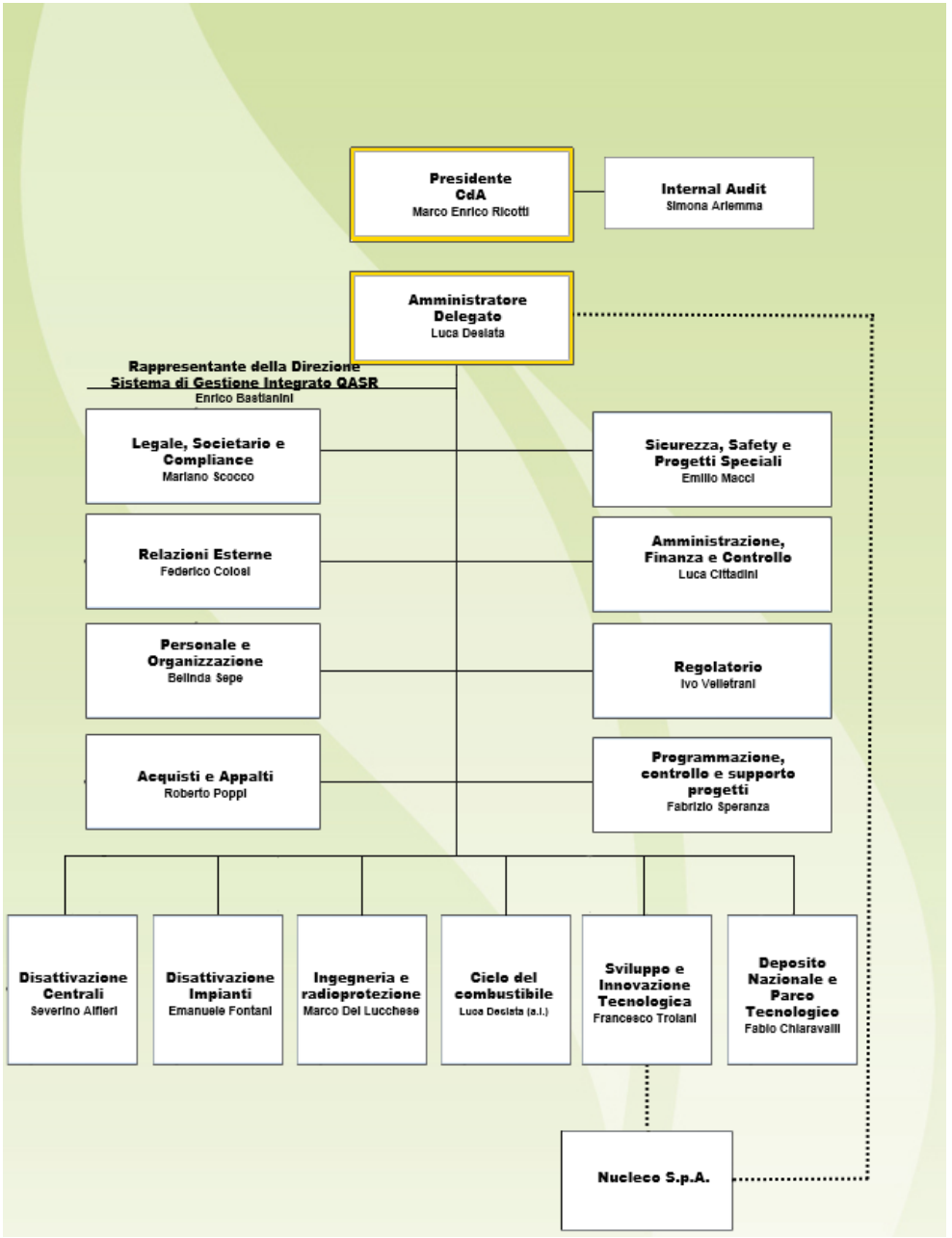
Organization

Based on the provisions of the Board of Directors, the organization of SOGIN gives the responsibility for managing the sites to the CEO, who is fully endowed with power of attorney.

Organization is based on a functional structure reporting to the CEO, with 6 business Dept., two of them are in charge of coordinating the deco-activities related to the nuclear sites.

The CEO has established an appropriate power allocation system to the technical staff for assuming operational responsibilities, while leadership and strategic choices remain on his charge.

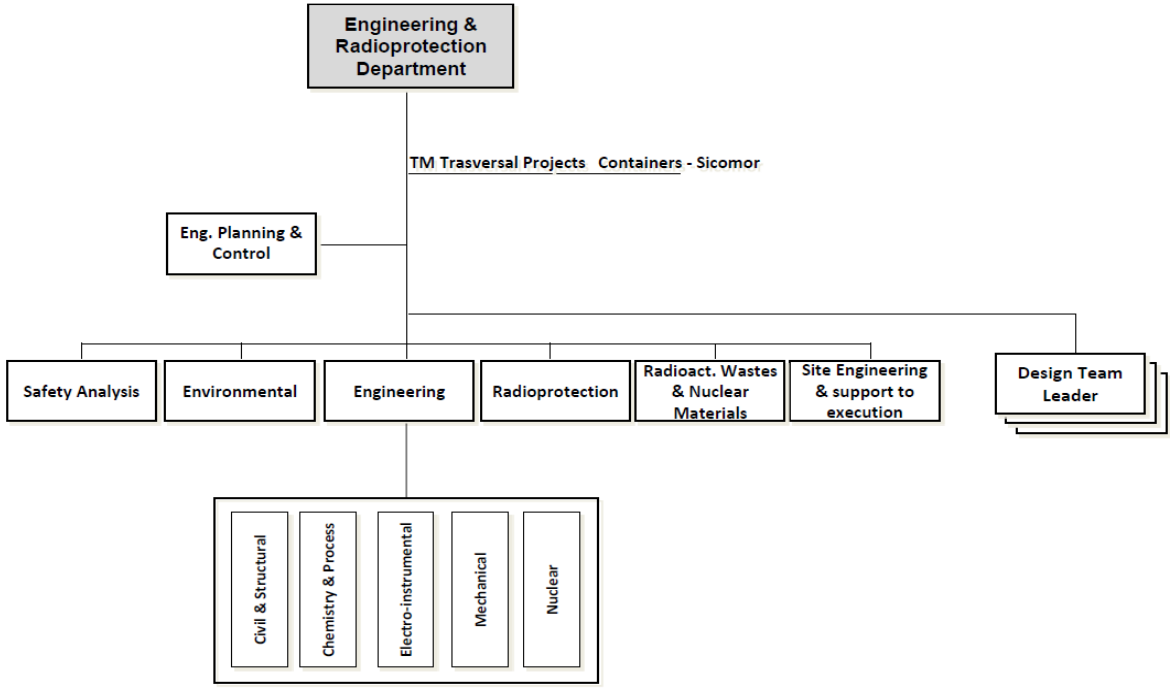
For the management of sites, the power is properly discharged by the CEO directly to site representatives, who as licensees remain accountable for all safety and decommissioning operational activities.



MANAGEMENT AND ORGANIZATION OF DECOMMISSIONING PROJECTS

Engineering & Radiation Protection Department

Design activities, ranging from conceptual to detailed design focused on radioactive waste management and decommissioning activities, are managed by **Engineering & Radiation Protection Department.**



The Department is organized into Technical Units and Disciplines, covering all engineering sectors (mechanical, civil, electro-instrumental, environmental, chemistry, nuclear) and specific aspects of the nuclear industry (nuclear safety analysis, radiation protection, radiological characterization, radioactive waste treatment and management).

Engineering & Radiation Protection Department (2)

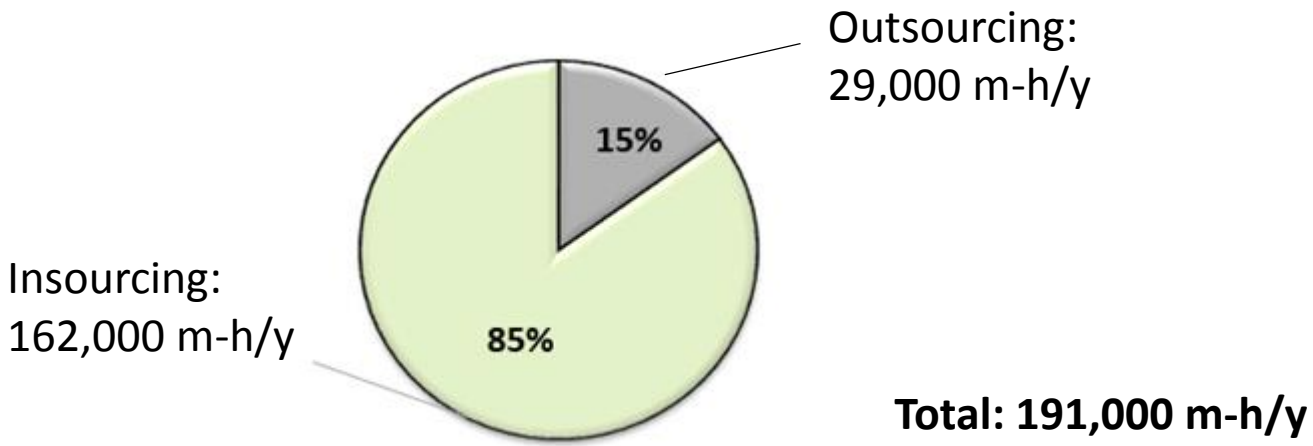
- Engineering Department develops all technical documentation requested for supply, contracting (feasibility studies/preliminary designs, detailed designs) and licensing procedures (overall decommissioning plan, operative plans "OP" or detailed projects "DP", etc.). The Department develops the environmental characterization of sites, Environmental Impact Analysis, design and supervision of geotechnical and hydrogeological investigations, providing also support to conventional waste management.

- Engineering Department assists the Field Management to supervise Contractors (technical deliverables; on-site construction phases; in-factory activities; on-site/in-factory functional tests, structural test, etc.)

- Engineering services outsourcing is limited to 15% of total man-hours; additionally, it's necessary to supervise Engineering companies, (checking out drawings, technical reports, calculations, and so on).

People

- Man-Hours of Engineering Department are deployed on a large number of simultaneous Tasks. The total number of Tasks carried out on 8 Sogin Site can be grouped in the range of around 200 Activities (50% relates to the preparation of tender projects and **licensing procedures**)
- Additional man-hours of Engineering Department are requested by National Repository Project and the International Markets Division.



Main Decommissioning Projects

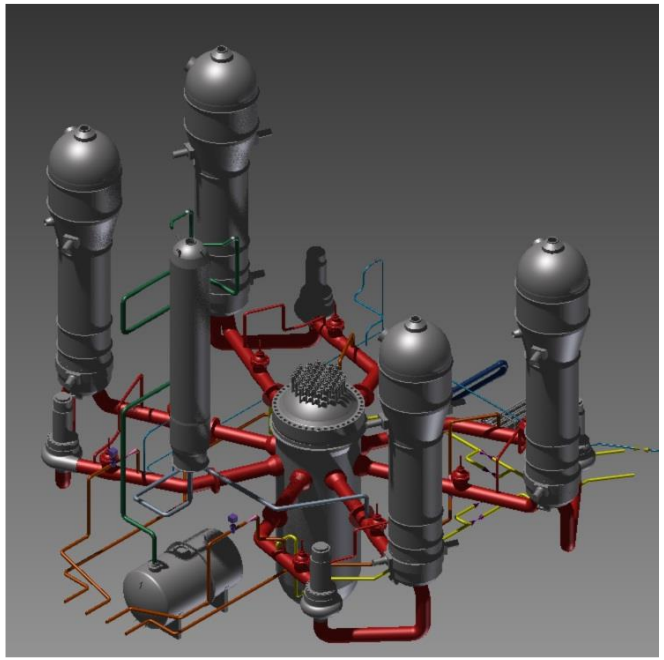
Engineering Department is involved in a range of technically challenging projects:

- Solid and liquid radioactive **wastes treatment and conditioning Plants**
  - Cemex e ICPF are cementation plants for high radioactive liquid wastes arising from fuel treatment campaign;
  - Waste Management Facilities treat solid waste arising from dismantling of Systems structures and Component. Examples are: Cutting facility in Latina NPP to treat boilers metallic sections; Cutting Stations and Sand Blasting Station of Turbine Building in Garigliano NPP to treat spool coming from piping and component dismantling of BOP; Supercompactor to reduce volume of spools and wastes.
  - Wet Oxidation Plant construction is planned on-site to treat borated resins stored in Trino NPP

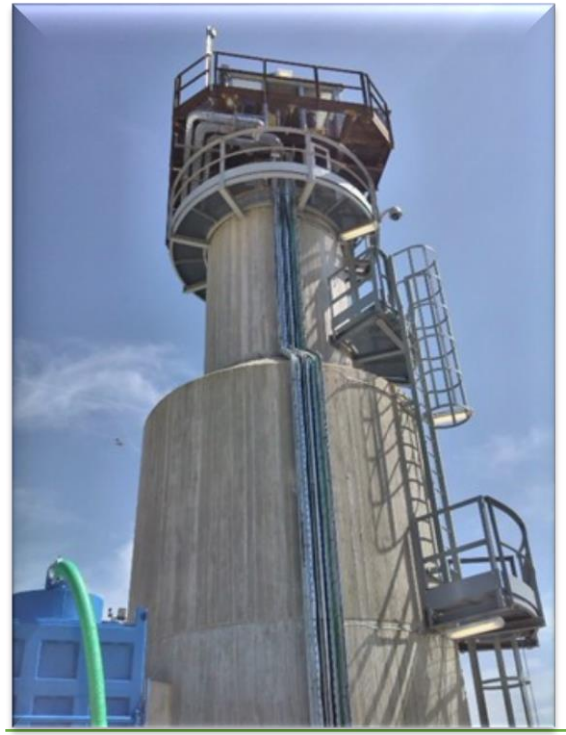
- **Temporary Storage Buildings** are built on site to receive conditioned waste from decommissioning activities and waste management, awaiting the availability of National Repository.

Main Decommissioning Projects (2)

- **Nuclear Island** – Large Components Removal and Dismantling
  - Primary Circuit of Trino NPP (Steam Generators, Pressurizer, Primary circulation Pumps, Relief Tank)
  - Turbine Building components of Garigliano NPP
  - Boilers of Latina NPP
  - Vessels (3 Feasibility Studies are already issued for Caorso, Garigliano and Trino NPP with detailed schedule of activities and authorization documents)



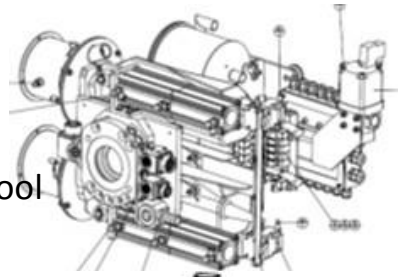
DECOMMISSIONING EXPERIENCE IN NUCLEAR FACILITIES
R&D Experience: tools for dismantling of contaminated Stack



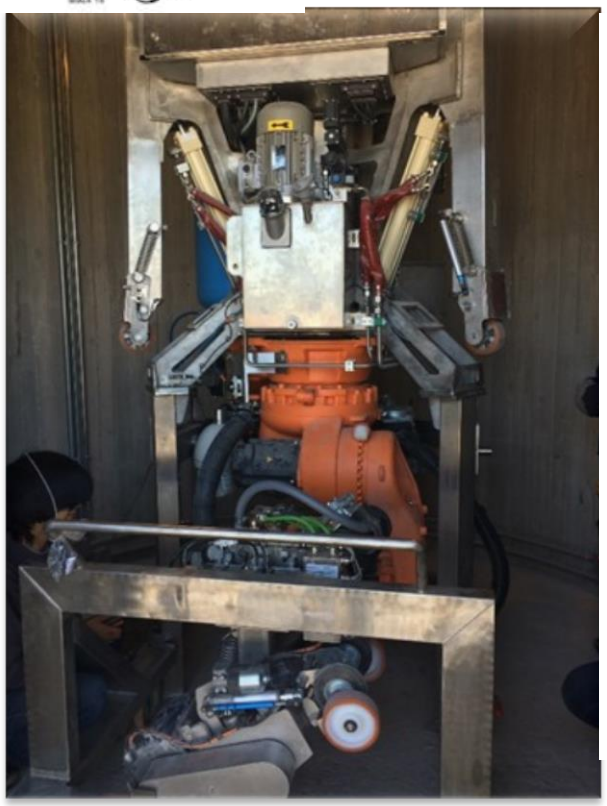
Mock-up of 12 metres high

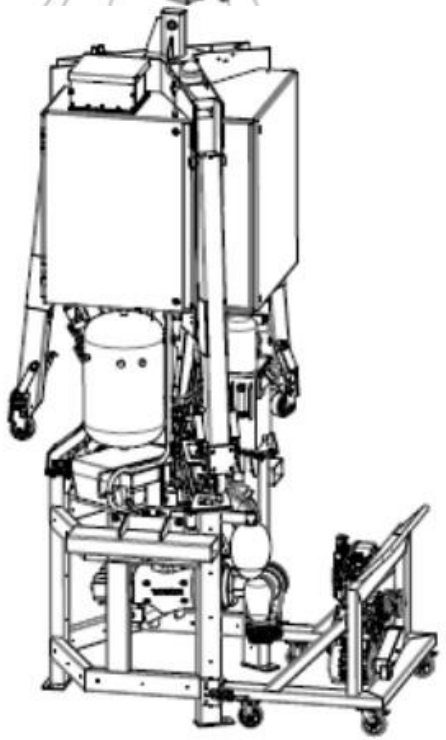
Purpose:	• Test of Robotic Equipment • Set-up of main Parameters
Tests of:	• Remote Control System • Concrete Scarifying Tool • Concrete Sample Tool

Scarifying Tool

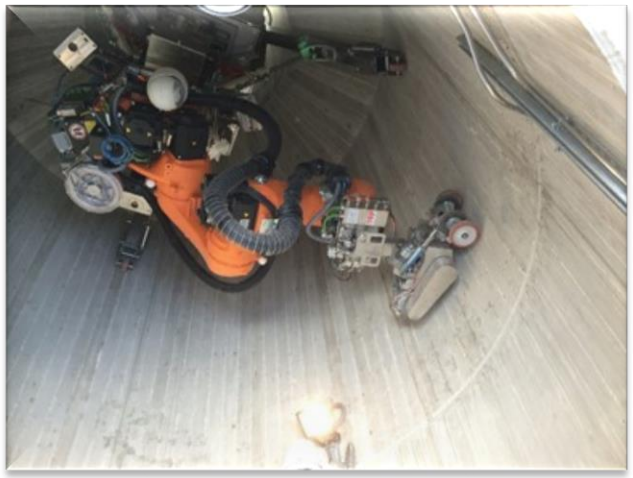


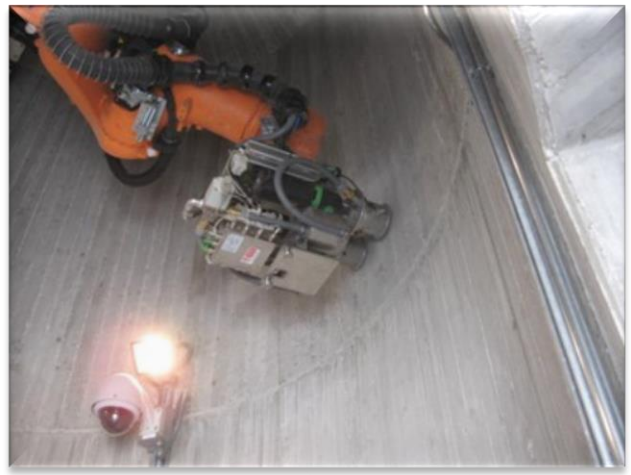
Sampling Tool





Robotic Equipment





DECOMMISSIONING EXPERIENCE IN NUCLEAR FACILITIES

R&D Experience: Pu glove-box dismantling

In MOX Fuel FP - the matter:

Dismantling of 56 Pu contaminated Glove Boxes in MOX fuel fabrication Plant

The solution:

A PVC alpha tight tent is built around the glove-box. The tent includes an external solid frame structure and an inner flexible PVC film.

It is equipped with gloves which allow to operate inside with appropriate tools.

When opening the contaminated glove-box, the spread of contamination is effectively enclosed by the tent's film.

DECOMMISSIONING EXPERIENCE IN NUCLEAR FACILITIES
R&D Experience: transportable cementation system

In Sites - the matter:

Develop a system able to process different types of radioactive waste (liquid, sludge, powder, etc.) containing beta/gamma and/or alpha emitters. Modular system, transportable and easy dismountable, without any permanent building

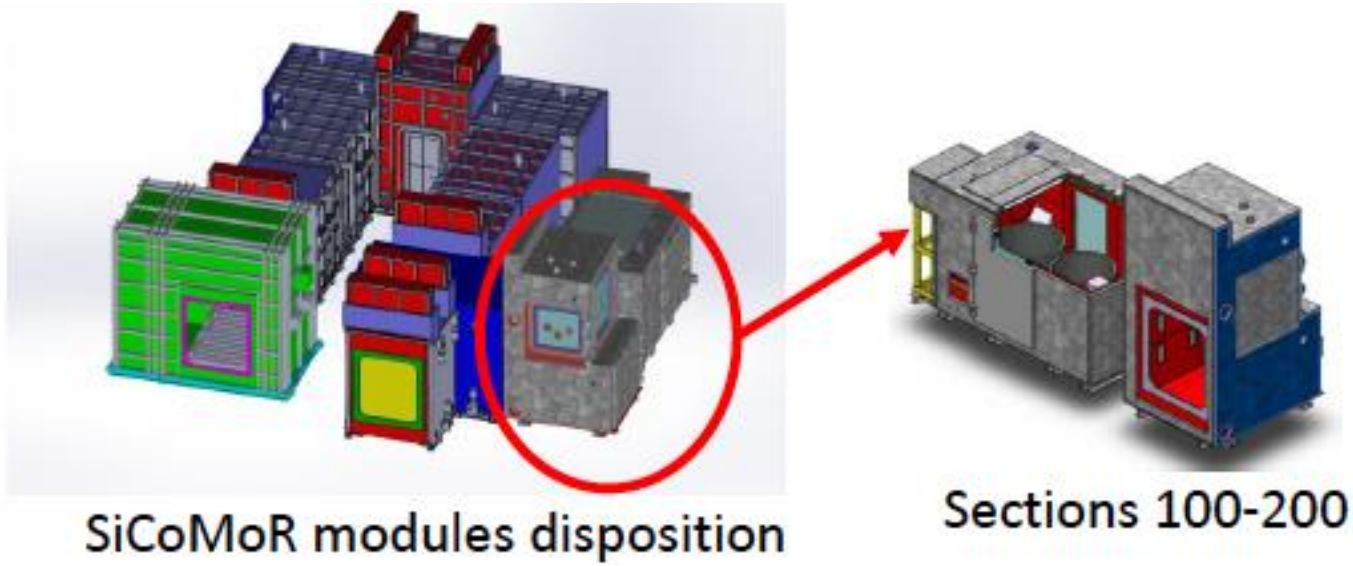
The solution:

SiCoMoR system is realized in separated module:

- Liquid waste receipt and calibration module (MOD-100);
- Cementation module (MOD-200);
- Module for capping;
- Modules for active matrix and capping maturation;
- Module for drum lid closing;
- Service modules (filter module, ventilator module, control module, module for the main electric panels);

Each module is preassembled and transportable and will be coupled to the other modules on the site of installation.

Process modules are installed inside a confining structure.



SiCoMoR modules disposition

DECOMMISSIONING EXPERIENCE IN NUCLEAR FACILITIES

R&D Experience: In glove-box cementation

In MOX Fuel FP - the matter:

Find a solution for the treatment and conditioning of high Pu content of Intermediate Level Aqueous Liquid Waste stored into several containers of about 10-15 l

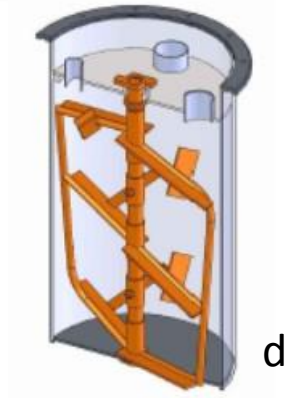
The solution:

Pre-Treatment: Find condition for chemical adjustment.

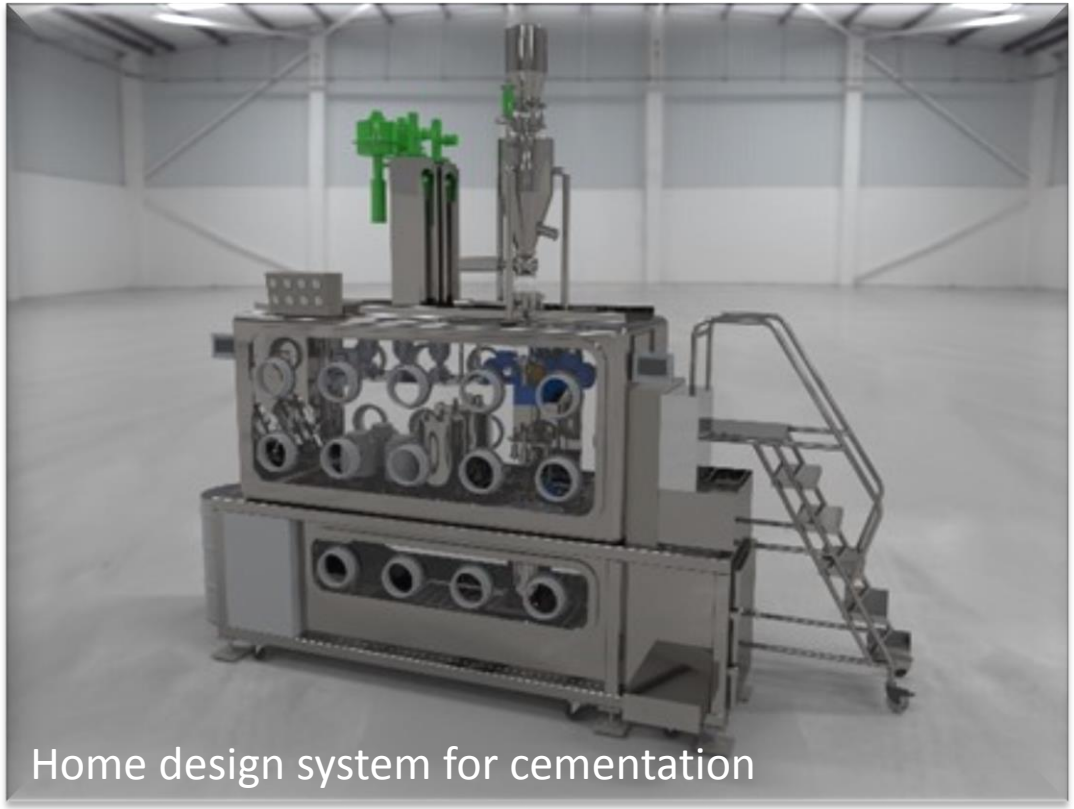
Treatment – Direct cementation (in drum mixing system) in small volume drum.

Chemical adj.

Cement matrix



drum



DECOMMISSIONING EXPERIENCE IN NUCLEAR FACILITIES

R&D Experience: waste form qualification

In Sites - the matter:

Find conditioning matrix for relevant quantities of Low and Intermediate Level of radioactive waste (liquid, slurry, wet solids and sludge) collected in Sogin sites. Qualification of the process to demonstrate, on a documentary basis, that the conditioning system has the capability to put the waste into a form suitable for handling, transport, storage and disposal.

The solution:

Homogeneous cementation with simple and low-cost process at room temperature and commercial cement, qualifying the matrix and waste form, by:

- Laboratory Waste Simulation: by using non-radioactive materials, or limited amounts of radioactive components;
- Chemical Treatment: alkalinisation of acidic waste, precipitation of interfering component;
- Laboratory formulation study: in order to define the cement type and the Waste/cement ratio (Workability – Monolithic solid – NO Free standing water);
- Test specimens preparation and execution of a complete set of tests to study the stability and durability of the selected waste form.

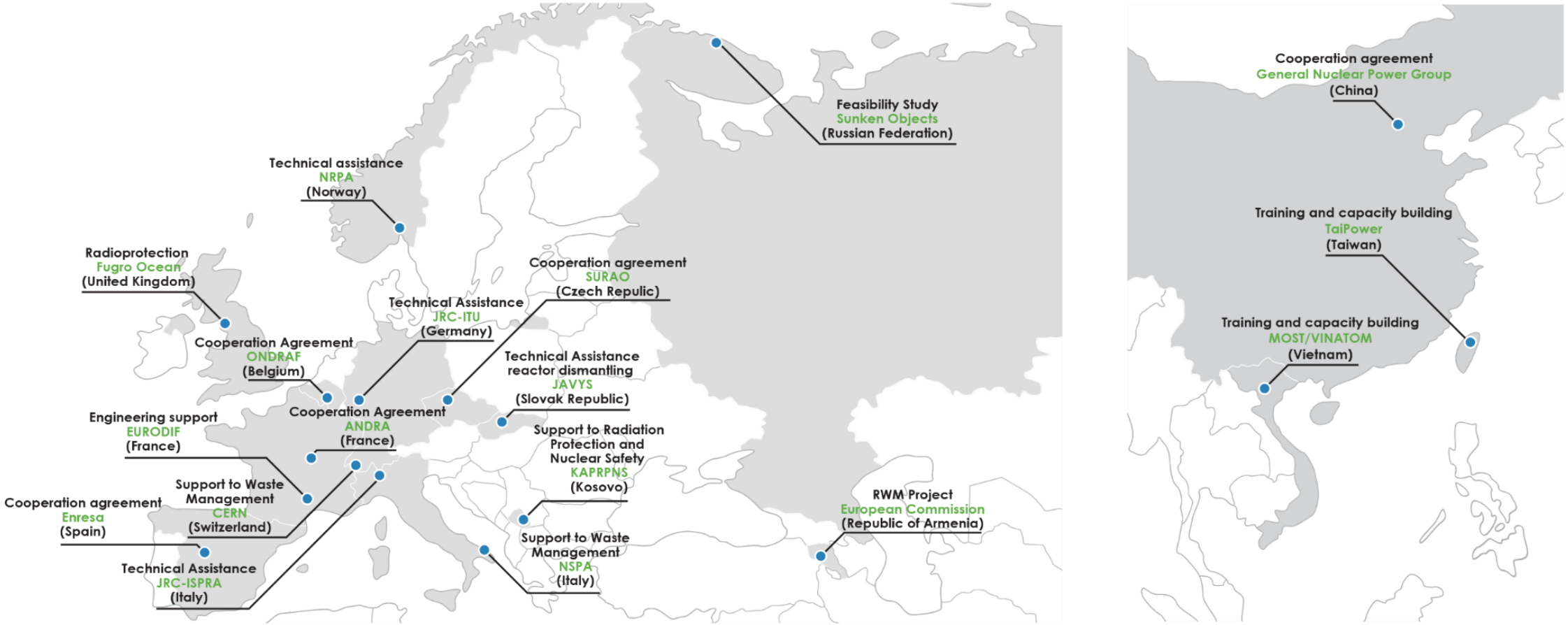
Licensing Process in Italy

- The decommissioning process involves obtaining the decommissioning instance through a ministerial decree authorizing the implementation of the activities (Overall Decommissioning Plan).
- This decree is issued by MISE with the opinion of various other ministries and entities involved in addition to ISIN (nuclear regulatory authority)
- the Overall Decommissioning Plan is itself divided in single Decommissioning Projects that are structured in Operative Plans (OP) and Detailed Projects (DP), which shall follow an additional approval process, by ISPRA.
- In addition Sogin SOGIN shall submit to the competent authorities also the Environmental Impact Assessment (EIA), which shall follow an additional approval process managed by the Ministry of Environment
- Some specific projects require a set of non-nuclear permission by local authorities
- The decommissioning process requires the construction of new facilities, i. e. for the treatment and storage of radioactive waste and nuclear materials, and therefore the request for new authorizations.
- Authorization processes are therefore very articulated and often require specific permissions, as if the plant was still in operation

DECOMMISSIONING WORLDWIDE

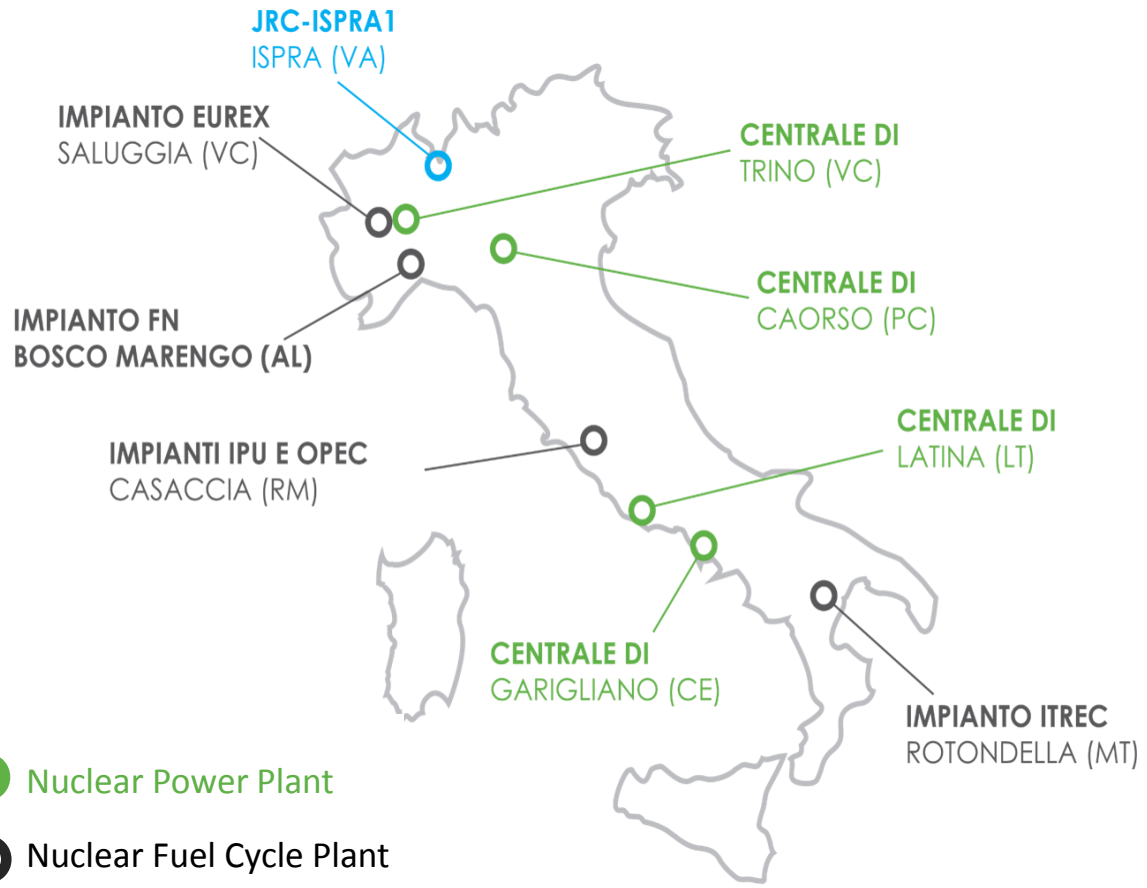
SOGIN GROUP INTERNATIONAL ACTIVITIES

INTERNATIONAL ACTIVITIES



DECOMMISSIONING OF NUCLEAR SITES IN ITALY

THE ITALIAN CASE: FROM ENRICO FERMI TO DECOMMISSIONING



Four NPPs were connected to the grid:

- 210 MWe GGR (5/63) – Latina
- 160 MWe BWR (4/64) – Garigliano
- 270 MWe PWR (10/64) – Trino
- 870 MWe BWR (12/81) – Caorso

An extensive R&D program was developed:

- Starting from Ispra-1, several other Research Reactors (by ENEA and Universities) were tested;
- Plutonium fuel fabrication plant and OPEC spent fuel testing facility – Casaccia
- EUREX (U-Pu) fuel reprocessing and IFEC fuel fabrication plants – Saluggia
- ITREC (U-Th) reprocessing plant at Trisaia.

A private LEU fuel fabrication plant was commissioned at Bosco Marengo

Note : All the 8 nuclear Sites (4 NPPs and 4 Nuclear fuel cycle installations) are different; consequently the dismantling solution must be tailored for each site with specific projects, authorizations and contracts.

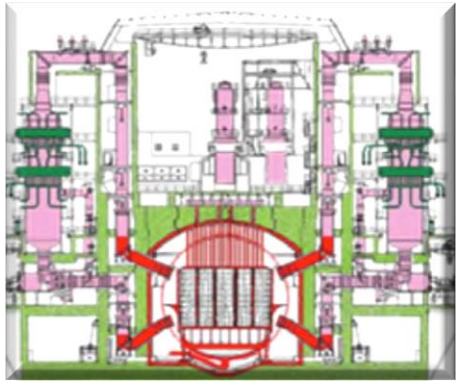
GRAPHITE DECOMMISSIONIG STRATEGY

STATUS DECOMMISSIONING ACTIVITIES – LATINA NPP

GCR-Magnox , Termination: 1987

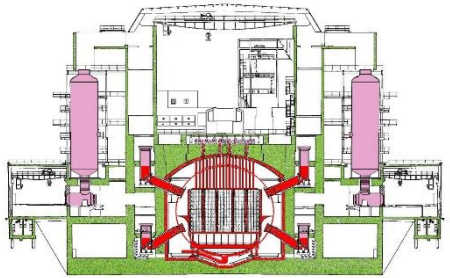
ACHIEVEMENTS

- Conditioning of radioactive waste and Temporary Storages.
- Removal of spent nuclear fuel from the site.
- CO2 conducts an blowers dismantling.
- Fuel pools remediation.
- All conventional components were dismantled
- New Temporary Waste storage facility.



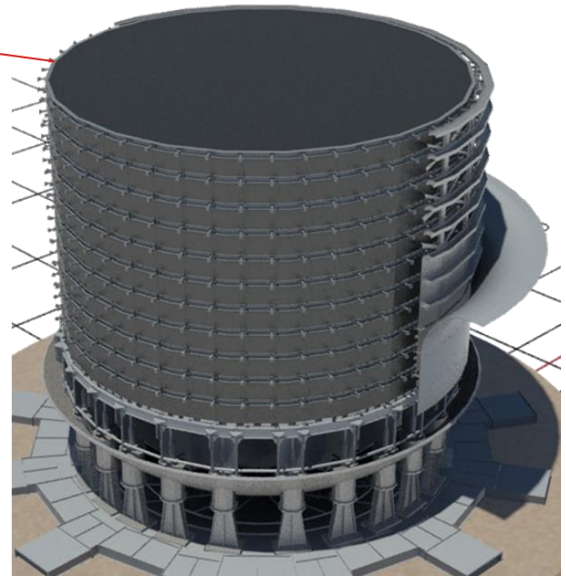
WORK IN PROGRESS

- Sludge Treatment Plant and Remediation of fuel pool n. 1.
- Station for metallic materials treatment “Cutting Facility” for boilers treatment
- New Effluent Treatment Plant.



Sogin decommissioning strategy for graphite

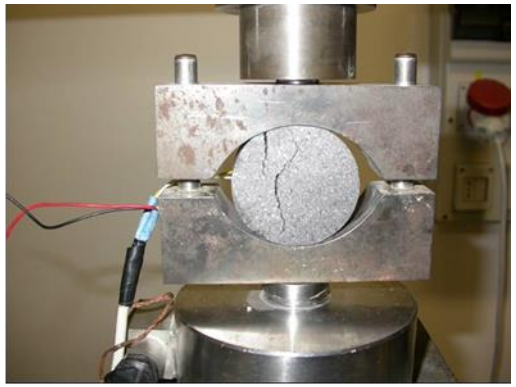
Decommissiong Strategy: Sogin has decided:



- Removal of graphite blocks as they are.
- Temporary storage inside special containers in a surface repository.

Performed activities on graphite

- Systematic reorganization of the information concerning the plant in the current state and in particular concerning the irradiated graphite
- Mechanical characterization of the graphite and verification of the technical feasibility of removing the entire blocks of graphite from the core
- Realization of the prototype of the tool for gripping the graphite blocks.

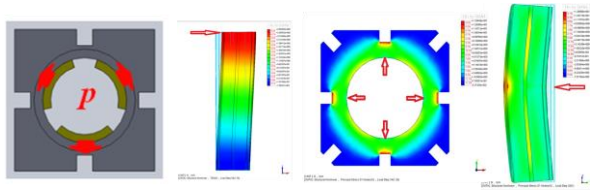


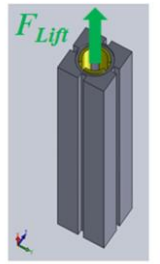
MECHANICAL CHARACTERISATION

Future developments (1)

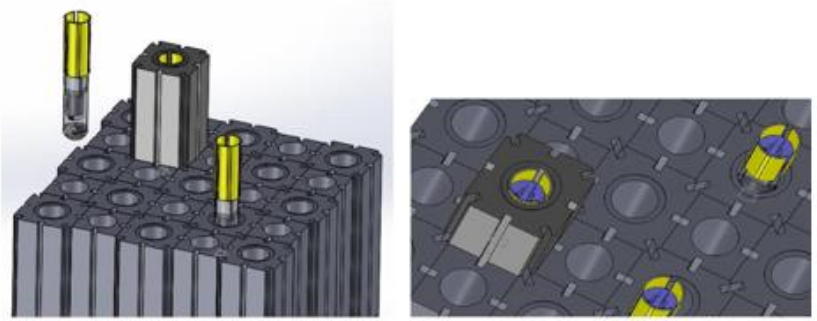
Mechanical investigations

- Completion of the mechanical characterization of irradiated graphite
- Integrity verification of the graphite blocks inside the core (non-invasive methods)
- Refinements of the blocks removal model considering the internal tensions due to contacts between the blocks and other boundary conditions



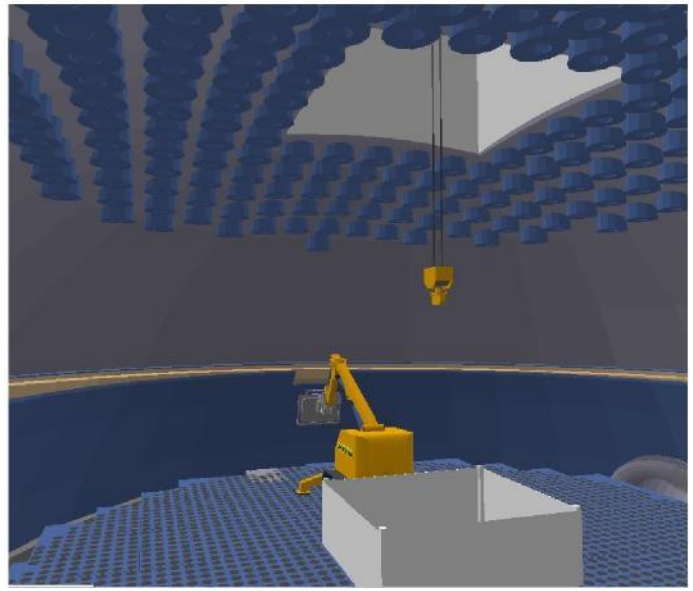


FINITE ELEMENT MODELLING TO DEFINE STRESS DURING RETRIEVAL



Future developments (2)

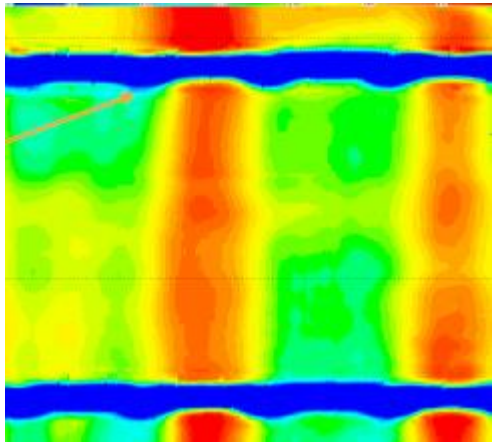
- Studies on vessel accessibility
  - structures segmentation, confinement, radiation protection issues
- Technical solutions for graphite blocks handling
- Study of special containers for graphite long-term storage
- Keep participating actively to the IAEA-GRAPA and OECD/NEA-WPDD working groups

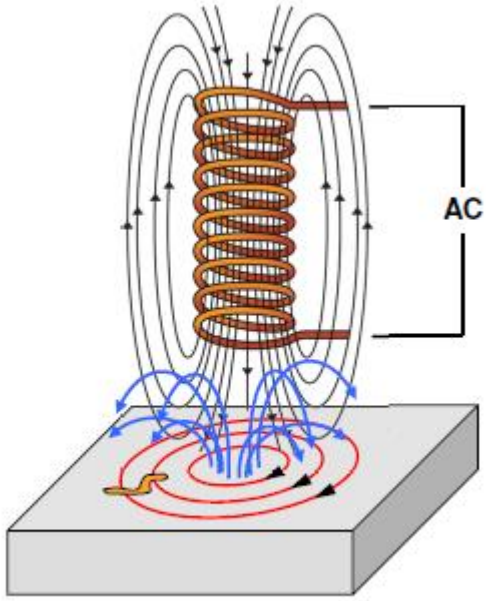


Non distructive testing (NDT)

Eddy current testing

- ✓ typically used for on-site application in aerospace, oil industry, public building and of course power generators
- ✓ to detect ferrous and non-ferrous irregularities in materials by using induced current





Benefit

- ✓ In “bulk” measurement
- ✓ Density variation
- ✓ Detection of initiated cracks

SOGIN

We protect the present
We guarantee the future