SNETP FORUM 2021:
Towards innovative R&D in civil nuclear fission

2, 3 and 4 February 2021

Fuel cycle closure in Italy

Decommissioning, RadWaste Management and Disposal

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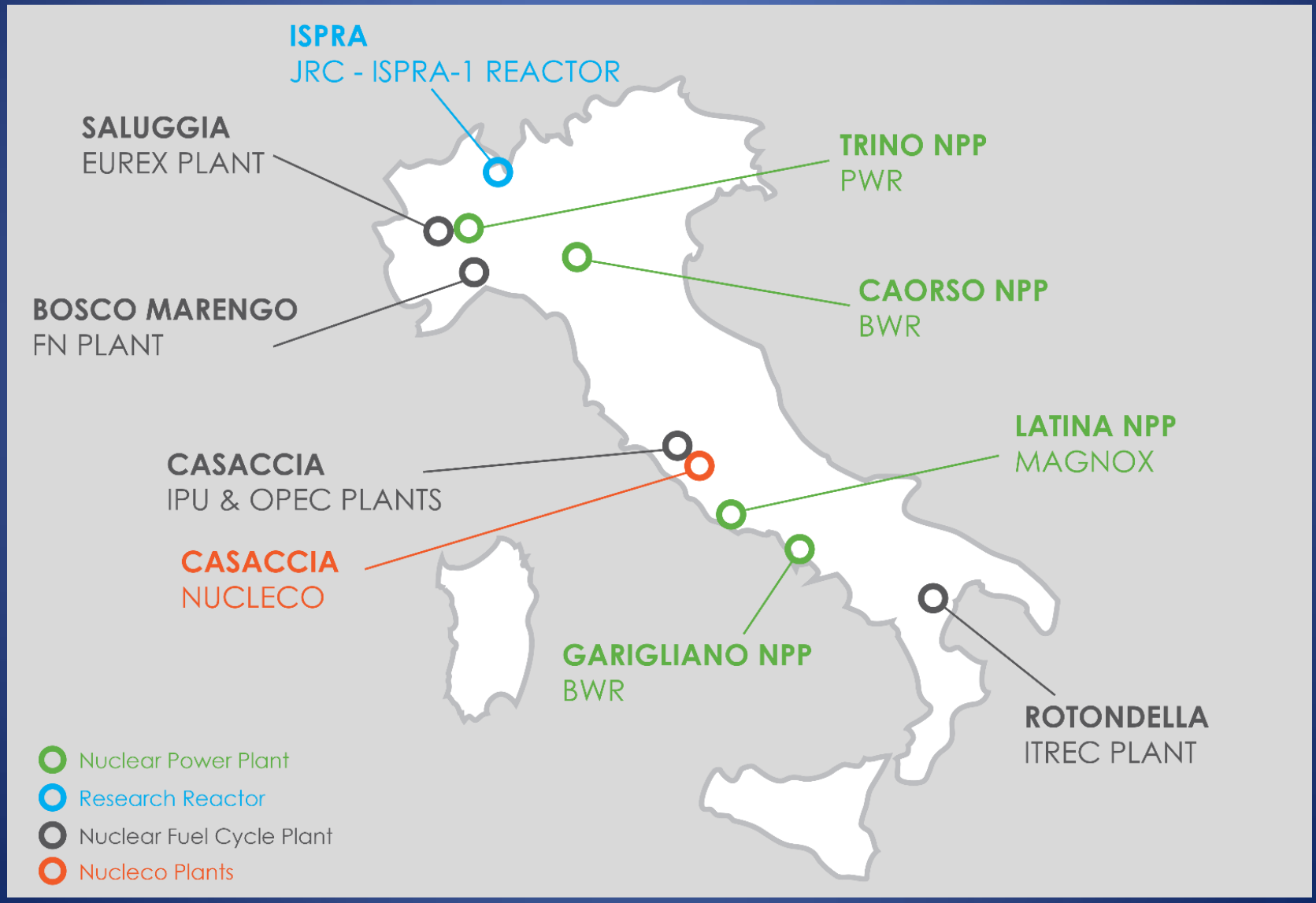
Massimo Sepielli (ENEA)

Nuclear installations under decommissioning



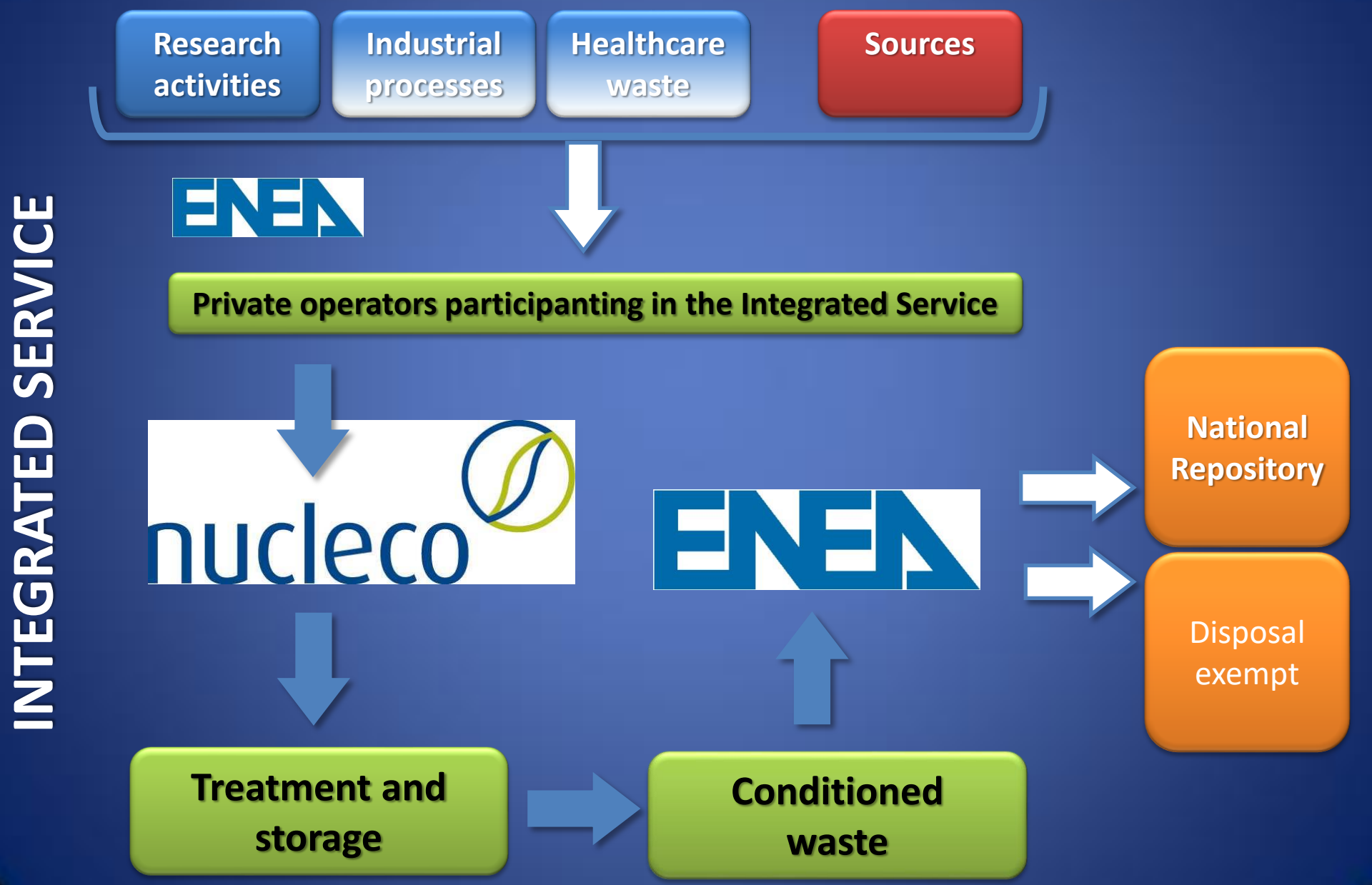
RW storage facilities

Waste Amount Projection

Classification	Origin	WP volume* (m3)	Destination
VLLW	•Operations and decommissioning of NPP's, Fuel Cycle facilities, research reactors •Medicine, industry, research	**38.000**	Surface disposal – National Repository
LLW	•Operations and decommissioning of NPP's, Fuel Cycle facilities, research reactors •Medicine, industry, research	**37.000**	Surface disposal – National Repository
ILW	Operations and decommissioning of NPP's, Fuel Cycle facilities, research reactors	**16.700**	Long-term storage pending geologic disposal
HLW	•Residues from fuel reprocessing •Non reprocessable fuel	**400**	Long-term storage pending geologic disposal

* Overall volume of the WP containers

Institutional RW management



Institutional RW Management

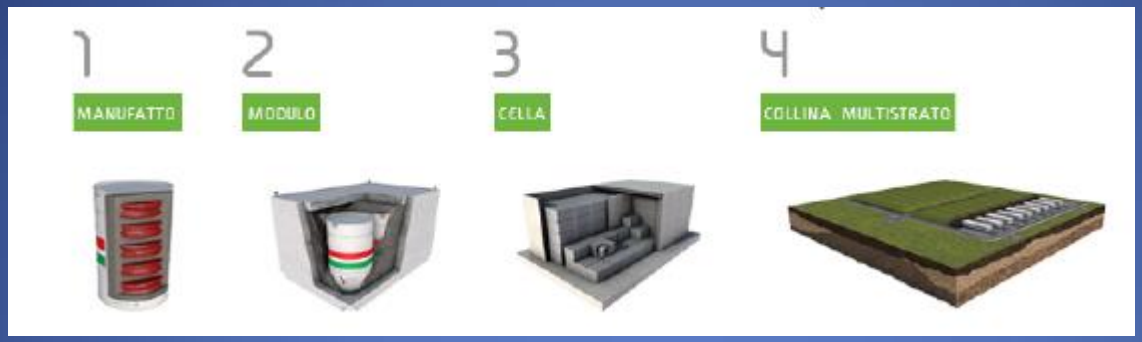
Completion of the Integrated Service Activities, i.e. conclusion of the cycle.

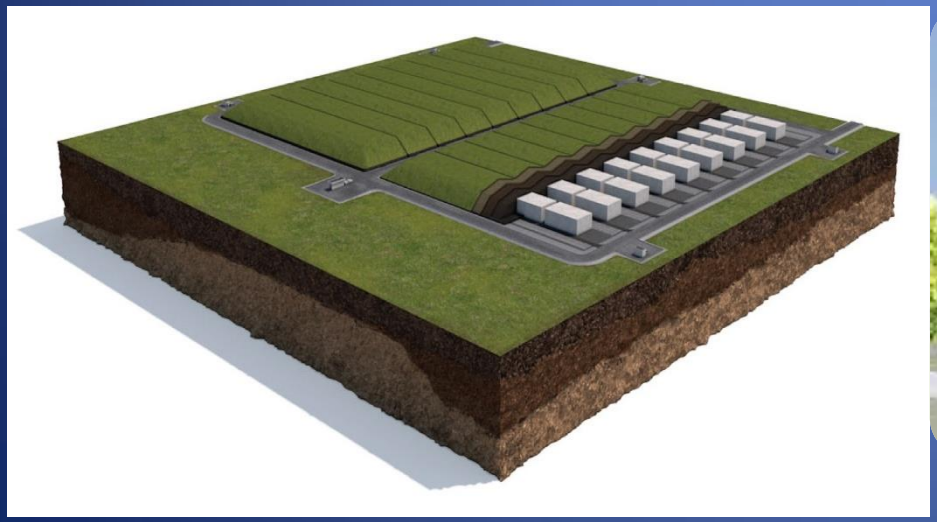
Compaction, drumming, cementation and temporary storage of low-activity non energy wastes

EU Directive 2011/70 - National Programme

- ***Each Member State shall have ultimate responsibility*** *for management of spent fuel and radioactive waste generated in it.*
- *Each Member State* ***shall ensure the implementation for its national programme*** *for the management of spent fuel and radioactive waste…*
- *The national programmes shall include: …****the research, development and demonstration activities that are needed in order to implement solutions for the management of spent fuel and radioactive waste…***
- ***Member States shall ensure that the national framework require*** *all parties to make arrangements for education and training for their staff, as well as* ***research and development activities to cover the needs of the national programme****…*

National repository





Disposal of VLLW and LLW

Long-term storage of ILW and HLW

Technology Park

The National Repository will be realized within a Technology Park, a centre of excellence for advanced R&D on nuclear matters and sustainable development with structures dedicated to information and training. It will support the local communities bringing added value to the territory

Foreseen research laboratories and infrastructures:

- New technologies for decommissioning and waste management activities
- Laboratories for Environmental Analyses
- Training School and visitors centre
- Additional research laboratories to be agreed with local authorities during the site selection phase

Siting phases

Phase 1: analysis of the national territory

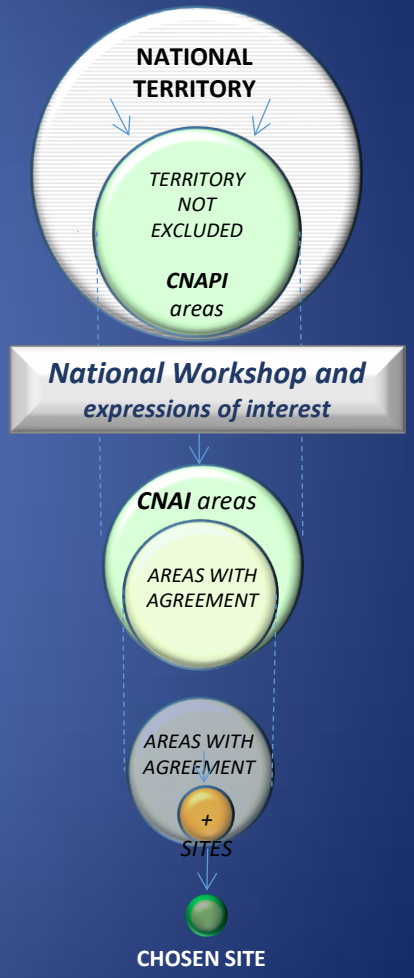
- The exclusion criteria are applied, in overlap, on a **national and regional level**. The result constitutes the **CNAPI** proposal (**National Map of Potentially Suitable Areas**)

PHASE 2: analysis at a regional and local level

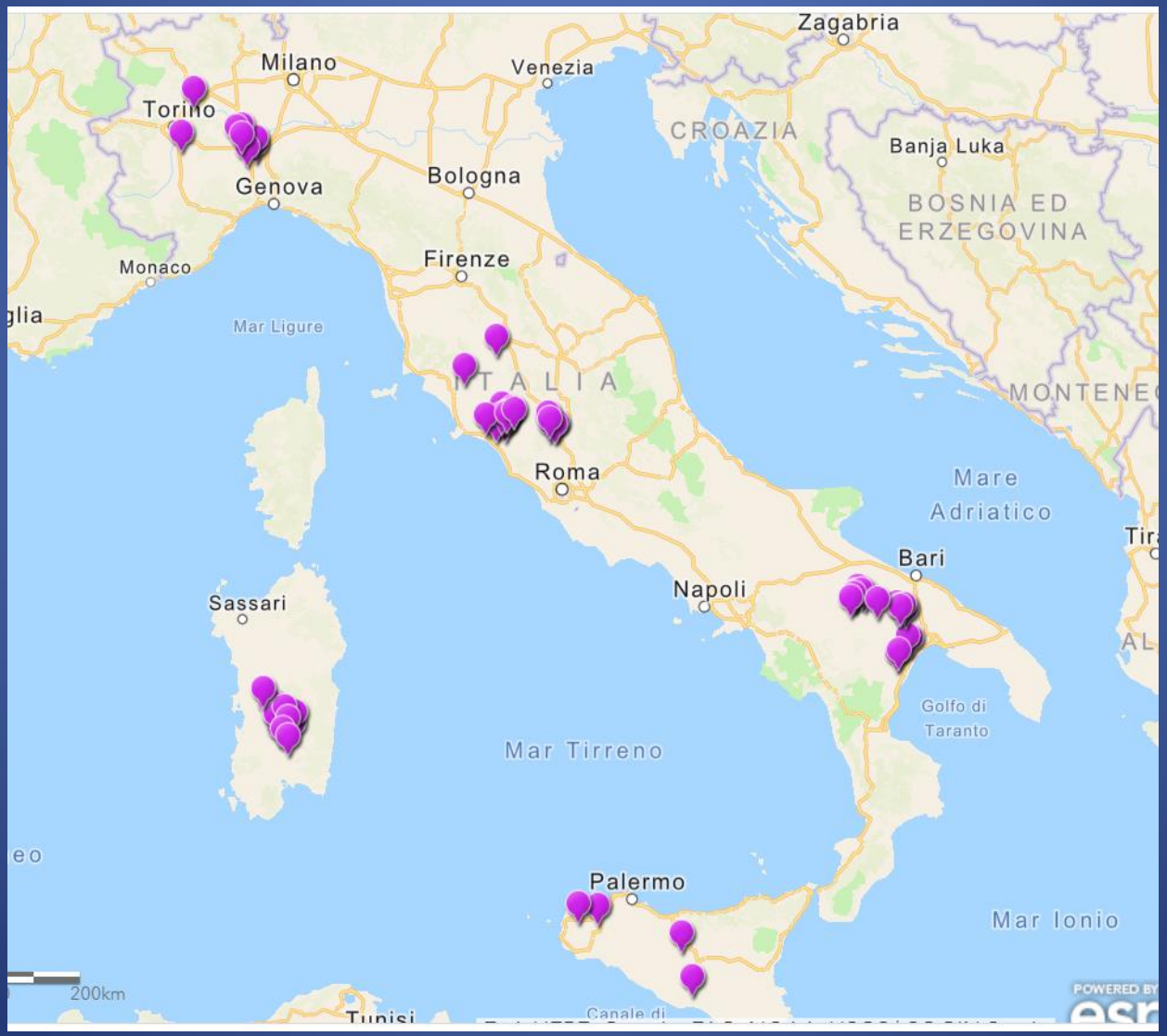
- After the expressions of interest collected from local authorities, the institutional agreements are framed. Then the **possible suitable sites** are identified within the areas selected in Phase 1

PHASE 3: detailed surveys and analyses at the site level

- In areas with agreement, detailed technical surveys are carried out under the surveillance of ISIN (national nuclear authority) to indicate the final site which will be subjected to safety analysis for the **Site qualification**



Map of Potentially Suitable Areas
(CNAPI - Published Jan 5th 2021)



National repository realization process

Italian participation to EURATOM R&D on D&WM

The SHARE projects intends to provide an inclusive roadmap for Research, in technical and non-technical fields, enabling stakeholders to jointly improve safety, reduce costs and minimize environmental impact in the decommissioning of nuclear facilities.

Sogin

The PREDIS project targets the development and implementation of activities for pre-disposal treatment conditioning methodologies for wastes, other than nuclear fuel and HLW, for which no adequate or industrially mature solutions are currently available.

Ansaldo Nucleare
ENEA
INFN
Nucleco
Politecnico di Milano
Sogin
Università di Pisa

Italian main tasks in PREDIS

WP2 – Strategic Implementation

- Establish a pre-disposal stakeholder community
- Developement of a pre-disposal Strategic Research Agenda
- Guidance on waste-form qualification for disposal and derivation pf generic WAC

WP5- Innovation in liquid organic waste treatment and conditioning

- Study of direct conditioning process
- Study of conditioning matrix performances
- Preliminary technical, economic and environmental analysis

WP7- Innovations in cemented waste handling and storage

- State of the art in packaging, storage and monitoring of cemented WP
- Innovative integrity testing and monitoring techniques
- Digital twin
- Data handling, processing and fusion
- Demonstration and implementation of monitoring, maintenance, and automation/digitalization techniques

Challenges and technology needs

- National repository siting and construction
- Return to Italy of HLW residues from fuel reprocessing in UK and France
- Pre-disposal issues (R&D needs)
  - Carbowaste management (Graphte of the Latina NPP)
  - Resins / sludge / liquid / organic streams treatment and conditioning
  - Legacy waste characterization and re-treatment
- Geologic disposal of ILW and HLW