

**National Inspectorate  
for nuclear safety  
and radiation protection**

# **CONVENTION ON NUCLEAR SAFETY**

## **Tenth Italian National Report**

**August 2025**



*The present report has been prepared, on behalf of the Italian Government, by the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN) in coordination with other national involved Administrations and Organizations*

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## Section A. Introduction

### A.1 About this Report

This National Report (NR) fulfills Italy's obligations under Article 5 of the Convention on Nuclear Safety (CNS). It was prepared by the National Competent Authority ISIN (National Inspectorate for nuclear safety and radiation protection) on behalf of the Italian Government, on the basis of the NR template provided after the 3<sup>rd</sup> Extraordinary meeting, held on 3 and 4 September 2024.

This Report is intended to provide an updating of the Italian ninth National Report issued in 2022 for the joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting of the Convention. To organize its content, the following aspects have been considered:

- the changes in policy as well as in national nuclear safety regulatory framework, legislation, regulations and practices;
- the safety issues identified through the joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting;
- the progresses made on challenges and suggestions from joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting;
- the decisions taken during the 3<sup>rd</sup> Extraordinary meeting.

The above considerations led to prepare a self-standing Report providing a general update of the "article-by-article review", as applicable to the Italian situation, with Annexes integrating information provided in the main text.

On the basis of the decisions taken during the 3<sup>rd</sup> Extraordinary meeting, Italy is a Category 3 Contracting Party to the CNS: it has no nuclear programme but it is planning to embark on a nuclear programme in the near future. Moreover, in this Report, information on civilian nuclear reactors (research reactors) in operation, not covered by the Convention, are reported.

In accordance with the letter of February 6, 2025 of the President of the 10<sup>th</sup> Review Meeting of the Convention, the following information are reported:

- the relevant changes occurred in national nuclear safety legislation, regulations and practices since 2022,
- the strategies adopted to solve, where applicable, the Major Common Issues (MCIs) identified during the joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting,
- the progresses made on challenges and suggestions raised from 8<sup>th</sup> & 9<sup>th</sup> Review Meeting.

This National Report, pursuant to Article 5 of the Convention on Nuclear Safety, which entered into force on 24 October 1996, describes the official actions that the Government of the Republic

of Italy, as a Contracting Party to the Convention since 15 April 1998, has taken in order to fulfil its obligations as specified in Articles 6 through 19 of the Convention.

## **A.2 Nuclear Programme in Italy**

Italy has no nuclear installations as defined by the CNS and to date has no nuclear programme. However, Italy has nuclear installations under decommissioning, listed in the next paragraph, coming from the past nuclear programme definitely stopped in 1990, after a referendum held in 1987, in the aftermath of the 1986 Chernobyl accident.

With regard to start a new nuclear programme, the energy crisis linked to the war in Ukraine, the energetic dependence from other Countries and the European commitments towards decarbonisation, have relaunched the issue in the political and public debate.

The Government is strongly working to a possible nuclear option for a new energy strategy based on SMR technologies: the actual strategy, as reported in the National Integrated Plan for Energy and Climate (PNIEC), foresees the possible inclusion of 8 GW of nuclear capacity by 2050, through SMR and AMR.

To this aim, the National Platform for a Sustainable Nuclear (PNNS) initiative was launched in 2023 by the Ministry of the Environment and Energy Security to identify the national infrastructures needed and to trace a roadmap to start the new nuclear program.

Starting from the outcomes of the works performed by PNNS in 2024, the Council of the Ministries approved in February 2025 a bill to delegate the Government to issue the necessary legislative framework to regulate the overall nuclear cycle. The bill is now under discussion by the Parliament and, after its approval (foreseen by the end of 2025), the Government, by the end of 2027, will have to issue the Legislative Decrees necessary for, siting, construction, operation and decommissioning of NPPs, but also with regard to facilities for nuclear research, fabrication and reprocessing of spent fuel.

Background historical information on Italian past Nuclear Programme are summarised in Annex 1.

As referred in the previous Reports, Italy has traditionally been active in international nuclear cooperation within IAEA, OECD/NEA, G7, EU and FORATOM as well as in bilateral contexts. An active contribution to these activities is considered to be important to keeping up-to-date the national competencies and capabilities in the safety and in the technology of nuclear installation as well as the promotion of maintaining and updating the nuclear safety culture at national level. At the same time, Italy continues to ensure a wide participation in international activities as aimed at contributing to the establishing of a Global Safety Regime for achieving and maintaining a high level of nuclear safety worldwide.

Moreover, Italy is actively involved in many international research and industrial initiatives and activities such as the participation in the Industrial Alliance, launched at European level, with the

aim of accelerating the development, demonstration, and deployment of the first SMRs in Europe by the early 2030's, or as the participation in international projects for the development of Generation IV reactors, with a particular focus on Lead-cooled Fast Reactors (LFRs) were State Institutions (as ENEA - Italian National Agency for New Technologies, Energy and Sustainable Economic Development) and industries (as Ansaldo and SIET) collaborate with key industrial partners for design and technological development of LFR systems.

At industrial level it has to be mentioned also the participation in the in realisation activities and supply of major components to new reactors and on-site assistance programmes (e.g.: ANSALDO for NPPs in Romania, Slovenia, France, UK, China, JRC-EU, Russia), the participation of ENEL (main national utility) in abroad nuclear activities (includes 70% of ENDESA, Spain).

### A.3 Nuclear installations

As already mentioned, Italy is a Category 3 Contracting Party, as such, it has no NIs subject to the CNS.

However, all four NPPs, operating during the past closed nuclear programme, are under decommissioning and their location and details are showed in following Fig. 1 and in Table 1.



Fig. 1 Nuclear power plants in decommissioning map

Name and Location	Licence Holder	Unit	Type	First Criticality	Capacity (Mwe)	Status
Garigliano	(Enel) SO.G.I.N.	1	BWR	5 June 1963	160	In decommissioning
Latina	(Enel) SO.G.I.N.	1	GCR	27 Dec, 1962	210 (160) <sup>1</sup>	In decommissioning
Caorso	(Enel) SO.G.I.N.	1	BWR	31 Dec 1977	882	In decommissioning

<sup>1</sup> the power was reduced with respect to the design value

Trino	(Enel) SO.G.I.N.	1	PWR	21 June 1964	270	In decommissioning
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Table 1: Relevant Nuclear Installations

A short description of the status of the four NPPs is reported in Annex 2.

On the basis of the decision taken during the 3<sup>rd</sup> Extraordinary meeting, Italy has decided to report on the three research reactors still in operation whose location and details are showed in following Fig. 2 and in Table 2.



Fig. 2 Research reactors in operation map

Name	Location	Licence Holder	Power	First criticality	Status
TRIGA	Pavia	University of Pavia	250 kW <sub>th</sub>	1965	In operation
TRIGA	CCR Casaccia	ENEA	1 MW <sub>th</sub> (100 kW <sub>th</sub> ) <sup>2</sup>	1967 (1965)	In operation
TAPIRO	CCR Casaccia	ENEA	5 kW <sub>th</sub>	1971	In operation

Table 2: Relevant Research Reactors

Italian research reactors are used as radiation sources for scientific research purposes, for example for teaching and training, to verify the behaviour of materials subjected to neutron and gamma irradiation, and to tests for antitumor therapies. The reactors are subject to surveillance

<sup>2</sup> the power was increased with respect to the design value

and inspection activities by ISIN. Currently, in Italy, the three research reactors RSV TAPIRO, TRIGA RC1 and TRIGA MK II are in ordinary operation. Other research reactors in Italy, no more in operation, are: the AGN 201 reactor of the University of Palermo (in cold/permanent shutdown conditions), the ESSOR Research Reactor, operated by the European Commission and located at the Joint Research Centre (JRC) of Ispra (Varese) (in decommissioning), L 54 M Research Reactor, of the Polytechnic of Milan (in decommissioning) and ISPRA1 Reactor, operated by SO.G.I.N and located at the Joint Research Centre (JRC) of Ispra (in decommissioning).

A short description of the status of the three research reactors in operation in Italy is reported in Annex 3.

## Section B. Summary

Italy is a Category 3 Contracting Party and as such, it has reported on some subset of Articles of the CNS.

This National Report, pursuant to Article 5 of the Convention on Nuclear Safety which entered into force on 24 October 1996, describes the official actions that the Government of the Republic of Italy, as a Contracting Party to the Convention since 15 April 1998, has taken in order to fulfil its obligations as specified in Articles 6 through 19 of the Convention.

This Report is the 10<sup>th</sup> National Report. It represents a revision to the 9<sup>th</sup> Report submitted by Italy in 2022 for the joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting. This 9<sup>th</sup> National Report was prepared in accordance with the *“Guidelines Regarding National Reports under the Convention on Nuclear Safety”* and in accordance with the communication of February 6, 2025 of the President of the 10<sup>th</sup> Review Meeting of the CNS. It contains updated information on matters covered in the previous Reports, reporting the relevant changes occurred in national nuclear safety legislation, regulations and practices since 2022, the solution adopted to solve, where applicable, Major Common Issues (MCIs) identified during the joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting and the progresses made on challenges and suggestions raised from joint 8<sup>th</sup> & 9<sup>th</sup> Review cycle. It also provides an updated “article-by-article” review.

As just previously mentioned, all the four Italian NPPs (Garigliano, Latina, Trino and Caorso) were definitively shut down more than 30 years ago and all the fuel elements have been permanently removed from the plants. At present, all four NPPs are under decommissioning and at the date of the present report they cannot be any more considered “nuclear installations” under the definition given in Article 2i of the Convention.

In this regard it has to be mentioned that, due to the status of the Italian NPPs all under decommissioning with spent fuel removed from the site, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable in the national situation.

However, with respect to the decisions taken during 3<sup>rd</sup> Extraordinary Meeting, this Report provides information on research reactors in operation in Italy.

Among major developments occurred since the 9<sup>th</sup> Report, the following has to be mentioned:

- the Government, in charge since the end of 2022, still pending from the decision of the Parliament foreseen by end 2025, plans to reintroduce the nuclear power generation in the national energy mix;
- even if it lay down under Joint Convention, it has to be mentioned that in 2023 Italy held the ARTEMIS peer review mission for the evaluation of the implementation of the National Programme, as requested by the Council Directive 2011/70/Euratom;

- as requested by the Council Directive 2009/71/Euratom, as modified by Council Directive 2014/87/Euratom, in the period 22nd of November – 2nd of December 2026 Italy will host the second IRRS mission. The IRRS mission will be a full scope one covering modules on responsibilities and functions of the Government, global nuclear safety regime, responsibility and functions of the regulatory body, management system of the regulatory body. It will be addressed to radiation sources, research reactors, radioactive waste and spent fuel management facilities, transport and installations under decommissioning;
- as requested by the Council Directive 2009/71/Euratom, as modified by Council Directive 2014/87/Euratom, Italy participated in the peer review called Topical Peer Review II (TPR-II), called by European Commission, on fire risk at nuclear installations.

With regard to ISIN new staff members recruited in 2022, the process of knowledge transfer was completed: for some of them the training to obtain the inspector qualification is ongoing.

About the challenges identified during joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting, the actions performed to solve them are reported in the following paragraph.

## **B.1 Summary of Responses to Applicable Challenges and Suggestions**

Italy has addressed the Challenges that remain open from previous RMs as follows:

Challenge 1 from joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting: *Complete in a reasonably short period of time the process of knowledge transfer to the newly recruited ISIN members.*

The process of knowledge transfer to the newly recruited staff in ISIN was completed through in house training, courses provided by University and training on the job.

Challenge 2 from joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting: *Conduct planned peer review missions (ARTEMIS 2023, IRRS 2026).*

The ARTEMIS peer review mission was held in 2023 and the relevant outcomes are reported in the 7<sup>th</sup> Italian National Report of the Joint Convection. In the period 22<sup>nd</sup> of November – 2<sup>nd</sup> of December 2026 Italy will host the IRRS mission.

No suggestions remain open from previous Review Meetings.

## **B.2 Summary of Other Significant Changes Since Previous Report**

In addition to the work summarized above to address the Challenges that remain open from previous RMs, Italy has undergone the following changes:

Article 7 “Legislative and Regulatory framework”

Government is strongly working to a possible nuclear option for a new energy strategy based on SMR technologies; for this the National Platform for Sustainable Nuclear (PNNS) initiative, was launched by the Ministry of the Environment and Energy Security to identify the national infrastructures needed and trace a roadmap to start the new national nuclear program. The decision to reintroduce nuclear energy in the national energy mix is pending from the decision of the Parliament, foreseen by end 2025.

### **B.3 Notable Achievements**

In 2025, Italy participated in Convex-3 exercise. All Administrations, at national and local level, foreseen by the National Plan for nuclear and radiological emergencies established in 2022, participated. During the exercise, additional injects were introduced, to test some specific national objectives, that would not be activated by Convex-3 scenario. More details are given under Article 16.

### **B.4 Future Focus**

Italy has identified the following issues as areas that demand future effort to resolve:

- in case the Parliament will take the decision to reintroduce the production of nuclear energy in the national energy mix, the national legislative and regulatory framework for design, siting, construction, commissioning and operation of new NPPs will have to be developed. Moreover, the actual National Competent Authority ISIN will need to be strengthened in its duties, functions, competences and resources.

### **B.5 Major Common Issues**

At the joint 8<sup>th</sup> & 9<sup>th</sup> Review Meeting, several major common issues were identified. Table 3 indicates where they are, as applicable, addressed in this report:

<b>Major Common Issue</b>	<b>Article.para</b>
Managing extraordinary circumstances impacting the safe operation of nuclear installations	9.1
Strengthening national regulatory capabilities taking into account new and innovative technologies	8.4
Fostering international collaboration	8.4
Foster international peer review missions and timely addressing of findings	Summary, B.1.2
Possible impact of global climate changes on the safe operation of nuclear installations	N.A.
Securing reliable supply chains	N.A.
Strategies for ageing management in support of the operation of nuclear installations	6.1

Strengthening emergency preparedness and response arrangements and fostering cross border collaboration	16.2, 16.3
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Table 3: Major common issues

## Section C. Compliance with articles 4 to 19

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### Article 4. Implementing measures

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Each Contracting Party shall take, within the framework of its national law, the legislative, regulatory and administrative measures and other steps necessary for implementing its obligations under this Convention.

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The Italian Legislative and Regulatory framework has been long in force (since the early 60<sup>ties</sup>), as discussed in detail in the first seven Reports and summarized in the present Report. It is considered that this framework is quite complete and updated according to the national nuclear programme and EU Directives, taking into account the Vienna Declaration principles. Considering that existing NPPs are in decommissioning and that no decision has been taken to build new NPPs, no further steps are necessary to implement the obligations of the Convention.

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### Article 5. Reporting

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Each Contracting Party shall submit for review, prior to each meeting referred to in Article 20, a report on the measures it has taken to implement each of the obligations of this Convention

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The present Report constitutes the 10<sup>th</sup> Italian Report issued in compliance with Article 5 of the Convention.

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### Article 6. Existing Nuclear Installations

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Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading

cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

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## **6.1 Overview of major events since the last Report**

As indicated in all previous Reports, Italy decided the shutdown of all its NPPs in 1987. The installations were not shut down for specific safety reasons but following a decision of the Government taken on the basis of the results of a national referendum. All spent fuel has been removed from all the NPPs sites.

Safety issues currently of concern for the four Italian NPPs are therefore those related to decommissioning activities as well as to the safe management of radioactive waste on the sites, which are covered under the Joint convention on the safety of spent fuel and radioactive waste management.

More information on the state of activities performed at NPPs is reported in Annex 2.

For all national NPPs of Trino, Garigliano, Caorso and Latina the decommissioning license was granted.

On the bases of what is reported in this section, due to the status of the Italian NPPs, which are under decommissioning with spent fuel removed from the site, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable in the national situation.

As a Category 3 CP, Article 6 does not apply.

However, with reference to research reactors in operation in Italy, in the last years some safety improvements have been implemented as outcomes of the TPR I and TPR II conducted on the basis of the Council Directive 2009/71/Euratom, as modified by Council Directive 2014/87/Euratom.

The TPR-I conducted in 2017 had as scope the Aging Management and was conducted on TRIGA RC-1 (1 MW<sub>th</sub>) operated by ENEA (Italian National Agency for New Technologies, Energy and Sustainable Economic Development) and TRIGA Mark II (250 kW<sub>th</sub>), operated by the Applied Nuclear Energy Laboratory (LENA) of the University of Pavia.

The findings concerned some areas for improvement regarding the Overall Ageing Management Programme (OAMP) of the two research reactors and electric cables, reactor pressure vessel, concrete containment structure and pre-stressed concrete pressure vessel for TRIGA RC-1.

A national action plan (NAcP) was developed to solve the findings and in 2024 all the activities foreseen by the NAcP were concluded.

The TPR-II conducted in 2023 had as topic the Fire Protection at nuclear installations. It has been performed on TAPIRO RSV (5 kW) and NAcP will be developed to implement improvements identified during TPR process.

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## Article 7. Legislative and Regulatory Framework

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1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of nuclear installations.
  2. The legislative and regulatory framework shall provide for:
    - i. the establishment of applicable national safety requirements and regulations;
    - ii. a system of licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence:
    - iii. a system of regulatory inspection and assessment of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;
    - iv. the enforcement of applicable regulations and of the terms of licences, including suspension, modification or revocation.
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### 7.1 Nuclear safety legislation and regulatory framework

The current Italian legislative and regulatory framework related to nuclear safety and radiation protection is the result of an evolution of rules and provisions that begun in the early 60<sup>ties</sup> and that took into account the experience of licensing and operation of NPPs of different types and generations and of other nuclear installations.

The Italian regulatory system is made up of three types of rules of different legal force depending on their origin:

- legislation proper, that are Acts, legislative decrees and governmental or ministerial decrees;
- technical guides;
- technical standards.

As already said, Italy is a Category 3 CP, has no NPPs in operation or any under construction but the Government is strongly working to a possible nuclear option for a new national energy strategy that foresees, as reported in the National Integrated Plan for Energy and Climate (PNIEC), the possible installation of 8 GW of nuclear capacity by 2050, trough SMR and AMR.

To this aim, the Ministry of the Environment and Energy Security launched in 2023 the National Platform for a Sustainable Nuclear (PNNS) initiative by to identify the national infrastructures needed and to trace a roadmap to start the new nuclear program.

Starting from the outcomes of the works performed by PNNS in 2024, the Council of the Ministries approved in February 2025 a bill to delegate the Government to issue the necessary legislative framework to regulate the overall nuclear cycle. The bill is now under discussion by the Parliament and, after its approval (foreseen by the end of 2025), the Government, by the end of 2027, will have to issue the Legislative Decrees necessary for, siting, construction, operation and decommissioning of NPPs, but also with regard to facilities for nuclear research, fabrication and reprocessing of spent fuel.

The actual legislative and regulatory framework is compliant with international standards for activities related to decommissioning of nuclear installations and waste and spent fuel management and for operation of research reactors. The legislation related to construction of new nuclear installations is in place, but need to be deeply updated to the most recent international standards: this will be one of the first actions in case of decision by the Parliament to start the nuclear program.

In any case in 2026, Italy will host the second full scope IRRS mission that will cover the actual legislative and regulatory framework.

### **7.1.1 Legislation**

In the Italian regulatory system, the source of legally binding rules must be either an Act of Parliament or a Legislative Decree issued by the Government thus empowered by Parliament. The Government can also issue governmental or ministerial decrees binding in law. The practice of laying down numerical limits and minute regulations in decrees issued by the Executive is very frequent in particular areas relative to radiation protection. An important feature of legally binding rules concerning nuclear safety and radiation protection in Italy is that contravention to obligations by operators and/or users constitutes a misdemeanour and entails a penal sanction; compliance can be enforced by means of criminal proceedings after due process of law.

The main corpus making up, inter alia, the Italian system are itemised below, as regards Acts and Legislative decrees:

- **Act No. 1860 of 31 December 1962:** published in the Italian Republic's Official Journal No. 27 of 30 January 1963, as amended by the President's Decree No. 1704 of 30 December 1965 and by the President's Decree No. 519 of 10 May 1975;
- **Act No. 393/1975:** which contains Administrative rules on the selection of the site for NPPs;
- **Presidential Decree No. 1450/1971:** which contains Requirements and procedure for the acquisition of the operational personnel licences;
- **Presidential Decree No. 519/1975:** "Civil responsibilities in the field of nuclear safety";

- **Legislative Decree No. 241/2000:** which has transposed European Union (EU) directive 96/29/Euratom laying down basic safety standards for the radiation protection of workers and the public; the standards laid down in the directive incorporate the 1990 Recommendations of the International Commission on Radiation Protection (ICRP) into EU radiation protection legislation.
- **Legislative Decree No. 257/2001:** which modified certain details in Legislative Decree No. 241/2000 concerning requirements for notification and authorisation of non-nuclear installations where ionising radiation is used for industrial, research and medical purposes;
- **Legislative Decree No. 23/2009:** which has transposed EU directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel;
- **Act No. 99/2009,** related to the process to start the new nuclear programme.
- **Legislative Decree No. 31/2010** The Decree includes provisions for the site selection procedure of the national repository for the long term radioactive waste management, giving the responsibility to SO.G.I.N. and defining the relevant authorization procedure.
- **Legislative Decree No. 185/2011** which transposes the EU Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.
- **Act No. 27/2012** on the economic development, through the Art. 24, establishes a new procedure to reduce the timing of the licensing phases for decommissioning activities, with a strengthened involvement of local administrations.
- **Legislative Decree No. 45/2014** which transposes the EU Directive 2011/70/EURATOM establishing a community framework for the responsible and safe management of spent fuel and radioactive waste. Legislative Decree No. 45/2014 establishes the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN) as the new competent regulatory authority in the field of nuclear safety and radiation protection and establishes the roadmap for the development of the National Program for radioactive waste and spent fuel management.
- **Joint Ministerial Decree 7/8/2015** which establishes a new classification for radioactive waste more in line with the recommendations of the IAEA standards.
- **Act. No. 58/2015** on the ratification of the Amendment to the Convention on Physical Protection of Nuclear Materials and Nuclear installations.
- **Legislative Decree n° 137/2017** which transposes the Directive 2014/87/Euratom on nuclear safety which modify the EU Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.
- **Legislative Decree n.101/2020** which transposes the Directive 2013/59/Euratom, laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation, was published; this Decree entered into force on 27 august 2020 and it repeals the Legislative Decrees n° 230/1995, n° 187/200, n° 241/2000 and n° 52/2007. This decree establishes safety rules in order to protect people from radiation hazards and disciplines:

- the protection of public and workers subject to any type of exposure to ionizing radiation,
- the maintenance and promotion of continuous improvement of the safety of civil nuclear facilities,
- the safe management of nuclear spent fuel and radioactive waste,
- the control of the shipments of spent fuel, radioactive waste and radioactive materials.

On the consequences of the Fukushima accident, the Referendum held on 12 June 2011 definitely sanctioned the abandon of the nuclear power development programme in Italy started in 2009 and the following legislative provisions were issued:

- **Legislative Decree No. 41/2011** amended the Legislative Decree No. 31/2010 with reference to the future nuclear development in Italy.
- **Act No. 75/2011** that modifies all the provisions given in the Act No. 99/2009 and in the Legislative Decree No. 31/2010, as amended by the Legislative Decree No.41/2011, concerning the development of new NPP in Italy, relinquishing the nuclear development in Italy. The provisions for the development of the national site for LLW disposal and ILW-HLW interim storage has been confirmed. Furthermore, the Act No. 75/2011, modifies the regulatory process by cancelling of the “Technical Commission on nuclear safety and radiation protection” entitled to formulate an independent technical advice to the Regulatory Body during the assessment process connected to the granting of licences, authorizations and approval of detailed designs.
- **Act No. 214/2011** that abrogates the Nuclear Safety Agency (created with the Act No. 99/2009, but never applied) and the functions have been assigned to ISPRA and then to ISIN.

A series of Governmental and Ministerial Decrees have also been issued to implement the Act No. 1860/1962.

The main functions of the Regulatory Body, as better identified under article 8, were in the past entrusted to the Directorate for Nuclear Safety and Health Protection (DISP) of CNEN, later on ENEA. Such functions, together with staff, technical structures, equipment and financial resources of DISP, were transferred to ANPA, then APAT, ISPRA, and now ISIN.

The Acts of legislative force on the institution and subsequent re-organisations of the competent regulatory authority are listed below:

- **Act No. 933/1960:** on the establishment of the National Committee for Nuclear Energy (CNEN);
- **Act No. 84/1982:** on the establishment of the State Agency for new technologies, energy and environment (ENEA);

- **Act No. 61/1994:** on the establishment of the National Agency for the Environment Protection (ANPA).
- **Legislative Decree No. 300/1999 and President of the Republic Decree No.207/2002:** on the establishment of APAT, by merging ANPA with other national Technical Services;
- **Act No. 286/2006:** on the reorganisation of APAT as a legal entity of public administration, endowed with new institutional Organs;
- **Act No. 133/2008:** on the establishment of the Institute for the Environmental Protection and Research (ISPRA);
- **Legislative Decree No. 45/2014:** on the establishment of the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN) as the new competent regulatory authority in the field of nuclear safety and radiation protection.
- **Legislative Decree n° 137/2017** which transposes the Directive 2014/87/Euratom on nuclear safety which modify the EU Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.

### **7.1.2 Technical Guides**

Issuing of technical guides is assigned to ISIN, according to article 236 of the Legislative Decree No. 101/2020 and by art. 6 of Legislative Decree n. 45/2014.

Technical guides set up technical criteria to be taken into account by Operators in the siting of nuclear installations, submittal of specific projects for approval, conduct of operations as well as rules of good practice. Technical guides represent a minimum set of safety requirements the operators have to comply with; in case of non-compliance, the licensee is requested to demonstrate that the safety case fulfil alternative equivalent or higher requirements. Compliance with Technical Guides is assessed during licensing process and inspection activities. A set of 33 technical guides have been issued on nuclear safety, radiation protection and waste management matters ranging from licensing procedures to detailed technical guidance.

In addition, the existing wealth of international recommendations, such as those reported in IAEA (International Atomic Energy Agency) and ICRP (International Committee on Radiological Protection) publications, is largely used in the Italian system.

The list of the most important Technical Guides is reported in Annex 4.

The public consultation of the Technical Guide n. 34 on technical investigations for the qualification of the site for the location of the national repository started on July 2025 and its issue is foreseen by the end of 2025.

In case of decision by the Parliament to start the nuclear program, all technical guides related to siting, construction, commissioning and operation of NPPs will need to be developed or deeply updated to the most recent international standards.

### **7.1.3 Technical standards**

These standards are mainly published by UNI (Ente Nazionale Italiano di Unificazione), the Italian National Standards Body. Selected standards for decommissioning are listed in Annex 3.

Other Standards often used were those published by CEI (Comitato Elettrotecnico Italiano) and by ISO (International Standards Organisation).

Standards documents are developed within an Expert Group and approved by UNI and/or CEI Technical Committees.

Standards developed within the above mentioned Bodies are intended to reflect the broad consensus of industry and research experts in the specific fields. These standards are thought to represent industrial good practice.

Moreover, in the design, construction and operation of nuclear installations, other rules such as the ones concerning firefighting, pressure components integrity, labour and health are applied. Among the other, foreign technical standards are often adopted and endorsed, on a case by case basis.

A wider list of the main different rules which comprise national Legal and Regulatory framework is reported in Annex 4.

In case of decision by the Parliament to start the nuclear program, many technical standards related to safety of NPPs will need to be developed or updated to the most recent international standards.

## **7.2 National safety requirements and regulations for radiation protection**

Information reported in paragraph 7.1.1 and in Annex 5, provide a comprehensive picture of the national safety requirements and regulation for radiation protection.

## **7.3 Licensing System**

Article 6 of Act No. 1860/1962 establishes that the operation of nuclear installations has to be authorized by the Ministry of Industry, now Ministry of Environment and Energy Security. Authorization is granted according to provisions established in Title IX of the Legislative Decree n. 101/2020, based upon the technical advice of ISIN, which is formulated as result of the assessment of the safety case developed by the applicant. Title IX also define the licensing procedure relevant for each phase of the nuclear installation life (i.e. from siting to decommissioning).

So, the combination of the current regulatory provisions established by Law 1860/62 and Legislative Decree 101/2020 currently permits the construction, operation, and decommissioning of nuclear installations in Italy, whether intended for research, energy production, fuel cycle, or radioactive waste management. However, the regulatory provisions related to construction and

operation of NPPs, are no longer compatible with the current system of powers at State and Regional level, and therefore have become inapplicable or need to be updated.

In relation to the current status of all the NPPs under decommissioning, the legislative and regulatory framework for decommissioning and waste management is updated to the most recent international standards, and the licensing system is reported under the Joint Convention.

As already said, the current regulatory framework shows that there is still a legislative framework, albeit partial, that regulates the authorization for the construction and operation of nuclear power plants, including those for electricity generation, as provided for in Title IX of Legislative Decree 101/2020, and by in articles 6, 7, 8, and 33 of Law N. 1860 of 1962, while there is no longer a legislative framework that allows the siting for new nuclear plants.

The following is a detailed report of the articles of Legislative Decree 101/2020 relevant to define the governance and the authorization process for the construction and operation of nuclear power plants.

### **7.3.1 Licensing process of nuclear power plants and research reactors**

The licensing process foreseen by the actual legislative framework, that, as already said, will need to be deeply reviewed in case of decision to build new NPPs, is established from article 76 to article 93 of Legislative Decree 101/2020, as following and shortly reported:

**Article 76** concerns the documentation and the procedure that the authorization applicant must submit, for the operation and modification of the following facilities: NPPs, research facilities, facilities for the treatment of irradiated fuels, facilities for the preparation and production of special fissile materials and nuclear fuels. The set of safety documentation has to be submitted by the applicant to the Ministry of the Environment and Energy Security and to ISIN for the grant of the authorization.

**Article 77** concerns the process for issuing permits for the construction of NPPs, which are authorized by the Ministry of the Environment and Energy Security, with ISIN binding advice ISIN.

**Articles 78 and 79** regulate the nuclear safety objectives for NPPs and the measures to achieve them.

**Article 80** regulates the authorization holder's obligation to systematically and periodically reassess the safety of the nuclear power plant, at least every ten years, in order to comply with the design basis requirements and identify further safety improvements, taking into account the consequences of the aging of the plant.

**Articles 81, 82, and 83** regulate the overall licensing process for the authorization for construction, modification and operation of NPPs.

In particular, article 81, provides that the technical report, issued by ISIN on the basis its technical review and assessment, shall be transmitted to the Ministry of the Environment and Energy

Security, the Ministry of the Interior, the Ministry of Labour and Social Policies, the Ministry of Health and any other interested Ministries.

Moreover, article 82, provides that the aforementioned administrations may request from ISIN further information to ISIN for additional evaluation for the siting of the plant and the preliminary project, and shall transmit to ISIN their respective advices.

**Article 86** requires the holder of the authorization to conduct, under the supervision of the ISIN, non-nuclear verification tests for the purpose of commissioning the facility once construction and combined tests of the facility prior to fuel loading have been completed.

**Article 87** regulates the execution of nuclear tests and operations with nuclear fuel by the holder of the authorization, in accordance with a general test program approved by the ISIN.

**Article 88** requires and regulates the holder of the authorization to take measurements and record the data of each nuclear test and to prepare a report detailing the methods and results of such tests.

**Article 93** regulates the process for determining and approving the limits and conditions that the licensee must observe in operating the facility, under the supervision of ISIN. The operating license is granted for successive phases of operation and is issued by the Ministry of the Environment and Energy Security (MASE), based on the opinion of the ISIN, upon the successful outcome of subsequent groups of nuclear tests.

With regard to research reactors, **article 94** of Legislative Decree 101/2020, introduces a simplified regime for research reactors with a power output not exceeding 100 kW<sub>th</sub>, exempting them from the authorization procedure for the construction, modification, or operation of facilities.

For research reactors with a power output exceeding 100 kW<sub>th</sub>, the same procedure established in articles 81 and 82 for NPPs must be followed.

## **7.4 Regulatory Inspection and Assessment**

The purpose of the regulatory inspections during the NPPs life (from the construction to the decommissioning) is to verify the fulfilment of the rules coming from the Legislative Decree No. 101/2020 and of the technical specifications which are part of the licence conditions for the specific plant.

According to Art. 9 of the Legislative Decree No. 101/2020, inspections are performed by ISIN inspectors having the authority to enter any area of the installation, as well as to have access to any relevant documentation. In case of infringement of specific rules of the nuclear act and licence conditions, including technical specifications, ISIN inspectors are entitled to report to the public attorney of the jurisdiction which the installation belongs to. The purpose of such inspections is to verify the fulfilment of binding rules having legal relevance. On-site controls are also frequently

performed by other ISIN technicians with the purpose of achieving data, information and other technically relevant elements to be evaluated with respect to technical regulations. Inspection activities may be ordinary (planned in advance for each technical area) or extraordinary.

ISIN is entrusted with general inspection powers for installation falling under the provisions of the Act and the Decrees. In the fulfilment of their duties, ISIN inspectors are vested with police powers, that is, they have power of seizure on installations deemed to be non-compliant with relevant provisions laid down in law.

Apart from ordinary powers given to police, other authorities such as Labour Inspectorate, local Health bodies and regional Agencies for the Protection of the Environment are vested with competence in the fields entrusted to their surveillance.

The Italian compliance and inspection system is based upon the fact that legislation provides for penal and administrative sanctions in cases of non-compliance, in application of the graded approach; inspectors are required under law to communicate every case of non-compliance that foresees a penal sanction, to the Office of Public Prosecution; for those non-compliances that foresees an administrative sanction (fee), ISIN inspectors impose directly the fee.

As already said, in relation to the status of NPPs in Italy, all, under decommissioning, review and assessment is performed only on documentation submitted for decommissioning operations. Review and assessment of applicant documentation are performed by ISIN that formulate binding technical specifications taking into account observations of other relevant ministries (Ministries of Interior, Labour and Health) and the Region concerned.

The applicant has to submit the documentation so that compliance with nuclear safety and health protection requirements may be verified. The requested documents are:

- preliminary plans of the installation complete with a topographical map, explanatory diagrams, drawings and descriptions of the installation and a preliminary study concerning the disposal of radioactive waste;
- preliminary safety report, indicating the envisaged safety and protection measures.

Annex II to the decommissioning licence lists the decommissioning projects which describe all relevant activities for nuclear safety and radioprotection (e.g. dismantling of reactor building, modify or rearrange interim storage facilities, etc...) by identifying Detailed Projects and Plans of Operations to be approved by ISIN before performing specific activities. The decommissioning project list can be updated if necessary. The information to be included in Detailed Projects or Operative Plans are described in technical guide n.4 and plant management specifications (Annex I to decommissioning licence), respectively.

The review and assessment of the documentation submitted is performed through national and international safety standards and national regulations (IAEA, ISO, UNI, ASME, IEEE, ASTM,

NUREG, National Technical Guides), and the implementation of their outcomes are verified by frequent on-site controls and inspections.

The main topics reviewed and assessed by ISIN in the submitted documents are:

- radioprotection objectives;
- safety classification and design criteria of SSCs;
- radioactive waste management;
- structures systems and components;
- fire prevention and protection;
- safety analysis;
- radioprotection of people and workers;
- Quality Assurance Program.

After the DP or PO approval, for particular systems or structures whose malfunction can have a major impact on the safety and on the protection of workers and environment, in factory surveillance activities are performed through technical controls performed by ISIN experts.

Once the Structures, Systems and Components (SSC) foreseen in the DP or PO approved have been implemented, the operator has to send ISIN an “as built” document in which all changes compared to the DP or PO approved have to be reported with the relevant justifications. ISIN can decide to accept or not such changes, also requiring a different solution, in case safety requirements established in the approval are not satisfied.

Moreover, during the implementation of the decommissioning operations, QA/QC activities are performed on new SSCs during on-site controls through the documents the operator shall keep up to date, as requested by the Quality Assurance Program approved.

## **7.5 Enforcement**

Article 101 of Legislative Decree No. 101/2020 establishes the procedure according to which, in case of non-compliance with the conditions attached to the licence, the Ministry of Environment and Energy Security can suspend or revoke the licence or the authorization.

Enforcement of applicable regulations and of licence conditions is ensured on the bases of the sanction system as established in Title V of the Act n. 1860 and in Title XVI of Legislative Decree 101/2020. According to Art. 9 of Legislative Decree No. 101/2020, ISIN inspectors have the authority to request any information they deem relevant to ascertain the compliance of the activities performed at the nuclear installations with the requirements established in the Legislative Decree and in the licence conditions. Inspectors are entitled to report the results of their inspections to the public attorney of the jurisdiction the nuclear installation belongs to.

The Italian inspection system is based upon the fact that legislation provides, in application of the graded approach, for penal and administrative sanctions in cases of non-compliance; inspectors are required by law to communicate every non-compliance that foresees a penal sanction, to the

Office of Public Prosecution; for those minor non-compliances that foresees an administrative sanction (payment of a fee), ISIN inspectors impose directly the fee that is paid to ISIN.

## **7.6 Assessment of Compliance**

The current national legal framework related to safety and radiation protection at nuclear installations is considered in line with obligations of Art. 7 of the Convention.

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## Article 8. Regulatory Body

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Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 7, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.

Each Contracting Party shall take the appropriate steps to ensure an effective separation between the functions of the regulatory body and those of any other body or organization concerned with the promotion or utilization of nuclear energy.

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### 8.1 Authorities responsible for the application of the legislative framework

The key regulatory functions (rulemaking, licensing, assessment, inspection and enforcement) related to nuclear safety and radiation protection matters, related to NPPs (siting, construction, operation and decommissioning) as well as safe management of spent fuel and radioactive waste, are currently exploited by the following main bodies:

- a) The Ministry of Environment and Energy Security, in this report defined as the Licensing Body, is the authority which grants the licence/authorization for nuclear installations (from the design and construction to the decommissioning). The actual legislation foresees that authorizations for construction and operation are granted on the basis of the technical advice provided by the competent regulatory authority ISIN. For decommissioning authorizations, the legislation foresees that they are granted on the basis of the technical advice provided by the competent regulatory authority ISIN and in agreement with the Ministries of Interior, Labour, Health and the Region concerned; also the issuing of the Environmental Compatibility Decree from the Ministry of Environment and Energy Security is foreseen;
  
- b) The National Inspectorate for Nuclear Safety and Radiation protection - ISIN, is the national competent regulatory authority in the fields of nuclear safety and radiation protection and is the governmental body responsible, among other functions, for the assessment and the inspection activities on nuclear installations, as well as for approving specific designs of specific safety related parts of the NPPs. ISIN was established with the Legislative Decree n.45 in 2014 and entered in operation in August 2018 by transferring personnel and functions from the previous National Competent Authority, the Nuclear, Technological and Industrial Risk Department of ISPRA (National Institute for Environmental Protection and

Research). ISIN supervises the compliance with the requirements established in the legislation and the conditions and specifications established in the Ministerial authorizations throughout its inspection activity. ISIN inspectors are entitled by the law with the proper authority to request the licensee any information deemed necessary to ascertain compliance with legal requirements and licence conditions. In case of infringements, ISIN inspectors report to the Public Attorney of the jurisdiction the installation belongs to.

ISIN is also the competent body entitled to support the Governmental rule-making function in the field of nuclear safety and radiation protection. ISIN is entitled to issue technical guides pertaining the different operational aspects of the regulatory process. It has also to be mentioned that duties and responsibilities assigned to ISIN include: supervision activities on safeguards and physical protection, certification and control for transport of nuclear and radiological materials, the exploitation of technical support function in the field of emergency preparedness and the control function in the field of environmental radioactivity.

## **8.2 Competent Regulatory Authority - ISIN**

ISIN has regulatory, operational and administrative independence. The Director is nominated with a Decree of the President of the Republic following the designation by the Council of Ministers based upon the proposal of the Minister of the Environment and Energy Security with the Minister of Economic Development, and following the positive advice of Parliamentary Commissions; the Advisory Board, composed of 3 members, is nominated under the same procedure of the Director.

ISIN financial resources consist of four components:

- a) the resources allocated by State budget;
- b) an *una tantum* budget, only for the startup phase;
- c) the resources coming from part of the levy on the electric bill allocated to cover costs of decommissioning activities of nuclear installations;
- d) the resources coming from the fees that ISIN is authorized to apply and collect from the license holders for the exploitation of its regulatory functions (under implementation).

According to the institutional law the staff assigned to ISIN comprises 90 units, 60 technicians plus 30 units with administrative and legal background.

ISIN has the possibility to get technical support of third, independent, expert organisations. In this regard specific arrangements are in place.

### **8.3 Independence of the regulatory function**

ISIN performs its regulatory functions in a fully independent and autonomous manner, being completely independent from any entity involved in the promotion and use of nuclear energy. As described in previous paragraph, the process for the nomination of the Director and the Advisory Board, strengthen the independence of ISIN in addition to the regulatory, operational and administrative autonomy. Due to the independence from political entity, ISIN is entrusted by law to transmit a yearly report to the Government and the Parliament on the activities performed and on the national status of nuclear safety.

As previously said, licences are granted by the Ministry of Environment and Energy Security on the basis of the binding technical advice of ISIN issued on the basis of review and assessment performed on the documentation submitted by the applicant. Moreover, any approval of specific safety related technical designs and operations are granted by ISIN, which may establish technical specifications.

ISIN inspectors are entitled by law with the authority to access to any installation where radiation sources are used or stored and to request any information in order to ascertain compliance with legislative requirements and licence conditions.

As already said, ISIN is also entitled to issue technical guides on specific aspects related to the regulatory process.

### **8.4 Participation of the Competent Regulatory Authority in international fora**

In the framework of a regulatory system, it is recognized that the international cooperation provides also a significant contribution to the quality of the national safety and radiation protection regulatory work. In such a context international cooperation activities conducted by ISIN have primarily regarded regulatory issues dealt with in the International Organizations. In addition to the activities performed to fulfil the obligations on the Conventions, it is mentioned the participation of ISIN experts in the development and updating of IAEA safety standards as members of the safety standards Committee (NUSSC, WASSC, RASSC, TRANSSC, EPRReSC).

As member of the EU Institutions committees facing the nuclear regulatory issues, ISIN fully takes its responsibility in contributing to the enhancing of the nuclear safety as a main objective of the EU international policy, not only through an active participation at level of production of Commission binding instruments (i.e. WPAQ of the Council) but also through direct participations in all the fora where cooperation actions in the nuclear safety field are proposed and evaluated.

In its Competent Regulatory Authority institutional role, ISIN is member of the European Nuclear Safety Regulators Group (ENSREG) and actively participates in all its activities.

In addition, ISIN is member of the Western European Nuclear Regulators Association (WENRA) and has actively participated in the comparison of safety requirements of the different member countries, against agreed reference levels, as basis for harmonisation.

Together with all the other WENRA Members, ISIN has used the outcomes from this project for establishing the national action plan to correspondently update its technical guides, mainly addressing issues related to decommissioning and waste management.

Moreover, ISIN is actively participating in many other international technical groups and initiatives launched to share knowledge in new technologies and for the development and the harmonization of licensing process for the new emerging technologies as SMR and AMR: it's the case of the Task Force on SMRs, established at European level in the framework of ENSREG, of the CNRA at NEA/OECD, of the Nuclear Harmonization and Standardization Initiative (NHSI) at IAEA.

Equal importance has been traditionally assigned by Italy to bilateral cooperation. In this regard cooperation agreements established in 2010-11 with Regulatory Authorities of neighbouring countries (Switzerland/ENSI, France/ASN and Slovenia/SNSA) in the field of nuclear safety and EP&R are in place. As a relevant example of a long lasting tradition in international bilateral cooperation, a cooperation arrangement on nuclear safety matters with the US.NRC, in place since 1975 and renewed in 2025, has to be mentioned. In this context, the renewal of the Bilateral Agreement between ISIN and the related national competent authority of Switzerland ENSI had been signed in 2019.

## **8.5 Assessment of Compliance**

On the bases of what is reported in this section it may be concluded that Italy has adequate provisions to fulfil its obligations under Art. 8 of the Convention related to independence of the competent regulatory authority. Financial resources assigned to the competent regulatory authority have also been increased with the transposition of the amended EU Directive on nuclear safety.

With regard to human resources of ISIN the institutional law establishes in 90 units the assigned staff. In case of decision by the Parliament to start a new nuclear program, specific actions to increase the number of currently available personnel, financial resources and improve the competences, will be required.

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## **Article 9. Responsibility of the licence holder**

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Each Contracting Party shall ensure that prime responsibility for the safety of a nuclear installation rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.

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### **9.1 Responsibility of the licence holder**

According to Act No. 1860/1962 and the Presidential Decree No. 519/1975, the primary responsibility for safety is assigned to the licence holder. This is more clearly stated by art. 102 of the Legislative Decree No. 101/2020.

The licence holder is responsible of all the activities having direct influence on safety performed during design, construction, commissioning, operation as well as of all the activities performed during decommissioning and management of spent fuel and radioactive waste.

In this regard, during particular situation that may affect safety of the nuclear installations, (e.g. Covid-19 pandemic), the operators have developed specific procedures to manage personnel and activities required to guarantee nuclear safety. Given the national situation where all NPPs are under decommissioning and the spent fuel is completely removed, most of the procedure developed, regarding lack in staff, require to stop the activities, and leave on the plant the staff number to guarantee the safety and security status of the installation.

The regulatory system in place ensures that appropriate supervision activity is exploited by ISIN to verify that the licence holder properly meets its responsibility: also during Covid-19 pandemic, inspections on site or by remote tools were performed.

### **9.2 Ensuring that the licence holder meets its responsibility for safety**

The system of controls provided for in the Italian rules uses four tools:

1. the analysis of the safety reports and other relevant documents, the analysis on the results of tests and measurements, the performance of additional or repeated tests;
2. the inspection system, in order to verify compliance with applicable rules and constraints at all stages from design to operation of facilities as well as during the phases of decommissioning and during all stages of the management of the spent fuel and radioactive waste;
3. the performance of periodic audits to the applicant and to the licensee for the purpose of verifying, inter alia, that licensee maintains the capability in terms of staffing and competences adequate to completely undertake the activities during the lifetime of the

facility from siting to decommissioning. Periodic audits to manufacturers, and suppliers in general were also conceived as an indirect tool of control of the applicant and of the licensee activities;

4. the sanctions in case of non-compliance either with provisions in Law or prescriptions in the licensing acts range from penal to administrative measures. The former may entail deprivation of freedom and fines, the latter consists in fines and suspensions or revocation of the licences in worst cases. The penal sanctions are applied by Courts following reports from Inspectors entitled as police officers in the Italian system. With regard to administrative measures, fines are directly applied by ISIN inspectors while suspensions or revocation of the licences are applied by the Ministry of Environment and Energy Security.

### **9.3 Assessment of compliance**

On the basis of what discussed about, it is considered that there are adequate provisions in the Italian legislative system to comply with the obligations of this article of the Convention.

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## Article 10. Priority to safety

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Each Contracting Party shall take the appropriate steps to ensure that all organizations engaged in activities directly related to nuclear installations shall establish policies that give due priority to nuclear safety.

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With regard to the fulfilment of the requirement under this article of the Convention, it is to be firstly considered that Italy is a Contracting Party that relinquished the operation of its nuclear installations since 1987. In this way, any potential conflict between production and safety has been removed.

All the national Organisations have continued to operate with the only aim of maintaining the safety of the shut-down NPPs during their decommissioning and of the research reactors during their operation.

The principle of priority to safety is clearly addressed in art. 102, paragraph 1 of Legislative Decree No.101/2020.

On the implementation side it is addressed by requirements on: Quality Assurance, Operating Organisation rules and Authorisation procedures. Moreover, in the above frames, the licensees are required to issue appropriate documents on their policies on quality, environment and safety, establishing due priority to such topics.

It is anyhow recalled that also at the time of the development of the nuclear programme, the legislative framework and the Italian regulatory practice that have been long in use even before the publication of IAEA Safety Fundamentals, stimulated all the involved national Organisations to be committed to reaching and maintaining the highest priority in safety matters. Example of regulatory tools are:

- Legislative Corpus itself, which imposes a multi-step licensing process;
- General design criteria, requiring, inter alia, the application of the defence in depth principle;
- Regulatory guides, as listed in Annex 4;
- Preliminary, Intermediate and Final Safety Reports;
- Detailed designs;
- Quality Assurance Programmes;
- Safety relevant works Operational Rules;
- Technical Specifications;
- Operating Manual (e.g.: Procedures for normal and emergency condition);
- State exams for Operator Licences and State Certification for Plant Managers;
- Periodic assessment and reporting of performances;
- Inspections.

Since the inception of the closed Italian Nuclear Programme, the licence holder operates, maintains and modifies the systems of the nuclear power station by assigning the highest priority to the nuclear safety and so keeping the consequential risk to the public as low as reasonably achievable, economic and social considerations being taken into account; this basic principle was implemented even before it was laid down, significantly in artt. 1 and 2 of Legislative Decree No. 101/2020. On the operation side, the license holder is required by Law to set up a special Plant Safety Committee at each nuclear installation site, which has the responsibility to examine all the relevant decisions (e.g.: plant hardware or procedures modifications), in order to identify their safety relevance. The Plant Safety Committee, whose members are nuclear safety and radioprotection experts from the plant, have to be approved by ISIN.

All the national Organisations having competence in the nuclear field are involved in International fora dealing with nuclear safety. Consequently, the latest international achievements have been implemented in Italian applications.

Moreover, various Organisations, dealing with nuclear legislation and/or regulations, such as Ministries, besides ISIN itself, each give independent assessment to the documentation submitted by the applicant and to ISIN safety evaluations.

Today, the actual implementation of the priority to safety principle to the Italian nuclear installations regards mainly their safe management and the associated activities of decommissioning and spent fuel and radioactive waste management and the safe conduct of research reactors still in operation.

It has to be also highlighted that Legislative Decree n. 101/2020, establishes specific provisions on operators' obligations to continuously improve safety and to implement a management system based upon the necessary priority to safety.

## **10.1 Assessment of compliance**

Based on information reported above it may be concluded that Italy meets the requirements of this Article of the Convention.

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## Article 11. Financial and human resources

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1. Each Contracting Party shall take the appropriate steps to ensure that adequate financial resources are available to support the safety of each nuclear installation throughout its life.
  2. Each Contracting Party shall take the appropriate steps to ensure that sufficient numbers of qualified staff with appropriate education, training and retraining are available for all safety-related activities in or for each nuclear installation, throughout its life.
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### 11.1 Financial resources

#### 11.1.1 NPPs Decommissioning funding

The National Electricity Company (ENEL S.p.A.) decided to start accumulating decommissioning funds during NPP operation even without a formal obligation. At the time of the premature shut down of these plants however all the necessary decommissioning funds were not available. When in 1999 all the liabilities and assets related to nuclear power plants belonging to ENEL were transferred to the newly established company SO.G.I.N. S.p.A (Società Gestione Impianti Nucleari), soon new funding mechanisms were identified to finance the full decommissioning costs. Since January 2000 the financial resources are provided by a levy on the price of the kWh to the consumers in combination with the pre-existing ENEL funds that have been transferred to SO.G.I.N. S.p.A. which is responsible for performing decommissioning and waste treatment activities for all Italian nuclear installations. Funding of the fuel cycle facilities in decommissioning has been included in the above mentioned levy.

In 2021 the new regulatory system, introduced by Italian Regulatory Authority for Energy, Networks and Environment (ARERA), provided that SO.G.I.N. must send an updated report on the physical and economic progress of the decommissioning projects to the ARERA every year. The financing of the activities remains the contribution on the kWh (defined by the  $A2_{rim}$  component of the electricity bill), paid by the end users, which is adjusted every 3 months. In this way, any additional costs due to changes in the strategies and activities necessary for safety reasons can be financed by ARERA. In 2021, the annual withdrawal corresponds to approximately 3 Euro / year for the average consumer of electricity.

Starting from 2023, decommissioning and waste management activities are financed within the limits established by Law No. 197 of 29 December 2022 (2023 Budget Law). This law amended previous provisions concerning the funding of such activities and allocates an annual budget of

€400 million, of which €15 million per year is specifically earmarked for territorial compensation measures.

### **11.1.1 Research Reactors funding**

With regard to TRIGA Mark II of University of Pavia, the University is responsible for the management and financial security of the LENA Center's facilities. The Center has a budget approved by the University Board of Directors on a three-year basis for the safe operation of the TRIGA System. Development, research, and training activities are managed through projects, also approved during the three-year budget forecasting phase, with external funding sources such as fee-based activities, research projects with public and private entities, or service activities. Historically, the annual budget is divided into maintenance management, external "third-party" financing, management of general expenses (insurance, electricity, heating), and personnel directly employed by the University.

With regard to TRIGA RC-1 and TAPIRO RSV of ENEA, the safety related activities are funded on the basis of a part of the annual budget assigned to ENEA. In case of operations to be performed on safety related SSCs, additional State funds are assigned on the basis of specific request by ENEA.

## **11.2 Human Resources**

Since the inception of the National Nuclear Programme, the licence holder was committed to provide human resources throughout the entire life cycle of the plant in order to ensure a safe operation.

It is important to highlight that SO.G.I.N., the national company responsible for the NPPs decommissioning activities, is implementing a recruitment program of young professionals, in order to overcome difficulties due to the retirement of experienced staff.

National Laws state that the operating personnel for the NPPs in operation must follow an appropriate training programme and their capacity to operate in a nuclear installation must be certificated. Qualified positions in the staff of the NPPs are approved by ISIN together with the Operation Rules. To certificate the qualification of the personnel coping specific safety position in the organization (plant director, supervisor, operator) for the conduction of the plant, a specific examination must be passed as stated in the Law No. 1450/1964.

Moreover, the position of Radiation Protection Expert requires to pass specific examinations depending on the level (3 levels are foreseen). For nuclear installations, the Radiation Protection Expert at level 3 (the highest one) is required. Art. 129 of Legislative Decree No.101/2020 establishes the national professional register where Radiation Protection Expert are recorded.

Today, staff qualification requirements for decommissioning and radioactive waste and spent fuel activities are the main focus of human resources management. Technical and operating staff

undertake training regarding technical and legal issues, according to the specific policy of SO.G.I.N. established at corporate level. Moreover, staff qualification for the performance of any safety-related activity is among the relevant aspects that are assessed during the licensing process. In nuclear installations and facilities key positions, only licensed personnel can operate. In such installation the Operation Rules, required by the Italian law, establishes requirements about the organization and the roles of the technical and operating staff, to ensure a safe management of the installation (even regarding the activities related to waste management and dismantling operations) in ordinary and emergency conditions.

Among the main objectives of the mentioned safety strategic project by the Implementer SO.G.I.N., many internal activities related to human resources training are carried out by the SO.G.I.N. "Radwaste Management School" (RMS).

RMS has been operating since 2008, providing education and training to the staff of SO.G.I.N. and external companies. in accordance with international safety standards and requirements established by the Italian Safety Authority. In this way SO.G.I.N. ensures high-level professional updating, promoting managerial and technological innovation based on the experience and specialized know-how in the field of decommissioning and radioactive waste management. The development of highly specialized know-how is part of the SO.G.I.N. strategy to guarantee maximum safety and implement an integrated knowledge management, education and training system. This is done in the light of transferring skills to future operators and satisfying the increasing knowledge demand in the sector both at international and national level.

The Radwaste Management School aims to:

- train the resources of SO.G.I.N., with particular attention to the safety aspects and to the management of radioactive waste and nuclear fuel;
- promote, improve and extend best practices in the nuclear safety culture, radiation protection and environmental safeguard;
- ensure integration, enhancement and sharing of the knowledge management system;
- involve universities and national/international nuclear training centres;
- training the "operators of the future", for example university and high school graduates in the disciplines related to decommissioning and radioactive waste management.

In the last years, the Radwaste Management School has developed a series of partnerships with certified national and international training organizations, research & development institutes, universities and scientific associations in order to integrate educational programs.

The Radwaste Management School has been certified ISO 9001/2015 (Quality Management System), ISO 14001/2015 (Environmental Management System), CEPAS (Certification of Competence and Training) and OHSAS 18001 (Occupational Health and Safety Management Systems).

For the educational and training of SO.G.I.N. staff, RMS currently provides around one hundred courses for year, for a total of about 30,000 hours, in the following technical and scientific subjects: Nuclear Safety and Security, Decommissioning and Waste Management, Radiation Protection, Environmental and Legislative aspects, Work Safety, Technology of nuclear installations, Quality, Environmental and Safety management system.

Furthermore, as part of the IAEA Collaborating Centre, stipulated in Vienna on 19 September 2019 in order to promote the transfer of knowledge, education and training and innovation in the fields of decommissioning of nuclear power plants and nuclear facilities, management of radioactive waste and radiation protection, SO.G.I.N. has launched an extensive education and training program aimed at both international institutions and national bodies and internal resources, to ensure effective retention of knowledge and skills in the safety and decommissioning sectors.

For research reactors in operation, national laws require that the operating personnel in operation must follow an appropriate training programme and their capacity to operate must be certificated passing a specific examination as required in the Decree of the President of the Republic DPR No. 1450/1964. These qualified positions in the staff regard plant director, supervisor and operator. In addition to this certification, the staff of the research reactors follow periodic specific training programme in the field of nuclear safety, radioprotection and conventional safety.

Moreover, in order to ensure, continuous professional development, the exchange of information and technical experiences gained through the operation of facilities of the same category, operating personnel actively participates in conferences, workshops, meetings at both national and international levels and also participates in international activities and working groups, organized mainly by IAEA, on issues relating to the management, operation and maintenance of nuclear research facilities, the development of new technologies, the dissemination of "good practices", the promotion and development of international cooperation.

### **11.3 Assessment of compliance**

Based on information reported above it may be concluded that the Italian licensee has overcome the lack of resources outlined in the previous Report and is actively operating in the area of training/retraining, and then Italy meets the requirements of this Article of the Convention.

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## Article 12. Human factors

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Each Contracting Party shall take the appropriate steps to ensure that the capabilities and limitations of human performance are taken into account throughout the life of a nuclear installation.

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### **12.1 Methods to prevent, detect and correct human errors**

The important role of human performance in all phases of the life of a nuclear installation, from design and operation until shut-down and decommissioning, has always been focused as an important safety concern. Adapted to the scope of the current national nuclear programme regarding the management of NPPs in decommissioning, spent fuel and radioactive management, research reactors in operation, these aspects include:

#### Safety relevant work Organization Rules

Operation Rules, on-site Organisation Chart, Roles and Responsibilities as summarised under the managerial and organisational issues in the following section.

#### Procedures development

Procedures development, in particular for the emergency situations, is performed by taking into the human factors issue. Procedures are verified with respect to technical accuracy, written correctness and usability.

#### Operator Training

SO.G.I.N., ENEA and University of Pavia technical and operating staff undertakes training regarding technical and legal issues as dealt with in the previous paragraph on the human resources.

#### Good understanding and clarity of Technical Specifications (TS)

A great emphasis is given to human factors principle in order to ensure a clear understanding of technical specifications attached to the authorization. From the human factors point of view, particular attention is devoted to exclude conflicting interpretation of TS requirements and to provide the associated technical bases.

### **12.2 Managerial and organizational issues**

According to the Italian law, the licence holder has to submit to the approval of ISIN the Operation Rules related to safety relevant works to be carried out in the installations. This document has to specify the organisation and functions of the staff under both normal and emergency conditions.

A Technical Guide on the contents of the safety relevant work Operation Rules with several specific criteria for the approval of the Operator's document was issued.

Safety of a nuclear installation, also in decommissioning phase, requires, from the human factors point of view, the maximum accuracy in the conduct of operation.

In order to assure full compliance to nuclear safety evolving regulations and to have and keep the highest safety standards in decommissioning, SO.G.I.N. in 2021 established its Nuclear Decommissioning Safety Board. Board's mandate is to support society Governance with any issue and improvement related to nuclear safety of decommissioning and waste management activities, knowledge recycling and diffusion, and any other matter related to, through independent analyses and advices, in a comprehensive and overlooking view. Board members are SO.G.I.N. Senior Technical Officers and/or former Plant Managers, which past work experiences are the basis of the Board advices.

Criteria of the competent regulatory authority require that activities, relevant to safety, are clearly defined, and properly assigned. These activities must also be executed according to predetermined and written procedures, carefully recorded, regularly supervised, and the whole system readily corrected when necessary.

### **12.3 Safety culture, Safety Management System and associated surveillance rules**

Methods of assessing and improving safety culture which comply with proved international practices (e.g. focus groups) are being implemented.

Safety culture is stimulated and improved by a combination of education, training, behaviours and attitudes, management's commitment etc. In addition, in the case of NPPs under decommissioning process involves some specific challenges to manage the transition phases and maintain the safety culture of the internal and contractors' personnel.

As already said, in order to ensure, knowledge keeping and continuous professional development, the exchange of information and technical experiences gained through the operation of facilities of the same category, operating personnel actively participates in conferences, workshops, meetings at both national and international levels and also participates in international activities and working groups, organized mainly by IAEA, on issues relating to the management, operation and maintenance of nuclear research facilities, the development of new technologies, the dissemination of "good practices", the promotion and development of international cooperation.

## **12.4 Role of ISIN and of the Operators regarding Human Performances issues**

ISIN, in the frame of its general duties, is also responsible for the controls on the training system and conducts the examinations on operators working in nuclear installations.

An Advisory Committee for Safety (called "Plant Council of Delegates for Safety") is required on each nuclear installation. This Council is formed by plant technicians supervising the most relevant activities (e.g.: operation, maintenance, radiation protection) supporting the Director of the installation with the following consultative functions, according to the Italian Law:

- a) to review any proposed modification to the plant or to part of it and to express evaluations and advice on safety matters;
- b) to review any proposed modification to the operating procedures of the plant and to express evaluations and advice on safety matters;
- c) to review programmes of trials, tests, and other special activities to be carried out on the plant and to express evaluations and advice on safety matters;
- d) to review periodically the overall operation of the plant, and to express opinion and possible recommendations regarding safety and protection;
- e) to lay down the internal emergency drill for the plant and arrange for any necessary modification in consultation with the Provincial Fire Service Headquarters;
- f) to assist the emergency director (person qualified by state examination to the "Direction" of nuclear plant in normal and emergency conditions, in "on call availability shift") or the plant superintendent in the adoption of the measures which may be necessary to deal with any unusual or abnormal condition which may constitute a danger for persons or goods.

## **12.5 Assessment of compliance**

Based on information reported above it may be concluded that Italy meets the requirements of this Article of the Convention.

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### Article 13. Quality assurance

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Each Contracting Party shall take the appropriate steps to ensure that quality assurance programmes are established and implemented with a view to providing confidence that specified requirements for all activities important to nuclear safety are satisfied throughout the life of a nuclear installation.

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Although the legislative system does not contain specific provisions regarding quality assurance in nuclear installations, QA requirements are detailed in specific Technical Guides issued by the Competent Authority (today ISIN) since 70's and 80's, in the frame of a more general programme of development of technical guides to support the regulation of installations of the national nuclear programme. On the bases of the requirements established in the technical guides, licensees developed proper QA General programmes for conduct of operation and/or Quality Procedures Guidelines/Instructions under the supervision of the competent regulatory authority.

For NPPs under decommissioning, conditions attached to the licence establish the requirements for the licensee to perform the decommissioning activities according to a QA programme to be submitted and approved by ISIN.

With regard to new facilities that today, in relation to the Italian situation where all NPPs are under decommissioning, are related only to the treatment and the storage of radioactive waste, QA requirements (as defined in the Technical Guide No. 4 related to the standard content of applications for detailed design of relevant parts of nuclear installations) are applied. In particular, an adequate demonstration with regard to quality assurance related aspects is requested to be provided by the licensee in the specific safety case, developed according to the Technical Guide No. 1, submitted to support the authorization.

With reference to the current implementation level, it is to be mentioned that the QA system of SO.G.I.N., as the main national licensee involved in the management of spent fuel and radioactive waste, is documented through two levels of documentation applicable for all projects:

- *Management System Manual* related to the main organization;
- *Quality Assurance Programme* related to the dismantling activities and operation of each site;
- *Quality procedures/Guidelines Instructions* and a third level of specific documentation for each project, related to Job Order documents.

With regard to research reactors, QA General programmes for conduct of operation and/or Quality Procedures Guidelines/Instructions have been developed and are in place.

### **13.1 Regulatory control**

The regulatory control during the licensing process is based on the analysis and review of QA Programmes submitted by the Applicant.

An additional primary tool of Regulatory Control is the possibility to perform periodic audits to the Applicant and to the Licensee.

### **13.2 Assessment of compliance**

Based on information reported above it may be concluded that Italy meets the requirements of this Article of the Convention.

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**Article 14. Assessment and verification of safety**

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Each Contracting Party shall take the appropriate steps to ensure that:

- i. comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;
- ii. verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

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In relation to the decommissioning status of all NPPs, the preservation of high level safety conditions remains one of the key objectives of the regulatory oversight activity.

It has to be highlighted that following their definitive shutdown, preservation of high level safety conditions was primarily based on maintaining of rules established for operation, even though progressively adapted, according to a graded approach, as required by the new plants' status.

During decommissioning safety analysis verification are performed on each safety relevant operation regarding dismantling of existing SSCs or building of new ones: review and assessment are first performed on the documentation submitted by the operators and then surveillance and inspections are performed during the execution of the activities and during operation.

On the basis of Surveillance procedures, the operators have to perform periodic surveillance and tests on the good performance of SSCs. ISIN perform inspections both during tests and on the tests performed.

As well as for NPPs in decommissioning, also for research reactors in operation, the operators have to perform periodic surveillance and tests on the good performance of SSCs. ISIN perform inspections on the surveillance performed.

All the tests performed and relevant outcomes are recorded and kept by the operators.

With regard to the assessment performed during the life cycle of the nuclear installations, article 80 of Legislative Decree n. 101/2020 foresees that Periodic Safety Reviews have to be performed by the operator at least every 10 years: the safety reassessment is intended to ensure compliance with the design basis and identifies further safety improvements taking into account the

consequences of ageing, operational experience, the latest research findings and the evolution of international standards.

Lastly, on the basis of Directive 2009/71/Euratom, as modified by Directive 87/2014/Euratom, Italy, every 6 years, participates in the peer review named Topical Peer Review (TPR) whose primary scope is to perform a national assessment, based on a specific topic related to nuclear safety of the relevant nuclear installations on the territory: in 2017 Italy participated at the TPR-1 whose topic was aging management and in 2023 Italy participated in TPR-2 whose topic was fire hazard.

#### **14.1 Assessment of compliance**

Based on information reported above it may be concluded that Italy meets the requirements of this Article of the Convention. On the bases of what is reported in this section, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable to the national situation.

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## **Article 15. Radiation protection**

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Each Contracting Party shall take the appropriate steps to ensure that in all operational states the radiation exposure to the workers and the public caused by a nuclear installation shall be kept as low as reasonably achievable and that no individual shall be exposed to radiation doses which exceed prescribed national dose limits.

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### **15.1 Legislation and Regulatory Framework**

The main Act that regulate radiation protection matters is the Legislative Decree No. 101/2020, as previously described in Article 7.1.

Legislative Decree No. 101/2020 which transposes the Directive 2013/59/Euratom, laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation; this Decree entered into force on 27 august 2020 and it repeals the Legislative Decrees n° 230/1995, n° 187/200, n° 241/2000 and n° 52/2007.

The Legislative Decree regulates every aspect of the radiation protection in nuclear installations and in non-nuclear installations or facilities (accelerators, irradiators, hospitals and other medical and industrial uses of radiation sources). It establishes the ALARA principle as required by Euratom Directives and fixes dose limits for workers and public.

In relation to NPPs decommissioning activities, all projects submitted to ISIN, have to contain specific sections on the envisaged radiation protection programme, including doses evaluation for people and workers and proper demonstration of the implementation of ALARA principle.

With regard to research reactors activities, they are performed on the basis of the requirements given by national legislation and by technical specifications reported in the licence.

A detailed description of the Italian radiation protection system is provided in the Annex 5.

### **15.2 Assessment of compliance**

Based on information reported above it may be concluded that Italy meets the requirements of this Article of the Convention.

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## Article 16. Emergency preparedness

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- i. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.  
For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.
- ii. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.
- iii. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

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### 16.1 On-site and off-site emergency plans

The off-site emergency planning of the Italian nuclear installations, and of the transportation of spent fuel, as well as the nuclear emergency national Plan are regulated by the Title XIV (Articles 172 to 197) of the Legislative Decree No. 101/2020. In addition, the Legislative Decree No. 1/2018 is the Civil Protection Code regulating the purpose, activities and organization of the National Civil Protection Service, as well as the emergency response management in all cases of accidental events and disasters of any nature, is also applicable.

With regard to the on-site emergency planning above provisions are complemented with those reported in Articles 89, 90 and 92 of the Legislative Decree No. 101/2020, respectively related to:

- the approval by ISIN of the Operating rules, the document which specifies the plant organization and the duties of the staff in charge of the management, operation and maintenance of a nuclear installation and which contains also a specific section dealing with exceptional plant conditions that are those determined by the prediction or the occurrence of a nuclear emergency; the Operational Manual of the plant, to be submitted to the competent regulatory authority, which includes the Instruction Manual for

exceptional situations, reporting instructions and procedures to be taken to prevent or mitigate the consequences of the exceptional situation taking into account radiation protection of the workers and the coordination with the off-site emergency plan during all stages of the emergency. Moreover, the Instruction manual for exceptional situations identifies the operating personnel which must be assigned to emergency tasks in case of occurrence of exceptional situations;

- the Committee of delegates for plant safety, approved by ISIN, who has different tasks including, among other duties, the elaboration of the on-site emergency plan, the elaboration of the Instruction Manual for exceptional situations and provide advises to the plant Director in taking measures that are necessary to deal with exceptional events or abnormal plant operational condition.

Following the provision given by the Technical Specifications attached to the license, emergency exercises are regularly conducted typically on yearly base. As a part of the regulatory oversight activities, the emergency exercises are attended by ISIN officers.

As far as the off-site planning is concerned if the potential consequences of postulated reference events result to be manageable at local level (which means that the contribution of resources at the national level is not expected), the off-site emergency plan is prepared under the authority of the Prefect of the province where the installation is located, as required by the Article 177 and following provisions stated in Articles 179, 180 and 181 of the Legislative Decree No. 101/2020.

According to Article 178 of the same legislative decree, the technical basis for the plan (hazard assessment) are established by the Licensee and reviewed by ISIN. The content of the off-site emergency plan is defined in the Annex XXXII of the Legislative Decree No. 101/2020.

Off-site emergency plans continue to be in force for the non-operational NPPs and nuclear fuel cycle facilities, until the ongoing decommissioning process will provide conditions for the lift of such emergency plans. Off-site emergency plans are in force for research reactors, for radioactive waste management and storage facilities, for spent fuel storage facilities, as well as for the Italian harbours where the presence of foreign nuclear powered ships is allowed.

Concerning the nuclear installation under decommissioning, the off-site emergency plans fulfils the same emergency functional requirements as those for operational plants but, of course, providing for a different size of the response and of the necessary emergency infrastructures. The off-site emergency plan is periodically reviewed and resized with reference to the progress of the different phases of the decommissioning process until its final withdrawal. A first updating of the off-site emergency plan is performed in the initial phase of the decommissioning process, following the authorization of the decommissioning plan, and in any case, following the removal of spent fuel from the site. This updating is based on safety analysis of the accident scenarios postulated for all the activities provided for the whole authorized decommissioning process.

Regarding the transportation of spent fuel (notably abroad for fuel reprocessing purposes), specific emergency plans are prepared, under the coordination of the Prefect of the province from which the transport will start according to the art. 186 of Legislative Decree No. 101/2020.

For cases where potential consequences of postulated reference events could affect larger parts of the national territory, provisions of the article 182 of the Legislative Decree No. 101/2020 concerning the National Plan for the management of radiological and nuclear emergencies, apply as discussed in the following paragraph.

## **16.2 National Plan for the management of radiological and nuclear emergencies**

Provisions of Article 182 of the Legislative Decree No. 101/2020 require the preparation of a National Plan for the management of radiological and nuclear emergencies under the coordination of the Department of Civil Protection. Such a plan is aimed at protecting general public and environment in case of accidents affecting the whole national territory, which requires response coordinated at national level.

The current edition of the National Plan was approved in March 2022 by the Italian Government. The Plan was prepared by the Department of the Civil Protection of the Council of Ministers with the support of a Committee composed by representatives from Ministry of Health, Ministry of Interior, Ministry of Foreign Affairs, ISIN, Institute of Health, Custom Agency.

Technical bases (hazard assessment) of the plan was prepared by ISIN. The new hazard assessment confirms the reference accident considered in the previous version, namely an INES 7 accident with low probability of occurrence. The confirmation of the source term derives from the fact that the releases calculated at the time are compatible with those estimated for the Fukushima accident.

The Plan includes 3 accidents scenarios in foreign NPP. The first scenario considers accidents at a NPP less than 200 km far from national borders, the second one considers an accident at a NPP more than 200 km far from national borders, the third scenario considers an accident anywhere else in the world.

For the first scenario, in case a major accident, in order to protect the population living in the most affected areas, sheltering and ITB are envisaged as urgent protective measures; food ban and protection of livestock are envisaged as early protective measures. For the second scenario only early protective measures such as food ban and protection of livestock are envisaged.

Other issues considered in the new Plan are the protection of national citizens in the accident country, the returning of people from areas affected by the consequences of the emergency, the monitoring of the imported goods, the better definition of KI distribution mechanism as well as a better definition of the areas where these countermeasures should be prepared. Moreover, the

plan has a new emergency classification which is in line with international emergency classification. This issue was also a recommendation from IRRS Mission that took place in 2016.

Italian organisations involved in the implementation of the national Plan, regularly participate in emergency exercises organized at international level by EU (ECURIE), IAEA (EMERCON) and OECD/NEA (INEX). Within the framework of bilateral agreements, the participation is extended to the national exercises organized by neighbouring countries (participation to Swiss national exercise of nuclear emergency in 2013, 2015 and 2017, and to Slovenian national exercise in 2014).

In this regard, it has to be mentioned that, in 2025, Italy participated in CONVEX-3, the large-scale international exercise organized by IAEA. The exercise represented a significant opportunity to test the arrangements foreseen by the National Plan for the Management of Nuclear and Radiological Emergencies, approved in 2022.

The event was marked by strong participation and high engagement from all response organizations, both at the national and local levels, demonstrating the commitment of institutions and administrations to ensuring preparedness in case of nuclear or radiological emergencies. In this context, the exercise served also as a platform for discussion and cooperation among all the authorities and stakeholders involved in the Plan.

In addition, the exercise enabled the identification of gaps, challenges, and areas for improvement. Several issues emerged that require clarification, review, or updating to further strengthen the effectiveness of the National Plan.

Building on the lessons learned from the exercise, a process of revision, integration, and continuous improvement of the National Plan will be launched, ensuring that Italy remains aligned with international best practices and prepared to effectively address potential nuclear and radiological emergencies.

At international level, Italy has ratified the Convention on Early Notification of a Nuclear Accident (1986) and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency (1987). Italy also established proper provisions to fulfil the requirements of European Union Council Decision No. 87/600/Euratom regarding the urgent exchange of information in case of radiological emergency.

### **16.3 Bilateral Cooperation**

A plan to establish bilateral cooperation on nuclear and radiological emergencies with neighboring countries having NPPs was launched on late 2009 and concluded in 2010-11 as reported in the following paragraphs.

The implementation activity of such a cooperation expedited in the aftermath of the Fukushima Daiichi NPP accident.

### **Agreement with Switzerland**

An Agreement between the Swiss Federal Council and the Government of the Italian Republic on the rapid exchange of information in case of nuclear accidents was signed on 15th December 1989 and entered into force on 26th February 1990. On this basis regular communication drills take place between the respective national contact points.

Parties are committed to notify each other immediately about emergency situations that could have radiological consequences, as well as abnormal levels of radioactivity on their territory, which have arisen as a result of any kind of activity.

Information about the emergency has to be promptly forwarded by the interested Party and to cover date, time and place of the event, its nature and the measures planned or taken on own territory and any further available information relevant to minimize the radiological consequences on the population of the other Party.

The information exchange system has to ensure the receipt and transmission on H24 and that the operating procedures are periodically tested.

In order to complement the above State level Agreement, a cooperation Arrangement between the Swiss Federal Nuclear Safety Inspectorate (ENSI) and the Italian Regulatory Authority (it was ISPRA, now ISIN) on nuclear safety matters was concluded on June 2011. On November 2012 an Italian-Swiss Commission for the cooperation on emergency preparedness and response and on matter of nuclear safety was established with the task to coordinate the overall cooperation activity. The Arrangement has been updated in July 2019 as result of the establishment of ISIN.

In this context also the national emergency Organizations (Civil Protection Department of the Presidency of the Council of Ministers for Italy and the National Emergency Operations Centre of the Federal Office for Civil Protection of Swiss Confederation) attend the regular meetings scheduled under the cooperation Agreement.

### **Arrangement with Nuclear Safety Authority - ASNR (France)**

A cooperation Arrangement between ASN, the French nuclear safety Authority (now ASNR) and ISPRA (now ISIN), was signed on April 2010. The Arrangement is based on the early exchange of information in the event of a radiological emergency and on the co-operation in the field of the nuclear safety.

In case of an event that could endanger the population of the other country, the Party is committed to notify to the other one the event, its nature, the time and location of its occurrence and any further available information relevant to minimize the radiological consequences on the population of the other country.

The Agreement provides for the setting up a joint expert group with the task to provide a common identification of the set of specific data to be transmitted both at onset of the event and during the evolution of the accident, and the transmission method.

The points of contact of the Parties are to be available on 24h/7d bases and are to be put periodically under test.

Concerning the co-operation on nuclear safety matters, the Arrangement provides for the information exchange and cooperation in many areas of the nuclear safety regulatory matters, for example:

- legislation, regulation, safety guides and technical criteria regarding siting, design, construction, operation, decommissioning and waste management;
- licensing, inspection and enforcement procedures;
- regulatory procedure and assessment methodologies related to nuclear safety, radiation protection, quality assurance, emergency planning, environmental impact evaluation, waste management and transportation;
- major public information activities;
- information concerning research and development programs.

#### **Arrangement with Nuclear Safety Administration - SNSA (Slovenia)**

In May 2010 an arrangement between the (SNSA) of the Republic of Slovenia and ISPRA (now ISIN) for the early exchange of information in the event of a radiological emergency and co-operation in nuclear safety matters, was signed. This Agreement applies to the notification and provision of information for emergency response in case of the radiological emergencies which include accidents involving facilities or activities referred to in Article 1 of the Convention on Early Notification of a Nuclear Accident and also to exchange of information and cooperation for emergency preparedness and other nuclear and radiological safety matters. Also in the case of events not specified in the mentioned Article 1 but which are of potential interest, the Party may request information about the nature of the event, its consequences and on the undertaken countermeasures.

#### **16.4 Assessment of compliance**

Based on information reported above it may be concluded that Italy meets the requirements of this Article of the Convention.

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**Article 17. Siting**

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Each Contracting Party shall take the appropriate steps to ensure that appropriate procedures are established and implemented:

- i. for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;
  - ii. for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;
  - iii. for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;
  - iv. for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.
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Due to the status of the Italian NPPs, which are all under decommissioning, the requirements set out in the Convention are not directly applicable. It has however to be mentioned that existing legal provisions (namely Law 1860 of 1962 and the Legislative Decree No. 101/2020), provide the adequate basis to comply with the requirements established in this Article of the Convention.

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**Article 18. Design and construction**

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Each Contracting Party shall take the appropriate steps to ensure that:

- i. the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;
  - ii. the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;
  - iii. the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.
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Due to the status of the Italian NPPs, which are all under decommissioning, the requirements set out in the Convention are not directly applicable. It has however to be mentioned that that existing legal provisions (namely Act 1860 of 1962 and the Legislative Decree No. 101/2020), provide the adequate basis to comply with the requirements established in this Article of the Convention. On the bases of what is reported in this section, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable in the national situation.

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## Article 19. Operation

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Each Contracting Party shall take the appropriate steps to ensure that:

- i. the initial authorization to operate a nuclear installation is based upon an appropriate safety analysis and a commissioning programme demonstrating that the installation, as constructed, is consistent with design and safety requirements;
- ii. operational limits and conditions derived from the safety analysis, tests and operational experience are defined and revised as necessary for identifying safe boundaries for operation;
- iii. operation, maintenance, inspection and testing of a nuclear installation are conducted in accordance with approved procedures;
- iv. procedures are established for responding to anticipated operational occurrences and to accidents;
- v. necessary engineering and technical support in all safety-related fields is available throughout the lifetime of a nuclear installation;
- vi. incidents significant to safety are reported in a timely manner by the holder of the relevant licence to the regulatory body;
- vii. programmes to collect and analyse operating experience are established, the results obtained and the conclusions drawn are acted upon and that existing mechanisms are used to share important experience with international bodies and with other operating organizations and regulatory bodies;
- viii. the generation of radioactive waste resulting from the operation of a nuclear installation is kept to the minimum practicable for the process concerned, both in activity and in volume, and any necessary treatment and storage of spent fuel and waste directly related to the operation and on the same site as that of the nuclear installation take into consideration conditioning and disposal.

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Due to the status of the Italian NPPs, which are all under decommissioning, the requirements set out in the Convention are not directly applicable. It has however to be mentioned that that existing legal provisions (namely Act 1860 of 1962 and the Legislative Decree No. 101/2020), provide the

adequate basis to comply with the requirements established in this Article of the Convention. On the bases of what is reported in this section, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable in the national situation.

## Section D. List of acronyms

<b>ALARA</b>	As Low As Reasonably Achievable
<b>AMR</b>	Advanced Modular Reactor
<b>ANPA</b>	National Environmental Protection Agency
<b>APAT</b>	National Agency for the Environment Protection and Technical Services
<b>ARERA</b>	Italian Regulatory Authority for Energy, Networks and Environment
<b>BWR</b>	Boiling Water Reactor
<b>CEI</b>	Comitato Elettrotecnico Italiano
<b>CEVaD</b>	Centre for Data Elaboration and Evaluation
<b>CIPE</b>	Inter-Ministerial Committee for Economic Planning
<b>DISP</b>	Nuclear Safety and Health Protection Directorate
<b>ENEA</b>	Agency for New Technologies, Energy and Environment
<b>ENEL</b>	National Electricity Company
<b>GCR</b>	Gas Cooled Reactor
<b>IAEA</b>	International Atomic Energy Agency
<b>ICRP</b>	International Commission on Radiological Protection
<b>ISPRA</b>	National Institute for Environmental Protection and Research
<b>LWR</b>	Light Water Reactor
<b>NEA</b>	Nuclear Energy Agency of OECD
<b>OECD</b>	Organisation for Economic Co-operation and Development
<b>PWR</b>	Pressurised Water Reactor
<b>QA</b>	Quality Assurance
<b>SO.G.I.N.</b>	Nuclear Installations Management Company
<b>SMR</b>	Small Modular Reactor
<b>SMS</b>	Safety Management System
<b>UNI</b>	Ente Nazionale Italiano di Unificazione
<b>WENRA</b>	Western European Nuclear Regulators Association

## Section E. Annexes

### **Annex 1 – Background historical information on the past Italian nuclear programme**

Commercial utilisation of nuclear power in Italy started in 1964 and within 1981 four nuclear power plants, namely the NPPs of Garigliano (BWR), Latina (Gas Grafite), Trino (PWR) and Caorso (BWR), had been commissioned.

Moreover, during the same period a LEU fuel fabrication installation (Fabbricazioni Nucleari S.p.A.), one fuel reprocessing facilities for uranium (EUREX) and one fuel reprocessing facilities for U-Th cycle (ITREC) plus other fuel experimental facilities (IPU, OPEC) and research reactors, had been commissioned.

The three NPPs of Latina, Trino and Caorso continued to be operated until 1987, when they were definitively shut down based on a governmental decision which in such a way interpreted the results of a national referendum called upon after the Chernobyl accident. The NPP of Garigliano had been already shut down in 1978, for technical reasons.

At the same time, the nuclear programme was closed, the Interministerial Committee for the Economic Planning (CIPE) required the National Electricity Company (Enel S.p.A.) to decommission the NPPs and a “safe store” option was adopted.

In 1999, all Enel S.p.A. liabilities and assets connected to nuclear power were assigned to a newly established company, named SO.G.I.N. (Società Gestione Impianti Nucleari) S.p.A., whose shareholder is the Ministry of Economy and Finance, while the strategic and operational aims are given by the today Ministry of Environment and Energy Security. The primary mission of SO.G.I.N. S.p.A. is to cover the decommissioning of all Italian nuclear installations and the safe management of the spent fuel and radioactive waste.

The spent fuel and the largest part of the radioactive waste to be managed in Italy derive from the operation of the above mentioned NPPs and fuel cycle facilities. As far as spent fuel is concerned, part of that has already been transferred abroad for reprocessing (namely the fuel of Latina and Caorso and the most of the fuel of Garigliano and Trino NPPs). In the framework of the Inter-Governmental agreement between Italy and France, the transfer in France of the remaining amount of fuel still in Italy for reprocessing, is foreseen. According to the same agreement, the treated and conditioned waste resulting from the reprocessing will return to Italy.

The technical guidance and standards that at the early 60ties were initially assumed as reference for the design, construction and operation of NPPs were essentially the ones developed in the Country where the specific technology was originated (US and UK).

A long process of assimilation into the main stream of the industrial and regulatory practices has been taking place since the inception of the Italian nuclear program. In the 80ties, some specific Italian requirements were introduced into a new homogeneous framework establishing general criteria and requirements applicable to pressurised light water reactors. That process lead to an approach that resulted in establishing integration between safety and radiation protection requirements. Full use of probabilistic assessments was required by applicants for demonstration of having met the radioprotection objectives in terms of doses to members of the public for the entire spectrum of operational scenarios (including transients and accidents).

A reflection of the adoption of nuclear US technologies was the use of some parts of 10 CFR (U.S. Code of Federal Regulations), and of other US industrial standards.

## Annex 2 – Status of nuclear installations in Italy

### Garigliano NPP



The Garigliano NPP is located in a curve on the left side of the homonymous river, making the border between the regions of Campania and Lazio, about 7 km from the Tyrrhenian Sea, in the municipality of Sessa Aurunca (CE). The plant construction ended in 1963, the commercial operation took place from 1964 to 1978 and, presently, the plant is under decommissioning.

The Garigliano NPP has been designed as a dual cycle BWR plant, 506 MWt, 160 MWe. The main nuclear components are the reactor vessel, the steam drum separator, the associated risers and downcomers tubing, two U-tubes steam generators. The nuclear island is enclosed in a steel spherical containment, 22 mm thick, with penetrations for connecting water-steam pipes to the turbine building.

In 1978, since structural problems had been discovered in the steam generators and given the short residual life of the plant, the owner (ENEL) took the decision to definitely shutdown the plant. In this regard the Ministry of Industry, now Ministry of Environment and Energy Security, issued in 1985 a licence for the plant decommissioning based on a safe storage strategy. Plant operation was performed based on Surveillance Rules, Technical and Management Procedures of the Operation Manual, under a quality system regime.

In 1985-1987, the nuclear fuel (about 300.000 TBq) was moved from the plant, to the spent fuel storage facility "Deposito Avogadro" in Saluggia (VC), for long term wet storage. Furthermore, extensive radioactive waste management activities related to low level waste were accomplished through treatment processes based on compaction and supercompaction. The intermediate level liquid waste from the reactor water chemical cycle and the activated solid waste were conditioned

by cementation. The generated waste was stored in the turbine building and in other structures on the plant site.

Another important activity was aimed to reach the safe storage condition of the reactor building (the so called CPP – “Custodia Protettiva Passiva”): extensive decontamination of accessible areas and equipment was performed, many systems and equipment were disconnected or de-energized, the nuclear components and process systems were emptied of operating fluids, their openings and penetrations were closed, fire loads in the containment were minimized, an internal sealed zone including the containment rooms with nuclear components, served with a passive filtered ventilation, was established in the containment to maintain the confinement of the residual radioactivity and to avoid its diffusion outside.

In 2001, on the basis of the Government decision to change the decommissioning strategy from safe storage to a single step decommissioning of all nuclear installations in Italy, an overall decommissioning plan was issued for Garigliano NPP. Later on, other projects have been issued and in particular, a project to build a new 4-modules structure for the temporary storage of existing wastes (about 500 TBq) and the future wastes from the single step decommissioning (about 700 TBq).

Several preparatory decommissioning activities have been performed in the past years.

In September 2012 the decommissioning licence was granted to SO.G.I.N. for Garigliano NPP based on the immediate dismantling, single step strategy.

The following main activities have been completed in the site:

- removal of asbestos in the turbine and reactor buildings,
- refurbishment of the pre-existing diesel generator building in a structure for interim storage of radioactive waste,
- realization of the “D1” interim storage facility for radioactive waste,
- remediation of underground trenches used for storage of very low level technological waste;
- demolition of the old stack used during operation and commissioning of a new one;
- dismantling of part of big components in turbine building (generator);
- commissioning of the new system for the treatment of the liquid waste;
- dismantling of the piezometric tower,
- conversion of the turbine hall in materials/waste treatment facility,
- adjustment and recovery of reactor building auxiliary systems needed for decommissioning,
- adjustment and recovery of turbine building systems needed for dismantling of thermal cycle and electric system components (turbine, generator, condenser, heater, steam pipes and valves,.),

The following main activities are under implementation:

- refurbishment of old interim storage facilities;
- dismantling of the vessel internals;
- construction of the new interim storage facility called “D2”;
- dismantling of old radioactive liquid treatment facility;
- dismantling of no more needed components in the Reactor Building;
- realization of the waste route from Reactor building and Turbine building.

The following main activities are under regulatory review and assessment:

removal of vessel internals.

### **Trino NPP**



The “Enrico Fermi” NPP, a 270 MWe PWR plant supplied by Westinghouse, is located in the northern Italy, in the municipality of Trino (VC), on the left bank of the PO river. It was operated by Enel from 1965 to 1987. Its operation was smooth, with the exception of two prolonged interruptions for implementation of important safety upgrades. After final shutdown, imposed by the Government after the Chernobyl accident, the decision was taken to put the plant in the safe storage condition in view of future decommissioning. In 1992 the reactor was defueled. All was removed from the plant.

In August 2012 the decommissioning licence, based on one phase strategy until the unconditional release of the site, was granted to SO.G.I.N. for Trino NPP.

In the Trino NPP significant activities on conventional parts were conducted during the safe store decommissioning phase, addressed to put out of service systems not any more necessary for the safe management of the plant.

Up to now several activities connected to decommissioning have been performed: removal of conventional parts, removal of asbestos, waste characterization and treatment, decontamination of steam generators, implementation of a new water supply system for the plant not derived from the Po river, modification of containment ventilation system; removal of material and equipment, located inside the controlled zone of the plant.

Other activities relevant to plant decommissioning or to maintaining the plant safety include: updating of the plant SAR, implementation of fire prevention and protection programme, updating of plant operation and management documentation.

At present the radioactive waste (about 1050 m<sup>3</sup>, 330 m<sup>3</sup> of which is still to be conditioned) is stored in the two storage facilities of the NPP site. Some semi-liquid radioactive waste (resins and sludge) is still to be conditioned.

The following main activities have been completed in the site:

- shipment of all remaining spent fuel abroad,
- restoration of reactor building ventilation system,
- treatment of LLW,
- commissioning of a new radioactive waste buffer building,
- upgrading of the system for treatment of liquid waste,
- removal of activated materials from clean-up system purifiers pool.

The following main activities have been approved and are being performed:

- refurbishment of one of the two existing interim storage facilities,
- radiological characterization of the Reactor Pressure Vessel (RPV) and internals and dismantling of the primary circuit,
- realization of the facility for treatment of dismantled materials,
- refurbishment of one of the two existing interim storage facilities.

The following main activities are under regulatory review and assessment:

- dismantling of the Auxiliary Building systems.
- dismantling the Reactor Pressure Vessel (RPV) head and part of the internals (upper package).
- realization of a grouting station for waste conditioning.

## Caorso NPP



Caorso NPP, a BWR unit (882 MWe), started its commercial operation in the year 1981 and was permanently shut down in 1986, just after the 4<sup>th</sup> refuelling.

Since 1998, the reactor core has been completely defueled and all the irradiated fuel elements were transferred to the spent fuel pools, in view of its shipping for reprocessing.

The NPP is actually regulated by the decommissioning licence granted in February 10, 2014.

The following activities have been completed in the site:

- decontamination of the circulation loops and of the clean-up system has been completed on February 2004,
- dismantling activities of RHR towers were completed in 2009 while the dismantling of thermal cycle and electric system components (turbine, generator, condenser, heater, steam pipes and valves,..) in turbine building and off-gas system respectively ended in 2009 and 2013,
- in May 2010, the permission to put into operation the Phadec plant for the chemicals decontamination of metallic materials, deriving from the dismantling inside the turbine and Off-Gas buildings was granted,
- in June 2010 the activities for removal and transport of all the spent fuel that were started in December 2007 for a total of 1032 spent fuel elements were completed,
- the over reduction of volumes of about 600 drums of technological radioactive wastes with 1.2 GBq of total radioactivity, on the bases of an international contract signed from SO.G.I.N. with Sweden company (Studvick) for the supply of treatment and conditioning services for operational radioactive wastes, in the period between July 2011 and May 2012, was carried out sending 355 ton of low activity wastes (1.84 GBq) of Caorso NPP to be incinerated and

put up in the cement matrix. In August 2013 wastes treated and conditioned returned to the site,

- The operational radioactive waste (resins and sludge for a total of 1250 m<sup>3</sup>) have been shipped abroad at Bouniche plant in Slovakia for treatment. Last shipment was performed in April 2022 and in December 2023 the treated waste were shipped back at Caorso NPP,
- In December 2022 the waste route from Reactor building and Turbine building was realized, In October 2023 a first existing interim storage facility refurbishment was completed.

The following activities are ongoing:

- realization of the waste management facility and storage buffer area in the turbine building,
- refurbishment of other two existing interim storage facilities,
- dismantling of auxiliary systems and components in the Reactor building.

### **Latina NPP**



The 160 MWe GCR of Latina is located on the Tirrenian sea coast, around 70 Km south of Rome. It was operated by Enel since 1962 until 1986. The initial installed electrical power of 210 MWe was later downrated to 160 MWe, after a reduction of 30°C of coolant temperature to avoid oxidation of reactor internals. The plant was definitely shutdown in November 1986, after the Chernobyl accident, by Government decision.

Since then, all spent fuel has been removed from the plant and the primary circuit has been filled with dry air. At present, the radioactive waste derived from plant operation (about 1220 m<sup>3</sup>, 900 m<sup>3</sup> of which is still to be conditioned) is stored in different facilities of the NPP site.

The NPP is actually regulated by the decommissioning licence granted on May 20, 2020.

The overall decommissioning licence is based on two phases:

- The first phase foresees the reduction of the height of the reactor building and the putting the reactor building in safe conservation.
- The second phase, to be implemented only after the commissioning of the national repository, foresees the dismantling of all structures with the aim to reach the green field end state.

The following activities have been completed in the site:

- commissioning of an interim storage facility,
- removal of large components stored in the spent fuel pond,
- removal and decontamination of blower shells,
- recovery of buried waste from KCFC trench,
- spent fuel pool sludge processing in the LECO facility.

The following main activities have been approved and are being performed:

- realization of a station for the treatment of materials derived from dismantling activities,
- realization of new facility for treatment of liquid waste (ITEA),
- removal of systems and components from reactor building,
- spent fuel pool decontamination,
- dismantling of steam generators.

The following activities are under regulatory assessment:

- magnox waste removal,
- old radioactive liquid treatment facility dismantling.

## Annex 3 – Research reactors in operation in Italy

The following describes the three research reactors currently in operation in Italy.

### TAPIRO RSV



The RSV TAPIRO nuclear reactor is a fast neutrons source, and its design is based on the Argonne Fast Source Reactor - Idaho Falls. The reactor's name comes from the Italian acronym Reattore Sorgente Veloce TARatura Pila Rapida potenza 0 (Fast source reactor - Fast Pile Calibration at 0 Power). RSV TAPIRO was built in the sixties and its first criticality was in April 1971. The RSV TAPIRO operates with a licence granted by the Italian "Ministero dell'Industria del Commercio e dell'Artigianato" (Ministry of Industry, Trade and Craft) to ENEA on November 29<sup>th</sup> 1985 (D.M. VII-225) and is renewed every 5 years. The last renewal was granted in December 2022. In the same site of RSV TAPIRO is located also the TRIGA RC-1 research reactor. Both are operated by ENEA.

The RSV TAPIRO reactor can operate at the maximum power of 5 kW, and the neutron flux at the center of the core at full power is about  $4 \cdot 10^{12} \text{ n} \cdot \text{cm}^{-1} \cdot \text{s}^{-1}$ . The reactor core is a cylinder made of highly enriched metallic uranium (weight 98.5% U; 1.5% Mo) enclosed in a stainless-steel cladding. The core is split into two parts, the first one is fixed and takes up 2/3 of the total volume, whereas the second one is movable. The core refuelling is not contemplated due to the low value of the fuel burn-up. The cylindrical core is surrounded by a cylindrical reflector made of copper, with a thickness of about 30 cm and a height of 72 cm. The reflector is housed in a steel sheath surrounded by a biological shield made of borate concrete of about 1.3 m. The reactivity is controlled by the movement of 5 control rods and a safety plug composed of the movable core and reflector. The heat is removed by a flow of Helium and a Helium-Freon heat exchanger. Many irradiation channels crossing the reflector are used for the neutron irradiation experiences. The main channels on the horizontal plane are two radial channels, a diametral channel, and a tangential channel.

Since 1971, when the reactor reached its first criticality, the TAPIRO nuclear research reactor has been used as a source of fast neutrons for several research activities in the fields of aerospace,

nuclear fusion, burning of minor actinides, particle accelerators, neutron cross-sections measurement, biological damage. The neutron field produced by the reactor was characterized during a very important experimental campaign performed from 1980 to 1985 in collaboration with the SCK-CEN center in Mol, Belgium. In this characterization campaign, it was demonstrated that the TAPIRO can provide neutron fluxes with extremely variable energy spectra starting from that close to the fission spectrum that occurs at the center of the core. This characteristic, together with the excellent spherical symmetry of the spatial distribution of the flow, makes the TAPIRO a unique facility for notable metrological and experimental applications. In 2012, the TAPIRO reactor became part of the Mediterranean Research Reactor Network (MRRN) promoted by the IAEA, and in 2016, it was included in the neutron training program organized by the National Institute of Metrology of Ionizing Radiations (INMRI) of AENEAS. The life of TAPIRO was characterized by a few significant operational stops. One occurred in 1978 when a fire event was initiated in a component of the console in the control room and involved several electrical cables and electronic devices. The event was characterized by slow combustion with the absence of flames; more precisely, we can classify this event as a smoldering event. The reactivation of the reactor required about two years. From 2012 to 2020, there was a second plant shutdown to restore its nominal configuration and reconfigure the irradiation channels and reflector.

## **TRIGA MARK II**



The TRIGA MARK II reactor is installed at the University of Pavia, Applied Nuclear Power Laboratory (LENA), and reached the first criticality on November 15, 1965; the operation of the facility at present is authorized with the Decree of the Ministry of Economic Development n.VII-285 of May 22, 1990

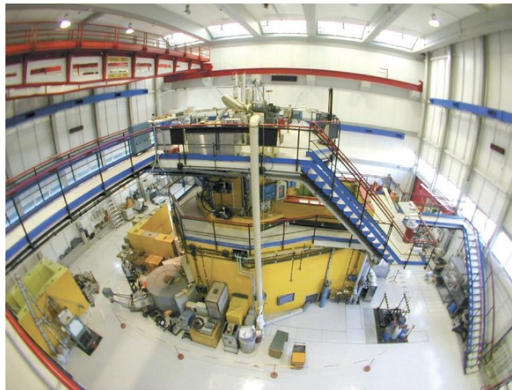
LENA is an "Interdepartmental Service Laboratory" of the University of Pavia which manages, in addition of the TRIGA reactor, also a IBA CYCLONE® 18/9 cyclotron to produce radioisotopes. The Laboratory is also equipped with other radiation sources, such as an industrial RX irradiator, a Co-60 irradiator and laboratories for the manipulation of radioactive materials produced by neutron activation. LENA is part of the Nuclear Pole of the University, which includes the

Radiochemistry area with a medium-activity laboratories (NAA), a sub-critical assembly, SM1 complex, that consists of 206 fuel elements divided into ingots (5 for each element) for a total of about 2000 kg of natural uranium. The neutron injecting source is a Pu-Be source with an intensity equal to  $7 \cdot 10^6 \text{ s}^{-1}$ . It also belongs to this area, the Environmental Monitoring Laboratory, equipped dedicated to gamma, LSC and alpha measurements.

The TRIGA (Training Research and Isotopes-production General Atomics) Mark II is in operation since November 1970 and is a pool-type reactor cooled and partly moderated by light water, with the fuel consisting of a uniform mixture of uranium and zirconium hydride, which provides a negative prompt temperature coefficient. The TRIGA Mark II installed at the Laboratory of Applied Nuclear Energy (L.E.N.A.) of the University of Pavia is licensed for operating at 250 kW power in steady state, with the total neutron flux of about  $2 \cdot 10^{13} \text{ n} \cdot \text{cm}^{-1} \cdot \text{s}^{-1}$ . The reactor core is shaped as a right cylinder and contains 90 slots, distributed over 5 concentric rings; they can contain either fuel elements, graphite (dummy) elements, control rods or in-core irradiation channels. The fuel consists of a uniform mixture of uranium (8% wt., enriched 19.95% wt. in  $^{235}\text{U}$ ), zirconium (91% wt.) and hydrogen (1% wt.). These elements are solid cylinders, assembled with top and bottom graphite reflectors and an aluminium alloy or stainless-steel cladding. Core reactivity is governed by three control rods, named Shim, Regulating and Transient; the first two contain boron carbide, while the latter is filled with boron enriched graphite. A 30 cm thick radial graphite reflector surrounds the core while the axial reflector is provided by two graphite cylinders located at the ends of the fuel element itself (inside the cladding).

The TRIGA Mark II reactor is operated in compliance with the license and in compliance with the plant requirements, regulations and current legislation. Starting from the first release of the operating license, considering the subsequent renewals and the release in 1990 of the current operating license with the related five-year extensions, the Operator has demonstrated that the objectives and design criteria of the structures, systems and components identified for safety purposes have been achieved. The plant documentation starting from the Final Safety Report and through the technical reference documentation and publications proves the reliability, stability and operability of the TRIGA type Reactor.

## TRIGA RC-1



Since June 1960 a TRIGA (Training Research Isotopes General Atomics) Mark II reactor, built by General Atomics, is in operation at the ENEA Casaccia Research Center that is located in S. Maria di Galeria, a small area in the municipality of Rome. This reactor, named RC-1 (Casaccia Reactor 1), was operated at 100 kW power up to August 1965. At this power the maximum flow in the core was  $4 \cdot 10^{13} \text{ n} \cdot \text{cm}^{-1} \cdot \text{s}^{-1}$ . During the period from June 1960 until August 1965 the TRIGA RC-1 reactor was used for research in the field of Physics of Solids and Nuclear Physics, as well as for the preparation of radioisotopes used for physics, biology and chemistry experiments. In the summer of 1965, work began to increase the reactor power to 1 MW. The first criticality in the current operating configuration of 1 MW was reached in July 1967.

From the date of the first criticality in the current 1 MWth operating framework (July 1967), until the date of issue of the operating license (Ministerial Decree No. VIII/27 of September 10th, 1970), the Safety and Control Division of CNEN (the national competent regulatory authority for nuclear safety and radiation protection at that time) authorized the provisional operation of the reactor for performing nuclear power tests (measurements of the temperature prompt coefficient, determination of spatial distribution of the neutron flow, measurement of power effects, detection of the radiological parameters, etc.) and for the functional verification of experimental equipment coupled directly or indirectly to the core.

TRIGA reactors are the most widely used non-power nuclear reactors in the world. These nuclear research reactors are used in many diverse applications, including production of radioisotopes for medicine and industry, treatment of tumors, nondestructive testing, basic research on the properties of matter, and for education and training.

TRIGA RC-1 reactor is mainly utilized for training of reactor's operators and students from the university, neutron activation analysis, non-destructive techniques, tests on new type of neutron detectors and as a reference facility for safety-security emergency drills. During these 50 years of operation, many experiments took place also in the field of radiochemistry for medicine and industry.

In 2017, the TRIGA RC-1 reactor was operated for a total of a few MWd due to planned replacement and maintenance activities of nuclear instrumentation for reactor control and monitoring. These activities include a series of interventions aimed at adapting the SSCs of the TRIGA RC-1 reactor due to ageing, on the basis of the evaluations performed during the first ENSREG Topical Peer Review that has been introduced by the revised Nuclear Safety Directive 2014/87/Euratom. In the second half of 2018, the reactor has been put in temporary shutdown condition in order to implement some interventions based on ageing-related evaluations and involving both the structural part of the reactor building and the electrical power supply part, in addition to the modernization of the instrumentation and control system.

In the period 2020 – 2022, following the various plant shutdowns, the reactor was operated for the activities aimed at identifying damaged fuel element, which has been extracted in February 2022. In June 2024 a new reactor core configuration was defined.

## **Annex 4 – List of acts, decrees, regulations, guides and standards**

### **a) Acts and Decrees**

**Act No. 933/1960:** on the establishment of the National Committee for Nuclear Energy (CNEN);

**Act No. 1860 of 31 December 1962:** published in the Italian Republic's Official Journal No. 27 of 30 January 1963, as amended by the President's Decree No. 1704 of 30 December 1965 (Italian Republic's Official Journal No. 112 of 9 May 1966) and by the President's Decree No. 519 of 10 May 1975 (Italian Republic's Official Journal No. 294 of 6 November 1975);

**Presidential Decree No. 185 of 1964:** "Safety of plants and protection of workers and general public against the risk of ionising radiation associated to the peaceful use of Nuclear Energy replaced in 1996 by the Legislative Decree No. 230/1995, described below;

**Presidential Decree No. 1450/1971:** which contains Requirements and procedure for the acquisition of the operational personnel licences;

**Presidential Decree No. 519/1975:** "Civil responsibilities in the field of nuclear safety";

**Act No. 393/1975:** which contains Administrative rules on the selection of the site for NPPs;

**Act No. 84/1982:** on the establishment of the State Agency for new technologies, energy and environment (ENEA);

**Act No. 61/1994:** on the establishment of the National Agency for the Environment Protection (ANPA);

**Act No. 10 of 19<sup>th</sup> January 1998:** promulgated for the ratification of the Convention on Nuclear Safety;

**Legislative Decree No. 300/1999 and President of the Republic Decree No.207/2002:** on the establishment of APAT, by merging ANPA with other national Technical Services;

**Legislative Decree No. 241 of 26th May 2000:** which has transposed EU (European Union) directive 96/29/Euratom laying down basic safety standards for the radiation protection of workers and the public; the standards laid down in the directive incorporate the 1990 Recommendations of the International Commission on Radiation Protection (ICRP) into EU radiation protection legislation. Decree No. 241 has modified and integrated Legislative Decree No. 230 of 1995, the latter constitutes the main piece of legislation laying down radiation protection requirements for workers and the public;

**Legislative Decree No. 257 of 9th May 2001:** which modified certain details in Legislative Decree No. 241 of 2000 concerning requirements for notification and authorisation of non nuclear installations where ionising radiation is used for industrial, research and medical purposes;

**Act No. 368 of 24<sup>th</sup> December 2003:** establishing the procedures for the site selection of a national repository for HLW;

**Act No. 239 of 23<sup>rd</sup> August 2004:** promulgated for the rearrangement of the energy sector extends the procedures established by the Act No.368 of 2003 also for the site selection of a national repository of LLW;

**Decree of 2<sup>nd</sup> December 2004 of the Ministry of Production Activities** (now Economic Development) provides directives to SO.G.I.N. for the implementation of decommissioning and radioactive waste management activities. The Decree also charges SO.G.I.N. to explore the feasibility of sending all the spent fuel currently stored in ITALY to abroad for reprocessing.

**Act No. 282 of 16<sup>th</sup> December 2005:** promulgated for the ratification of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management;

**Act No. 286/2006:** on the reorganisation of APAT as a legal entity of public administration, endowed with new institutional Organs;

**Legislative Decree n. 52 of 6<sup>th</sup> February 2007** which transposes EU directive 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources.

**Legislative Decree No. 23 of 20th February 2009:** which has transposed EU directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel; Legislative Decree No. 23/2009 has modified pertinent administrative provisions previously contained in Legislative Decree No. 230/1995 concerning the transboundary shipments of radioactive waste. Legislative Decree No. 230/1995 now contains new provisions on the supervision and control of shipments of spent fuel.

**Act No. 99/2009,** related to the process to start a new nuclear programme, in Article 29, establishes a new Nuclear Safety Agency with the role of Regulatory Body. As already mentioned, the Agency will be made by the resources of the Nuclear Department of ISPRA and by resources from the Agency for New technologies, Energy and sustainable development (ENEA). The full establishment of this new Safety Authority has, however, still to be completed.

**Legislative Decree No. 31/2010** related to the future nuclear development in Italy, provides criteria for the site selection procedure with the involvement of local administration, for the approval and for the compensation of the local municipality. The Decree includes also provisions for the site selection procedure of the national site for radioactive waste disposal giving the responsibility to SO.G.I.N.. Following the referendum in 2011 the decree was amended by abrogating parts related to the construction of new NPPs.

**Legislative Decree No. 41/2011** amended the Legislative Decree 31/2010 with reference to the future nuclear development in Italy.

**Act No. 75 of May 26<sup>th</sup> 2011** that modifies all the provisions given in the Act No.99/2009 and in the Legislative Decree No. 31/2010, as amended by the Legislative Decree No.41/2011, relevant to the development of new NPP in Italy, relinquishing the nuclear development in Italy. The provisions for the development of the national site for LLW disposal and ILW-HLW interim storage has been confirmed. Furthermore, by abrogating the Articles 8 and 9 of the Legislative Decree no. 230 of 1995, The Act 75/2011 slightly modifies the regulatory process by cancelling of the “Technical Commission on Nuclear safety and Radiation Protection”. This Commission was entitled to formulate an independent technical advice to ISIN (ex ISPRA) during the assessment process connected to the granting of licences, authorizations and approval of detailed designs.

**Legislative Decree No. 100 of 1st June 2011** which modifies the provisions of article 157 of Legislative Decree No. 230/1995 concerning the radiometric surveillance of metal scraps.

**Legislative Decree No. 185/2011** which transposes the EU Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.

**Act No. 214 of December 2011** abolished the Nuclear Safety Agency (created with the Act 99/2009, but not yet applied) and the functions have been temporary assigned to ISPRA (that in fact continue its work as nuclear authority) waiting for a definitive asset of the regulatory organization.

**Act No. 27 of March 2012** on the economic development, through the Art. 24, establishes new procedures to reduce the timing of the licensing phases for decommissioning activities with a strong involvement of local administrations.

**Act No. 100 of 12th July 2012:** regarding provisions on civil protection reorganisation.

**Legislative Decree No. 45/2014** which transposes the Directive 2011/70/EURATOM establishing a community framework for the responsible and safe management of spent fuel and radioactive waste

**Joint Decree of 7th August 2015** of the Ministry of Environment, Land Protection and Sea and the Ministry of Economic Development regarding a new radioactive waste classification.

**Act. No. 58/2015** on the ratification of the Amendment to the Convention on Physical Protection of Nuclear Materials and Nuclear installations.

**Legislative Decree n.137/2017** which transposes the Directive 2014/87/EURATOM on nuclear safety

**Legislative Decree No.101/2020** laying down basic safety standards from Directive 2013/59/Euratom, entered into force repealing the Legislative Decrees No. 230/1995, No. 187/200, No. 241/2000 and No. 52/2007, rearranging the legislation in the field of radiation protection.

**Decree of the Presidency of the Council of Ministers of 14 March 2022** “Adoption of the National Plan for the Management of Radiological and Nuclear Emergencies”

**Decree of the Presidency of the Council of Ministers of 29 April 2022** “Determination of the reference levels for radiological and nuclear emergency exposure situations and of the generic criteria for the adoption of protective measures to be included in the emergency plans referred to in Title XIV, Chapter I, of Legislative Decree 31 July 2020, n. 101”

**b) Technical guides addressing nuclear installations**

T.G. No. 1	“Content of the Preliminary Safety Analysis Report for NPPs“
T.G. No. 2	“Procedure for the Authorisation of Changes in NPPs“
T.G. No. 4	“Detailed Construction Designs“
T.G. No. 8	“Quality Assurance Criteria for NPPs“
T.G. No. 9	“Quality Assurance Description of the documentation required for design and construction phases prior to carry out nuclear tests“
T.G. No. 11	“Criteria for the compilation of information reports on the operation of NPPs to be sent to DISP“
T.G. No. 20	“Quality Assurance Description of the documentation required for operation phase of NPPs“
T.G. No. 21	“Content of Operating Rules“
T.G. No. 22	“Quality Assurance. Guide for collection, storage, preservation, and safekeeping of quality assurance records for NPPs“
T.G. No. 23	“Quality Assurance. Guide for procurement of Items and Services for NPPs“
T.G. No. 24	“Quality Assurance. Guide for Auditing on QA Programmes for NPPs“
T. G. No. 25	“Quality Assurance. Guide for Applying on design activities for NPPs“
T. G. No. 27	“In-service Inspection”
T. G. No. 31	“Safety criteria for decommissioning of nuclear installations”

## c) Technical Standards

### UNI standards related to decommissioning

The Standards applicable to the decommissioning of Italian installations are set out in a single document issued by the national standards organisation (UNI): UNI 9498.

That standard contains eight sections covering different topics. The contents of the individual sections of the document are summarised below.

In general, the present standard pertains explicitly to the following type of installations:

- nuclear reactors;
- nuclear subcritical units;
- nuclear power plants;
- nuclear research plants;
- nuclear plants for spent fuel reprocessing;
- plants for preparation and fabrication of special fissile materials and of nuclear fuel;
- storage of special fissile materials and of nuclear fuel;
- installations for reprocessing, conditioning or temporary storage of radioactive wastes.

The standard is not applicable to:

- uranium mines;
- storage of final disposal of radioactive wastes;
- plant where during the operation, no radioactivity has been produced;
- plants which have been converted to a new nuclear related use.

### UNI 9498/1 - General criteria

This standard gives a general picture that includes principles and factors which have to be considered for the decommissioning of a nuclear plant. It includes the general requirement that all the procedures, either of a management, accounting and administrative type, or of a technical type, must be planned and done in a controlled and documented way.

The standard is addressed to the operator of nuclear plants to be decommissioned and to persons responsible for the planning and execution of decommissioning operations; it provides to indications and recommendations about the methods and the technical options which are convenient in order to maintain an adequate health protection for workers, public and environment, and finally to minimise the radiological risk associated to the plant.

The scope of the standard begins at the decision of the owner/operator to permanently shut down the plant, and terminates when a situation without radiological constraints is reached. The status of the plant taken as a reference in the present standard is the configuration existing at the moment the decision is made to permanently shut down. The radioactive

substances considered are those associated with the normal operation of the plant itself. The standard does not deal with decommissioning activities following a severe accident.

The aspects related to processing, conditioning, transportation and disposal of radioactive wastes are not included in the scope of the standard. The numerical definition of radioactivity limits for materials free from radiological constraints are also not included. Nor the management, accounting and administrative aspects. The standard does not exempt the user from observing the rules and authorising procedures in force.

#### UNI 9498/2 - Decontamination techniques

The section describes the principles and the methodologies which have to be considered for the planning and execution of decontamination activities at a nuclear plant being decommissioned, for the case of either immediate or deferred dismantling. It provides technical information and recommendations necessary to the owner/operator of the plant and to people responsible for the planning and execution of all the decontamination procedures which are useful in improving the conditions of radiological protection at the plant as well as in achieving the optimum management of wastes.

It is not applicable to plants which, following an accident, show a generalised contamination of components, structures and buildings and of the site itself. In this case specific decontamination techniques will have to be set up, and they are allowed to be different to those described in the present standard.

#### UNI 9498/3 - Storage and surveillance

This section identifies the fundamental activities which are necessary to be done on a nuclear plant at the end of operation, to leave it in a safe condition for an adequate period of time. It is concerned in particular with plants where the existing radioactivity, after the complete removal of all fissile materials, is due primarily to radioisotopes which have decay times which justify placing the plant in a conservation and maintenance (C&M) state for appropriate period, in order to allow the plant to be completely dismantled with a greatly reduced level of radioactivity.

#### UNI 9498/4 - Dismantling of structures and components

This section describes the principles and the factors which have to be taken into account for the dismantling and removal of structures and components which have become contaminated and/or activated during the operation of the plant.

#### UNI 9498/5 - Radioactive inventory

This section specifies the methodologies to be followed in the evaluation of the remaining radioactivity and of the associated radiation fields in order to carry out the radiological

characterisation of the nuclear plants to be decommissioned. Such methodologies must be programmed and performed in a checked and documented way.

UNI 9498/6 - Radiological characterisation and classification of materials

This section deals with the factors which have to be taken into account to characterise and classify the materials produced during the decommissioning of nuclear plants. It provides the criteria against which the most appropriate methodology for characterisation and classification of materials as a function of their type is to be chosen, as well as provides guidance for the choice of measurement instrumentation appropriate to define the radiological state of the materials.

UNI 9498/7 - Criteria for partial release of a nuclear plant and/or site

This section deals with those nuclear plants to be decommissioned for which a decision has been made to delay final dismantling for a sufficiently long period of time, such that they will have to be placed in a C&M state.

The decision of putting a part of a nuclear plant in a C&M state depends on the requirement to release some zone where other activities of a non-nuclear type can continue to be performed.

Usually the part of the plant that will be put in a C&M state will be that part where the radioactivity cannot be easily removed but can be confined for long periods of time in well-defined and sealed zones. Usually these are areas where the major part of the radioactivity is coming from neutron activation.

UNI 9498/8 - Requirements for the temporary storage of radioactive wastes and materials

This section gives the criteria to be followed in the design of a temporary store for the radioactive wastes resulting from the operation and dismantling of the nuclear plants. It also provides the general technical requirements which have to be fulfilled either in the design and management of the new temporary store, or in the modification of already existing facilities.

Furthermore, it provides the criteria for environment protection against pollution resulting from management of radioactive wastes, in order to minimise the individual and collective doses of population and workers, and to preserve the quality of the environment for the present and future uses of the site.

The radioactive wastes mentioned above include those arising from reprocessing and/or conditioning activities, that are solid and satisfy the radioactivity concentration limits according to present standards for temporary storage or for disposal at an appropriate site.

## **Annex 5 – Additional information on safety and radiation protection rules**

As referred in Article 15, the main body of the applicable Italian rules is contained in the Nuclear Act 31.12.1962, n° 1860, Legislative Decree No. 31/2010, Legislative Decree No. 45/2014 and Legislative Decree n° 101/2020.

The act and the legislative decrees provide for the most important aspects concerning both safety and radiation protection, as regards not only nuclear installations but also other aspects of the uses of radiation, so as to make up a comprehensive corpus of rules at the highest level.

The legislative provisions apply to every aspect of activities relevant to radiation protection, such as:

- Construction, operation, decommissioning of nuclear installations; provisions for decommissioning are a new feature of this Legislative Decree that were not included in the previous rules.
- Production, import, export, handling, holding, processing, use, marketing, storage, transport, termination of holding, collection and disposal of nuclear radioactive substances.
- Work with radiation generating devices.
- Mining activities.
- Exposure to natural radiation sources of radiation as well as any other activity or situation involving a significant risk, such types of exposures are to be laid down by governmental decrees.
- Medical exposure.

It must be recalled here that the European Union Members States of the share common directives and regulations that have been inspiring more and more many relevant aspects of the national regulatory system, above all in the field of radiation protection. Even in the Rome Treaty, signed in 1957, directives were included regarding radiation safety fundamental rules; procurement, treatment, controls and property of special fissile material. The quoted Treaty requires (art. 37) also the notification to the member States about the construction of any kind of plant that may discharge radioactive wastes. The aim of the notification is to give the possibility to verify whether any possible discharge can lead to contamination of water, ground or air of any member state.

The Legislative Decree n° 101/2020 clearly state that the operator of a nuclear installation or non-nuclear installations or facilities making use of radioactive materials, must implement all the safety and protection measures suitable to keep the exposures of workers and population as low as reasonably achievable, social and economic considerations being kept into account. The implementation of the optimization principle by the operator must be demonstrated firstly at the design stage and subsequently along the plant operation and decommissioning.

As far as situations concerning unplanned or uncontrolled releases of radioactive material into the environment are concerned, it has been a practice in the authorization procedure - in force in Italy since 1964 – to request to the applicant an analysis of possible scenarios and the assessment of the consequences (in terms of radiological impact on representative member of the public), together with appropriate measures implemented with a view of preventing and controlling accident conditions, and mitigating their consequences, with the aim of establishing ad hoc emergency plans. An analogous provision is also established for non-nuclear installations.

### **Practices (planned exposure situations)**

In accordance with the provisions of Legislative Decree n° 101/2020, a practice with radioactive materials is subject to radiation protection requirements when the following conditions occur jointly:

- the average concentration of each radionuclide is equal to or greater than the values reported in Table I-1A of the Annex I of Legislative Decree n° 101/2020;
- the total amount of radioactivity of each radionuclide is equal to or greater than the values reported in Table I-1A.

However, for certain practices, such as medical use of radiation, deliberately adding radioactivity to consumer goods, importing and exporting such goods, discharges, reuse or recycle of radioactive materials from installations, the Italian legislation's requirements apply for any radioactivity contents, without thresholds.

The concept of triviality in individual as well as provisions for unrestricted release of radioactive materials from installations have also been formally introduced into Italian legislation according to the basic 'below regulatory concern' criteria of an effective dose  $\leq 10 \mu\text{Sv/year}$ .

From an administrative viewpoint, practices can be subject to the mutually exclusive requirements either of notification or of authorization. In accordance with the provisions of Legislative Decree n° 101/2020, a practice is subject to notification requirements starting from defined thresholds in activity and activity concentration as far as radioactive materials are concerned. A holder of sources is required to notify local authorities of his intention to carry out the practice at least 30 days before the start of the practice. Besides, detailed requirements for notification apply which closely mirror those provided for in case of authorization.

The Legislative Decree's provisions state that a practice is subject to notification insofar as requirements for authorization do not apply. In particular, nuclear installations do not require notification since they continue being subject to the ad hoc authorization requirements laid down in Legislative Decree no. 101/2020.

For non-nuclear installations using ionizing radiation for medical, industrial and research purposes, the Italian authorization system is based, as in the past, on a two tiered structure: authorization of the more important installations is the competence of the of Ministry of Economic

Development which issues authorizations in accordance with other relevant Ministries; the advice of ISIN is sought under law in order to determine technical specifications applicable to the installation.

For smaller industrial and research installations the Prefect of the province, in which the installation is located, has administrative competence to issue authorizations after seeking the advice of regional technical bodies and of the Fire Corps; the authorization required for small medical installations is issued by the Regions, which are responsible for health in the Italian system.

A Technical Annex to Legislative Decree no. 101/2020 lays down thresholds in order to determine which installations are authorized by the Ministry of Economic Development and which ones by local authorities; thresholds are set in terms of values of activity, activity concentration and neutron yield for radioactive sources, and of energy and neutron yield for accelerators. The same Annex also lays down the technical features of the radiation sources and of the installation which must be specified in the application.

An authorization is required for the release, reuse and recycle of radioactive materials from the installations and specifications to that effect are established in the license. The authorization is given on the basis of a “case-by-case” analysis which has to demonstrate compliance with the basic 'below regulatory concern' criterion stated above, in particular in Annex I of the Legislative Decree n° 101/2020 are established “clearance levels” for the release of radioactive solid materials from practices. The authorization is issued by the Regions for radioactive materials from practices subject to notification, or by the authority which grants the authorization of the practice.

The contravention to prescriptions included in the authorization acts is opposed by ad hoc sanctions.

### **Emergency exposure situations**

As regards emergency, it must be stated beforehand that requirements for detailed emergency response plans providing for intervention in case of accidents in nuclear installations had been in force in Italy since Presidential Decree no. 185 of 1964 was promulgated. Further requirements to that effect are contained in Legislative Decree no. 101/2020 in cases of radiological emergencies in non-nuclear installations.

In the Title XIV of Legislative Decree No. 101/2020 are established the general principles for interventions that must be met for the purposes of the decisions regarding the possible implementation and the extent of intervention in cases of radiological emergencies or in cases of prolonged exposure resulting from the effects of a radiological emergency or a practice that is no longer in place.

As previously said, since the promulgation in 1964 of the first Radiation Protection Decree it had been a practice in the authorization procedures to request of the applicant an analysis of possible

accident scenarios and of their radiological consequences, together with appropriate measures to be implemented with a view to preventing and controlling accident conditions, and mitigating their consequences.

Article 174 of the Legislative Decree n° 101/2020 requires for each non-nuclear installation subject to authorization that evaluations of potential exposures should be made by the applicant so that an “intervention plan” can be prepared by emergency preparedness and management Authorities.

For the installations authorized by the Ministry of Economic Development the emergency plan is always expected, while for those non-nuclear installations which require authorization by the Prefect or by the Regions, it is expected if the potential exposures are likely to exceed 1 mSv of effective dose to the representative individual of the population.

Annex XXXI of Legislative Decree no. 101/2020 lays down indicative intervention levels in terms of effective, equivalent and absorbed doses for purposes of planning and intervention in case of emergency; broadly.

### **Existing exposure situations**

Further requirements are contained in Legislative Decree no. 101/2020 and for exposure resulting from the after effects of a radiological emergency or of a past or old practice or work activity, which were not regulated in previous radiation protection legislation.

### **Dose limits**

#### **A) Workers**

The following limits shall not be exceeded for exposed workers:

- an effective dose of 20 mSv in any single (calendar) year;
- an equivalent dose of 20 mSv per calendar year to the lenses of the eyes;
- an equivalent dose of 500 mSv per calendar year to skin and extremities.

However, in exceptional circumstances, recourse can be made to specially authorized exposures for medically fit category A workers (as herein below defined) if exceeding dose limits cannot be avoided; such exposures can be incurred only by voluntary workers. In particular, no women of reproductive capacity can undergo such exposures; the same rule applies to male workers having exceeded dose limits in the twelve months before.

If for exposed workers it is exceeded the annual effective dose limit of 20 mSv, subsequent exposures must be limited, per calendar year, at 10 mSv until the annual average of the exposures for all subsequent years, inclusive the year of overcoming, is no more than 20 mSv.

### Worker classification criteria

An individual, in relation to his work activity, can be classified:

a) non-exposed worker, if he is not likely to receive, because of his work, doses exceeding the following limits in a (calendar) year:

- an effective dose of 1 mSv, or
- an equivalent dose of 15 mSv to the lenses of the eye, or
- an equivalent dose of 50 mSv to skin

(the above limits are numerically equal to those laid down for members of the public).

b) exposed worker, if in relation to his work activity he has a likelihood to receive doses exceeding the following limits in a (calendar) year:

- an effective dose of 1 mSv, or
- an equivalent dose of 15 mSv to the lenses of the eye, or
- an equivalent dose of 50 mSv to skin or extremities.

Exposed workers can be classified in two categories for monitoring and surveillance purposes: Category A and Category B workers.

**Category A workers:** Exposed workers are classified in such category when they have a likelihood to receive in a calendar year doses exceeding:

- an effective dose of 6 mSv, or
- an equivalent dose to the lenses of the eye of 15 mSv, or
- an equivalent dose to skin and extremities of 150 mSv.

**Category B workers:** Exposed workers are classified in such category when they have a likelihood to receive in a calendar year:

- an effective dose between 1 mSv and 6 mSv
- an equivalent dose to skin or extremities between 50 mSv and 150 mSv.

Exposed workers must be individually monitored for external exposures, while the evaluation of committed effective doses must be carried out on the basis of suitable physical and/or radio-toxicological methods.

Other special provisions are laid down in Legislative Decree n° 101/2020 with a view to protecting: apprentices and students of age  $\geq 18$  years (who are training for employment involving exposure to radiation), the worker classification criteria shall be applied; apprentices and students of age between 16 and 18 years (who are training for employment involving exposure to radiation); apprentices and students of age 16 years or less; pregnant and nursing women.

Moreover, delineation of work areas (i.e. supervised and controlled areas) based upon by reference to an assessment of the expected annual doses and the probability and magnitude of potential exposures, thus distinguishing work areas at risk in controlled and surveyed areas.

Special provisions are established in the Legislative Decree no. 101/2020 for outside workers and in particular the use of a radiation “passport”, logging doses incurred during their working activities.

#### B) Members of the public

The following limits shall not be exceeded for members of the public:

- an effective dose of 1 mSv per year
- an equivalent dose to the lenses of the eye of 15 mSv per year
- an equivalent dose to skin of 50 mSv per year.

#### **Radiological safety objectives and Authorized Limits**

The Italian Regulatory Practice has always made intensive use of radiological safety objectives and authorized limits for ensuring that, during normal operating conditions, doses to workers and representative members of the public are well below primary dose limits: in particular, article 5 of the Legislative Decree n° 101/2020 requires that specific dose constraints have to be established for workers and population as an optimization tool.

As regards transient and accident conditions, radiological criteria applicable to each kind of installation are identified, seeking to differentiate between various types of transient and accidental conditions in terms of reference levels not to be exceeded to the representative members of the public.

#### **Surveillance**

For the implementation of provisions regarding radiation protection of workers and public, the Italian regulatory system identifies the radiation protection expert, whose technical qualification is recognized through State examinations. Those professionals have been playing an advisory role and bearing technical responsibility, as far as radiation protection is concerned; their role consists in carrying out both preventive and periodical radiation protection evaluations and measurements, in particular regarding dose assessments both for workers and members of the public. Moreover, radiation protection experts bear technical responsibility in that they must give operators all technical advice relevant to ensuring effective radiation protection of workers and public at the design stage, at the operational level and at the decommissioning stage.

An important instrument for the radiation protection of exposed workers is medical surveillance carried out by specialized physicians whose capacity to act as approved medical practitioners is

recognized by means of State examinations. Every member of the work force must be recognized as fit prior to being exposed to radiation as a category A or B worker and is also subject to periodic reviews of health.

All considerations, evaluations, measurements and technical advice by radiation protection expert must be recorded, in particular as regards dose assessment records for which a strict regime of filing is provided for; the same requirement for filing holds for records concerning medical surveillance of exposed workers.

### **Radiation Protection Inspections and enforcement**

Verification of compliance with radiation protection requirements laid down in law and in licensing prescriptions is the responsibility of various independent bodies. ISIN inspectors are vested with authority over the whole domain of radiation protection requirements as both workers and public are concerned, Labour Inspectorates are concerned with requirements pertaining to workers' protection while regional bodies Inspectors are mainly concerned with radiation protection requirements for the public. It must be remembered that Inspectors are vested with police powers in the Italian system.

The Italian compliance and inspection system is based upon the fact that legislation provides for penal sanctions in cases of non-compliance; penalties are meted out by the Courts at the instigation of the Office of Public Prosecution to which inspectors are required under law to communicate every case of non-compliance. Particular measures are laid down in legislation in order to prompt and/or force swift compliance, especially for non-compliance concerning provisions for radiation protection of workers; in these cases, inspectors are bound to evaluate if the user could avoid undergoing a trial by complying with *ad hoc* specifications established by inspectors and paying a fine.

### **The ALARA Principle**

The principle that doses incurred in relevant exposures are to be kept as low as reasonably achievable, social and economic considerations being kept into account, is laid down in article 1 of Legislative Decree n° 101/2020, together with the principles of justification and of dose limitation. It must be remembered that the optimization principle, together with the justification principle, had been implemented in Italian regulatory philosophy and practices long before it was legislated into the Legislative Decree no. 230/1995.

The implementation of the ALARA principle in the Italian system of regulatory control is ensured by means of two regulatory tools:

- provisions in the Legislative Decree n° 101/2020
- administrative prescriptions.

The Legislative Decree has distinct provisions for doses to workers and public to be kept ALARA by operators: the provisions state, essentially, that rules of good practice are to be obeyed at every stage. Rules of good practice are not an exclusive means to ensure optimization as ALARA is also called: other means may be used to that end provided that results are the same.

The second regulatory tool, largely employed in the Italian system for the purpose of implementing ALARA, is the use of administrative prescriptions at every stage of the licensing process. It must be pointed out that such prescriptions are enforceable by means of criminal penalties.

From an operational viewpoint the whole of the regulatory instruments available, that is:

- the careful planning at the design stage, through the laying down of the radiological safety objectives;
- the consequent safety assessment and all ensuing reviews;
- the safety and radiation protection culture fostered among all Italian organizations involved;
- the independent prevention role played by the radiation protection expert;
- the support role by the NPP Council of Delegates;
- the system for verification of compliance;
- the compliance with dose constraints, as reported in article 5 of the Legislative Decree n° 101/2020.

All have conspired so that a more than satisfactory radiation protection level from the ALARA viewpoint was ensured for all stages of the installation life.

### **Incident reporting**

The most important provisions are contained in Legislative Decree n° 101/2020, namely Articles 142 and 149.

In case of accidents, or incidents that could result in an exposure to workers above dose limits, according to article 142 of the Legislative Decree n° 101/2020, the operator is requested for notification as soon as possible, but not later than 3 days after, to the following Institutions:

- Competent Regulatory Authority (ISIN)
- Local Labour Inspectorate (Province)
- Local Offices of the National Health Service.

In case of unexpected radioactive contamination inside the plant boundaries or an accidental occurrence implying a significant increase of the risk of exposure to the workers, the Operator has to implement all suitable measures aiming at avoiding any risk increase (article 149 of the Legislative Decree n° 101/2020). Moreover, when significant contamination of air, water or land

outside the plant boundary, or exposure to the public, at the occurrence of accidental events, the operator is required to immediately notify to:

- Local Government Representative (Prefect)
- Local Fire Brigade
- Local Offices of the National Health Service

and, in relation to the level of risk, to ISIN.

Furthermore, the operator shall take all the measures suitable to reduce the radioactive contamination in the areas outside the boundary of the plant, so to limit the risk to the public.

### **ISIN Authors Team (in alphabetical order)**

Luca CRETARA

Marco GERVASI

Marco MATTONI

Francesco Paolo MICHETTI

Sebastian Nicola PIRAS

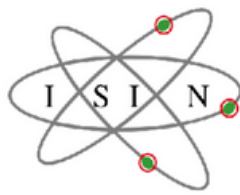
Pasquale PUTORTI'

Carmelina SALIERNO

Silvia SCARPATO

Fabrizio TRENTA

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**National Inspectorate  
for nuclear safety  
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