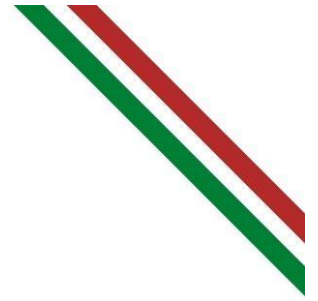




ITALY



Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management

Sixth Italian National Report



October 2020

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. Presentation of the report

The Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was adopted in the Vienna Diplomatic Conference on 29 September 1997 and entered into force on 18 June 2001. Italy signed the Convention on 26 January 1998 and deposited the instrument of ratification on 8 February 2006.

This is the sixth national report prepared under the obligations of the Convention. It is based on the previous reports and provides an updating of the national situation, with particular emphasis on the relevant topics raised during the 2018 review meeting by other contracting parties as well as on significant facts and events, having relevance for the improvement of the safety of spent fuel and radioactive waste management, occurred during the last period.

As done in the previous reports, the fulfilment of the obligations established in the Convention is assessed. The evaluation is mainly based on the Italian legislation and regulations as well as on the continuous safety assessment of Italian radioactive waste and spent fuel management facilities and activities. The assessment on the safety of the NPPs and other nuclear installations covers also the facilities for the management of operational waste and storage of spent fuel located in their sites. The plans for decommissioning of nuclear facilities are also discussed. The management of radioactive waste generated outside the nuclear fuel cycle is also discussed.

This report has been compiled according to INFCIRC/604/Rev.3 "Guidelines Regarding the Form and Structure of National Reports", (2014).

In Section B, policies and practices of waste and spent fuel management in Italy are summarised as stipulated in Article 32, paragraph 1. In Section C, the scope of application taking into account the Italian circumstances is explained, as stipulated in Article 3. Section D provides information on spent fuel and waste management facilities in Italy and on inventories of spent fuel and radioactive waste, as stipulated in article 32, paragraph 2. The implementation of each of the Articles from 4 to 28 of the Convention is evaluated in Sections E to J. Section K deals with further development to improve the safety of spent fuel and radioactive waste management.

A.1.1 Conclusions of the 6th review meeting

Within the Country Group n. 4 at the 6th Review Meeting, many issues of special interest to both spent fuel and radioactive waste management emerged and were discussed.

At the end of the review meeting, the following challenges were identified:

- Complete the siting process for the LLW repository and long-term storage facility for ILW/HLW.
- Continue efforts to finalize national policies and strategies for management of radioactive waste specifically related to disposal of ILW/HLW.
- Implementation of recommendations and suggestions raised during IRRS 2016 mission.

- Continue to develop confidence in “letter of comfort” process to support long-term storage and ultimate disposal.
- Complete SF transfer from Avogadro interim storage facility for reprocessing.
- Revisions of technical guides for RW management to be adopted

Actions taken in relation to the above challenges and the related status will be discussed in the present report.

As a general observation, the Country Group was satisfied with the answers and believes that Italy met the obligations of the Joint Convention.

A.1.2 Most relevant events since the sixth review meeting

The following main events and activities relevant for the Convention and occurred after the sixth review meeting can be highlighted.

Among major developments occurred since the sixth review meeting it is to be mentioned that since January 2019, the new national competent regulatory authority ISIN – National Inspectorate for Nuclear Safety and Radiation Protection, replacing the previous Nuclear, Technological and Industrial Risk Department of ISPRA, has become fully operative.

The human and financial resources from the previous Nuclear Department of ISPRA have been transferred to ISIN. Additional human and financial resources, established by Legislative Decree 45/2014 as amended by Legislative Decree n.137/2017 are assigned to ISIN. The current lack in staff resources remains a challenge, also considering the forthcoming retirement of the older personnel. Specific actions are expected in the near future to allow ISIN to recruit new staff.

The new Legislative Decree, n. 101/2020, that regulates radiation protection and nuclear safety in Italy, has been published on August 2020. This Decree, besides the implementation of the Euratom Directive 59/2013, has repealed the Legislative Decree No. 230/1995 and introduces new provisions for radioactive waste management addressing, in particular, the issue of traceability.

On December 2019, the National Programme for the implementation of the policy for the management of spent fuel and radioactive waste has been adopted by the two Ministries (Environment and Economic Development) and published on the web-site¹.

On August 2020, Italy formally submitted a request to IAEA for an ARTEMIS peer review mission for the evaluation of the implementation of the National Programme, as requested by the Council Directive 2011/70/Euratom, to be held in 2023.

In May 2020 the decommissioning license for the Latina NPP (MAGNOX) was granted. The decommissioning strategy foresees two-phase decommissioning plan, with the first one aimed at the safety of all previous radioactive waste or produced by the dismantling of structures, system and components of the plant, and also to conservation of reactor building (with radioactive graphite inside) and the second one, to be implemented only after the siting and construction of the National

¹ https://www.minambiente.it/sites/default/files/archivio/allegati/rifiuti_radioattivi/programma_conformepdfa.pdf

repository, foresees the dismantling of all plant structures with the purpose to reach the green field end state (this second phase will be subject to specific authorization).

With reference to the long term management of radioactive waste, as also reported in the previous national report, the national strategy envisages the construction of a National Repository comprising a near surface disposal facility for LLW/ILW² (herein after referred to as disposal facility) and a facility for the interim long term storage of ILW³/HLW (here in after long term storage facility). The role of implementer responsible for the siting, construction and operation of the national repository is assigned to SOGIN.

The siting process for the localization of the National Repository of radioactive waste provides, as a starting phase, the preparation of a proposal for a National Chart of Potentially Suitable Areas (CNAPI) by SOGIN, which must be verified by ISIN. On the basis of the siting criteria issued by ISIN with Technical Guide n.29, SOGIN presented a first CNAPI proposal on January 2, 2015, which was validated by the former ISPRA Nuclear Department (now ISIN) in July 2015. As a result of the delay in the publication of the CNAPI prepared in 2015, a revision due to the update of the national Databases utilized in the application of the exclusion criteria (such as for instance: map of seismicity, map of the hydrogeological risk, etc ...), has been necessary. SOGIN sent to ISIN a revised proposal of CNAPI in 2019 which has been validated by March 2020. The validated list of potential areas has been transmitted to the Ministry of Economic Development and the Ministry of Environment, Land and Sea Protection that will decide about its publication, first act of the process of approval having, as starting point, a public consultation. Publication of the list of areas is expected by the end of 2020. Once the National Chart will be published, together with a preliminary design of the facilities to be realized (LLW repository and ILW/HLW storage), a national debate will start with the aim to find an agreement with the regions involved.

In relation to the remaining spent fuel to be shipped abroad for reprocessing, discussions are in progress among French and Italian Authorities to complete the shipments programme with the transfer in France of the remaining 13 tHM stored at Avogadro AFR storage facility.

On the implementation side, it is worthwhile to mention the project for the conditioning of the spent resins of Caorso NPP. These operational radioactive waste (resins and sludges) have been treated in the past with urea-formaldehyde but, due to the presence of significant amount of free (corrosive) liquids, the treatment process was not satisfactory. As result of an international tender, the thermal treatment and conditioning of operational radioactive waste has been assigned to a qualified Slovak operator. The licensing process from both Italy and Slovak Republic Authorities has been completed and the transfer of spent resins to be treated in Slovakia is ongoing.

² ILW suitable for being disposed off in a near surface disposal facility

³ ILW not suitable to be disposed off in a near surface disposal facility

A.1.3 Overview matrix of Italy

Type of Liability	Long-term management policy	Funding of Liabilities	Current practice / Facilities	Planned facilities
Spent fuel	Reprocessing abroad. Remaining SF, long term interim storage	Activities of SOGIN financed through levy on electricity tariff.	To complete shipments to reprocessing. Only exception: Elk River SF from ITREC site.	For Elk River SF on site dry cask storage envisaged.
Nuclear fuel cycle wastes	National VLLW/LLW near surface facility and Interim ILW/HLW storage facility.	Existing funds for NPP waste, and, since 2000, levy on electricity tariff – for nuclear fuel cycle waste.	Stored in NPPs where generated. Its treatment / conditioning is ongoing. Responsibility: SOGIN.	National LLW near surface facility and Interim ILW/HLW storage facility.
Non-power wastes	Central interim storage.	Producer pays	Transfer to ENEA Casaccia treatment, conditioning and storage facility operated by NUCLECO.	National LLW near surface facility.
Decommissioning liabilities	Decommissioning of all nuclear facilities. Strategy selected: one step decommissioning (two phases for Latina NPP)	Activities of SOGIN financed through levy on electricity tariff.	Decom progresses pending on availability of on-site storage.	On site waste treatment and interim storage facilities.
Disused Sealed Sources	Temporary storage.	Owner pays	- Return to suppliers - Transfer to by NUCLECO	Centralized storage.

A.2 Executive summary

In Italy, four nuclear power plants (i.e. Garigliano, Latina, Trino and Caorso) were operated until middle of '80s together with a few fuel cycle facilities. At present they are, at different stages, in the

process of being decommissioned according to a national strategy for decommissioning, established in late '90s, aimed at the release of the sites without radiological constraints. The spent fuel and the largest part of the radioactive waste to be managed in Italy derive from the operation of the above mentioned nuclear installations and from the future dismantling operations associated to decommissioning. Radioactive waste from medicine, industry and research activities are collected for temporary storage by private operators specifically authorized to conduct these practices.

The present Italian regulatory system related to nuclear and radiation safety is the result of an evolution of rules and standards that begun in the early '60s and that takes into account the experiences of licensing and operation of NPPs of different types and generations and of other nuclear installations. The system covers also the government of safety of spent fuel and radioactive waste management.

The main regulations are acts of Parliament, Legislative Decrees, governmental or ministerial Decrees. Technical Positions and Guides issued by the Competent Regulatory Authority, the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN), (here in after ISIN) are also considered.

Italy is a member state of the European Union. Thus, the directives of the EU are implemented. When necessary, the Italian regulations have been modified to take into account the EU directives (e.g. to radiation protection, trans-boundary movements of radioactive waste and spent fuel, and control of high activity sealed sources and orphan sources).

The licensing body is the Ministry of Economic Development, which grants authorizations bounded by the technical advice of ISIN.

The main national operator entitled to perform spent fuel and radioactive waste management and decommissioning activities is SOGIN (Società Gestione Impianti Nucleari), a company whose shareholder is the Ministry of Economy and Finance, while the Ministry of Economic Development provides to SOGIN the strategic and operational directives.

The national policy on spent fuel management calls for the shipment abroad of the spent fuel still present in Italy for reprocessing in foreign facilities. To this aim in November 2006 an agreement between the Italian and the French Governments regulating the transfer in France of about 235 tHM of spent fuel was signed. At present about 13 tHM of spent fuel still remain to be shipped to France from Avogadro AFR storage pool.

As far as the radioactive waste is concerned, almost all the waste generated by the operation of nuclear installations are stored in the sites of origin. Additional amounts of radioactive waste arise from a number of facilities using radioactive sources in medical, research and industrial applications.

Several projects related to the enhancement of the safety level of the radioactive waste (such as treatment and conditioning activities as well as the construction of new storage facilities, either by refurbishing existing buildings or by constructing new buildings) have been implemented or launched.

In relation to the long term management of radioactive waste and spent fuel, according to the Italian National Programme, a National Repository consisting of a LLW/ILW disposal facility and an

ILW/HLW long term storage facility has to be realized in Italy. In particular, the ILW/HLW long term storage facility will be devoted to the storage of HLW resulting from the reprocessing of the spent fuel abroad.

The role of implementer responsible for the siting, construction and operation of the national repository is assigned to SOGIN.

With reference to the activities related to the siting of the National Repository, in March 2020 ISIN transmitted) to the Ministry of Economic Development and the Ministry of Environment, Land and Sea Protection the reviewed National Chart of Potentially Eligible Areas (CNAPI). The review of the Chart, performed by SOGIN and validated by ISIN, has been necessary due to the update of the national Databases utilized in the application of the exclusion criteria (such as for instance: map of seismicity, map of the hydrogeological risk, etc ...).

After the authorization by the two Ministries for the publication of the Chart, a national debate will start with the aim to identify, on the basis of declaration of interest from the Regions involved, one or more sites on which to perform detailed investigations in order to select the final site. Final decision on the publication of the CNAPI is expected in the coming months.

In the safe management of spent fuel and radioactive waste, international co-operation is recognized to be fundamental, and the Italian regulatory authorities, nuclear decommissioning and waste management operators and research institutes maintain connections with international organisations. In this respect, it is worthwhile to mention the activities of the IAEA and OECD/NEA and the R&D framework programmes of the European Union. ISIN is also actively participating in the ENSREG and WENRA initiatives for the harmonization of spent fuel and radioactive waste storage, decommissioning, waste processing and disposal safety requirements.

Based on the evaluation conducted in preparing the present report, the Italian authorities consider that the obligations of the Convention are generally met, taking into account some relevant ongoing activities on the nuclear sites for treating, conditioning and storage of the existing waste as well as to complete the transfer abroad of the spent fuel for reprocessing. With regard to challenges identified in the 6th RM, some steps forward have been taken in place to address them. In particular, with regard to the siting of the National Repository, a National Chart of potential suitable areas has been prepared and is ready to be published to start the public consultation. Transfer abroad for reprocessing of a part of the remaining spent fuel has taken place. A small amount (about 13 tHM) of spent fuel remains to be transferred. New provisions have been established in the legislation to strengthen the resources of the Regulatory Authority.

The need to accelerate in the ongoing process for conditioning existing waste and to improve some aspects of the current regulations attaining the safe management of spent fuel and of radioactive waste is also recognised and specific related actions are ongoing.

Section B. Policies and Practices

Article 32 paragraph 1

In accordance with the provisions of Article 30, each Contracting Party shall submit a national report to each review meeting of Contracting Parties. This report shall address the measures taken to implement each of the obligations of the Convention. For each Contracting Party the report shall also address its:

- (i) spent fuel management policy;
 - (ii) spent fuel management practices;
 - (iii) radioactive waste management policy;
 - (iv) radioactive waste management practices;
 - (v) criteria used to define and categorize radioactive waste.
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B.1. Introduction

In relation to the obligations under article 32, paragraph 1, background information regarding the history of the national nuclear programmes will be provided. In addition, due to the fact that all the Italian nuclear installations were definitively shut down many years ago, with the only exception of a few research reactors still under operation, background information on the decommissioning policy and practices will be also provided.

Policy and strategies for the management of spent fuel and radioactive waste have been issued along the years as Directives of the Ministry of Economic Development. As result of the transposition of the EU Directive 2011/70 they are now updated in the context of the National Programme for the management of the spent fuel and radioactive waste, published by the Ministry of economic development and the Ministry of Environment in December 2019.

B.2 The National Programme for the management of spent fuel and radioactive waste

Historical background

Commercial utilisation of nuclear power in Italy started in 1962 and within 1981 four nuclear power plants, namely the NPPs of Garigliano (BWR), Latina (Gas Graphite), Trino (PWR) and Caorso (BWR), and a LEU fuel fabrication installation (Fabbricazioni Nucleari S.p.A) have been commissioned. Figure 1 shows the nuclear installations in Italy.



Figure 1: Location of NPPs and other facilities

During that period an extensive R&D programme on the nuclear fuel cycle was developed by the National Committee for Nuclear Energy (CNEN) - now the National Agency for New Technologies, Energy and the Sustainable Economic Development (ENEA) - with the operation of experimental fuel cycle installations (e.g. ITREC and EUREX).

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 time the nuclear programme was cancelled, the Interministerial Committee for the Economical Planning (CIPE) required the National Electricity Company (ENEL) to start the decommissioning of the NPPs. At this aim a “Safe storage” option was adopted.

In 1999, in the frame of the privatisation process of ENEL, liabilities and assets connected to NPPs were assigned to a newly established company, named SOGIN (Società Gestione Impianti Nucleari), whose shareholder is the Ministry of Economy and Finance, while the Ministry of Economic Development provides the strategic and operational directives.

The primary mission of SOGIN is the decommissioning of all Italian nuclear installations according to a single step strategy, as well as the safe management of the spent fuel and radioactive waste related to those installations. In 2003 the responsibility to manage the facilities of ENEA (EUREX and ITREC fuel reprocessing facilities, OPEC and Plutonium Laboratories at the Casaccia site) and Bosco Marengo fuel fabrication facility (former Fabbricazioni Nucleari S.p.A.) was assigned to

SOGIN with the main objectives to manage the activities related to their spent fuel, radioactive waste and decommissioning.

A special allocation of funds for financing all these activities is ensured by means of a specific levy on the price of the electricity.

The National Programme

As already anticipated, on December 2019 the National Programme for the implementation of the policy for the management of spent fuel and radioactive waste has been adopted by the two Ministries (Environment and Economic Development). The National Programme is based on the following objectives:

1. implementing the decommissioning of nuclear installations, until the release of the sites without restrictions of a radiological nature;
2. treatment and conditioning of all the liquid and solid radioactive waste located on site, in a suitable form for the transfer to the National Repository;
3. annual update the national inventory of radioactive waste and spent fuel;
4. safely dispose of the radioactive waste generated in Italy, as priority, on the national territory, as established by Directive 2011/70/Euratom;
5. identify the location for, construct and operate the National Repository for radioactive waste generated in the country, originating from industrial, research and medical related activities and from the previous operation of nuclear plants and related fuel cycle facilities, including their decommissioning, within a Technology Park that will include a study and experimentation centre, as specifically defined in article 27 of Legislative Decree 31 of 15 February 2010;
6. dispose of LLW and short lived ILW in the National Repository;
7. store within this National Repository the long lived ILW and the HLW, including the spent fuel not intended to be reprocessed, in a long-term storage facility;
8. transport abroad the spent nuclear fuel still present in the country, for reprocessing, and successive reception of the residues coming from reprocessing;
9. ensure respect for the commitments between the Republic of Italy and EURATOM on the management of radioactive waste in the Joint Research Centre of Ispra (VA);
10. establish a R&D programme for the safety of spent fuel and radioactive waste management;
11. during the implementation of the mentioned objectives, to ensure transparency and public participation in the decision-making processes concerning the spent fuel and radioactive waste management.

For the disposal of long lived ILW, HLW and spent fuel, geological formation is considered. However, the National Programme does not provide a scheduled programme for a geological disposal facility. During the transitional period while the high activity radioactive waste is stored in the National Repository, the most appropriate disposal solution for this waste will be identified, taking also into account the opportunities provided within the context of any international agreements that could be reached within this period.

B.3 Decommissioning Policy

As previously said, a safe storage option was initially selected for the Italian nuclear installations.

In December 1999, the Ministry of Industry, Commerce and Crafts, now Ministry of Economic Development, issued a strategic document providing guidelines for the management of liabilities resulting from past national nuclear activities, including the previously mentioned establishment of SOGIN.

Another key aspect of this new policy was the adoption of the strategy for a single step decommissioning (until the release of the sites without radiological constraints) of all national shutdown nuclear installations, thus abandoning the previous “safe storage” option.

The directive of the Ministry of Economic Development indicated at that time the year 2020 as the reference time to complete the decommissioning activity.

That policy declaration was followed by the Ministerial Decree of January 26, 2000 which establishes plans and procedures for funding the decommissioning of the nuclear facilities, dismantling, waste conditioning and disposal included.

The strategy identified in the Ministry document of December 1999 was further detailed in the Ministerial Decree of May 7, 2001, which provided also directives to SOGIN for the safe management of spent fuel based on a dry storage strategy.

Later on, the Ministry of Economic Development, with the Ministerial Decree of December 2, 2004, updated the strategic objectives assigned to SOGIN, and envisaged the decommissioning of all nuclear power plants and nuclear fuel cycle facilities in a 20 years' time frame, provided that an adequate storage capacity of the resulting waste would be available. In the context of the ongoing authorization process of the NPPs decommissioning plans, the Competent Regulatory Authority ISIN, at that time called APAT, has in fact taken the position that, before the start up of dismantling activities of the nuclear island, in the case of unavailability of the final National Repository, the licensee has to provide an adequate on-site interim storage capacity to be authorized

On the basis of the governmental decision to move into a decommissioning strategy involving the unconditional release of the sites, comprehensive plans have been submitted by SOGIN to the Ministry of Economic Development for Garigliano, Caorso, Trino and Latina NPPs in order to obtain the overall decommissioning licenses, to be granted according to the provisions envisaged in the former Legislative Decree of March 17, 1995, n. 230.

Due to the current unavailability of a National Repository the national decommissioning strategy is articulated into two phases. The first phase is aimed at reaching in the sites the so called status of “*brown field*”, in which all the dismantling and waste treatment activities have been completed and all the radioactive waste (originated by past operation and by dismantling) is temporarily stored in dedicated interim storage facilities on the sites.

The second phase is aimed at reaching the so called status of “*green field*”, in which all the waste has been transferred to the National Repository and the sites have been released without radiological constraints.

According to the plan of the national implementer decommissioning activities are expected to be concluded in 2036 for the latest installations. The duration of the “*brown field*” configuration will depend on the availability of the National Repository.

It has to be noted that the Italian legislation regulates the decommissioning of nuclear installations as a comprehensive set of actions where authorisations can be granted for subsequent phases leading up to planned and definite intermediate states. Such a possibility, however, is recognised on the condition that the proposed subdivision into phases is shown to be part of an overall decommissioning plan leading up to a final site of unconditional release and defining, inter alia, the destination of resulting radioactive materials.

In addition, the national legislation requires that the decommissioning plans can be authorised only in presence of the results of the environmental impact assessment performed by the Ministry of Environment, Land and Sea Protection.

Furthermore, the experience resulting from the management of nuclear installations permanently shut down since many years, clearly indicates some other priorities before starting the bulk of the dismantling activities. In particular, there is the need to remove the spent fuel still present in the pools and to manage (conditioning and storage) the waste already existing on the sites, generated by the past operation. To this aim, as discussed in more details in the following, activities for the management of the spent fuel and several projects aimed at the conditioning of existing waste and at the construction of temporary waste storage facilities on the sites are in progress or have been proposed. The storage facilities are in some cases also intended to accommodate decommissioning waste for the period between the completion of their conditioning process and their transfer to the National Repository.

Furthermore, law provisions establish the possibility to authorise specific activities related to decommissioning and dismantling before the approval of the overall decommissioning plan, when benefits to safety and radiation protection exist. On this basis, several preliminary decommissioning activities have been therefore conducted on the sites and others are in progress. These activities are mainly related to the treatment and conditioning of existing waste, to the decontamination of some systems and components, to the removal of piping isolation, to the preliminary dismantling of systems, components and structures, to the construction of new interim storage facilities on the sites, also by the refurbishment of existing buildings.

The decommissioning licences for Trino and Garigliano NPPs were issued in 2012, and for Caorso NPP in February 2014. In May 2020 the decommissioning license for the Latina NPP (MAGNOX) was granted.

The decommissioning licence for Bosco Marengo LEU fabrication facility was granted in November 2008 and the *brown field* configuration is expected to be reached by the end of 2020.

Decommissioning activities are in progress in all the four NPPs. Due to the fact that national legislation foresees, as final stage for decommissioning, the release of the sites without radiological constraints, it is very difficult to give a percentage of the decommissioning progress because today in Italy there isn't any final repository for radioactive waste and even if dismantling activities will be concluded, storage facilities will remain on the sites waiting for the National Repository. For all the four NPPs a brown field stage is envisaged, in which all the waste including that deriving from dismantling activities, will be stored on the site in interim storage facilities, in the wait to be transferred to the National Repository. Today So.G.I.N. forecasts for the completion of the

dismantling activities are: Caorso and Trino NPPs in 2031, Garigliano NPP in 2026. For Latina NPP, a GCR type, the plan is to reach in 2031 the stage in which dismantling activities are concluded leaving the graphite in the reactor waiting for the National Repository.

For other facilities, activities related to the treatment of existing waste and to the management of the spent fuel have to be conducted. Also, for these installations preliminary decommissioning activities are conducted based on specific approvals granted according to plant modifications licensing procedure.

B.4 Spent fuel management policy and practices

Since the beginning of its nuclear programmes, Italy had pursued the option of reprocessing abroad the spent fuel produced in its NPPs.

As far as the spent fuel still present in Italy, the option of adopting an on-site dry storage was initially selected (strategic document of December 1999 and Ministerial Decree of May 7, 2001). This strategy however resulted difficult to be implemented, mainly due to the strong opposition of local communities, who considered the presence of the dry stored spent fuel as an obstacle for the release of the site. This led the Government to reopen the option of reprocessing. In this regard, the Ministerial Decree of December 2nd, 2004 already included directives to SOGIN to perform a feasibility evaluation of the shipping abroad of the spent fuel still existing in NPPs' and in interim storage sites, for its reprocessing with the subsequent re-entry in Italy of the resulting conditioned waste.

In November 2006, an Agreement between Italian and French Governments regulating in the transfer to France of the spent fuel present in Italy (about 235 tHM) was signed. On this basis, in April 2007, SOGIN signed a contract with AREVA. In June 2010, the shipment of spent fuel from Caorso NPP to France was completed. The shipment from Trino NPP was completed in November 2015. To date, the shipment of the remaining spent fuel still stored at the Avogadro AFR storage pool is waiting for a new negotiation of some terms of the pertaining agreement with French authorities still in progress. Pending the completion of the transfer abroad for reprocessing, the spent fuel will continue to be stored in the pool as detailed in Sections D and G. It's safe management will continue to be performed according to existing licence conditions and technical specifications.

The only fuel that will not be reprocessed is represented by the 1,7 tHM of Uranium/Thorium fuel, stored in the fuel pool of ITREC experimental reprocessing facility, located in the southern Italy. For this fuel the storage into dual-purpose dry cask is now envisaged and a new storage facility is under construction. While waiting for the operation of this facility, also in this case the fuel will continue to be managed according to the existing licence conditions and technical specifications regulating the storage in the pool.

B.5 Radioactive waste management policy and practices

As previously indicated, the large part of the radioactive waste existing in Italy was produced during the operation of the nuclear installations connected to the national nuclear power programme, definitively closed in 1987. Another significant amount of waste will result from the decommissioning activities, as well as from the re-entry in Italy of the high and intermediate level conditioned waste resulting from the reprocessing.

At present, almost all the waste generated by the operation of nuclear installations is stored in the sites of origin.

A minor fraction to be managed is represented by the radioactive waste produced by R&D, medical and industrial uses.

The Ministerial Decree December 2nd, 2004 requested SOGIN to proceed to the treatment and conditioning into certified form, in a 10 year time frame, of all liquid and solid wastes, ready to be delivered to the National Repository. Specific projects for most relevant waste streams are however on-going. There are however some delays in the implementation of this programme.

As described in Para. B.2, the National Programme for the implementation of the policy for the management of spent fuel and radioactive waste has been adopted by the two ministries (Environment and Economic Development). Key policy elements for the long term management of radioactive waste, as provided in the National Programme, call for:

- a) export for reprocessing of the spent fuel present in the nuclear installations, with the return to Italy of the resulting waste;
- b) treatment and conditioning of all radioactive waste;
- c) decommissioning of nuclear power plants and fuel cycle facilities until the unconditional release of the sites;
- d) interim storage of waste in the sites of nuclear facilities and, for radioactive waste coming from industrial, medical and research activities, interim storage in the installations of authorized operators;
- e) sites selection, construction and operation of a National Repository for the near surface disposal of low and intermediate level waste and for the long term storage of intermediate and high level waste.

For long lived ILW and HLW, a long term storage period (50-100 y) is envisaged. For their geological disposal, the solution will be explored during this storage period, by also envisaging participation to international research activities in connection with multinational solutions.

In connection with the mentioned Agreement Italy-France for the reprocessing of the spent fuel still stored in Italy, the commitment of the Italian Government to make a national site available in due time has also to be highlighted. In fact, the Agreement establishes the milestones of a national road map for enacting all the amendments to the existing legislative provisions necessary to rule the implied matter (i.e. selection of a national site for a radioactive waste long term storage facility) and

to execute all the construction works in order to have facilities ready in time to accommodate the re-entry of the high and intermediate level waste as indicated in the agreement.

Site selection procedure

In 2010 specific legislative provisions were established to regulate the siting, the construction and the operation of a National Repository, through the enactment of the Legislative Decree n. 31/2010. The Decree and its subsequent amendments establish that the National Repository will be realized in the context of a Technological Park and assign to SOGIN the role of the Implementer, responsible for the siting, construction and operation of the repository itself.

In particular, the Legislative Decree n° 31/2010 assigns to SOGIN the responsibility to propose areas suitable for the siting of the installation based upon criteria established by the IAEA and the national regulatory authority. The steps to be made in order to realize a national storage facility are described below, together with the timeframes to perform each of them.

At first, a list of suitable areas is proposed by the Implementer (SOGIN S.p.A.) taking into account the criteria established by the Competent Regulatory Authority (ISIN) and IAEA and subsequently validated by ISIN itself.

After this preliminary selection (9 months), a period for a public consultation is foreseen. After the publication of the list of suitable areas, a public debate will be organized by SOGIN through a seminar in which all central and local interested administrations and other stakeholders will be invited.

Once the Chart of potential suitable sites will be approved by the Competent Regulatory Authority, SOGIN will invite the involved Regions to declare their potential interest within 60 days. Once one (or more) Region shows interest, SOGIN performs its extensive investigations on the sites (15 months) and submits a request for authorization to the Competent Regulatory Authority, which expresses its judgement within 6 months. A one step licence is envisaged (i.e. the authorization is given for construction and operation). For closure, a specific licensing procedure is defined.

In the case of lack of interest, SOGIN will submit to the Ministry of Economic Development the list of the candidate areas indicating the first three more suitable sites, and within 30 days an inter-institutional Committee will be created, with the participation of representatives from different Ministries and Regions, with the task to reach an agreement with one of the Regions.

With reference to activities related to the siting of the National Repository, on June 2014 ISPRA which at that time played the role of Competent Regulatory Authority through its Nuclear Department, issued the Technical Guide n. 29 related to the siting criteria for near surface disposal facility for low and intermediate level waste. This Guide has been issued following a review performed by IAEA and a consultation process with other interested technical bodies in Italy.

According to the time schedule foreseen by Legislative Decree n° 31/2010, in January 2015 SOGIN presented the chart of potentially suitable areas, called the National Chart. After that, following a review performed by the Nuclear Department of ISPRA, the validated chart was sent in July 2015 to the Ministries of Economic Development and to the Ministry of Environment, Land and Sea Protection. At that time, the Government took the decisions to publish the chart after the issue of the National Programme on spent fuel and radioactive waste management.

As a result of the delay in the publication of the list prepared in 2015, a revision due to the update of the national databases utilized in the application of the exclusion criteria (such as for instance: map of seismicity, map of the hydrogeological risk, etc ...), was necessary. In 2019 SOGIN sent to ISIN, which in the meantime had become operative as the new independent Competent Regulatory Authority, a revised proposal of the potential areas (CNAPI), which was validated in March 2020. The validated CNAPI was transmitted to the Ministry of Economic Development and the Ministry of Environment, Land and Sea Protection that will decide about its publication as the starting point for public consultation. Publication of the list of potential suitable areas is expected by the end of 2020. Once the National Chart will be published, together with a preliminary design of the facilities to be realized (LLW repository and ILW/HLW storage), a national debate will start with the aim to find an agreement with the regions involved.

Waiting for the availability of the National Repository, radioactive waste will continue to be stored in the nuclear installations of origin. Activities are in progress to enhance the safety level of waste by implementing specific treatment and conditioning projects and by refurbishing existing buildings or by constructing new interim storage facilities on the sites. New facilities will also be used to ensure temporary storage capacity for waste resulting from decommissioning preliminary activities. Radioactive waste coming from medical, industrial and research uses will continue to be stored at the sites of dedicated operators.

B.6 Radioactive waste classification and requirements

For many years a classification system based upon three categories was in place. A new classification system was established by the Decree from Ministries of Economic Development and of the Environment on August 7th, 2015. It envisages five different categories:

Very short lived waste.

Radioactive waste containing radionuclides with very short half-life, of less than 100 days, requiring up to 5 years to reach activity concentrations lower than values specified in art. 2, paragraph 3 of Legislative Decree n. 101/2020. This type of waste mainly arises from medical uses and research activities. This waste shall be stored in facilities suitable for temporary storage or waste management for disposal, such as those authorized by art. 59 of Legislative Decree n. 101/2020, for a period of time necessary to reach the abovementioned required activity concentration level.

Very low level waste.

Radioactive waste with activity concentration that doesn't meet the criteria set out for exempt waste, but though lower than 100 Bq/g with a maximum alpha contribute of 10 Bq/g for alpha-emitting long-lived radionuclides. This waste will be disposed of in the near surface disposal facilities at the National Repository envisaged by the Legislative Decree n. 31 of 15 February 2010.

This category includes also radioactive waste containing mainly short lived radionuclides, which over a period of up to 10 years reach an activity concentration beneath the clearance levels set out in Artt. 54 and 55, paragraph 3-bis of the Legislative Decree n. 101/2020. This waste shall be stored in facilities suitable for temporary storage or management of wastes for disposal, such as those authorized by the art. 59 of Legislative Decree n. 101/2020.

Low Level Waste

Radioactive waste that doesn't meet the criteria established for exempt waste and that requires containment and isolation periods of up to a few hundred years in order to be disposed of.

This category includes radioactive waste characterized by levels of activity concentration of up to 5 MBq/g for short-lived radionuclides, of up to 40 kBq/g for the long lived isotopes of Nickel and of up to 400 Bq/g for long lived radionuclides. This category includes much of the waste from nuclear installations, such as parts and components of the plant arising from the dismantling operations and from some medical, industrial and scientific research uses. This category of waste will be disposed of in near surface disposal facility at the National Repository envisaged by Legislative Decree n. 31 of 15 February 2010.

Intermediate level waste

Radioactive waste with activity concentrations exceeding the values set out for low level waste, though not requiring provisions for heat dissipation during its storage and disposal.

This category includes waste containing long lived radionuclides that mostly requires a degree of isolation higher than that provided by near surface disposal facilities with engineered barriers, therefore requiring disposal in geological formations. Pending the availability of a disposal facility in geological formation, such waste shall be stored in suitable storage facilities, such as the long term storage facility in the National Repository envisaged by art. 2, paragraph 1, letter i) of Legislative Decree n. 31 of 15 February 2010.

This category includes also waste characterized by levels of activity concentrations of up to 400 Bq/g for alpha-emitting radionuclides and mainly containing radionuclides beta/gamma emitters even long lived, with such an activity concentrations that they can be disposed of in near surface facilities with engineered barriers, provided that the level of activity concentration complies with the objectives of radiation protection established for the above-mentioned surface disposal facility, such as, for instance, the waste containing activation products arising from the decommissioning of some parts of the nuclear facilities.

High level waste.

Radioactive waste with high activity concentrations, such as to generate a significant amount of heat or with high concentrations of long-lived radionuclides, or both of these characteristics, which require a degree of isolation and containment for a time period of thousands of years and over. This waste requires disposal in geological formations.

This category includes, in particular, liquid waste with high activity concentration arising from the first extraction cycle (or equivalent liquid) of nuclear fuel reprocessing facilities, or

the spent fuel itself in case of direct disposal without reprocessing. In the predisposal period, this waste shall be stored in suitable storage facilities, such as the long term storage facility in the National Repository envisaged by art. 2, paragraph 1, letter i) of Legislative Decree n. 31 of 15 February 2010.

The following scheme shows the new classification system established in Italy

Category	Conditions		Final destination
VSLW	$T_{1/2} < 100$ d	Cleared within 5 y	Temporary storage (art. 59 Legislative Decree n. 101/2020) and disposal in compliance with the provisions of the Legislative Decree n. 152/2006
VLLW	≤ 100 Bq/g (alfa ≤ 10 Bq/g)	Cleared within 10 y	
LLW	<ul style="list-style-type: none"> Short lived ≤ 5 MBq/g Ni59-Ni63 ≤ 40 kBq/g Long lived ≤ 400 Bq/g 		Surface, or small depth, disposal facilities with engineered barriers (National Repository Legislative Decree n. 31/2010)
ILW	<ul style="list-style-type: none"> Short lived > 5 MBq/g Ni59-Ni63 > 40 kBq/g Long lived > 400 Bq/g No heat production 	Alpha-emitting radionuclides ≤ 400 Bq/g beta-gamma emitters in concentrations which meet the objectives of radiation protection established for the surface disposal facility.	
HLW	Heat production or high concentrations of long-lived radionuclides, or both of such characteristics.		Interim storage facility of the National Repository (Legislative Decree n. 31/2010) waiting for the geological disposal

Radioactive waste storage requirements

Taking into account lessons learned and recent regulatory experiences, a Technical Guide on safety requirements for storage facilities, according to a graded approach depending on the RW classes and time of storage has been finalized after a process of public consultation where all stakeholders, including operators, had the opportunity to propose or suggest modifications. The Technical Guide n.30 will be published within 2020.

Radioactive waste conditioning requirements

For radioactive waste conditioning facilities, the review of the Competent Regulatory Authority is addressed to demonstrate that the process will produce waste form and waste packages suitable for interim storage, transport and disposal.

Technical Guide no. 26 "Management of radioactive waste" (1987), even though is based on the past radioactive waste classification system, provides specific safety requirements for 2nd Category

homogeneous radioactive waste packages (that corresponds to LLW in the new classification system).

In this regard radioactive waste packages must fulfil a set of requirements concerning their chemical, physical and mechanical characteristics and their radionuclide content. The requirements to be complied with by the conditioned radioactive waste are related to:

- Compressive strength
- Thermal cycling resistance
- Radiation resistance
- Fire resistance
- Leaching rate
- Free liquids
- Biodegradation resistance
- Immersion resistance
- Radionuclide concentrations

Furthermore, a record keeping system must be implemented such that each waste package can be uniquely identified in terms of:

- producer;
- dimensions and weight;
- beta, alpha and gamma total activity;
- main radionuclides concentration;
- dose rate at surface;
- non-fixed surface contamination;
- waste package characteristics;
- treatment and/or conditioning process.

Waste producer is responsible for the waste treatment, conditioning and storage and must submit to the competent regulatory authority a complete documentation concerning:

- Quality Assurance Programme;
- Adopted criteria for the waste conditioning facility design, operation and process control;
- Results of product characterization.

The waste producer is also responsible for labelling, tracking and activity inventorying of the radioactive waste.

The quality assurance program specifies the quality control requirements for the solidification and packaging processes and defines waste recording criteria from waste generation through final disposal. Quality assurance and quality control, as related to waste packages, include all those planned and systematic actions to ensure that the waste acceptance requirements for waste packages are met throughout the waste conditioning, storage, transportation and disposal processes.

The requirements adopted for conditioning of Low and Medium radioactive waste are sufficiently conservative for the disposal in a near surface facility.

In the licensing processes for RW conditioning, among the requirements which the waste packages have to comply with, some are relevant to the package other than the waste form. In particular

packages must demonstrate strong mechanical resistance (qualification requirements for transport are applied) and a corrosion resistance for at least 50 y.

Furthermore, ISIN has recently introduced an additional requirements to the operators for RW conditioning that refers to a certification, named Letter of Compliance, issued by SOGIN, the operator of the future National Repository, has to issue to each operator for each radioactive waste campaign, declaring that the conditioned waste will be accepted at the surface disposal. A different situation is for the ILW, where the strategy foresees storage at the long term storage facility that will be realized at the site of the National Repository. Conditioning requirements mainly address long term storage and assurance that conditioned waste will be accepted to the future geological disposal is subject to more uncertainty.

It has to be underlined that for those cases which are not addressed in T.G. no. 26 (for instance safety requirements for heterogeneous waste, and for ILW), the specific conditioning requirements are established a case by case basis. The safety requirements for the management of each category as established in the new classification system, will be the subject of a revision of the existing Technical Guide n° 26.

The new system for radioactive waste traceability and inventory

The recent Legislative Decree 101/2020, introduces new provisions regarding the management of radioactive waste and the use of radioactive materials or sources. All the operators involved in these activities have the obligation to register on the ISIN institutional web-site. In particular:

- who imports or produces for commercial purposes, materials or sources of ionizing radiation;
- who carries out activities of detention of sources of ionizing radiation;
- who carries out transport activities of radioactive materials and radioactive waste;
- who carries out radioactive waste management activities.

All the subject must transmit information relating to each operation carried out, the type and quantity of the materials or sources involved in the operation and all relevant information on the radioactive waste produced or stored.

The new system, called STRIMS (System for Radioactive Waste, Radioactive Material and Radioactive Sources Traceability), will start online operators' registration and data collection by February 2021.

Section C. Scope of Application

Article 3

- i) This Convention shall apply to the safety of spent fuel management when the spent fuel results from the operation of civilian nuclear reactors. Spent fuel held at reprocessing facilities as part of a reprocessing activity is not covered in the scope of this Convention unless the Contracting Party declares reprocessing to be part of spent fuel management.
 - ii) This Convention shall also apply to the safety of radioactive waste management when the radioactive waste results from civilian applications. However, this Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party.
 - iii) This Convention shall not apply to the safety of management of spent fuel or radioactive waste within military or defence programmes, unless declared as spent fuel or radioactive waste for the purposes of this Convention by the Contracting Party. However, this Convention shall apply to the safety of management of spent fuel and radioactive waste from military or defence programmes if and when such materials are transferred permanently to and managed within exclusively civilian programmes.
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- i) The Convention applies to the safety of spent fuel, originated from civilian power reactors which operated in Italy until 1987, currently present in the Italian territory, as well as to the spent fuel still stored in experimental reprocessing facilities whose operation terminated several years ago. All the installations are in the process of being decommissioned. The Convention also applies to the spent fuel originated from research reactors and other research activities.
- ii) This Convention applies to the radioactive wastes arising from the past operation of nuclear fuel cycle installations and to the waste derived from the application of radioisotopes in industry, research and medicine or arising as a result of past activities, incidents and accidents involving radioactive materials.
The Convention also applies to the radioactive wastes resulting from the spent fuel reprocessing activities performed abroad which will be returned to Italy.
- iii) Art. 242 paragraph 3 of the Legislative Decree 101/2020 introduces the new provision that radioactive waste generated by the installations and activities of the Defence Administration will be regulated by ISIN and that they will be transferred to the National Repository.

Section D. Inventories and Lists

Article 32, paragraph 2

This report shall also include:

- (i) a list of the spent fuel management facilities subject to this Convention, their location, main purpose and essential features;
- (ii) an inventory of spent fuel that is subject to this Convention and that is being held in storage and of that which has been disposed of. This inventory shall contain a description of the material and, if available, give information on its mass and its total activity;
- (iii) a list of the radioactive waste management facilities subject to this Convention, their location, main purpose and essential features;
- (iv) an inventory of radioactive waste that is subject to this Convention that:
 - (a) is being held in storage at radioactive waste management and nuclear fuel cycle facilities;
 - (b) has been disposed of; or
 - (c) has resulted from past practices.

This inventory shall contain a description of the material and other appropriate information available, such as volume or mass, activity and specific radionuclides;

- (v) a list of nuclear facilities in the process of being decommissioned and the status of decommissioning activities at those facilities.
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D.1 Spent fuel management facilities

The spent fuel originated from the operation of the commercial reactors, not yet transferred abroad for reprocessing, as well as that of research reactors and the spent fuel used in experimental reprocessing facilities, is currently stored in the pools of the installations described in following paragraphs.

D.1.1 AVOGADRO AFR facility

AVOGADRO is a spent fuel storage facility away from reactors placed at Saluggia, sited in northern Italy.

It was set up in the period 1977-1982 from a general refurbishment of the structure of the previous MTR research reactor called "AVOGADRO RS-1". AVOGADRO began storage operation on January 1st, 1984.

The AVOGADRO site includes a central storage building and four auxiliary service buildings. The storage building is focused on its storage pool, where the spent fuel lays in several racks. During

stationary storage, the fuel is shielded by a height of water of 6 m, which reduces to a minimum of 3 m during fuel handling operations for shipment.

The temporary spent fuel storage service is presently supplied to SOGIN, the owner of the spent fuel unloaded from Trino and Garigliano power plants.

During 2007, the spent fuel stored at the EUREX fuel pool, i.e. 52 special (cross shaped) Trino NPP spent fuel assemblies and limited amount of Garigliano NPP (48 pins) and research reactors spent fuel (10 pins of MTR Petten and one rod from European JRC), was transferred to the Avogadro facility.

Large part of the spent fuel was transferred to UK for reprocessing in the period 2003-2005 and to France in the period 2011-2013 (see Figure 2).

At the end of 2012 ten fuel plates from a dismantled MTR element from Petten (NL) were transferred to USA under the Global Threat Reduction Initiative (GTRI).

There are 64 elements, for a total of about 13 tHM still stored in the pool (1 Trino NPP element and 63 MOX Garigliano NPP elements).



Figure 2: Spent fuel transportation from Avogadro AFR for reprocessing abroad

D.1.2 Spent fuel pool of the ITREC facility

ITREC, a pilot reprocessing facility located in the Southern part of Italy, was operated by ENEA in the '70ies (uranium-thorium cycle fuels from the US Elk River reactor) until 2003, when it was taken under SOGIN responsibility.

After having reprocessed 20 Elk River spent fuel elements, during the commissioning tests (1975-78), the operation was stopped. 64 U-Th spent fuel assemblies are still stored in the pool (10,7m x 3m x 7m). The pool has a steel liner and a water clean-up system, to maintain the required chemical, physical and radiological conditions.

Fuel elements come from the ELK RIVER US reactor, where they were burned before 1967. Each fuel assembly is stored in leak tight stainless steel bottles, located along the pool walls.

D.1.3 OPEC 1

OPEC 1 is a post-irradiation examination facility, also located in the Casaccia Research Centre. It was operated by ENEA from 1962 to 1990. Activities were carried out on metal uranium and uranium oxide in a series of hot cells. From 1992 to 1998 activities on spent fuel scraps encapsulation and hot cell decontamination were carried out. The main decommissioning issue is the repackaging of spent fuel scraps. The dismantling of the tanks used for the collection of liquid waste of the facility was completed in 2016. Such tanks were located in underground concrete structures.

Since 2010, one building of the plant is dedicated to the dry storage of fragments of spent fuel and a specific license for this purpose has been granted.

D.1.4 JRC Ispra

The Joint Research Centre (JRC) was set up at the beginning of the 1960s, under Article 8 of the Euratom Treaty.

Safety and radiation protection of the Ispra JRC facilities, including the safe management of spent fuel and radioactive waste, are regulated by the Italian legislation according to agreement between the European Commission and the Government of the Republic of Italy, dated July 22, 1959, transposed into the Italian legislation with Law No. 906 of August 1, 1960.

The JRC spent fuel coming from past research activities is currently stored in the spent fuel pool of ESSOR research reactor and in dry-well pits, in the form of fuel fragments contained in sealed pots, located in the waste management area of the site.

The spent fuel located in the dry-well pits has been removed in 2019 (Figure 3) and transferred for dry storage in a refurbished hot cell of the ESSOR research reactor named TSA. It is envisaged that also the fuel currently present in the pool will be transferred into the hot cell.



Figure 3: Cold test for the transfer of spent fuel pots from dry-well pits to the dry storage in ESSOR reactor hot cell

D.1.5 Spent Fuel in research reactors

Italy also operates five research reactors. The only ones which store spent fuel on site are the TRIGA Mark II, site at L.E.N.A. (Laboratory of Applied Nuclear Energy) of the Pavia University, and the TRIGA RC-1, site at C.R. Casaccia of ENEA.

D.2 Spent Fuel Inventory

D.2.1 Spent fuel currently present in Italy

Total inventory of the spent fuel stored in Italy on December 31st, 2019 amounts to a total of about 15,8 tHM, as detailed in Table D.1

Table D.1 - Total inventory of the spent fuel stored in Italy (12/2019)				
Facility	Fuel Type	N° of fuel elements	Mass (tHM)	Activity (TBq)
AVOGADRO AFR Facility	PWR - TRINO UO ₂	1	0,31	888
	BWR-GARIGLIANO MOX	63	12,88	28.400
	Garigliano Rod	1	0,00132	n.a.
	CIRENE Rods	4(*)	0,00588	n.a.
ITREC	ELK RIVER U-Th	64	1,68	1.491
OPEC-1		580 (*)	0,116	32,80
JRC Ispra		-	0,68	4.265(**)
TRIGA Mark II		9	0,0017	6
TRIGA RC-1	Elementi TRIGA	12	0,0023	8,04
	RITMO, RANA, ROSPO		0,16	
TOTAL		-	15,837	35.091

(*) N° of rods, some partially dismantled

(**) Activity not updated for Decay

D.2.2 Spent fuel already sent abroad for reprocessing

Since the beginning of nuclear activities, Italy has pursued the reprocessing option using foreign reprocessing facilities. In this connection “service agreements” contracts were stipulated by ENEL. After the political decision to stop all nuclear power activities, no new reprocessing agreements were established.

Up to 2005, the following amounts of spent fuel had been transferred abroad for reprocessing:

- 963,2 tHM before 1978. In this case, the radioactive waste resulting from reprocessing will not return to Italy;
- 678 tHM after 1978 until 2005. In relation to this amount, it is envisaged the return to Italy of radioactive waste resulting from reprocessing.

As already mentioned, in April 2007 SOGIN signed a contract with AREVA for reprocessing of the spent fuel still present in Italy (about 235 tHM), with the only exception of the Elk river spent fuel

present in the ITREC facility. In June 2010 the shipments of 190,4 tHM of spent fuel from Caorso NPP was completed.

In November 2015 the shipment of spent fuel from Trino NPP was completed.

Transfer of the spent fuel stored in the Avogadro AFR storage pool is waiting for a new negotiation of some terms of the pertaining agreement with French authorities still in progress.

D.3 Radioactive waste management facilities

As already mentioned in Section B, all the radioactive waste originated from the operation of NPPs and experimental fuel cycle facilities are generally stored in the installations of origin, which were shut down several years ago and which are currently in the process of being decommissioned. Radioactive waste from medicine, industry and research activities are collected for temporary storage by NUCLECO and other private operators.

The installations where radioactive waste is currently stored are discussed in the following paragraphs.

D.3.1 Nuclear Power Plants

The Caorso NPP obtained the decommissioning licence on February 2014. At present in the **Caorso** NPP the radioactive waste is stored in the three storage facilities of the NPP site (see Figure 4). 1250 m³ of operational radioactive waste (resins and sludge) have been treated in the past with urea-formaldehyde but, due to the presence of significant amount of free (corrosive) liquids, the treatment process was not satisfactory.

As result of an international tender, the thermal treatment and conditioning of operational radioactive waste has been assigned to a qualified Slovak operator. The licensing process from both Italy and Slovak Republic Authorities has been completed and the transfer of spent resins to be treated in Slovakia recently started.

In accordance with the approved decommissioning plan, the upgrading of the turbine building as storage facility and waste management station is in progress and in 2020 started the installation of the cranes and the plant systems. Subsequently refurbishing of the three existing storage facilities on the site will be carried out through the demolition and rebuilding of two and the restructuring of the third. The construction of a confined waste route for the transfer of dismantled materials from the reactor building to the WMF was also authorized.



Figure 4: Caorso NPP – ERSBA 2 storage facility

The **Trino** NPP, 272 MWe PWR, sited in northern Italy, was in operation from 1964 to 1987. All spent fuel was removed from the plant since 2015 and radioactive waste is stored in the two on site storage facilities. Some semi-liquid radioactive waste is still to be conditioned.

The Trino NPP obtained the decommissioning licence on August 2012. According to the decommissioning program the existing waste storage facilities will have to be refurbished, also in order to accommodate waste packages deriving from dismantling activities.

The construction for the “Wet Oxidation” treatment process of resins (Figure 5) and sludge was approved by ISIN on July 2020.

Licensing process for the construction of the conditioning facility SICOMOR is ongoing. Also the detailed project for the refurbishment of one of the storage facilities on site is under licence approval by ISIN. The installation of a new facility for the treatment of liquid waste is ongoing.



Figure 5: TRINO NPP – Resins from past operation stored in the site

The **Garigliano** NPP 160 MWe BWR, sited in Southern Italy, was in operation from 1963 to 1978.

The Garigliano NPP obtained the decommissioning licence on August 2012.

All spent fuel was removed from the plant since many years, the radioactive waste is stored in different buildings in the NPP site. The Emergency Diesel building was refurbished to adapt the building itself as an interim storage facility. This new facility started its operation in 2013.

A new interim storage facility (named D1, Figure 6) has been realized and started its operation in 2014 as well. In 2019 the refurbishment of another storage facility (called ex-compattatore), was approved and the construction of a new storage facility (called D2) is under licence approval by ISIN.

These facilities will host a large part of the existing on site waste in improved safety conditions, also including the very low level waste buried in trenches realised in the '60. The remediation of two of the three tranches was completed, the remediation of the last one is scheduled to be concluded by the end of 2020.



Figure 6: Garigliano NPP – D1 storage facility

The 153 MWe GCR of **Latina**, located in the Central Italy, was operated by ENEL since 1962 until 1987. In May 2020 the decommissioning license for the Latina NPP (MAGNOX) was granted.

All spent fuel has been removed from the plant since decades. At present, the radioactive waste is stored in different storage facilities of the NPP site.

A Radioactive Sludges Conditioning facility (LECO facility) has been realized and commissioning is expected by 2021.

The construction of a new waste storage facility is completed and it is expected to host the waste resulting from the extraction and conditioning of the sludges and from the extraction and conditioning of the Magnox residues (splitters), (see Figure 7).

The decommissioning strategy foresees two-phase decommissioning plan, with the first one aimed at the safety of all previous radioactive waste or produced by the dismantling of structures, system and components of the plant, and also to conservation of reactor building (with radioactive graphite inside) and the second one, to be implemented only after the siting and construction of the National

Repository, foresees the dismantling of all plant structures with the purpose to reach the green field end state (this phase two will be subject to specific authorization).



Figure 7: Latina NPP – New storage building

D.3.2 Fuel Cycle facilities

AVOGADRO

All the radioactive waste generated from the operation of the facility (AFR spent fuel storage in pool) is stored in the facility itself.

Bosco Marengo

Bosco Marengo (former Fabbricazioni Nucleari), an industrial scale plant for LWR fuel fabrication located at Bosco Marengo (AL), was operated by FN from 1973 to 1995. The decommissioning license was granted in November 2008. Most of the nuclear material has been removed from the site and the operational dry radioactive wastes have been super compacted.

The dismantling plan was divided into 2 phases: the first step included the dismantling of the fuel assembly fabrication equipment and its accessories, and the auxiliary systems such as ventilation, decontamination systems and liquid waste treatment plants; the second phase includes the shipment of the waste to the National Repository and the free release of the site.

The dismantling of the auxiliary systems has been completed in 2016. Resulting waste will be conditioned outside the plant by a qualified operator and will return to the site for interim storage.

All the overpacks with other unconditioned waste are now located in a buffer station in the wait to be transferred to the site interim storage facility to be realized by refurbishing the site storage facility existing at the time of plant operation denominated Building B106.

On April 2017, operations for the refurbishment of building B106 were approved by ISPRA. In 2019 were completed the activities to refurbish the existing building B106 as interim storage facilities and currently the commissioning of the systems is ongoing.

From the dismantling of the plant, about 270 tons of materials are below clearance level and about 500 drums (220 litres each) of radioactive waste have been produced.

As said, it is expected that the plant will reach the “brown field” configuration by the end of 2020.

EUREX

The main activities in progress at EUREX facility, located in the Northern part of Italy, is to treat and condition liquid wastes produced for the reprocessing of MTR and CANDU fuel (some 120 m³ ILW and some 100 m³ LLW). This liquid waste represents in terms of activity the largest part of waste present in Italy and it is currently stored in a dedicated storage facility located in a bunkerized building in the site. This waste will be conditioned by cementation. The project of the cementation facility has been approved in 2015. A first part of the civil structures has been constructed. Construction activities have been suspended in 2017 due to contractual problems among the operator and the contractor.

After an interruption of the program of about two years, in 2019 the project has been restarted with the construction of the storage building (Deposito D3) and the review of the overall design.

This year, an European public procurement has been released with the aim to complete the construction of the CEMEX complex.

Operation of a new interim storage facility, denominated D2 (see Figure 8), licensed in 2012, started in 2019.



Figure 8: EUREX D2 storage facility

ITREC

The radioactive waste present on the site originates from the experimental reprocessing activities performed on the plant in the 70'ies, as described in previous section.

All the liquid waste (LLW, ILW and HLW) produced by the operation has been cemented by the so called SIRTE campaigns (see Section H).

The plant is operated under a licence granted in 2006 which also regulate relevant activities to be conducted preliminarily to the decommissioning.

These in particular includes the removal of a solid waste underground pit, the conditioning of U-Th final product solution and the implementation of a dry storage configuration for the remaining 64 irradiated fuel elements.

Detailed design for the remediation of the underground pit, containing radioactive waste drums immobilized in a block of concrete (6,5 x 6 x 1.5 m) set, built during the former operation, has been completed as approved by ISIN. In order to remove the concrete block the project envisaged to cut it into four main pieces to be located in the storage facilities of the site. Concrete block have been removed in 2019 (see figure 9), waiting for the detailed design of further cutting operations.



Figure 9: ITREC concrete block removal

The conditioning process for the 3,3 m³ of U-Th solution final product has been approved by ISPRA in 2010. Construction activities started with the waste storage building. Construction activities of the cementation facility, to be located in the same area of the underground pit, could start only after its removal.

An additional important task is to manage the transfer the 64 spent fuel elements still stored in the pool into dual purpose casks for dry storage. Detailed design of the storage facility and of the two cask has been approved by ISIN in March 2020.

In the frame of the SIRIS project (Settlement of Solid Radioactive Waste), characterization and treatment activities by grouting and super-compaction of metal wastes generated in the former operation are undergoing.

PLUTONIUM pilot MOX fuel fabrication facility, located at Casaccia Research Centre, was operated by ENEA from 1968 to 1974 (process development) and from 1977 to early eighties (MOX fuel fabrication experimental campaigns).

At the end of 2010 the first glove box (SaG) of the plutonium plant (IPU) was dismantled, as a hot test of the dismantling project of the remaining 55 SaG's, started in 2012. The SaG's were used in the past operation for manipulating uranium and plutonium during the manufacture of MOX fuel.

In the period 2013-2014 some amount of fresh plutonium and enriched uranium has been transferred to USA, under the Global Threat Reduction Initiative (GTRI).

In the near future, the treatment of many radioactive waste streams (1 m³ of plutonium bearing liquids) will be carried out.

D.3.3 Other facilities

European Joint Research Centre of Ispra (Varese)

A full description of the different facilities in the JRC Ispra is expected to be provided in the EURATOM report under the Joint Convention.

The Joint Research Centre of Ispra is currently undertaking a global Decommissioning and Waste Management Programme aimed at dismantling the nuclear installations that operated in the Centre as well as to perform a complete characterization and conditioning of the radioactive waste produced in the past activities and currently stored on the site. As said, licensing and supervision activities are conducted by the Italian authorities according to the in force agreement between the Italian Republic and the Euratom Community signed in 1960.

The decommissioning programme is regulated according to the Italian legislation. Main current activities are related to projects addressing the treatment, conditioning and interim storage of legacy waste, as well as interim storage of research spent fuel. A grouting station for the conditioning of existing LLW is under construction in the site. An interim Storage Facility has been constructed. The storage of all waste from the research center is foreseen, waiting to be transferred to the Italian National Repository.

According to a transaction agreement between the European Commission and the Italian republic the decommissioning of the Ispra -1 research reactor will be conducted by SOGIN.

Ispra-1 is a research reactor with a power of 5 MW, last version of Chicago-Pile developed by Enrico Fermi. It has been the first Italian research reactor. It was built between 1957 and 1958 by Consiglio Nazionale Ricerche Nucleari and worked since 1959 to 1973.

NUCLECO (Nuclear Ecology)

Nucleco company, owned by ENI (60%) and ENEA (40%), was created in 1980 with the mission to operate the waste facilities sited in the Casaccia centre. In September 2004 the ENI part was transferred to SOGIN.

Nucleco is authorized to manage the radioactive waste produced in the ENEA Research Centres and is an operator in charge of collection, transportation, storage, treatment (mainly by supercompaction) and conditioning of waste generated by the industrial, medical and research processes in the context of the Integrated Service coordinated by ENEA. Treatment and conditioning services are also offered to nuclear installations under decommissioning providing that, after conditioning, the waste packages are returned to the installation of origin for interim storage.

The Integrated Service is a special technical service that ENEA offers to small producers of radioactive waste (medicine, industry, agriculture, research and education). ENEA has entrusted NUCLECO with the operative and commercial task and offered to NUCLECO the access to use specific Casaccia facilities and infrastructures. The two parties drew up a special agreement describing mutual duties and responsibilities.

Integrated Service has also collected disused sealed radioactive sources with Cs-137 and Co-60 and small quantities of Ra-226, no longer used in medical therapy. Except this last type of waste, ENEA becomes owner of the radioactive waste collected, also in view of disposal.

OPEC 2

In the same site of OPEC 1 spent fuel storage facility, there is the OPEC 2 waste storage facility that started operation in 2019. The facility is authorized to store the waste coming from the past operational activities and future decommissioning activities of Plutonium plant.

Operators in the industrial and medical sector

In Italy there are also other operators for collection and storage of limited quantities of industrial and medical wastes (e.g. Protex, Campoverde and MITAmbiente).

CEMERAD

The CEMERAD company, based in Statte municipality (TA), has been operating since 1984 for temporary storage of solid and liquid radioactive waste, produced in medical, industrial and research activities, until June 2000, when, after court proceedings, the owner has been sentenced for the non-respect of good practice and the facility has been put under judicial custody.

The storage facility is located outside the city centre although there are some residential buildings nearby.

The facility is constituted by an industrial warehouse, which is deteriorated and, in any case, not suitable for the storage of radioactive materials.

The distribution of the drums inside the storage facility is such that it does not allow appropriate inspection (see Figure 10). The floor surface have a degree of roughness that would cause difficulties in the decontamination operations that may be required.

There are a number of drums inside the store, showing signs of corrosion, deformation and potential loss of content.

With the Decree of the President of the Council of Ministers no. 3061 of 14/12/2015, an Extraordinary Commissioner has been appointed for the implementation of the safe-keeping and management of radioactive hazardous waste located in the storage facility.

Remediation activities have approved by the Extraordinary Commissioner in 2017, based upon an advice of ISIN. The activities are carried out by SO.G.IN and Nucleco and are expected to be completed by 2021.



Figure 10: CEMERAD storage facility

D.4 Radioactive waste inventories

The overall national inventory of the radioactive waste, spent sealed sources and spent fuel presently stored in the Italian Nuclear Installations is continuously updated by ISIN. The Data Base is able to present the data in terms of volumes, mass, activity and physical status.

The inventory of the radioactive waste currently present in Italy is, at December 31st, 2019, as follows: 14.072 m³ of VLLW, 12.521 m³ of LLW and 3.028 m³ of ILW.

Details are presented in Table D.2 and D.3. Data on Very Short Lived Waste are excluded.

To this amount it should be added some 20 m³ of vitrified HLW arising from reprocessing of spent fuel that will be returned from Sellafield (UK). Similar amount of HLW, together with 53 m³ of ILW, will have to return in Italy from the reprocessing of the 235 t of spent fuel in France. In addition, some 30.000 m³ of VLLW and L-ILW from decommissioning of nuclear facilities.

Since the provision that radioactive waste from defence administration will be transferred to the National Repository has been introduced by the Legislative Decree 101/2020, inventory of such waste is not included.

Table D.2 – Activity Inventory of the radioactive waste and spent sources stored in Italy (December 2019)				
Facility	VLLW	LLW	ILW	Spent sources
	Activity (GBq)	Activity (GBq)	Activity (GBq)	Activity (GBq)
Caorso	16,32	2187,21	0,00	0,02
Garigliano	9,78	20782,45	337633,60	0,00
Latina	12,76	16444,18	10682,74	0,00
Trino	8,54	896,75	9648,38	0,00
Eurex	12,82	255,68	2104028,63	6,38
Itrac	65,16	2997,63	248921,94	0,01
OPEC 1	0,00	57,42	3928,02	1187,24
Impianto Plutonio	0,00	0,00	19022,55	0,00
Bosco Marengo	0,40	34,36	0,00	0,00
Nucleco	37,08	3115,28	1922,58	891183,93
JRC Ispra	6,32	493,82	97496,39	261,00
Avogadro	12,67	403,95	0,00	0,00
Others *	18,39	210,07	378,18	16594,72
Total	200,24	47.878,8	2.833.663	909.233

* includes operators in medical and industrial waste as well as research organizations.

Table D.3 – Volume Inventory of the radioactive waste and spent sources stored in Italy (December 2019)				
Facility	VLLW	LLW	ILW	Total
	Volume (m ³)	Volume (m ³)	Volume (m ³)	Volume (m ³) **
Caorso	781,04	1584,90		2365,94
Garigliano	1727,98	1149,66	90,00	2967,64
Latina	867,77	489,10	437,57	1794,44
Trino	874,31	201,48	65,11	1140,9
Eurex	1533,57	890,94	518,11	2942,62
Itrec	2810,60	356,28	194,88	3361,76
OPEC 1		2,79	63,50	66,29
Impianto Plutonio			184,54	184,54
Bosco Marengo	183,22	329,41		512,63
Nucleco	2786,22	3734,10	337,36	6857,68
JRC Ispra	1382,20	3235,30	1089,95	5707,45
Avogadro	80,38	3,22		83,6
Others *	1045,11	544,01	46,94	1636,06
Total	14072,4	12521,19	3027,96	29621,55

* includes operators in medical and industrial waste as well as research organizations.

** presented volumes are referred to as produced waste, in average about 85 % is still as produced.

D.5 Nuclear facilities in the process of being decommissioned

As already said in section B3, all the Italian NPP's (Caorso, Garigliano, Latina and Trino) were definitely shut down in the 80's. For all NPP's the decommissioning licenses were granted.

For each NPP an environmental impact assessment related to decommissioning activities was conducted. Preliminary and partial decommissioning activities have already been performed or are underway on the basis of specific authorization.

As far as the fuel cycle facilities are concerned, they were also shut down at the same time. For Bosco Marengo the decommissioning authorisation was granted in November 2008. It is expected that the brown field configuration will be reached in by the end of 2020.

As far as research reactors under decommissioning is concerned, the Decommissioning license for RB-3 research reactor was granted in 2010. The procedure for the site release without radiological constraints is in progress.

An application for the decommissioning of Ispra-1 RR was submitted by SOGIN in April 2020.

Section E. Legislative and Regulatory System

Article 18. Implementing measures

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.

18.1 Implementing measures

The Government, the Ministry of Economic Development, the Ministry of Environment, together with other relevant Ministries and authorities, according to their respective competencies and duties, with the technical advice of the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN), develop legal, regulatory and administrative provisions related to the safe management of radioactive waste and spent fuel, taking into account contributions from national stakeholders.

Italy, as member of the European Union, has transposed in the Legislative Decree n. 45/2014 the EU Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. According to this decree a National Programme was issued in 2019 (see Para B.2).

Based upon the existing legislative framework, as described under article 19, the licensing procedures in place allow to apply the international experience and practices as codified in the IAEA standards, which are always considered in the authorization and regulatory supervision of any activity related to spent fuel and radioactive waste management.

Furthermore, ISIN, as a fundamental task of its mission, is continuously performing reviews and inspections in the nuclear installations where spent fuel and radioactive waste are stored and/or managed. This activity will further increase in the future, when decommissioning and waste conditioning activities will be extensively performed in all nuclear facilities.

The construction of interim storage facilities in the different sites is authorised on the bases of a comprehensive regulatory review aimed at ensuring improvements of the safe storage conditions for the coming years, until the national disposal facility will be into operation. In the context of the mentioned regulatory review the compliance with up-to-date safety principle and criteria for waste storage is verified.

ISIN is also implementing a plan to update existing technical guides, related to the management of radioactive waste. A guide on siting criteria of a disposal facility for low and intermediate level radioactive waste was issued in 2014. The guide for waste storage facilities will be issued soon. Other guides on decommissioning and waste management have been developed and will be issued for public consultation. These guides are mainly based on WENRA Safety Reference Levels. They have been developed based upon the licensing experience of the past years and the related requirements are assumed as reference in all the involved authorization processes.

18.2 Assessment of compliance

The current national legal framework related to nuclear safety and radiation protection at nuclear installations can be considered adequate. A proper integration of the legal and regulatory framework is foreseen in the near future, in particular as far as the final phase of the waste management is concerned, together with an updating of the pertaining Technical Guides.

Article 19. Legislative and regulatory framework

1. Each Contracting Party shall establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.
 2. This legislative and regulatory framework shall provide for:
 - (i) the establishment of applicable national safety requirements and regulations for radiation safety;
 - (ii) a system of licensing of spent fuel and radioactive waste management activities;
 - (iii) a system of prohibition of the operation of a spent fuel or radioactive waste management facility without a licence;
 - (iv) a system of appropriate institutional control, regulatory inspection and documentation and reporting;
 - (v) the enforcement of applicable regulations and of the terms of the licences;
 - (vi) a clear allocation of responsibilities of the bodies involved in the different steps of spent fuel and of radioactive waste management.
 3. When considering whether to regulate radioactive materials as radioactive waste, Contracting Parties shall take due account of the objectives of this Convention.
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19.1 Legislative and regulatory framework

The current Italian legislative and regulatory framework related to nuclear and radiation safety is the result of an evolution of rules and provisions that begun in the early 60^{ties} and that took into account the experience of licensing and operation of NPPs of different types and generations and of other nuclear installations. The system, therefore, covers also the government of safety of spent fuel and radioactive waste management.

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

- legislation proper, that is Acts and legislative decrees, and governmental or ministerial decrees;
 - technical guides;
 - technical standards.
- a) Legislation and ministerial decrees.

In the Italian regulatory system the source of legally binding rules must be either an act of Parliament (statute) 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 related to Radiation Protection. An important feature of legally binding rules concerning 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 regulatory system are itemised below, as regards Statutes and Legislative acts:

- Act n° 1860/1962 published in the Italian Republic's Official Journal n° 27 of 30 January 1963, as amended by the President's Decree n° 1704 of 30 December 1965, the President's Decree n° 519 of 10 May 1975, the Legislative Decree n. 45/2014 and the Legislative Decree n° 101/2020.
- Presidential Decree n° 1450/1971, which contains requirements and procedure for the acquisition of the operational personnel licences.
- Legislative Decree n° 23/2009: which transposes EU directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel; Legislative Decree n° 23/2009 has modified pertinent administrative provisions previously contained in Legislative Decree n° 230/1995 concerning the trans-boundary shipments of radioactive waste.

In 2009, the Italian Government, with the aim to restart a new nuclear programme, promulgated a new Act (Act 99/2009) establishing the necessary legislative provisions. Other Legislative Decrees have been issued or were in preparation, but a public debate brought to a popular referendum on June 2011, the result of which definitely sanctioned the abandon of the nuclear programme in Italy.

- Act n° 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 Competent Regulatory Authority. 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 Economic Development (ENEA). This new Safety Authority has, however, been cancelled in 2011 following the above mentioned referendum before becoming operative.
- Legislative Decree n° 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. This part of the decree was also abrogated in 2011. The Legislative Decree includes also provisions setting up the procedure for the selection, construction and operation of the National Repository and giving the related national site for radioactive waste disposal giving the responsibility to SOGIN.
- Legislative Decree n° 41/2011 amended the Legislative Decree n° 31/2010 with reference to the future nuclear development in Italy.

- Legislative Decree n° 100/2011 which modifies the provisions of article 157 of Legislative Decree n° 230/1995 concerning the radiometric surveillance of metal scraps.
- Legislative Decree n° 185/2011 which transposes the EU Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.
- Act n° 75/2011, that modifies all the provisions given in the Act n° 99/2009 and in the Legislative Decree n° 31/2010, as amended by the Legislative Decree n° 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 however been confirmed. Furthermore, by abrogating the Articles 8 and 9 of the Legislative Decree n° 230 of 1995, this Act slightly modifies the regulatory process by cancelling of the “Technical Commission on Nuclear safety and Radiation Protection”, as described in Art. 20 of this report.
- Act n° 214/2011 that abrogates the Nuclear Safety Agency (created with the Act n° 99/2009, but never applied) and assigns 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 n° 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 strong involvement of local administrations.
- Legislative Decree n° 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 n° 45/2014 has modified and integrated the Act n° 1860/1962, the Legislative Decree n° 230/1995 and the Legislative Decree n° 31/2010. This Legislative Decree included also provisions for the establishment of a new competent Regulatory Authority (Inspectorate for Nuclear Safety and Radiation Protection, ISIN) fully dedicated to the regulation and control in the nuclear field with strengthened independence and human and financial resources and based on the current ISPRA organization. The enactment of further legislative provisions were required for the full and formal establishment of the new Regulatory Authority.
- Ministerial Decree of August 7th, 2015 from the Ministry of Economic Development and the Ministry of the Environment, established a new RW classification system.
- 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° 137/2017 has modified the Legislative Decree n° 230/1995 and Legislative Decree n° 45/2014 establishing also new provisions for the Inspectorate for Nuclear Safety and Radiation Protection, ISIN.
- Legislative Decree n° 101/2020, which transposes EU 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. As already foreseen in the Legislative Decrees n° 230/1995, waste storage facilities included in nuclear installations are licensed together with the installations themselves. In the other cases, for radioactive waste storage facilities, in relation to their size, authorisation shall be granted by the Ministry of Economic Development together with the Ministries of Environment, of Labour, of Health and of Social Affairs, and the region concerned, on the basis of technical advice of ISIN or by the Prefect. Article 150, establishes that waste must be managed in accordance with the rules of good practice and the technical prescriptions set out in the licence; also, any person producing, treating, handling, using, dealing in or storing radioactive substances must conduct a whole series of assessments concerning the disposal of solid, liquid or gaseous radioactive waste in order to ensure that the limits and the other conditions governing disposal into the environment are observed (Article 151).

The main functions of the Competent Regulatory Authority was exploited by the National Centre for Nuclear Safety and Radiation Protection of the ISPRA until July 2018.

On 1 August 2018, the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN) became operational and in full exercise of the functions referred to in art. 6, paragraph 2, of Legislative Decree no. 45/2014 and subsequent amendments.

The Acts and legislative decrees on the institution and subsequent re-organisations of the Competent Regulatory Authority are listed below:

- **Act n° 933/1960** on establishment of the National Committee for Nuclear Energy (CNEN)
- **Act n° 84/1982** on establishment of the State Agency for new technologies, energy and environment (ENEA).
- **Act n° 85/1982** with specific provisions to ensure independency of DISP in the frame of ENEA.
- **Act n° 61/1994** on establishment of the National Agency for the Environmental Protection (ANPA).
- **Legislative Decree n° 300/1999 and Presidential Decree n°207/2002** on establishment of the APAT, by merging ANPA with other national technical services.
- **Act n° 133/2008** on establishment of the Institute for the Environmental Protection and Research (ISPRA).
- **Legislative Decree n° 45/2014**
Establishment of the Inspectorate for Nuclear Safety and Radiation Protection (ISIN)
- **Legislative Decree n° 137/2017**
Financial and human resources for the ISIN (Inspectorate for Nuclear Safety and radiation protection) have been increased.

b) Technical guides

The issuing of technical guides, previously carried out by the Directorate for Nuclear Safety and Health Protection (ENEA-DISP), then assigned to ISIN by Article 236 of the Legislative Decree n° 101/2020.

Technical guides issued by ISIN are regulatory documents by which ISIN discloses best practices on operational and technical measures to implement legislative provisions in the field of nuclear safety and radiation protection, as well as criteria and methodology of its control activity.

Compliance with Technical Guides is verified by the Competent Regulatory Authority during the licensing process based upon assessment and demonstrations provided by the operator. Some thirty Technical Guides have been issued on Safety and Radiation Protection matters ranging from procedural to detailed technical guidance.

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

The list of the most important Technical Guides is reported in Annex B. It is worthwhile pointing out that one of the Technical Guides, i.e. the T.G. n° 26, is related to safe management of radioactive waste reflecting the fact that, since 1987, when it was issued, the importance of defining specific requirements to be fulfilled in this area by licensees was recognized. An updating of this guide, taking into account, the new classification system of radioactive waste, the experience and the lessons learned in the recent times, is in progress. A first issue will be related to storage requirements. At the beginning of 2014 the Technical Guide n. 29 was issued in which the siting criteria of a near surface disposal facility for low and intermediate level radioactive waste are established. With reference to the procedure laid down in the Title III of the Legislative Decree n. 31/2010, for the siting, construction and operation of the national disposal facility within a Technology Park, the criteria established in the Technical Guide n. 29 are also applied in the siting process of the aforementioned disposal facility from the definition of the proposed National Chart of potentially eligible sites until the selection of the suitable site.

c) Technical standards

Technical standards are mainly issued by UNI (Ente Nazionale Italiano di Unificazione) the Italian National Standards Body. Selected standards related to decommissioning and to waste management are listed in Annex B.

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

Standards documents are developed within expert groups and approved by the Technical Committees.

Moreover, in the design, construction and operation of nuclear installations and radioactive waste facilities, other rules apply, such as those concerning firefighting, pressure components integrity, labour health.

Some wider description of the Italian legislative and regulatory framework relevant to the Convention is given in Annex C. In the following the main outlines are presented.

19.1.1 National safety requirements and regulations for radiation safety

Information under article 19.1 and in Annexes B and C provide a comprehensive picture of the national safety requirements and regulation for radiation safety.

19.1.2/3 Authorization System of nuclear installations

Article 6 of Act n. 1860/1962 establishes that the operation of nuclear installations has to be authorized by the Ministry of Industry (now Ministry of Economic Development). Authorization is granted according to provisions established in Title IX of the Legislative Decree n. 101/2020, based upon the technical advice of ISIN, to be considered binding, which is formulated as result of the assessment of the safety case filed by the applicant.

With regard to the licensing of spent fuel and radioactive waste related activities, the following different cases can be pointed out as existing in the national facilities, together with the specific applicable legislative provision:

- a) Storage of spent fuel in the pools of the nuclear installation where it was generated or used for reprocessing purposes;
- b) Storage of spent fuel in facilities specifically devoted to the purpose;
- c) Treatment and storage of radioactive waste in the facilities where it was generated;
- d) Treatment and storage of radioactive waste in facilities under decommissioning;
- e) Storage of radioactive waste in facilities specifically devoted to the purpose.

In the case of spent fuel stored in the pools of the nuclear installation where it was generated, or used for reprocessing purposes, its safe management is regulated by specific conditions attached to the licence and by the technical specifications defined for the nuclear installation.

Facilities specifically devoted to the temporary storage of spent fuel need to be authorised according to the provisions of Article 95 of Legislative Decree n. 101/2020, which requires a specific authorization to be granted by the Ministry of Economic Development, in agreements with the Ministries of Labour, Interior and Health, based upon the technical advice of ISIN.

Activities connected with the treatment and the storage of radioactive waste in the facilities where it was generated are regulated by specific conditions attached to the licence and by the technical specification of the facilities. In the case of new and relevant waste management activities to be performed on the site (for example the construction of a temporary storage facility) they are authorised following the procedure established for the authorization of plant modifications of nuclear installations, as defined by Article 6 of Act n. 1860/1962 and detailed in the ISIN Technical Guide n° 2 “*Authorization procedure for nuclear installations modifications*”. New interim storage facilities are authorized by the Ministry of Economic Development based upon the advice of ISIN as well as of the Ministry of Environment and the Ministry of Health.

Any management and storage activity of radioactive waste during decommissioning requires a specific approval by the Competent Regulatory Authority in the frame of the authorization process

of the decommissioning operations which is granted in compliance with the procedure defined in Articles 98 and 99 of the Legislative Decree n. 101/2020.

As far as the radioactive waste management associated with decommissioning activities are concerned, Articles 98 and 99 of the Legislative Decree n. 101/2020 establish that decommissioning operations of nuclear installations have to be authorized based upon a decommissioning plan including, inter alia, proper management of the radioactive wastes already existing on the sites and of all the wastes which will result from the dismantling activities. The authorization is granted by the Ministry of Economic Development based upon the technical advice of ISIN and taking into account observations expressed by different involved Ministries as well as relevant Regional authorities. A separate Environmental Impact Assessment procedure is performed under the coordination of the Ministry of Environment. Furthermore, any specific management and storage activity of the radioactive waste which will be generated during decommissioning will require, on the bases of specific decommissioning licence conditions, the approval by the Competent Regulatory Authority.

Figure 11 shows the Regulatory system in the field of nuclear safety and radiation protection in Italy applicable to the decommissioning activities of nuclear installations. Additional information on the decommissioning license procedure are provided in paragraph 26.1.

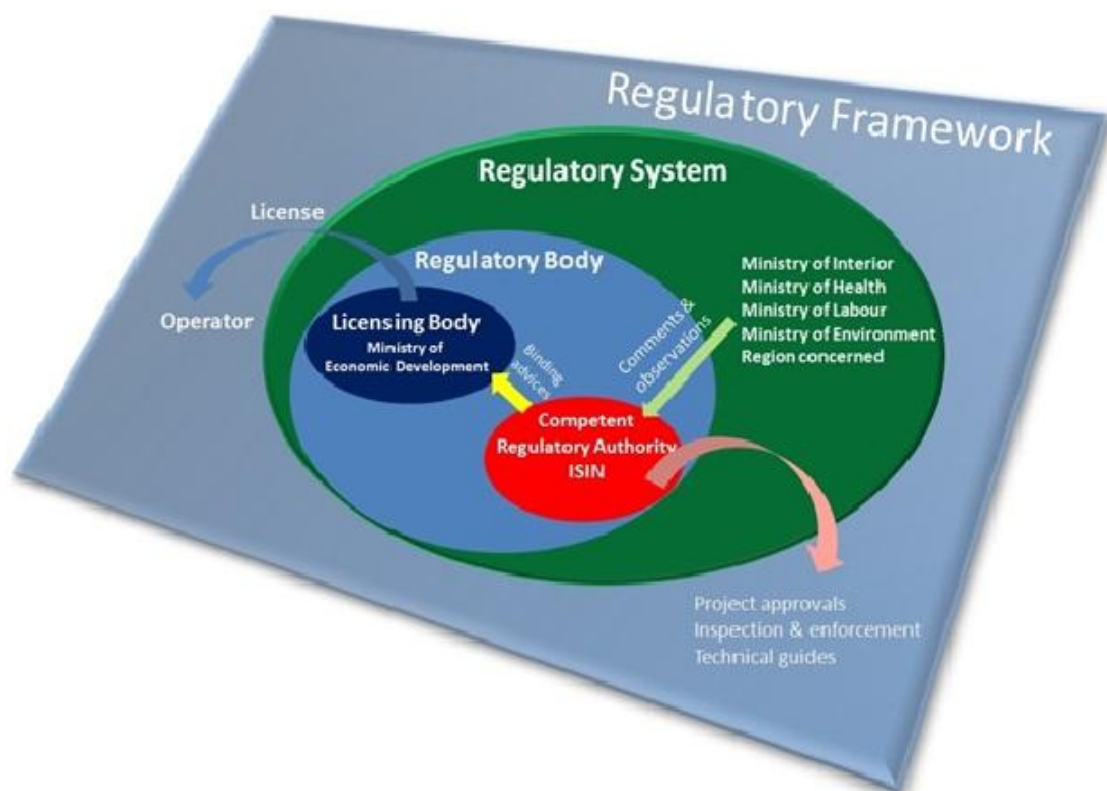


Figure 11: Regulatory system in the field of nuclear safety and radiation protection for decommissioning activities

For radioactive waste storage facilities, different from nuclear installations, a specific authorization is also required. In particular, in the case of installations for temporary storage or for disposal of radioactive wastes their authorization is granted under Articles 50, 51 and 52 of Legislative Decree n° 101/2020. A specific implementation Decree to be enacted according to art. 59 of the above mentioned Legislative decree n° 101/2020 is under preparation to regulate facilities outside nuclear installations for waste storage and disposal. The authorization is granted by the Ministry of Economic Development, in agreement with other involved Ministries, regional administrations and based upon the technical advice of ISIN. For minor facilities, authorization is granted by Prefect of the province where the installation is located.

Taking into account lessons learned and recent regulatory experiences, a Technical Guide on safety requirements for storage facilities, according to a graded approach depending on the RW classes and time of storage.

The technical guide has been finalized after a process of public consultation where all stakeholders, including operators, had the opportunity to propose or suggest modifications. The Technical Guide n.30 will be published within 2020.

Art. 236 of Legislative Decree 101/2020 states that ISIN, after consulting the other bodies and organizations concerned, can elaborate and disseminate, through guides also basing on international standards, good practice standards in the field of nuclear safety and radiation protection. Technical guides are part of the national legislative framework. These technical guides represent the minimum set of safety requirements the operator shall apply, on the contrary the operator can claim to comply with different requirements providing in the licensing process the demonstration that an equivalent level of safety is achieved.

19.1.4 Institutional Control and Regulatory Inspection

With regard to the system of institutional control and regulatory inspection the Legislative Decree n. 101/2020 establishes that regulatory inspection activity on the general compliance with the provisions established by the Legislative Decree is performed by ISIN inspectors. On the bases of Legislative Decree n. 101/2020 and of its institutive Act, ISIN inspectors are entitled to perform any supervision activity which is deemed necessary and relevant to the nuclear safety and the radiation protection of the workers and the population.

19.1.5 Enforcement and sanctions system

Enforcement of applicable regulations and of licence conditions is ensured on the basis of the sanction system, as established in Chapter V of the Act n° 1860/1962 and in Title XVI of Legislative Decree n° 101/2020, taking into account that Article 9 of Legislative Decree n° 101/2020 gives to ISIN inspectors 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. ISIN inspectors are entitled to report any violation to the public attorney of the jurisdiction the nuclear installation belongs to.

Moreover, Articles 61 and 101 of Legislative Decree n° 101/2020 establish the procedure according to which, in case of non-compliance with the conditions attached to the licence, the Ministry of Economic Development can suspend or revoke the licence or the authorization.

19.1.6 Assignment of responsibilities

Section B of this report, related to policies and practices, describes the responsibilities assigned to SOGIN S.p.A. as implementer for activities in particular related to:

- Treatment and conditioning into certified form of all liquid and solid wastes, ready to be delivered to the national repository;
- Perform all the actions needed for managing spent fuel;
- Contribute to the decommissioning of all nuclear facilities owned by other licensees;
- Implement the single phase decommissioning strategy in all nuclear installations;
- Siting, construction and operation of the National Repository.

Responsibilities assigned by the law to the Ministry of Economic Development, ISIN and to other governmental bodies are described in other paragraphs of this section.

19.2 Assessment of compliance

On the bases of the information included in the previous paragraphs of this section of the report and taking into account information reported in the following article 20, it is concluded that Italy has an adequate legislative and regulatory framework to ensure the safe management of spent fuel and radioactive waste.

Article 20. Regulatory Body

1. Each Contracting Party shall establish or designate a regulatory body entrusted with the implementation of the legislative and regulatory framework referred to in Article 19, and provided with adequate authority, competence and financial and human resources to fulfil its assigned responsibilities.
 2. Each Contracting Party, in accordance with its legislative and regulatory framework, shall take the appropriate steps to ensure the effective independence of the regulatory functions from other functions where organizations are involved in both spent fuel or radioactive waste management and in their regulation.
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20.1 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, including also the safe management of spent fuel and radioactive waste, and decommissioning, are assigned in Italy to the following main bodies:

- a) The Ministry of Economic Development, in this report defined as the Licensing Body, is the authority which grants the licence/authorization for nuclear activities (from the design and construction to the decommissioning and waste disposal) and for major practices involving the use of ionising radiations. Authorizations are granted on the bases of the technical advice, to be considered binding, provided by the Competent Regulatory Authority – the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN). Some authorizations are granted in agreement with other ministries (Ministry of Interior, Ministry of Labour and Social Affairs, Ministry of Health, Ministry of Environment) and taking into account the Region where the installation is located. For the decommissioning authorization observations formulated by the above mentioned Ministries have to be taken into account. For specified activities, the authorisation shall take also into account environmental impact assessment.
- b) ISIN is the Governmental body entrusted with the role of Competent Regulatory Authority responsible for the assessment and the inspection activities on nuclear installations, as well as for approving detailed designs or activities related to the construction of nuclear facilities, which are part of the general construction licence granted by the Ministry of Economic Development, or to the implementation of a plant modification. Any licence/authorization issued by the Ministry of Economic Development is based on the technical advice and specifications formulated by ISIN, which supervises, throughout its inspection activity, the

compliance with the requirements established in the law, with the technical specifications issued in the authorization and with the conditions attached to specific approvals of detailed projects or plans of operations. 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 and have the authority to establish specifications in order to interrupt any violations in place. ISIN is also the competent body for giving support to the Governmental rule-making function in the field of nuclear safety and radiation protection and it is also entitled to issue technical guides pertaining the different operational aspects of the regulatory process.

As introduced under the previous Article 19, a legislative and regulatory relevant development is represented by the enacting of the Legislative Decree n° 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. This Decree included in fact provisions for the establishment of a new Competent Regulatory Authority (Inspectorate for Nuclear Safety and Radiation Protection, ISIN) fully dedicated to the regulation and control in the nuclear field with strengthened independence and human and financial resources and based on the current ISPRA staff. Legislative Decree n. 137/2017 establishes provisions that strengthen financial and human resources of ISIN.

ISIN, replacing the Nuclear Department of ISPRA as Competent Regulatory Authority on nuclear safety and radiation protection has become operative in august 2018.

ISIN is entrusted with functions and duties related to technical regulation, implementation of licensing procedures, technical assessments, control and surveillance of nuclear installations no longer in operation and in decommissioning, as well as of research reactors, of facilities and activities related to management of radioactive waste and spent fuel, of nuclear materials, of the passive physical protection of nuclear materials and facilities, of the use of ionizing radiation sources and of the transport of radioactive materials, issuing in this case, the certifications foreseen by the current legislation. ISIN issues technical guides and provides support to the competent ministries in the elaboration of legislative acts in the fields of its own competence. Provides technical support to the civil protection authorities in the field of radiological and nuclear emergency planning and response, implements monitoring activities on environmental radioactivity as envisaged by the current legislation and ensures the fulfillment of the obligations of the State stemming from international safeguards agreements. ISIN, in relation to matters of its own competences, represents Italy in the activities performed by the international organizations and the European Union, and assures the participation to the international and European assessment activities related to the nuclear safety of nuclear installations and to the spent fuel and radwaste management in other countries.

According to the institutional law the staff assigned to ISIN comprises 90 units, 60 technicians plus 30 units with administrative and legal background. The current staff is of 65 people, mainly coming from the previous Nuclear, Technological and Industrial Risk Department of ISPRA, which has previously carried out the functions of national competent regulatory authority on nuclear safety and radiation protection.

Technical staff currently counts 41 units. About other 12 units will retire by 2021. There is therefore the need to complete the assigned staff and to compensate the expected turn over in the short term. This issue was also raised as a main recommendation by the IRRS mission in 2016. Actions are ongoing to allow ISIN to recruit in the near future at least 10 units. This in particular to cope with the personnel retirements and the expected significant increase of regulatory activity at national level on spent fuel and radioactive waste management and decommissioning, including to the siting and construction of a National Repository.

ISIN has the possibility to get technical support of third, independent expert organizations, in particular ISPRA and regional agencies for environmental protection. In this regard specific arrangements are in place.

ISIN can have access to fees paid by applicants and external independent technical support.

20.2 Independence of the regulatory function

The main national Operator involved in the decommissioning and in the spent fuel and radioactive waste management is SOGIN whose only shareholder is the Ministry of Economy and Finance, while the strategic and operational aims are given by the Ministry of Economic Development.

SOGIN S.p.A. has the responsibility for:

- the management of the nuclear spent fuel and of the treatment and conditioning of radioactive waste stored at the Italian nuclear facilities;
- the decommissioning of the Italian nuclear facilities;
- the construction and operation of the national waste repository.

As indicated under art.19 of the Convention, authorisations are granted and can be revoked by the Ministry of Economic Development on the basis of the independent, binding technical advice of ISIN. The other regulatory functions, such as the assessment activity during the licensing process and the inspection activity to supervise the compliance with law and the authorization conditions, are performed by ISIN itself, which also grants directly the approval for the detailed designs and plans of operations.

Legislative Decree No. 45/2014 and subsequent amendments states that ISIN is the Competent Regulatory Authority, independent according to the directives 2009/71/EURATOM and 2014/87/EURATOM. It has regulatory, managerial and administrative autonomy; it is independent from any entity involved in the promotion or utilization of nuclear energy and not subject to the supervision of any minister. ISIN is entitled to transmit a yearly report to the Government and the Parliament on the status of nuclear safety. ISIN is also entitled to provide data to the Ministry of Economic Development and to the Ministry for Environment and Land and Sea Protection for the preparation of reports under the present Directive.

ISIN has a Director and an Advisory Board, nominated with a Decree of the President of the Republic following a designation from the Council of Ministers, upon a proposal of the Ministers of Environment and Economic Development and following the positive advice of competent parliamentary Commissions.

ISIN is a Governmental Institution endowed with a full autonomy, completely separate from other body or organization concerned with the promotion or utilization of nuclear energy, as well as with

the radioactive waste and spent fuel management activities. Licensees have no voice in ISIN internal organisation, finance matters, policy and in the decision making process of the Institute; moreover the Inspectorate budget is mainly funded by the State, together with the possibility of collecting fees from applicants.

20.3 Assessment of compliance

On the bases of what is reported in this section it may be concluded that Italy has sufficient provisions to fulfil its obligations under Art. 20 of the Convention.

Section F. Other General Safety Provisions

Article 21. Responsibility of the licence holder

1. Each Contracting Party shall ensure that prime responsibility for the safety of spent fuel or radioactive waste management rests with the holder of the relevant licence and shall take the appropriate steps to ensure that each such licence holder meets its responsibility.
 2. If there is no such licence holder or other responsible party, the responsibility rests with the Contracting Party which has jurisdiction over the spent fuel or over the radioactive waste.
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21.1 Responsibility of the licence holder

According to the Act n° 1860/1962 and the Presidential Decree n° 519/1975, the primary responsibility for safety is assigned to the operating organisation; in the quoted legislation it is specified that such a responsibility is extended from the nuclear facility to the nuclear fuel and radioactive waste.

The operating organisation is therefore fully responsible of all the activities performed during design, construction, commissioning, operation and decommissioning having direct influence on safety.

The principle of prime responsibility for safety of the license holder is clearly stated in article 1-bis of Legislative Decree n. 45/2014 and subsequent amendments. Moreover in art. 102 of Legislative Decree n. 101/2020, it is stated that such a responsibility cannot be delegated and includes the responsibility for activities relevant to safety performed by contractors.

As result of this allocation of responsibilities the licensee takes the obligation to supervise on the activities conducted by its contractors.

Furthermore, all the activities involving the management of the spent fuel and radioactive waste require an authorization.

The regulatory system in place also ensures that appropriate supervision activity is exploited to verify that the license holders meet their responsibility.

The system of controls provided for in the Italian rules is based upon the following pillars:

1. the authorization process in place for activities related to spent fuel and radioactive waste management,
2. the independent verification of the safety reports and other relevant documents, the analysis on the results of tests and measurements, the performance of additional tests,
3. the inspection system, in order to verify compliance with applicable rules and technical specifications, at all stages from design to operation,
4. the sanction system, in case of non-compliance, either with provisions of the Law or with conditions and technical specifications attached to the licence. The system envisages penal and administrative measures. The former can entail deprivation of freedom and fines, the latter consists in suspensions or, in worst cases, revocation of the licences. The penal sanctions are

applied by Courts following trial proceedings initiated by reports from ISIN inspectors. The administrative measures are applied by the Ministry of Economic Development. Before applying the administrative measures, the Ministry can issue an injunction to comply with applicable regulations and prescriptions. In case of non-compliances with Plans of Operations or Detailed projects approved by the competent regulatory authority administrative sanction can be enforced by ISIN inspectors.

The national legislation, art. 1-bis of Legislative Decree 45/2014 and subsequent amendments, ensures that in case of lack of the licensee holder State administrations will take care of spent fuel and radioactive waste and to adopt the necessary measures to ensure safety.

21.2 Assessment of compliance

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

Article 22. Human and financial resources

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

- (i) qualified staff are available as needed for safety-related activities during the operating lifetime of a spent fuel and a radioactive waste management facility;
 - (ii) adequate financial resources are available to support the safety of facilities for spent fuel and radioactive waste management during their operating lifetime and for decommissioning;
 - (iii) financial provision is made which will enable the appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility
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22.1 Staff qualification

Current regulation establishes specific qualification requirements for the staff involved in the operation of the NPPs, Research Reactors, Fuel Reprocessing Facilities etc. These requirements are also applicable to radioactive waste and spent fuel management facilities which, as already said, are operated under the licensing conditions of the main nuclear installation they belong to.

In the Italian nuclear installation (NPP and fuel cycle facilities) the rules governing the organization and the roles of the technical and operating staff to ensure a safe management of the facility, both during ordinary and emergency conditions, are stated in a specific document (named “*Rules of operation*”) as required by the Italian law. This document rules also activities related to waste management and dismantling operations. According to that document only licensed personnel can operate in NPPs and other facilities having spent fuel on site. In other installations precise staff qualification requirements are established. Legislative Decree n. 137/2017 establishes the requirement for the Rules of Operation and licensed personnel also for spent fuel storage facilities.

SOGIN is well aware of the need of both preserving the knowledge in the nuclear field and further develop the know-how in decommissioning and radioactive waste management. For that matter, an ad-hoc HR strategy is implemented, according to which the personnel is suitably educated and trained. Experienced staff has been refocused whereas a young talent internal recruitment program has been carried out, through which young professionals are trained to ensure an effective future leadership (by mentoring/coaching, by taking part in project-specific experts teams or by on-site training alongside Project Managers). However, all employees are involved in in-house training courses and national/international collaborations in order to be provided with the most up-to-date knowledge and technology regarding the entire nuclear cycle.

Since decommissioning is a long process, which will take several decades to be accomplished, SOGIN considers essential to attract the young generations towards a career in the nuclear field.

SOGIN is looking forward to enhancing international cooperation, from which room for improvement can be obtained, as it was the case of the IAEA mission for a Peer Review on the decommissioning and radioactive waste management programme, concluded successfully in September 2017.

Moreover, SOGIN is sensitive to providing equal opportunities for women, who are hence given the opportunity to secure managerial and leading roles in the company.

Additionally, staff qualification for the performance of any safety-related activity is among the relevant aspects assessed during the licensing process. Moreover, SOGIN technical and operating staff undertakes training regarding technical and legal issues, according to the specific company policy of SOGIN, which has created the “Radwaste Management School” (RMS) where SOGIN personnel and operators of qualified companies selected to work in the decommissioning activities are trained.

In particular, the RMS has been operating since 2008, providing education and training to the staff of SOGIN Group and external companies, in accordance with international safety standards and requirements established by the Italian Regulatory Authority. In this way, the RMS guarantees the highest levels of safety in the field of decommissioning and radioactive waste management.

The Radwaste Management School aims to:

- train SOGIN Group, with particular emphasis on disciplines related to nuclear safety regarding spent fuel and radioactive waste management;
- promote, improve and extend best practices in the nuclear safety culture, radiation protection and environmental safeguard;
- assure integration, promotion and sharing of knowledge management systems;
- involve universities and international nuclear training centres;
- train young graduates and undergraduates in the field of nuclear decommissioning and radioactive waste management activities.

In the last years, SOGIN 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 9001/2008 (Quality Management System), ISO 14001/2014 (Environmental Management System), and OHSAS 18001 (Occupational Health and Safety Management Systems).

SOGIN provided, in the past three years, an overall training for its employees of around 35,000 hours a year. The RMS delivers a larger fraction of these hours (about 20,000 per year) in the following technical and scientific subjects: Nuclear Safety and Security, Decommissioning and Waste Management, Radiation Protection, Environmental aspects of decommissioning, Work Safety and Nuclear Plant Technology.

Figure 12 shows the trend of participation (in terms of number of hours) to about 80 training courses delivered by RMS in recent years.

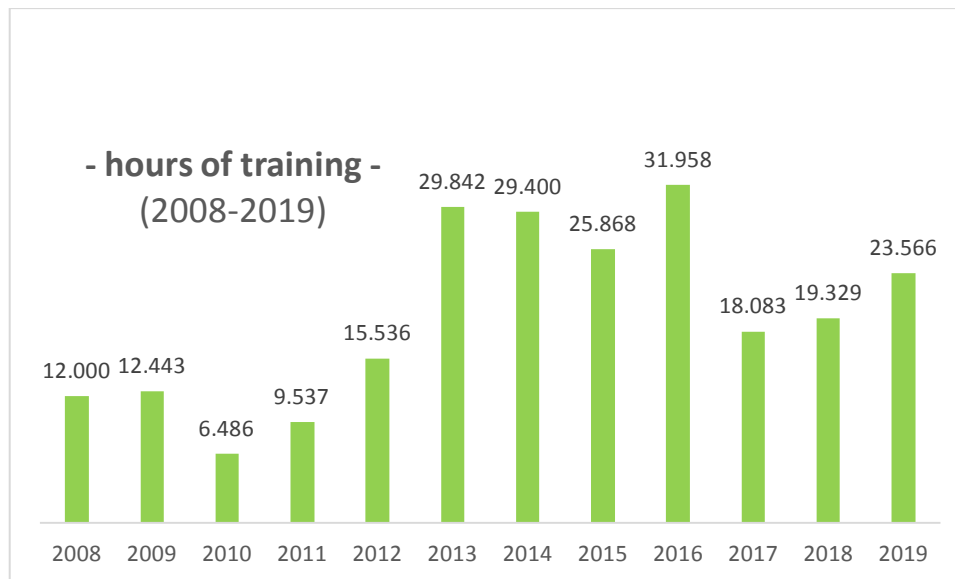


Figure 12: Training provided by SOGIN Radwaste Management School

22.2 Financial resources

The current Italian decommissioning strategy foresees a deferred decommissioning until the unconditional release of the sites. In order to finance the decommissioning cost, the Ministry of Productive Activities (now Ministry of Economic Development) issued the Legislative Decree of 26th January 2000, which established the related instrument with a levy on the price of the electricity. The funds are transferred yearly to SOGIN which, as stated in Section B, is responsible for performing decommissioning and waste treatment activities for all Italian nuclear installations. For this purpose, SOGIN has been also charged to prepare dismantling plans and cost estimations. The cost estimation is done as a best estimate. However, it includes a contingency depending on the specific activity and on the time of expenditure, together with the management costs.

The same decree quoted above states that every year SOGIN has to submit to the National Authority for the Electricity and Gas (AEEG) an updated report on technical and economic plan of the global decommissioning project. The yearly reports shall contain an update of the decommissioning plan and cost estimate. The levy on the price of electricity, paid from the final users, is adjusted regularly on the basis of the contents of the yearly reports. In this way, possible additional costs due to changes of strategies and the activities needed for safety reasons, need to be endorsed by the National Authority for Electricity and Gas. Efficiency criteria related to the program management and to the progress of activities are taken into account in performing such adjustments.

The latest cost assessment update was reviewed and assessed in June 2020, when SOGIN Board of Managers has approved the updated document "Total dismantling project costs". The review indicates an amount of over € 7,8 billion for the complete decommissioning of the four NPPs and of the Nuclear Fuel Cycle Facilities. The mentioned amount comprises all the costs until today sustained. The main components of overall costs are the dismantling and waste management (Engineering, Procurement, Licensing, Construction and Project Management) costs (about € 3,591 billion), the spent fuel reprocessing and nuclear material management related costs (about €

1,872 billion), the costs related to Mandatory Costs (Safety and Security Management) (about € 1,481 billion), General Management Costs (Overheads and Site Electrical Power Costs, about € 0,942 billion).

The increase of overall costs is due to several factors, such as:

- delay in the realization of National Repository which has made necessary the construction of new facilities on the sites for interim storage of radioactive wastes;
- the evolution of safety criteria which requires improvements in waste management technologies;
- additional costs for re-treatment of waste already conditioned in the past in a way not acceptable today according to new requirements.

The following activities were taken into account in the overall costs evaluation:

- on-site storage of fuel;
- spent fuel reprocessing;
- decontamination for conditional, unconditional recycle, re-use or release;
- selection of appropriate treatment and conditioning technologies for volume reduction of radioactive waste materials;
- packaging of historic/operational waste, e.g. sludge, ion-exchange resins;
- dismantling of reactor/fuel cycle facility building;
- dismantling of conventional plant buildings, e.g. turbine hall;
- disposal of radioactive waste;
- disposal or recycling of non-radioactive waste material;
- final site surveys and release without radiological constraints (de-licencing).

It has to be underlined that the operators are also liable for the cost of managing any radioactivity discovered after the de-licensing process has been completed if they continue to be the owners of the site.

22.3 Institutional control

Costs for appropriate institutional controls and monitoring arrangements to be continued for the period deemed necessary following the closure of a disposal facility have not been evaluated yet. They will be taken into account in the framework of the national strategy that currently envisages the construction of a near surface disposal facility.

22.4 Assessment of compliance

- (i) Staff qualification is required by specific provisions of legislative decree n. 101/2020.
- (ii) Financial resources are available for the foreseen activities. The same mechanisms will be used for the long term needs.

- (iii) Detailed components of costs related to the closure phase of disposal facility have not been allocated yet. They will be considered as far as practicable in the frame of the current national strategy which envisages the construction of a near surface facility.

On those bases, it can be concluded that no further measures have to be implemented to fulfil the obligation of this article of the Convention.

Article 23. Quality assurance

Each Contracting Party shall take the necessary steps to ensure that appropriate quality assurance programmes concerning the safety of spent fuel and radioactive waste management are established and implemented.

23.1 Undertaken steps associated to QA programmes

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 Regulatory Authority in the middle of 70's and at the beginning of 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. Technical guides are normally used as key references regulatory tools during the licensing process. They do not have a mandatory character but, in case of non-compliance, the licensee is requested to demonstrate that the safety case fulfils alternative equivalent requirements. 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 Regulatory Authority.

General QA requirements as defined in Technical guides related to plant operation are therefore applicable also to the safe management of the spent fuel and radioactive waste.

With regard to new facilities connected to the treatment and the storage of radioactive waste to be realized as preliminary activities for decommissioning, QA requirements (as defined in the Technical Guide n° 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 filed to support the authorization or the approval of a specific project.

For installations which are being decommissioned, conditions attached to the licence establishes the requirement for the licensee to perform the decommissioning activities, including waste and

spent fuel management, according to a QA programme to be submitted and approved by the Regulatory Authority.

With reference to the current implementation level it is to be mentioned that the QA system of SOGIN as the main national licensee involved in the management of spent fuel and radioactive waste, is documented through three levels of documentation applicable for all projects - *Quality 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, such as a *Quality Plan and purchase technical specifications*.

For the approval of activities related to waste treatment, conditioning and storage as well as to spent fuel management and decommissioning a specific quality plan is requested.

23.2 Assessment of compliance

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

Article 24. Operational radiation protection

1. Each Contracting Party shall take the appropriate steps to ensure that during the operating lifetime of a spent fuel or radioactive waste management facility:
 - (i) the radiation exposure of the workers and the public caused by the facility shall be kept as low as reasonably achievable, economic and social factors being taken into account;
 - (ii) no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection; and
 - (iii) measures are taken to prevent unplanned and uncontrolled releases of radioactive materials into the environment.

 2. Each Contracting Party shall take appropriate steps to ensure that discharges shall be limited:
 - (i) to keep exposure to radiation as low as reasonably achievable, economic and social factors being taken into account; and
 - (ii) so that no individual shall be exposed, in normal situations, to radiation doses which exceed national prescriptions for dose limitation which have due regard to internationally endorsed standards on radiation protection.

 3. Each Contracting Party shall take appropriate steps to ensure that during the operating lifetime of a regulated nuclear facility, in the event that an unplanned or uncontrolled release of radioactive materials into the environment occurs, appropriate corrective measures are implemented to control the release and mitigate its effects.
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24.1 Undertaken steps

Legislative Decree n° 101/2020, that entered into force in August 2020 and replaced, among others, the Legislative Decree Legislative Decree n° 230/95 clearly states that the Operator of a nuclear installation or a facility 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. The implementation of the optimisation principle by the Operator must be demonstrated firstly at the design stage and subsequently during the plant operation and decommissioning. The compliance with the implementation of the optimisation principle is ensured by specific rules and “ad hoc” demonstrations that have to be provided in this regard in the

documentation submitted by operators for the authorization process of spent fuel and waste management, as well as decommissioning activities, including the “dose constraints” for workers and public.

Legislative Decree n° 101/2020 states limits of effective dose and of equivalent dose for specific organs and tissues respectively addressed to members of the public, exposed workers, as well as apprentices and students. Such limits and the criteria for the exposures assessment comply with the indications of the Directive n° 2013/59/Euratom issued on the basis of the ICRP recommendations, in particular Publications n. 103, 116 and 119. The compliance with the provisions on the dose limits is ensured by specific rules.

With specific regard to any activity subject to licensing approval, including spent fuel, waste and decommissioning activities, a dose estimation for workers has to be submitted to show compliance with dose limits and ALARA principle.

The same Legislative Decree states that, for any practice notified or authorized according to the provisions of the same decree, the release of waste and of any other material containing radioactivity aimed at the disposal or addressed to locations, installations or anyhow to activity not subject to the clauses of the Legislative Decree, must be authorized. In the case of practices subject to authorization, the authorization to the clearance of materials can be issued with the same procedure that authorizes the practice in which technical specifications are inserted. The clearance levels to be specified in the technical specifications shall comply with the basic “*below regulatory concern*” criterion for practices – also established in the Directive 2013/59/Euratom. At present, specific clearance levels are defined for all the installations that envisage to release material as result of their activities.

With regard to members of the public, compliance of estimated doses with the “below regulatory concern” criterion has therefore also to be demonstrated for routine discharges.

As far as situations having the potential to imply unplanned or uncontrolled releases of radioactive material into the environment are concerned, the authorisation procedure - in force in Italy since 1964 – requires that the applicant provides an analysis of possible accident scenarios involving unplanned or uncontrolled releases and the assessment of the relevant consequences in terms of radiological impact on critical groups of public concerned, with the aim of establishing ad hoc emergency plans. Following the transposition of the Directive 2013/59/Euratom in the Legislative Decree n° 101/2020, an analogous provision was introduced also for facilities making use of radioactive materials.

Design basis accident conditions associated to waste, spent fuel and decommissioning management activities have to be demonstrated to comply with 1 mSv/event reference dose objective.

24.2 Assessment of compliance

On the basis of what stated above it is considered that Italy has adequate provisions to fulfil obligations under this article.

Article 25. Emergency preparedness

1. Each Contracting Party shall ensure that before and during operation of a spent fuel or radioactive waste management facility there are appropriate on-site and, if necessary, off-site emergency plans. Such emergency plans should be tested at an appropriate frequency.
 2. Each Contracting Party shall take the appropriate steps for the preparation and testing of emergency plans for its territory insofar as it is likely to be affected in the event of a radiological emergency at a spent fuel or radioactive waste management facility in the vicinity of its territory.
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25.1 On-site and off-site emergency plans

Emergency planning at nuclear installations is regulated by the provisions reported in Articles 172 to 197 of the Legislative Decree n° 101/2020. In addition, the general legislation governing emergency preparedness and response provisions in all cases of accidental events and disasters, as reported in the Legislative decree 1/2018 (Civil Protection Code), is applicable.

With regard to *on-site emergency planning* above provisions are complemented with those reported in Articles 89, 90 and 92 of the Legislative Decree n° 101/2020 and subsequent amendments respectively related to:

- the approval by the competent regulatory authority 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 Manual for the Conduct of Plant Operation, the document, where provisions and procedures are provide making reference to the plant as a whole and to its components, for the different operating conditions. The manual contains a specific section (Instruction manual for the exceptional conditions, i.e. emergency conditions) which includes the accident management plant procedures, the measures to prevent or mitigate the accident consequences, the On-site Emergency Plan and the provisions and procedures for the coordination with the off-site emergency plan, in all phases of the emergency;
- the Plant Safety Committee, approved by the Competent Regulatory Authority. The Committee has different tasks, including the on-site emergency planning and advising the plant Director in taking measures that are necessary to deal with exceptional events or abnormal plant.

Technical specifications attached to the license regulate the performance of periodic onsite emergency drills. As a normal practice these drills are attended also by representatives of the regulatory authority.

As far as off-site emergency preparedness response concerns its organization differs depending on extension and type of the consequences of the postulated events (namely events which could affect a local area or a larger part of the national territory).

If the potential consequences of postulated reference events result to be manageable at local level, the *off-site emergency plan*, as required by the Articles 177 of the Legislative Decree n° 101/2020, is prepared under the authority of the Prefect of the province where the installation is located, following provisions stated in Articles 179, 180 and 181 of the same legislative decree. Contents to be included in off-site emergency plans are defined in annex XXXII of the Legislative Decree n° 101/2020.

According to article 178 of the same legislative decree, the technical basis for the plan are established by the Licensee and revised by the Regulatory Authority. The plan is prepared taking into account the indications reported in the Legislative decree 1/2018, which establishes the National Service of Civil Protection and is the general legislation governing emergency preparedness and response management following accidental events and disasters of any nature.

Off-site emergency plans are in force for the non-operational NPPs and nuclear fuel cycle facilities, for research reactors and for radioactive waste management facilities.

Off-site emergency plans are in place also for the nuclear installation in decommissioning, fulfilling the same emergency functional requirements as those for operational plants but, of course, providing for a different size of both the emergency response and of the necessary emergency infrastructures.

For the nuclear installation under the decommissioning process, the off-site emergency plan shall be 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 authorized whole decommissioning process. Technical bases take into account the configuration of the installations during decommissioning and reference scenarios are updated taking mainly into account the presence radioactive wastes in the site.

With reference to the transport activity of spent fuel abroad for reprocessing, it should also be mentioned that 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 101/2020.

For cases in which potential consequences of postulated reference events could invest larger parts of the national territory, provisions of Article 182 of the Legislative Decree n° 101/2020, related to National Plan on Radiological Emergencies, apply, as discussed in the following point.

25.2 National Plan against Radiological Emergency

Provisions of Article 182 of the Legislative Decree n° 101/2020 require the preparation of a General National Plan of Protective Measures for Radiological Emergencies under the authority of the Department of Civil Protection. Such a plan is aimed at protecting general public and environment in case of accidents that need to be coordinated at the national level.

The current edition of the National Plan for nuclear emergency was approved in March 2010 by the Italian Government. The Plan was prepared by the Department of the Civil Protection of the Presidency of Council of Ministers and represented the revision of the previous 1997 edition. The hazard assessment on which the Plan was implemented was provided by the competent regulatory authority, making reference to a severe nuclear accident occurring at a NPP, in a neighbouring country, among those closer to the Italian borders.

The outcomes of the hazard assessment suggest the sheltering and stable iodine administration as possible protective measures that the Plan should be considered to implement in the territories (in the northern regions of the country) affected by the released radioactivity. Moreover, the expected ground contamination requires the implementation of a radiological monitoring programme to be extended on large areas of the country, aimed to control environmental and food matrices for providing the necessary technical basis for any decisions about food production and consumption restrictive measures.

The detailed description of the bases for the revision of the 2010 edition of the National Plan, the postulated reference scenario and the assessment of the accident consequences, as well as the main features of the revised plan and of the emergency response organization provided for, were described in the previous Third National Report – October 2011.

Currently the National Plan as well as the hazard assessment are under revision. The revision of the National Plan will take on consideration the lesson learned by Fukushima Accident and by international exercises, the provisions of the new Legislative decree n.101/2020 transposing the Euratom directive 59/2013 and the new international standards.

The regular participation to the international emergency exercises organized at international level by EU (ECUREX), IAEA (ConvEx) and OECD/NEA (INEX) is assured by the competent regulatory authority, together with other EPR relevant organizations.

It is finally to be mentioned that, 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 has also established proper provisions to fulfil the requirements of European Union Council Decision n° 87/600/Euratom regarding the urgent exchange of information in case of radiological emergency.

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.

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

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.

In order to complement the above State level Agreement, a cooperation Arrangement between the Swiss Federal Nuclear Safety Inspectorate (ENSI) and 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.

In this context also the national Civil Protection Competent Authorities (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.

Agreement between ASN (France) and ISIN

A cooperation agreement between the French and Italian nuclear safety Authorities (ASN and ISIN) was signed on April 2010. The agreement envisages the early exchange of information in the event of a radiological emergency and for 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 will 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 arrangement provides for setting up a joint expert group which will 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 will be available on 24h/7d bases and will be put periodically under test.

As far as 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.

In October 2016 the renewal of the agreement with the French ASN was signed. In the new version the commitment of the parties to cooperate for promoting a coherent emergency response in case of a transboundary emergency is explicitly declared.

Agreement between SNSA (Slovenia) and ISIN

Likewise the aforementioned French agreement, a second arrangement was ratified on May 2010 by the ISIN and the Nuclear Safety Administration (SNSA) of the Republic of Slovenia, for the early exchange of information in the event of a radiological emergency and for the co-operation in nuclear safety matters. This Agreement will apply 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.

The second meeting under ISIN-SNSA agreement was held in October 2018.

25.3 Assessment of compliance

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

Article 26. Decommissioning

Each Contracting Party shall take the appropriate steps to ensure the safety of decommissioning of a nuclear facility. Such steps shall ensure that:

- (i) qualified staff and adequate financial resources are available;
 - (ii) the provisions of Article 24 with respect to operational radiation protection, discharges and unplanned and uncontrolled releases are applied;
 - (iii) the provisions of Article 25 with respect to emergency preparedness are applied; and
 - (iv) records of information important to decommissioning are kept.
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26.1 Undertaken steps

The decommissioning of a nuclear installation is subject to prior authorization of the Ministry of Economic Development (decommissioning license).

The authorization is granted on the base of a binding technical advice of ISIN which includes conditions and technical specifications formulated taking into account observations of other relevant administrations (Ministries of Environment, Interior, Labour and Health) and the Region concerned.

The entire decommissioning process is regulated by articles 98-100 of the Legislative Decree No. 101/2020.

The applicant for a decommissioning license shall submit the Comprehensive Decommissioning Plan to justify the selected decommissioning strategy and to provide demonstrations that the decommissioning operations will be safely implemented. The decommissioning authorization can be issued for intermediate phases leading up to the planned final state of the site. The current strategy for all national nuclear installations to be decommissioned is to reach unconditional release of the site. This possible subdivision into intermediate phases must be shown to be part of an overall decommissioning plan, to be submitted with the application for the authorization concerning the first phase.

Art. 98 of the Legislative Decree No. 101/2020 requires that the Comprehensive Decommissioning Plan shall include:

- a description of the installation status;
- a description of the expected status of the installation at the end of the decommissioning (or of each phase);
- the inventory of the radioactive materials (contaminated and/or activated) on the plant;
- the identification of the waste management and disposal;
- the safety analysis for the operation to be performed;
- the evaluation of the environmental impact of the decommissioning activities;
- a radioprotection program for normal, abnormal and accidental conditions;

- a proposal for a step by step dropping of mandatory operating constraints coming from the license.

The licensing process establishes the following steps (see also the attached scheme):

- the documentation attached to the decommissioning applications shall be transmitted to the different relevant administrations (Ministries of Environment, Interior, Labour, Health, and the Region concerned);
- after receiving the documentation, the above administrations transmit their observations to ISIN;
- taking into account the above comments and the results of its own review and assessment activities, ISIN issues a technical report which contains a safety and radiation protection assessment and identifies conditions and specifications for the conduct of the decommissioning activities. During review and assessment activity it is the case that ISIN may formulate to the applicant requests of clarifications and additional information;
- ISIN transmits its technical report to the involved administrations which should formulate and send to ISIN their final observations;
- ISIN transmits its final advice, formulated taking into account the observations of other administrations, together with technical specifications and conditions, to the Ministry of Economic Development;
- the Ministry of Economic Development posts on its institutional website the scheme of the decommissioning authorization decree with associated documentation to be submitted to a public consultation phase;
- the authorization process is concluded by the Ministry of Economic Development who grants the decommissioning license prescribing the compliance with conditions and technical specifications established by ISIN, taking into account observations coming from the public consultation phase.

If necessary, in order to gather the observations of the involved administrations, the Ministry of Economic Development can convene the so called “Conference of Services”, attended by all the administrations as specified in the article 98 of the Legislative Decree No. 101/2020.

Annex I to the decommissioning license contains the specifications for the decommissioning operations which are subdivided in:

- management conditions and specifications which identify the records to be kept and archived, the modality to carry out the operations, the list of the mass and surface activity limits for clearance for all type of materials and each radioisotopes present in the plant as resulting from the plant characterization documents, the requirements for a safety waste management, etc;
- technical specifications stated to assure the operability of structures, systems and components relevant for the plant safety.

Annex II to the decommissioning license 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 Operation

to be approved by ISIN before performing specific activities. The decommissioning projects list can be updated if necessary.

The information to be included in Detailed Projects or Plans of Operations are described in Technical Guide No. 4 issued by ISIN and in plant management specifications (Annex I to decommissioning license), respectively. Typical requested information are: description of the system (including design and data sheets), norms and standards to be applied, design criteria, safety and seismic classification, accident analysis, test programs (including mock-up realization if necessary), approach to minimize radioactive waste, dose optimization analysis, etc.

Furthermore, art. 100 of Legislative Decree No. 101/2020 requires that:

- at the end of decommissioning activities, the licensee has to issue and submit one or more reports describing the performed activities and the final state of the site;
- taking into account the results of the assessment performed by ISIN and by other involved Authorities, of the reports produced by the licensee, the Ministry of Economic Development issues a Decree for the release of the site.

After an application for the decommissioning license has been submitted and in the wait of the completion of the licensing procedure, according to art. 233 of Legislative Decree No. 101/2020, some operations related to decommissioning may be authorized in order to achieve a more effective radiation protection (e.g. building of a radioactive liquid waste treatment facility, interim storage facility, waste management facility and maintenance or upgrade of auxiliary systems).

A separate Environmental Impact Assessment evaluation is performed under the coordination of the Ministry of Environment, Land and Sea Protection.

The overall procedure is presented in the Figure 13 and 14.

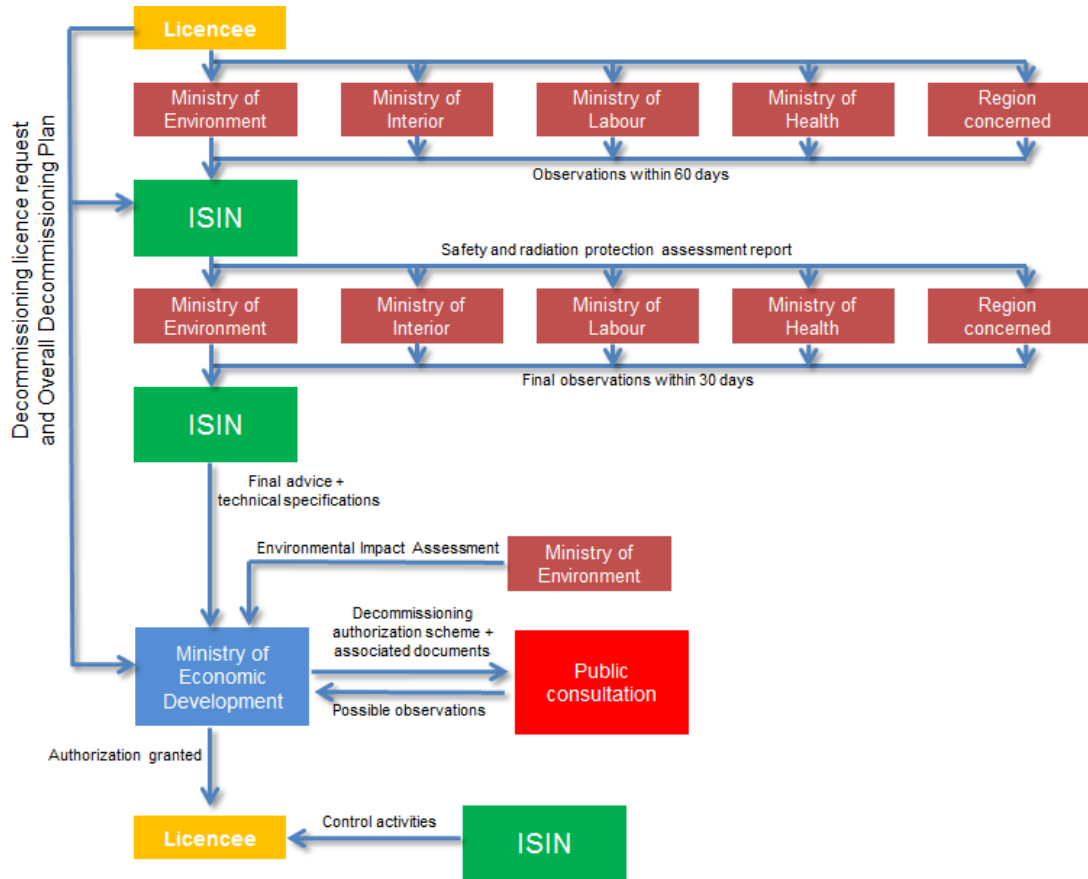


Figure 13: Decommissioning licensing process

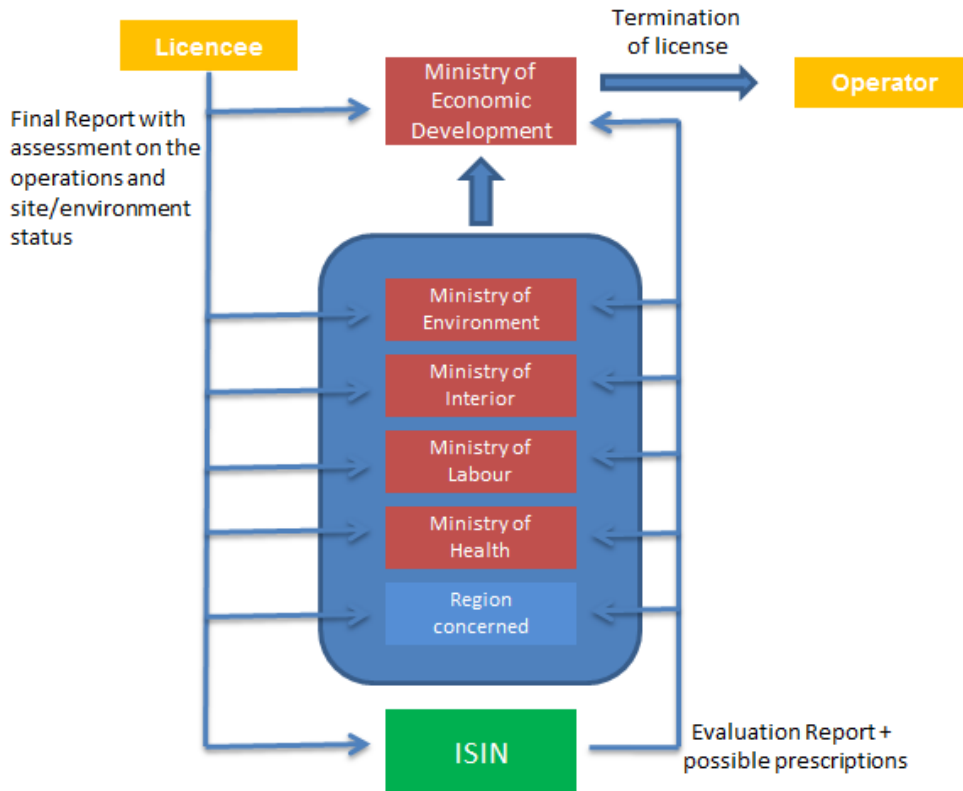


Figure 14: Licensing procedure for site release after decommissioning

- (i) Regarding staff qualification, it has to be underlined that relevant documents coming from the operational phase of the plant maintain their role also during decommissioning; with some adjustments based on the application of a graded approach.

There are several articles of the Italian applicable Laws and several technical guides issued by Italian Competent Regulatory Authority, dealing with requirements addressed to the Operating Organisation and to the plant staff. More in particular, the following Italian regulations may be quoted:

- Act n° 1860 (1962) on the *"Pacific Use of Nuclear Energy"*,
- Legislative Decree n° 101/2020 implementing EURATOM Directives on radiation protection and nuclear safety (89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 2006/117/Euratom, 2009/71/Euratom, 2011/70/Euratom, 2014/87/Euratom and 2013/59/Euratom)

In particular, according to art. 102 of Legislative Decree n° 101/2020, the licensee is obliged to develop and maintain competences of its staff on nuclear safety, including safety of spent fuel and radioactive waste and to ensure that the personnel of contractors involved in activities having relevance for the safe management of spent fuel and radioactive waste is properly trained and qualified.

- Technical Guide n° 8 *"General criteria of Quality Assurance for NPPs"*,
- Technical Guide n° 20 *"Q.A. Documents to be produced for the operation of NPP"*,
- Technical Guide n° 21 *"Content of the Operating Rules (Regolamento di Esercizio)"*,

In particular, the Operating Rules (Regolamento di Esercizio) and the Quality Assurance Programmes identify the qualification of the staff in key positions.

Regarding financial resources, the related funding system is described under Article 22.

- (ii) All the provisions described under Article 24 entirely apply to decommissioning activities. Regarding criteria for solid materials release see Section B. ALARA principles are implemented during all decommissioning activities. Specific limits for routine discharges complying with the *"below regulatory concern"* criterion are setup. Design dose objectives for members of the public are defined for each plant condition. In particular, for accidents conditions, the objective of 1 mSv/event to the representative individual of the public has been defined.
- (iii) All the provisions described under Article 25 entirely apply to decommissioning activities.
- (iv) Relevant records related to design, operation and decommissioning are required to be kept on the basis of specific requirements in the Quality Assurance Programmes. The principles that are at the basis of record keeping for materials during decommissioning are described below.

Identification and traceability of materials present in the plant

It is recognized that the dismantling of a complex structure, such as a nuclear installation, requires the orderly and organised management of substantial amounts of information, whose availability and proper use is essential for safe management of the dismantled material, radioprotection and characterisation of originated waste, according to final repository requirements.

In the light of managing consistent quantities of materials and consequentially a substantial amount of data, detailed Procedures/Instructions are established to keep the inventory of removed materials and progress report updated at all times.

In order to document the various operations to which each element⁴ is subjected during the dismantling phases, IAEA criteria are followed.

Preparation and upkeep of a database to ensure controlled material management

For the management of dismantled materials, the following phases have been identified:

- a) dismantling phase;
- b) radiological control phase, aimed at identifying the destination of the element (not-clearable, clearable after decontamination, clearable in current state);
- c) treatment phase (including any decontamination to reduce the doses to the personnel working on subsequent operations and/or to reduce the radioactivity content below the authorised clearance levels, etc);
- d) conditioning phase, in order to produce final packages complying with the requirements for storage, transportation and disposal in the final repository);
- e) storage phase in the site's interim storage facilities;
- f) clearance and release from the site, subjected to the required radiometric verifications.

26.2 Assessment of compliance

On the basis of discussion reported in the above sections can be concluded that adequate provisions are in place in Italy to fulfil the obligation of the present article of the Convention.

⁴ The term "element" is used to indicate any "object" that one wishes to trace, intending a spool of piping, a valve, a pump, an electric panel, a drum containing waste or any other object, on the condition that it is univocally identifiable.

Section G. Safety of Spent Fuel Management

Article 4. General safety requirements

Each Contracting Party shall take the appropriate steps to ensure that at all stages of spent fuel management, individuals, society and the environment are adequately protected against radiological hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

- (i) ensure that criticality and removal of residual heat generated during spent fuel management are adequately addressed;
 - (ii) ensure that the generation of radioactive waste associated with spent fuel management is kept to the minimum practicable, consistent with the type of fuel cycle policy adopted;
 - (iii) take into account interdependencies among the different steps in spent fuel management;
 - (iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;
 - (v) take into account the biological, chemical and other hazards that may be associated with spent fuel management;
 - (vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;
 - (vii) aim to avoid imposing undue burdens on future generations.
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4.1 Measures to ensure protection against radiological hazards

As indicated in Section E, the Italian legislative and regulatory framework, applicable to spent fuel management activities, defines the main principles related to nuclear safety and radiation protection and to applicable licensing procedures. Specific requirements to be met in any phase of the fuel cycle are then established in the context of specific technical licensing process.

Spent fuel management activities that continue to be performed in Italy are the storage in pools, the transport to reprocessing facilities located abroad or the dry storage. As indicated in Section D, the spent fuel still present in the national territory is very limited in quantities (15,8 tHM) and is stored in pools. In particular the remaining fuel stored at Avogadro AFR will be transferred abroad as soon as a negotiation in progress with French authorities on the implementation of the existing agreement will be completed. The Elk River spent fuel in ITREC plant will be stored in dual purpose casks in the site.

With regard to the provisions established under this article the following can be highlighted:

- (i) criticality prevention and residual heat removal were addressed in all the existing Italian fuel storage facilities during the licensing and supervision process. Details are provided under the following Art. 5; the issue is also addressed by the transport regulations;
- (ii) all spent fuels produced in Italy have been or will be reprocessed in European industrial reprocessing plants, with the only exception of the spent fuel stored at the ITREC facility. These plants guarantee that the production of radioactive waste coming from spent fuel reprocessing will be kept to the minimum practicable. The waste production in Italy is mainly related to the wet storage (systems for cleaning and decontamination of the pool water), and also will be kept to the minimum practicable;
- (iii) the interdependencies among the different steps in spent fuel management, connected to the residual activities, are limited and are taken into account. In fact, since in Italy no nuclear power is produced and no domestic reprocessing capabilities are available, the management approach for the largest part of spent fuel only entails the following main steps: wet storage, transport to foreign European reprocessing plants, return to Italy of corresponding nuclear material and conditioned radioactive waste. Very minor quantities of research spent fuel will be dry stored;
- (iv) protection measures of individuals and members of population are specified in the Legislative Decree n° 101/2020, as progressively modified to take the applicable European Union Directives into account;
- (v) no biological, chemical and other hazards have been identified to be associated with the specific spent fuel management activities that take place in Italy;
- (vi) (vii) Technical Guide N° 26 specifically addresses the principle that the potential impact on future generation of radioactive waste management activities should be taken into account. The principle of managing radioactive waste and spent fuel so as to avoid any burden to future generations is also clearly reflected in the National Programme for spent fuel and waste management.

4.2 Assessment of compliance

From what it has been said in each of the previous sections, taking also into account the transfer abroad of the largest part of the spent fuel for the reprocessing, it may be stated that Italy fulfils the obligations set up under this article.

Article 5. Existing facilities

Each Contracting Party shall take the appropriate steps to review the safety of any spent fuel management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility.

5.1 Status of safety assessment at existing facilities

Spent fuel management in the storage pools is regulated by the technical specifications of each facility. Regulatory supervision is performed on regular bases. Near future plans are mainly addressed to the delivery of the remaining spent fuel to reprocessing facilities abroad. The spent fuel management facilities will be decommissioned.

In the following additional information are provided on the facilities still having spent fuel in their storage pools. Some general information on the spent fuel stored at sites is provided in Table D.1.

In line with international practice of periodic safety review ISIN requested an extraordinary assessment on the status of structures, systems and components related to spent fuel pool to ascertain existing margins for the fuel safe storage until the complete removal of the fuel from the pools to be sent to reprocessing or to dry storage.

For each facility reference abnormal events and accident are systematically assessed in the safety case, which is part of the application documents submitted to support the licence, to demonstrate compliance with adopted radiation protection objectives.

ITREC

The facility is operating under a licence granted in 2006 specifically addressed to the safe management of the installation and to the performance of preliminary decommissioning activities (mainly waste treatment and conditioning etc.) for the period until the decommissioning authorization will be granted. Some spent fuel is stored on site, as specified below.

ITREC	
Name	ITREC
Location	Trisaia (Matera)
Category (e.g. commercial, prototype, research facility, other nuclear installation):	Research facility
Type (e.g. PWR, BWR, LMR, Fuel Cycle Facility, Hot-lab, Conditioning Facility, etc):	Pilot reprocessing facility
Type of reactor pressure vessel (e.g. steel, concrete, pressure tube, etc):	N.A.

Capacity on the site (MWe net)	N.A.
Number of employees during operation:	
Date of commissioning:	1962
Date of shutdown (termination of activities):	1978

ELK RIVER Fuel assemblies in TRISAIA site	
	64 FAs
Nominal HM mass kg (max)	28
Fuel type	ThO ₂ - UO ₂
Fuel element layout	5 x 5
Number of fuel elements per assembly	max 25 ⁵
Cladding material	Stainless Steel
Fuel material	ThO ₂ - UO ₂
Fuel initial enrichment (average)	25.5 kg ²³² Th, 1.2 kg ²³⁵ U
Essential feature of the storage	Storage in pool

Spent fuel pool

64 spent fuel assemblies are stored in a pool (10,7 x 3 x 7 m). The pool has a steel liner (AISI 304L) and a water clean-up system, to maintain the required chemical, physical and radiological conditions (e.g. normal water activity concentration of 37 Bq/l from ¹³⁷Cs against a maximum allowed by technical specifications about 10³ times that value). A 5 m water height over the fuel is ensured. Dynamic containment is provided in the pool area by active ventilation systems.

Spent fuel elements stored in the pool come from ELK RIVER US reactor where they were burned before 1967. 16 fuel assemblies have been disassembled into fuel elements. Each fuel assembly is stored in leak tight stainless steel bottles, located along the pool walls.

Subcriticality is ensured by geometry and by the administrative norms applicable to the fuel movement.

In the pool bottom there is an additional well (2,5 x 2,5 x 4,5 m) for temporary housing the transportation cask during fuel transfer.

The criticality safety is ensured by geometry: two rows of fuel elements are disposed at a distance of 34 cm that was calculated to be subcritical with adequate margins even in case of infinite rows at such distance.

⁵ 2 FAs were dismantled: 1 FA remained with 11 rods and 1 FA with 23 rods

The residual power is very limited, the number of stored elements is very low therefore there is no need for heat removal.

The quality of the spent fuel pool water is regularly controlled, also with the purpose to minimize the build-up of corrosion products and the consequent increase of wastes generation. In particular, the pool is equipped with a “cleaner” for cleaning the walls and the bottom, together with a clean-up system for the water, that includes an ion exchanger and a particulates filters. The activity concentration is kept very low (the maximum permitted value from technical specifications being 3700 Bq/l), due also to the fact that each spent fuel element is enveloped by a metallic leak tight box.

Cleaning of the thin sludge layer present in the pool bottom area has been performed.

A project to locate the fuel elements in new boxes is ongoing. As said, in the future the fuel elements will be interim stored into a dry storage facility on the site, inside dual purpose casks. The licensing process of this facility is ongoing.

With regard to the extraordinary review conducted in 2014, a numerical analysis has been performed to calculate tensional and deformational status of the structure. Two different load conditions have been considered: the first accounting for the static loads (mass of the structures, permanent overloads, hydrostatic pressure, geostatic pressure); the second accounting for a seismic input given by a reference heart-quake with 500 years return time, which equals to consider, from a seismic point of view, an operational residual lifetime of the structure of 25 years.

The performance parameters evaluated, considering the above mentioned loads, are the damage limitation state and the ultimate limit state. In both cases the calculations give positive results. In particular, referring to the static load conditions the calculations show a large margin in respect of cracking and leakages.

Fuel pool integrity is periodical verified trough visual control of dedicated sumps.

In April 2020, ISIN requested an up–date of the extraordinary assessment on the status of structures, systems and components related to spent fuel pool performed in 2014. The results of this up-date of the assessment, performed by SOGIN, demonstrated that the fuel pool integrity is still guaranteed.

It is planned to replace the stainless steel bottles with new ones that will be located in dual purpose casks for dry storage and transportation.

Avogadro AFR facility – Saluggia (VC)

AVOGADRO is a spent fuel wet storage facilities away from reactors, described in section D.1.3.

The storage building is focused on its storage pool, where the spent fuel lays in several racks. During stationary storage the fuel is shielded by an height of water of 6 m, which reduces to a minimum of 3 m during fuel handling operations for shipment.

Auxiliary systems of the storage building include:

- a decontamination bay for service and clean-up of transport casks;
- a gantry crane (60 t) for casks handling, a polar crane (15 t) for building service and a bridge crane (1 t) for fuel handling inside the pool.

The four peripheral auxiliary buildings are dedicated to general management services. All the principal auxiliary systems of AVOGADRO are located inside one of them. They include in detail:

- control room and general radioactivity monitoring systems
- primary and secondary decay heat removal systems
- pool water decontamination system (based upon ion exchange resins)
- raw water supply system (industrial water from wells)
- buildings general ventilation system (equipped with absolute filtering devices)
- liquid radioactive wastes collection and storage system
- liquid radioactive wastes release system.

The fuel temporary storage service is presently supplied to SOGIN S.p.A., the owner of the spent fuel unloaded from Trino and Garigliano power plants.

AVOGADRO storage operation is licensed by the Ministry of Economic Development.

Several transports have been arranged in recent years to transfer the fuel assemblies to UK and to France for reprocessing. At present only 63 fuel elements remain to be transferred to France in the framework of the in place agreement.

Criticality is prevented by the design of "high density" storage racks (limits to the reactivity – $K_{eff} < 0,95$ - accounting for the general nuclear features of the spent fuel - burn up and initial maximum enrichment). The decay heat removal during the spent fuel storage is assured by a largely oversized cooling system. It was designed to remove the whole thermal output of the previous research reactor "AVOGADRO RS-1", varying from 1 to 7 MW, while the maximum decay thermal power due to the stored fuel has always been well under 100 kW.

The cooling system includes:

- a closed-loop primary system, circulating the storage pool contaminated water through an heat exchanger;
- an open-loop secondary system, circulating uncontaminated raw water from a storage reservoir to the liquid release system;
- a raw water supply system, equipped with submerged pumps placed in wells.

The quality of the spent fuel pool water is regularly controlled, also with the purpose to minimize the build-up of corrosion products and the consequent increase of waste generation.

To prevent chemical corrosion of the structural materials of the fuel storage racks and of the bottles containing Garigliano fuel elements, the storage pool is filled with demineralised water. Periodical controls of the chemical composition of pool water are imposed by the operative technical requirements for AVOGADRO.

Surveillance monitoring for corrosion is provided by a qualified Supplier (CESI Institute), and yearly reports on the subject are sent to the Italian Regulatory Authority.

The radioactive contamination of pool water is systematically controlled by measurements on samples. The water specific activity level determined by the operative technical requirements for AVOGADRO is provided by a decontamination system using a batch of ion exchanging resins.

In particular the following fuel assemblies are currently stored in Avogadro facility pool. In 2007 fuel assemblies stored at the Eurex facility pool were transferred in the Avogadro pool as part of a program for the remediation of the Eurex pool and in view of the transfer abroad for reprocessing.

GARIGLIANO NPP Fuel assemblies in DEPOSITO AVOGADRO site	
	63 FAs
Nominal HM mass kg (average)	204,5
Fuel type	BWR
Fuel element layout	8 x 8
Number of fuel elements per assembly	64 ⁶
Cladding material	Zr 2
Fuel material	1 modified BWR ⁷ , 54 UO ₂ + MOX ⁸ , 8 MOX
Fuel initial enrichment in fissile isotopes (average)	2,85%
Essential feature of the storage	Storage in pool

TRINO NPP Fuel assemblies in DEPOSITO AVOGADRO site	
	1 FA
Nominal U mass kg	310
Fuel type	PWR
Fuel element layout	15 X 15
Number of fuel elements per assembly	208 + 1 rod position vacant
Cladding material	AISI 304
Fuel material	UO ₂
Fuel initial enrichment (average)	4,02%
Essential feature of the storage	Storage in pool

With regard to the extraordinary safety assessment of structures, systems and components of the plant requested by the Competent Regulatory Authority in 2014, according to international practice, the guidelines set out in IAEA Specific Safety Guide No. SSG-25 "Periodic Safety Review for Nuclear Power Plants" have been followed according to a graded approach.

From the analysis the following conclusions have been drawn:

⁶ some FAs were modified during irradiation: 2 FAs remained without 1 fuel pin, 3 FAs without 2 fuel pins
⁷ after last irradiation cycle in the FA were inserted 4 MOX and 2 UO₂ non irradiated fuel pins segments
⁸ in 4 FAs only the spacer capture rod is a UO₂ pin

1. The structural conformity of the pool and the containment building has been demonstrated, according to the Italian regulation.
2. The primary cooling system is to be considered fully adequate to its scope, both from a design and construction point of view.
3. Plant engineering works and periodic structural checks ensure the efficiency of the plant in case of flooding events.
4. There have not been any substantial changes made in the operating logic of the plant and the constant maintenance over the years has increased the reliability of the systems.
5. What was described in 1978 CNEN Safety Analysis is still valid and up-to-date and therefore it is possible to state that the plant is suitable to continue with the storage of spent fuel elements in the coming years.

Due to its old design, however, the installation remains not suitable for a long term storage and the plan to remove the fuel in the context of the in place agreement for reprocessing remains firm.

Spent fuel pool of Triga Research Reactor (ENEA Research Centre – Casaccia)

TRIGA RC-1 is a Mark II open tank reactor operating at a power of 1-MW. The core is cooled by light-water with an annular graphite reflector. The core has a cylindrical configuration and is placed at the bottom of an open tank. On the inner edges of the reactor tank, there are racks where partially burned fuel assemblies can be stored in a largely sub critical configuration. At present there are some partially burned fuel assemblies located in the racks. Spent fuel is stored in dedicated pits.

Spent fuel pool of LENA Research Reactor (University of Pavia)

LENA is a Triga type research reactor. The spent fuel is stored in special pits in the reactor building. There are 5 pits, two of them respectively contain 9 spent fuel assemblies. Moreover, on the edges of the reactor pool, there are fuel racks where partially burned fuel assemblies, to be possibly inserted in the reactor, are stored.

For Italian Research reactors a periodic review is foreseen every 5 years addressed to review the operating experience and the status of reactor systems and components. In this framework ISIN has requested to the operators to submit an updated evaluation of safety which takes into account recommendations of the Code of Conduct.

JRC Ispra

In 1999 the Commission decided to launch the Decommissioning and Waste Management Programme ("D&WM Programme"), for decommissioning its obsolete nuclear installations.

As far as spent fuel management practices the matter was investigated in detail and the current option is dry storage pending shipment to the national long term storage facility.

For spent fuel installation descriptions see point D.4.

From the point of view of safety assessment reference events (in particular the drop of a cask containing the fuel stored in the spent fuel pool during an operation handling) are assessed in the Safety Analysis Report. Technical specifications attached to the licence regulate the operation of the spent fuel pool and of the related auxiliary system.

For the “dry well” storage plant, the safety analysis considers the drop during the removal operations of a cask containing the fuel. Also in this case technical specifications attached to the authorization regulate the operation of the facility.

OPEC 1

This installation was realized initially for a post-irradiation examination facility, located in the Casaccia Research Centre, and operated by ENEA. From 1962 to 1990 activities were carried out on metal uranium and uranium oxide in a series of hot cells. In the period from 1992 to 1998 activities on spent fuel scraps encapsulation and hot cell decontamination have been carried out. Since 2003 the plant is managed by SOGIN and a new licence was issued only for a storage of remaining spent fuel. A table attached at the licence define the total amount of the content of the fuel stored.

From the point of view of safety analysis, the configuration of the OPEC 1 storage facility makes reference to an accident of drop of cask containing pins of spent nuclear fuel coming from Elk River Reactor. The technical specifications attached to the licence are set to regulate the use of the remaining hot cells (maximum quantity of fissile materials in every conditions), the ventilation system (values of negative pressure in every work place), monitoring system (with threshold for radioactivity airborne releases) and electricity power supply in case of black out.

5.2 Assessment of compliance

In summary, it can be underlined that the existing spent fuel storage facilities contain a limited amount of fuel assemblies and, according to the spent fuel management strategy (transfer abroad for reprocessing, dry storage), have a short residual operation period. A safety assessment is developed to support the safety case submitted during the licensing process developed to grant the licence. A specific safety review of operating spent fuel pools has been recently conducted. Taking into account what has been said in the previous section, further measures are not planned to be implemented as a result of the ratification of the Convention.

Article 6. Siting of proposed facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed spent fuel management facility:
 - (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime;
 - (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment;
 - (iii) to make information on the safety of such a facility available to members of the public;
 - (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.
2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 4.

6.1 Undertaken Steps

As indicated in Section B the national spent fuel management strategy envisages the transfer abroad for reprocessing of the spent fuel generated by the past operation of NPPs with the subsequent return to Italy of the resulting radioactive waste.

A limited amount of fuel still to be transferred remains in the Avogadro AFR storage facility. . The construction of a new storage facilities on the site is therefore not envisaged for this fuel.

The only two exception are represented by the spent fuel in the ITREC experimental reprocessing facility and the spent fuel coming from past research activities in the JRC of Ispra.

In the case of the ITREC plant, due to the difficulties for reprocessing the particular fuel (U-Th), it is in fact currently envisaged that the small amount of spent fuel (64 elements), currently stored in pool, will be stored in dual purpose cask waiting to be transferred to the long term storage facility for I-HLW and spent fuel that will be realized in the National repositoryThe construction of an onsite facility for the interim dry storage is therefore in progress.

In the licensing procedure, concluded in March 2020 with the approval by ISIN of the related project , all pertaining safety assessment evaluations have been performed, including site related

factors potentially affecting the new facility. Interested members of the public have been informed in the context of periodic meetings taken with the local administrations.

Being constructed in the same site, where the spent fuel is already stored in the pool of the ITREC facility, it is not expected that the new dry storage facility will affect other Contracting Parties.

For the case of the spent fuel in the JRC of Ispra, located in underground pits and in the pool of the ESSOR reactor, a dry storage facility has been recently realized using an hot cell of the ESSOR complex. The commissioning of this new facility has been almost completed with the transfer of the spent fuel pits. Also in this case, a specific safety case has been developed. In addition, being constructed in the same site where the spent fuel was previously stored, it is not expected that the new facility will affect other Contracting Parties.

In addition, the National Repository will have a facility dedicated to the long term storage of ILW-HLW, including spent fuel not reprocessed, such as the ITREC fuel and the fuel coming from research activities. As said, the siting process of the National Repository envisages a phase of public participation. Legislative decree n.31/2010 establishes that once the site will have been selected the national implementer has to organize an information campaign under the supervision of the competent regulatory authority. Consultation process of involved neighbouring countries has been done in relation to SEA of the national programme. A specific consultation will be also conducted according to art. 37 of Euratom Treaty before the construction will be started.

6.2 Assessment of compliance

Two new spent fuel storage facility are expected to be operated in the near future in the existing nuclear installations. A dry storage facility for the spent fuel located in the ITREC plant, for which the construction licence have been granted, and the dry storage facility in ESSOR reactor for the JRC of Ispra, already built and currently in the final stage of commissioning. In that frame, all the site related evaluations are confirmed. Regular consultations with the local authorities and stakeholders provide the proper level of information to the members of the public.

For the long term storage facility of ILW/HLW, including a dedicated structure to store the remained limited quantities of spent fuel, that will be part of the National Repository, the siting procedure envisages steps of public consultation and participation. Consultation of neighbouring countries are envisaged according to Art. 37 of Euratom Treaty.

On those bases, the existing measures are considered sufficient to fulfil the requirements under this article of the Convention.

Article 7. Design and construction of facilities

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

- (i) the design and construction of a spent fuel management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;
 - (ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a spent fuel management facility are taken into account;
 - (iii) the technologies incorporated in the design and construction of a spent fuel management facility is supported by experience, testing or analysis.
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7.1 Undertaken steps

As indicated in Section B, the current national spent fuel management strategy envisages the transfer of the remaining spent fuel abroad for reprocessing with the subsequent return to Italy of the resulting radioactive waste. The construction of new spent fuel storage facilities is therefore not envisaged, with the only exception indicated in article 6.1.

Being strictly connected to the site, the new installation for spent fuel dry storage at ITREC facility is licensed following the procedure for major modifications (Art. 6 of Act n° 1860/1962). A condition in the licence granted by the Ministry of Economic Development exists establishing that the facility has to be constructed and operated on the bases of a detailed design approved by ISIN.

The related project has been submitted by the operator SOGIN and it has been approved in March 2020. A safety case, including demonstration of protection against external event was evaluated.

The same approach was followed for the new dry storage facility in the JRC of Ispra.

The technical review process has taken into account the general principle of reducing exposures to the lowest practicable value (Legislative Decree n° 101/2020 art. 5), the need to facilitate future decommissioning activities and the suitability of the technology as required, either by specific technical guides issued by the Competent Regulatory Authority or by making reference to international standards.

Detailed technical requirements related to the design of dry spent fuel facilities have been issued by the Competent Regulatory Authority when the dry storage of spent fuel on the sites was selected as well as the criteria to be applied, specifying the acceptable requirements for the most important safety features of such facilities.

7.2 Assessment of compliance

New fuel management facilities are not foreseen to be constructed in the near future, with the only exceptions mention in article 6.1. The related licensing procedures for the dry storage facilities at the ITREC installation and at the JRC of Ispra, considered all measures to limit possible radiological impacts on individuals, society and the environment.

On the above bases Italy considers that the existing measures comply with the requirements of article 7 of the Convention. They will however be taken into account in the submitted safety case and in the related regulatory review and assessment.

Article 8. Assessment of safety of facilities

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

- (i) before construction of a spent fuel management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;
 - (ii) before the operation of a spent fuel management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).
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8.1 Undertaken steps

As already said, the spent fuel dry storage facility to be constructed on the ITREC plant site, which is the only one to be realized in Italy in the near future to manage the existing spent fuel – has been licensed according to the procedure for major plant modifications. In this context a comprehensive and systematic safety assessment covering radiological impact of the installation to the public and to the environment was filed by the applicant. Technical Guides issued by the Regulatory Authority specified more in detail licensing requirements to be applied.

The same approach was followed for the new spent dry storage facility at the JRC of Ispra which is now in the final stage of commissioning.

If a new facility should be constructed in a location different from a nuclear site, a specific licensing process should be followed according to the procedures envisaged in the Legislative Decree n° 101/2020 and an Environmental impact Assessment should be performed.

8.2 Assessment of compliance

On the bases of what reported above the existing measures can be considered in compliance with the requirements of article 8 of the Convention.

Article 9. Operation of facilities

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

- (i) the licence to operate a spent fuel management facility is based upon appropriate assessments as specified in Article 8 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;
 - (ii) operational limits and conditions derived from tests, operational experience and the assessments, as specified in Article 8, are defined and revised as necessary;
 - (iii) operation, maintenance, monitoring, inspection and testing of a spent fuel management facility are conducted in accordance with established procedures;
 - (iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a spent fuel management facility;
 - (v) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;
 - (vi) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;
 - (vii) decommissioning plans for a spent fuel management facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body.
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9.1 Undertaken steps

As already illustrated above Nuclear Power Plants and other nuclear Facilities in the process of being decommissioned have their own licenses, procedures, limits and conditions, which are based on part IX of the Legislative Decree n° 101/2020 which include also the spent fuel management facilities existing on the site.

Specific requirements are addressed in Chapter IX of the Legislative Decree n° 101/2020 and in relevant technical guides as following:

- (i) the relevant documents to be produced, which include the safety report, are covered in Articles 76 and 84.
- (ii) Articles 85 -88 regulate the commission tests.
- (iii) The requirement to issue an Operating Manual and Technical Specifications containing operating limits and conditions [OLC] is given in article 84; the contents of such documents are better specified in Article 7. In particular, the first issue of the OLC is required before the performance of the nuclear tests (Article 84), the final issue has to

be attached to the operating license (Article 93). At the moment no regulation addresses to regularly revise OLCs on the basis of the operating experience. Also the Operating Manual is required to be issued before the performance of the nuclear tests (Article 87); it has to incorporate all the procedures related to the operation, maintenance, and also in view of accident or emergency conditions;

- (iv) Articles 87 and 89 require for issuing the so called “Regolamento di Esercizio”, according to its definition under article 7. Technical Guide n. 21, as complemented by other relevant guides related to Quality Assurance, issued by the Regulatory Authority, specifies the requirement for technical support.
- (v) Technical Guide n. 11, which is related to notification reports, specifies the data to be provided to the Regulatory Authority, in case of incidents or failures.
- (vi) Current regulations do not require to regularly collect and revise data on the operating experience, although some technical guides ask for taking into account such data (e.g. for setting up maintenance programmes).
- (vii) Decommissioning plans are required by articles from 98 to 100, which require also the description of the plant state as results from the previous operations as well as the review by the Competent Regulatory Authority.

9.2 Assessment of compliance

Taking the existing legislative provisions into account and considering the limited residual life of the spent fuel management facilities currently into operation, it can be concluded that the existing measures comply with the requirements of article 9 of the Convention.

Article 10. Disposal of spent fuel

If, pursuant to its own legislative and regulatory framework, a Contracting Party has designated spent fuel for disposal, the disposal of such spent fuel shall be in accordance with the obligations of Chapter 3 relating to the disposal of radioactive waste.

10.1 Disposal of spent fuel

At present the National strategy does not envisage the disposal of spent fuel because it will be reprocessed abroad or dry stored. As already mentioned, only a limited amount of spent fuel will remain. With regard to its disposal, no decision has been taken, the present strategy foresees the onsite storage followed by the long term storage in a dedicated facility to be realized in the National repository.

Section H. Safety of Radioactive Waste Management

Article 11. General safety requirements

Each Contracting Party shall take the appropriate steps to ensure that at all stages of radioactive waste management individuals, society and the environment are adequately protected against radiological and other hazards.

In so doing, each Contracting Party shall take the appropriate steps to:

- (i) ensure that criticality and removal of residual heat generated during radioactive waste management are adequately addressed;
 - (ii) ensure that the generation of radioactive waste is kept to the minimum practicable;
 - (iii) take into account interdependencies among the different steps in radioactive waste management;
 - (iv) provide for effective protection of individuals, society and the environment, by applying at the national level suitable protective methods as approved by the regulatory body, in the framework of its national legislation which has due regard to internationally endorsed criteria and standards;
 - (v) take into account the biological, chemical and other hazards that may be associated with radioactive waste management;
 - (vi) strive to avoid actions that impose reasonably predictable impacts on future generations greater than those permitted for the current generation;
 - (vii) aim to avoid imposing undue burdens on future generations.
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11.1 Undertaken Steps

The protection of individuals, society and the environment against radiological and other hazards is covered by the legislative and regulatory framework for nuclear activities, as detailed in Section E.2, and by the general legislation on environmental protection.

- (i) Regarding the maintenance of conditions of sub-criticality and heat removal during radioactive waste management it is duly addressed in the safety case preparation and in the regulatory assessment, taking into account international standards and practices. Addressing this issue is, however, not considered a priority taking into consideration that radioactive wastes presently stored in Italy, as well as those produced during D&D operations, are such that problems of criticality or heat removal will never arise;
- (ii) As far as measures adopted to ensure that the generation of radioactive waste is kept at the lowest possible level, specific requirements are set out in the Technical Guide n. 26 on Radioactive waste management, in terms of waste mass, activity and volume minimization and optimisation of treatment and conditioning processes. In the specific national situation,

- according to which all nuclear installations are in the process of being decommissioned, the principle of waste minimization is applied during the licensing process of waste treatment and conditioning activities, as well as of dismantling and decontamination activities;
- (iii) Regarding measures adopted to take into account interdependencies between the different stages of radioactive waste management, key related aspects are covered by the requirements established in the Technical Guide n° 26 previously mentioned. In particular, all technical, operational and administrative aspects which affect or might affect the quantity of radioactive wastes produced and their volume reduction and concerning different phases such as plant design and operation, services and processes selection, shall be optimised;
 - (iv) With reference to measures to ensure effective protection of persons, society and environment see article 4, paragraph (iv);
 - (v) In relation to measures for consideration of biological, chemical and other risks potentially associated with radioactive waste management related to decommissioning projects it is the case to mention that a specific environmental impact assessment has to be produced by the Licensee and evaluated by a Commission established under the Ministry of Environment; in relation to disposal a specific implementation decree, to be issued, is envisaged by the Legislative Decree n. 101/2020 to establish specific requirements on the presence of other risks potentially associated with radioactive waste.
 - (vi) The principle of considering in the radioactive waste management activities the potential impact on future generations is addressed in the Technical Guide n. 26. It is also referred to in the National Programme. It is the case to mention that in relation to the siting of the national repository the radiation protection objective for the normal operating conditions based upon the “below regulatory concern” is established, as for the current installations so that not to impose to the future generations an impact greater than that permitted for the current generation;
 - (vii) The present strategy as defined in section B is however intended in perspective to fulfil the objective of preventing undue burden to future generations, throughout the planning of the different steps to be performed before disposal. Concrete steps are however still to be implemented, in particular in relation to the conditioning of existing waste and the construction of the National Repository.

Regarding above points vi and vii, the management of radioactive waste is and will be carried out in Italy adopting well known and proved technologies, among the best today available worldwide; in this connection, the impact on future generations as well as the avoiding of undue burdens is properly taken into account.

Compliance with the legal requirements regarding nuclear safety and radiation protection is verified and enforced by regulatory bodies. The compliance is verified by reviewing safety analysis reports during the licensing steps and by supervising construction and operation, particularly through inspections.

11.2 Assessment of compliance

On the basis of the above discussion it can be concluded that Italy has sufficient provisions to fulfil its obligations under the Art. 11 of the Convention. There is however room for some improvements to cover some specific requirements in the regulations.

Article 12. Existing facilities and past practices

Each Contracting Party shall in due course take the appropriate steps to review:

- (i) the safety of any radioactive waste management facility existing at the time the Convention enters into force for that Contracting Party and to ensure that, if necessary, all reasonably practicable improvements are made to upgrade the safety of such a facility;
 - (ii) the results of past practices in order to determine whether any intervention is needed for reasons of radiation protection bearing in mind that the reduction in detriment resulting from the reduction in dose should be sufficient to justify the harm and the costs, including the social costs, of the intervention.
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12.1 Undertaken steps

As already explained in Section D, the radioactive waste management facilities in Italy are the storage facilities present in the existing nuclear installations (NPPs, fuel cycle facilities and research centres). For the management of industrial, medical and research LLW there are a few authorised operators. Among them, NUCLECO has also on site capabilities for treatment, conditioning and storage of RW.

In this framework the safe management of existing radioactive waste is regulated under the operating license conditions of the facilities where wastes are stored.

As reported in section E, in most nuclear installations new temporary storage facilities have been constructed or are under design or construction. In some cases the refurbishing of existing buildings has been considered. New storage facilities have been authorised for Caorso, Garigliano and Latina NPPs, Eurex plant, JRC of Ispra, Casaccia research centre (Rome) The Garigliano, Latina and JRC storage facilities have already entered into operation. These facilities will allow to improve the safety condition of the radioactive waste already existing on the sites. Their construction will also allow to start some important waste treatment and conditioning process, also including the removal of waste from trenches, where they were buried in the '60s and early '70s,

according to a practice common at that time. As example for the Garigliano NPP remediation activities of two out of three trenches have been already completed and the same operations are in progress for the third one.

For the authorization of new storage facilities the licensee has to provide a specific safety case which is revised under the regulatory assessment process. A comprehensive review of the storage facilities characteristics and capabilities is conducted in the framework of the decommissioning licensing process of each installations.

In addition to the construction of new storage facilities in almost all the installations specific treatment and conditioning programmes are in progress or are planned for the coming years. In this regard it is worthwhile to mention:

- the cementation of the liquid waste at Eurex plant;
- the removal and conditioning of the waste at the ITREC plant, located in the '70s in a cemented ditch;
- the treatment and conditioning programmes of existing wastes in most installations.

In the past there were some experiences of onsite radioactive waste management facilities for the treatment of a specific radioactive waste stream.

More details on the measures under implementation in the different sites are reported in Section K.

12.2 Assessment of compliance

On the basis of the above discussion it can be concluded that Italy has sufficient provisions to fulfil its obligations under the Art. 12 of the Convention.

Article 13. Siting of proposed facilities

1. Each Contracting Party shall take the appropriate steps to ensure that procedures are established and implemented for a proposed radioactive waste management facility:
 - (i) to evaluate all relevant site-related factors likely to affect the safety of such a facility during its operating lifetime as well as that of a disposal facility after closure;
 - (ii) to evaluate the likely safety impact of such a facility on individuals, society and the environment, taking into account possible evolution of the site conditions of disposal facilities after closure;
 - (iii) to make information on the safety of such a facility available to members of the public;
 - (iv) to consult Contracting Parties in the vicinity of such a facility, insofar as they are likely to be affected by that facility, and provide them, upon their request, with general data relating to the facility to enable them to evaluate the likely safety impact of the facility upon their territory.
 2. In so doing, each Contracting Party shall take the appropriate steps to ensure that such facilities shall not have unacceptable effects on other Contracting Parties by being sited in accordance with the general safety requirements of Article 11.
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13.1 Undertaken Steps

- (i) Up to now waste management facilities, including waste storage buildings, are located in nuclear installations that have already a license, and siting considerations are widely discussed under the Safety Analysis Report of the installation themselves. For the new interim storage facilities as well as for other waste management facilities to be constructed on the nuclear sites main site related aspects (e.g. demography, hydrology, geology, seismology) are reviewed in the licensing process and an evaluation is included in the safety documentation submitted to the Competent Regulatory Authority;
- (ii) Radiation protection of the public has to be considered in the license application under the requirements of Legislative Decree n° 101/2020; for new facilities to be constructed in new sites, as in the case of the National Repository, environmental protection will be also addressed by the Environmental Impact Evaluation required by the specific law in force;
- (iii) information to the public on new facilities to be constructed in the nuclear sites is provided in the context of information meetings periodically arranged with local authorities. At least once a year the so called “Table of transparency” is arranged by the Region hosting the nuclear installations. The meetings are attended by the national competent regulatory authority,

operators, representatives from the Region and are opened to stakeholders, local communities and the public. Anyone of the participants can ask information about topics related to the decommissioning of the installations, management of waste and spent fuel and all other aspects linked to the safety management of the nuclear activities in the Region. These meetings represent, in particular for the public, a moment of information and clarification on topics and issues in the nuclear safety field and they are always welcome.

- (iv) The construction of waste interim storage facilities on the nuclear sites is not expected to affect other Contracting Parties, mainly due to the fact that they are aimed at improving the safety conditions of wastes already existing in the sites. In the case of the National Repository, where a long term storage facility for I-HLW is envisaged to be constructed, it is expected that consultation of other Contracting Parties will take place if required or under article 37 of the Euratom Treaty.

13.2 Assessment of compliance

On the basis of the above discussion it can be concluded that Italy has sufficient provisions to fulfil its obligations under the Art. 13 of the Convention. There is however room for some improvements to cover some specific requirements in the regulations.

Article 14. Design and construction of facilities

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

- (i) the design and construction of a radioactive waste management facility provide for suitable measures to limit possible radiological impacts on individuals, society and the environment, including those from discharges or uncontrolled releases;
 - (ii) at the design stage, conceptual plans and, as necessary, technical provisions for the decommissioning of a radioactive waste management facility other than a disposal facility are taken into account;
 - (iii) at the design stage, technical provisions for the closure of a disposal facility are prepared;
 - (iv) the technologies incorporated in the design and construction of a radioactive waste management facility is supported by experience, testing or analysis.
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14.1 Undertaken Steps

The construction of waste management facilities (treatment, conditioning, storage) in the site of an existing nuclear installation has to follow the same licensing procedure for nuclear installations, established by the Law 1860/1962 and by Title IX of the Legislative Decree n° 101/2020. The procedure for the approval of major plant modifications is followed, with an authorisation granted by the Ministry of Economic Development and an approval of the design by ISIN. For storage facilities the authorizations is granted also taking into account the advice of Ministries of Environment and of Health.

In the case of an installations operating under a decommissioning licence, the design of new storage facilities on the site has to be approved by the Competent Regulatory Authority (ISIN).

For new long term waste storage facilities to be realised in sites different from those of the existing installations, licensing procedures are currently specified in the Legislative Decree n° 101/2020. In order to further improve existing requirements, Art. 59 of the Legislative Decree n.101/2020 envisage a specific implementation decree, under preparation.

Licensing procedure for the construction of a national, near surface repository is reported in the Legislative Decree n. 31/2010 as subsequently amended.

- (i),(ii) The applicant has to submit to the Ministry of Economic Development and to ISIN a detailed design showing compliance with safety and radiation protection objectives as stated in the Legislative Decree n° 101/2020. In particular as far as the protection of general public is concerned, the facility shall be so designed that the radiological

consequences for the defined plant conditions do not exceed pre-defined dose objectives. The relative annual probability limits for each plant condition are referred to each single event, meant as an individual event or a discrete sequence of individual events. Any deviation found shall be justified for each individual case, in the light of design alternatives and/or other available solutions, also taking the collective dose into account. In the frame of the detailed design, provisions related to decommissioning are addressed.

(iii) As already said in Section B the current national strategy envisages the construction of a national near surface disposal facility for LLW/ILW. Detailed design requirements are still to be set out, including those related to the institutional control during the design life. Such requirements are those on which most of regulatory efforts will have to be addressed to in the future. Technical provision related to the closure phase of such a facility will be established in that context, as far as applicable. Legislative Degree N. 45/2014, with which the EU directive N. 2011/70/Euratom has been transposed into the national legislations establish the licensing procedure to regulate the closure of the facility.

(iv) In the frame of the above mentioned detailed design the applicant is requested to demonstrate that the adopted technologies are adequately supported by experience, testing and analysis. As already detailed in section B.6.2, for facilities whose purposes are to treat a specific waste stream (for instance a cementation facility), the applicant has to submit also the “*Qualification and Control Programme*” aimed to demonstrate the compliance of the final waste package characteristics with the TG n° 26 requirements. In the framework of the Qualification Program, a series of test are carried out by the applicant, under the ISIN surveillance, on samples reproducing the composition of the final waste matrix and/or on the final container. The test results will also be used to define a set of criteria and parameters for the waste conditioning facility design, operation and process control.

As far as interim storage facility is concerned, some of the most significant general design criteria or requirements are listed below:

- a) direct or indirect waste inspectionability;
- b) package protection from weathering;
- c) package protection from external events (e.g. tornado, earthquake, flooding);
- d) floor drainage systems equipped for collection and sampling of drained liquids;
- e) fire detection and suppression systems commensurate with fire loads;
- f) inaccessibility by non-authorized personnel;
- g) administrative procedures (labeling, waste registration systems, etc.) shall enable the waste control.

Safety assessment performed in the frame of the licensing process of new interim storage facilities takes fully into account IAEA applicable safety standards and WENRA safety reference levels (SRLs) as stated in document “Waste and Spent Fuel Storage Safety Reference Level Report – Version 2.2 – April 2014”. In compliance with these WENRA SRLs, ISIN has recently developed

the Technical Guide n. 30 – “Safety and radiation protection criteria for radioactive waste and spent fuel interim storage facilities”.

14.2 Assessment of compliance

On the basis of the above discussion it can be concluded that Italy has sufficient provisions to fulfil its obligations under the Art. 14 of the Convention.

Article 15. Assessment of safety of facilities

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

- (i) before construction of a radioactive waste management facility, a systematic safety assessment and an environmental assessment appropriate to the hazard presented by the facility and covering its operating lifetime shall be carried out;
 - (ii) in addition, before construction of a disposal facility, a systematic safety assessment and an environmental assessment for the period following closure shall be carried out and the results evaluated against the criteria established by the regulatory body;
 - (iii) before the operation of a radioactive waste management facility, updated and detailed versions of the safety assessment and of the environmental assessment shall be prepared when deemed necessary to complement the assessments referred to in paragraph (i).
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15.1 Undertaken steps

(i)(iii) The licensing process related to the construction of waste management facilities (treatment/conditioning and interim storage) on the nuclear sites envisages the submittal of a systematic safety and environmental assessment. The configuration of the installation before operation is verified in front of the performed assessment, and technical specifications are defined to regulate the operational phase. For radioactive waste management facilities to be constructed in new sites, including the disposal facility, a specific authorization is requested. A safety assessment is included in the documentation submitted by the applicant. It is then subject to the regulatory review process with an independent assessment performed by the Competent Regulatory Authority to support the authorizations. In a similar manner an environmental impact assessment is performed by the licensee. It is then independently reviewed by a Commission established under the Ministry of Environment Land and Sea. An updated version of the safety assessment has to be provided before the facility operation.

It is also to be mentioned that potential radiological impact of low probability events, like an airplane crash, are evaluated according to a "What if" methodology. In the case of radiological consequences exceeding a few mSv adequate protection of the waste is requested.

- (ii) As said in other sections the closure and post closure phases will be considered in the context of the licensing of the national disposal facility. The related requirements are under definition. As reported in the previous section the pertaining licensing procedures is established in Legislative Degree n. 45/ 2014 recently issued.

15.2 Assessment of compliance

On the basis of the above discussion it can be concluded that Italy has sufficient provisions to fulfil its obligations under the Art. 15 of the Convention.

Article 16. Operation of facilities

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

- (i) the licence to operate a radioactive waste management facility is based upon appropriate assessments as specified in Article 15 and is conditional on the completion of a commissioning programme demonstrating that the facility, as constructed, is consistent with design and safety requirements;
 - (ii) operational limits and conditions, derived from tests, operational experience and the assessments as specified in Article 15 are defined and revised as necessary;
 - (iii) operation, maintenance, monitoring, inspection and testing of a radioactive waste management facility are conducted in accordance with established procedures. For a disposal facility the results thus obtained shall be used to verify and to review the validity of assumptions made and to update the assessments as specified in Article 15 for the period after closure;
 - (iv) engineering and technical support in all safety-related fields are available throughout the operating lifetime of a radioactive waste management facility;
 - (v) procedures for characterization and segregation of radioactive waste are applied;
 - (vi) incidents significant to safety are reported in a timely manner by the holder of the licence to the regulatory body;
 - (vii) programmes to collect and analyse relevant operating experience are established and that the results are acted upon, where appropriate;
 - (viii) decommissioning plans for a radioactive waste management facility other than a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility, and are reviewed by the regulatory body;
 - (ix) plans for the closure of a disposal facility are prepared and updated, as necessary, using information obtained during the operating lifetime of that facility and are reviewed by the regulatory body.
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16.1 Undertaken steps

- (iii) With regard to the safety assessment and commissioning programme assumed as reference for the licence of a radioactive waste management facility they are clearly regulated under Chapter IX of the Legislative Decree n° 101/2020 In particular, as indicated under Art. 15 of this report, a safety case has to be presented by the Licensee to support the application and

a commissioning programme, approved and supervised by the Competent Regulatory Authority, has to be conducted.

- (iv) Operational limits and conditions, as specified in Art.15, are defined in the Technical Specification document attached to the licence; definition and general content of the technical specification document is reported in Article 87 of Chapter IX of Legislative Decree n° 101/2020.
- (iii) With regard to maintenance, monitoring, testing etc related procedures are reported in the Conduct of operation manual which has to be prepared for the facility according to requirements established in the same Article of the Legislative Decree identified above.
- (iv) With reference to engineering and technical support in safety related fields, although a specific requirement is not present in the in force regulations, its availability in the licensee organization is evaluated and requested in the licensing process.
- (v) Characterization and segregation of radioactive waste is performed according to general guidelines issued by SOGIN and approved by ISIN. Implementation is subject to regulatory authority supervision.
- (vi) As far as reporting of incidents important to safety is concerned, Article 183 of Chapter XIV of Legislative Decree n° 101/2020 establishes that the manager of the nuclear installation is responsible to notify any event relevant to safety to the Competent Regulatory Authority and to other Administrations involved in the management of a potential emergency. Moreover further guidance on the information to be provided to the Competent Regulatory Authority. Collection and analysis of operating experience is usually envisaged in specific QA procedures.
- (vii) Programmes to collect and analyse relevant operating experience are established and the results are acted upon, where appropriate;
- (viii) With reference to the decommissioning plan, although specific requirements are not envisaged in the present regulations, the proper consideration of decommissioning aspects is requested during the licensing process of the facility design. Furthermore, specific guidelines issued by SOGIN S.p.A. require that the final radiological characterization of the facility has to take into account its operating history
- (ix) See Art.17.

16.2 Assessment of compliance

On the basis of the above discussion it can be concluded that Italy has sufficient provisions to fulfil its obligations under the Art. 16 of the Convention.

Article 17. Institutional measures after closure

Each Contracting Party shall take the appropriate steps to ensure that after closure of a disposal facility:

- (i) records of the location, design and inventory of that facility required by the regulatory body are preserved;
 - (ii) active or passive institutional controls such as monitoring or access restrictions are carried out, if required; and
 - (iii) if, during any period of active institutional control, an unplanned release of radioactive materials into the environment is detected, intervention measures are implemented, if necessary.
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17.1 Institutional measures after closure

As said in other sections the current national strategy envisages the construction of a national near surface disposal facility. The closure and post closure phases will be considered in the context of the licensing process of that facility. Art. 28-*bis* of the Legislative Decree n. 31/2010 already define the licensing procedure for closure.

Section I. Transboundary Movement

Article 27. Transboundary movement

1. Each Contracting Party involved in transboundary movement shall take the appropriate steps to ensure that such movement is undertaken in a manner consistent with the provisions of this Convention and relevant binding international instruments.

In so doing:

- (i) a Contracting Party which is a State of origin shall take the appropriate steps to ensure that transboundary movement is authorized and takes place only with the prior notification and consent of the State of destination;
 - (ii) transboundary movement through States of transit shall be subject to those international obligations which are relevant to the particular modes of transport utilized;
 - (iii) a Contracting Party which is a State of destination shall consent to a transboundary movement only if it has the administrative and technical capacity, as well as the regulatory structure, needed to manage the spent fuel or the radioactive waste in a manner consistent with this Convention;
 - (iv) a Contracting Party which is a State of origin shall authorize a transboundary movement only if it can satisfy itself in accordance with the consent of the State of destination that the requirements of subparagraph (iii) are met prior to transboundary movement;
 - (v) a Contracting Party which is a State of origin shall take the appropriate steps to permit re-entry into its territory, if a transboundary movement is not or cannot be completed in conformity with this Article, unless an alternative safe arrangement can be made.
2. A Contracting Party shall not licence the shipment of its spent fuel or radioactive waste to a destination south of latitude 60 degrees south for storage or disposal.
 3. Nothing in this Convention prejudices or affects:
 - (i) the exercise, by ships and aircraft of all States, of maritime, river and air navigation rights and freedoms, as provided for in international law;
 - (ii) rights of a Contracting Party to which radioactive waste is exported for processing to return, or provide for the return of, the radioactive waste and other products after treatment to the State of origin;
 - (iii) the right of a Contracting Party to export its spent fuel for reprocessing;
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- (iv) rights of a Contracting Party to which spent fuel is exported for reprocessing to return, or provide for the return of, radioactive waste and other products resulting from reprocessing operations to the State of origin.
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27.1 Regulatory requirements

Transboundary movement of spent fuel and radioactive waste is regulated into the national regulatory framework by the requirements stated in:

- Act on peaceful use of nuclear energy (Act 31 December 1962, n° 1860 as amended);
- Radiation Protection Act (Legislative Decree 31st July 2020, n° 101, in particular to transpose Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel);
- Council Regulation (EC) n° 1334/2000;
- The Act on authorization of export of dual-use products and technical assistance (Legislative Decree 9 April 2003, n°96);

In summary, according with the national regulations, to export spent fuel or radioactive waste from Italy a licence cannot be granted if:

- the destination is south of latitude 60° south;
- a State party to the Fourth ACP-EEC Convention which is not member of the European Union;
- a State which, in the opinion of the Italian competent authority, does not have the administrative and technical capacity and regulatory structure, to manage the spent fuel or radioactive waste safely.

The international regulations for transport of dangerous goods, including class 7 (radioactive material) are applied for transboundary movement of spent fuel and radioactive waste to protect persons, property and the environment from the effects of radiation during their transport. Those materials are not categorized as such by the international regulations but on the basis of their radioactive and fissile properties. Therefore all the requirements stated in the modal regulations (ADR, RID, ADN, IMDG Code, ICAO TI), that are based on the IAEA Regulations for the Safe Transport of Radioactive Material, No. SSR-6 (Rev. 1), are applied for the shipments of spent fuel and radioactive waste.

27.2 Administrative requirements

For transboundary movement of radioactive waste and spent fuel Italy follows the administrative procedures established in the above mentioned European Union Directive 2006/117/Euratom

implemented into the national regulatory framework by the Radiation Protection Act (Legislative Decree 31 July 2020, n° 101).

The Directive establishes a set of requirements in order to ensure that the State of destination and the States of transit have the right to give their prior consent and to prescribe additional conditions and to be notified as is stated in the Directive. The Italian competent authority to grant the licence for export, import or transit of radioactive waste and spent fuel is the Ministry of Economic Development. The license is based upon the advice of the Competent Regulatory Authority (ISIN), other Ministries and the Region in which the facility is located.

For export of spent fuel in non EU countries the Council Regulation (EC) n° 1334/2000, setting up a Community regime for the control of exports of dual-use items and technology, is applied. In that case an authorization for export is issued by the Italian competent authority (Ministry of Economic Development – International Department) on the basis of a declaration of the consignee endorsed by the State of destination.

27.3 Experience of trans-boundary movements

National experience of transboundary movements of spent fuel and radioactive waste are related to the reprocessing of spent fuel and the treatment of radioactive waste arising from nuclear fuel cycle and from medical or industrial activities. The radioactive waste exported to UE countries, are re-imported after their treatment. Also in those cases the procedures stated in the Directive 2006/117/Euratom, quoted above, are applied.

27.4 Assessment of compliance

On the bases of information provided above Italy comply with article 27 of the Convention for such radioactive waste and spent fuel as defined by the Directive 2006/117/Euratom.

Section J. Disused sealed sources

Article 28. Disused sealed sources

1. Each Contracting Party shall, in the framework of its national law, take the appropriate steps to ensure that the possession, remanufacturing or disposal of disused sealed sources takes place in a safe manner.
 2. A Contracting Party shall allow for re-entry into its territory of disused sealed sources if, in the framework of its national law, it has accepted that they be returned to a manufacturer qualified to receive and possess the disused sealed sources.
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28.1 Sealed Sources Regulation in Italy

In accordance with the provisions of the Italian legislation, a practice with radiation sources is subject to radiation protection regulatory system if specified thresholds of activity and concentration are exceeded. 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.

From an administrative viewpoint, practices can be subject to the mutually exclusive requirements either of notification or of authorisation, in accordance with the provisions of Legislative Decree n° 101/2020.

A practice is subject to notification requirements if both defined thresholds in total activity and activity concentration of radioactive materials are exceeded. A holder of sources is required to notify local authorities on his intention to carry out the practice at least 30 days before the start of the practice itself. Moreover, detailed requirements for notification apply, which closely mirror those provided for in case of authorisation.

For installations using ionising radiation sources for medical, industrial and research purposes, the Italian authorisation system is based on a two tiered structure:

- Authorisation of the most important installations is the competence of the Ministry of Economic Development; the Ministry issues authorisations acting 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 authorisations after seeking the advice of regional technical bodies and of the Fire Corps; the authorisation required for small medical installations is issued by the authorities identified by regional legislation.

Specific provisions apply to closing down practices subject to notification or authorisation; in particular, users are required to submit in advance a report to competent authorities on close-down operations as well as the meant for the destinations of radioactive sources and waste.

Import and export of, and trade in, activities of radioactive materials, products, apparatus and any other devices containing radioactive materials, pursuant to the Act n° 1860/1962, are subjected to prior authorisation from the Ministry of Economic Development. Moreover, pursuant to Legislative Decree n° 101/2020, the licensees are required to comply with the following obligations:

- the import activity shall be notified by the licensee in advance at least 60 days before; the notification shall be addressed to a few Ministries and to ISIN;
- every source placed on the market shall be accompanied by written information on technical precautions to be taken to prevent any undue exposure and on the procedures to follow when such sources are disposed of or cease to be in possession of the holder;
- anyone who imports sources of ionizing radiation for commercial purposes must register on the ISIN institutional website and send the same information relating to each operation carried out, the contractors, the type and quantity of the sources involved in the operation. This information must be sent within ten days of the operation carried out.

An authorisation by the Ministry of Economic Development for transport of the radioactive materials is required as well, pursuant to art.43 of Legislative Decree 101/2020. The authorized carriers must register on the ISIN institutional website and send to ISIN, within 3 days of the end of each shipment, information about the radioactive material transported.

Article 62 of the Legislative Decree n° 101/2020 establishes that the holder of high-activity sealed radioactive sources shall demonstrate that adequate arrangements have been made to ensure the safe management of sources, including when they become disused; such arrangements shall include, in particular, obligation for the transfer of sources to the manufacturer or supplier, or their placement in a recognised installation or financial security for the safe management of sources when they become disused.

Article 74 of the Legislative Decree n° 101/2020 establishes specific provisions in order to identify the duties of two subjects which may take the charge of the disused sources management:

- the National Operator (Sogin S.p.a.) shall grant, in particular, for the long term storage (at least 50 years) of spent sources;
- the Integrated Service (E.N.E.A.) shall grant all the phases of the spent sources management.

Article 64 of Legislative Decree n° 101/2020 states specific provisions for the import and export of IAEA Categories 1 and 2 sealed sources; importation and exportation activities are subject to prior authorisation by the Ministry of Economic Development and the Ministry of Environment, with the advice of ISIN. Such provisions are established on the basis of the essential requirements of the IAEA Code of Conduct and supplementary Guidance.

ISIN plays a central role in the regulatory system. Apart from nuclear installations, which are always subject to ISIN review, ISIN is required by law to express advice and lay down technical specifications for installations which are authorised by the Ministry of Economic Development; moreover ISIN has general inspection powers for every kind of radiation source and 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 even have power of seizure on sources or installations they deem 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 field and entrusted to their surveillance.

28.2 Spent Sources Management

Responsibility is placed on the organisation receiving the sources to ensure that it complies with its authorisation to store radioactive material.

It should be noted that sealed sources are not manufactured or recycled in Italy; all sources are imported.

As far as the disused sealed sources management is concerned, one of these options can be adopted:

- transfer to the manufacturer or to the supplier (i.e. outside Italy).
- transfer to the waste processing and storage Italian facilities (e.g. NUCLECO at the ENEA Research Centre of Casaccia).
- transfer to one of the companies which provide regional services for the collection of sources for subsequent disposal (at present 3 companies are licensed).

In Italy there is no central repository for disused sources yet. In the meanwhile, every user either has his own storage facility, which is regulated by ad hoc provisions in the license, or makes use of medium or small size interim waste storage facilities. For instance, in a medium interim storage facility for radioactive wastes, many disused sources may be stored today after dismantling of equipment containing sources.

The services of Nucleco S.p.A include the collection of radioactive sources, the dismantling of equipment containing sources, processing of sources and the transfer of the processed material to the interim storage.

28.3 Assessment of compliance

From what is stated above, the existing measures comply with the requirements of article 28 of the Convention. Some actions are required in the medium/long term in order to enlarge the storage capacity, available at national level, to safely manage spent sources and in view of final disposal.

Section K. General Efforts to Improve Safety

K.1 General efforts to improve safety

On the legislative and regulatory side the legislative decree n. 101/2020, transposing EU directive 2013/59/Euratom has been issued in July 2020. The decree envisages the obligation for operators to register and submit information to ISIN on type and quantity of the sources involved in their installation or activity as well as on the radioactive waste produced or stored. ISIN is therefore developing an informatics system dedicated to this purpose.

The new System, called STRIMS (System for Radioactive Waste, Radioactive Material and Radioactive Sources Traceability), is envisaged to start online operators registration and data collection by February 2021.

On the implementation side, it is the case to mention that some important steps forward have been undertaken to start the operation of new interim waste storage facilities on the sites and for the remediation of some legacy waste (Garigliano NPP trenches, buried waste pits in ITREC plant, Latina NPP sludge, EUREX and OPEC 2 new storage facilities).

Relevant projects for the treatment and conditioning of liquid waste as well as sludge and resins (EUREX and ITREC plants liquid waste, Trino and Caorso NPPs resins) are in progress. For them there is the need to accelerate in their implementation. Their completion in the coming years will provide a significant improvement of the safety of the related wastes which represent the largest part of activity inventory present in the country. With regard to the challenges identified at the end of the sixth review meeting, the related actions which have taken in place are described in the following chapter.

K.2 Challenges from the sixth review meeting

In relation to the challenges from the sixth Review Meeting the actions undertaken are described in the following.

Completion of the siting process for the National Repository LLW disposal and ILW-HLW interim storage with public confidence.

After the sixth review meeting, the national chart of areas potentially suitable for the siting of the National Repository was not published, however, a revision of the Chart due to the update of the national Databases utilized in the application of the exclusion criteria (such as for instance: map of seismicity, map of the hydrogeological risk, etc ...), has been necessary.

Last validation of ISIN of the National Chart was in March 2020 and publication is expected by next months.

The subsequent steps leading to the site identification, consisting in the publication of the chart and in the implementation of a process of public consultation have to be undertaken.

Implementation of recommendations and suggestions raised during IRRS 2016 mission.

Some recommendations and suggestions have been addressed with the transposition of the Directive 2014/87/Euratom (i.e. PSR for research reactors, enforcement powers, public participation in licensing process for decommissioning, etc), and with the publication of the National Programme

for the spent fuel and radioactive waste management, some others have been addressed with the Legislative Decree n. 101/2020 in transposition of the Directive 2013/59/Euratom.

With regard to the recommendations to the Regulatory Body, some have already been implemented (increase of inspectors number, implementation of graded approach for the inspection program, development of technical guides, etc.), for several others their implementation is ongoing with the consolidation of the internal ISIN organization which started to be operative in 2019.

With reference to the graded approach for inspections, ISIN has recently adopted prioritization criteria taking into account safety relevance aspects related to type of installation, presence of liquid waste, conditioned/not conditioned waste, in progress specific decommissioning activities, etc...

Concerning the recommendations on the need to complete the assigned staff to ISIN, and to compensate the expected turn over in the short term, actions are ongoing to allow ISIN to recruit in the near future at least 10 units. This in particular to cope with the personnel retirements and the expected significant increase of regulatory activity at national level on spent fuel and radioactive waste management and decommissioning, including to the siting and construction of a National Repository. ISIN has also implemented specific agreements in order to ensure technical support of third, independent expert organizations, in particular ISPRA and regional agencies for environmental protection.

Continue to develop confidence in “letter of comfort” process to support long-term storage and ultimate disposal.

ISIN has recently introduced an additional requirements to the operators for RW conditioning that refers to a certification, named Letter of Compliance, issued by SOGIN, the operator of the future National Repository, has to issue to each operator for each radioactive waste campaign, declaring that the conditioned waste will be accepted at the surface disposal. A different situation is for the ILW, where the strategy foresees storage at the long term storage facility that will be realized at the site of the National Repository.

Transfer abroad of the remaining SF (approximately 13 tHM) for reprocessing is in progress, to be completed.

In 2015 the spent fuel still stored in the Trino NPP have been transferred abroad. The small amount of spent fuel (about 13tHM) still present in the Avogadro storage facility remain to be transferred.

New Technical Guides on RW management and decommissioning to be established through a consultation process.

A Technical Guide on safety requirements for radioactive waste and spent fuel storage has been finalized (TG n.30) and a public consultation conducted. The final version of the guide will be published soon.

Other technical guides are in the development process, such as:

- Safety requirements of predisposal radioactive waste management
- Safety requirements for decommissioning
- Safety requirements for near surface disposal

Section L. Annexes

Annex A List of Abbreviations and Acronyms

AFR	Away From Reactor
ALARA	As Low As Reasonably Achievable
APAT	National Agency for Environment Protection and Technical Services
BWR	Boiling Water Reactor
CIPE	Interministerial Committee for Economic Planning
DISP	Nuclear Safety and Health Protection Directorate
DPCM	Decree of Prime Minister
ENSREG	European Nuclear Safety Regulatory Group
ENEA	Agency for New Technology, Energy and Sustainable Economic Development
ENEL	National Electricity Company
GCR	Gas Cooled Reactor
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ISIN	National Inspectorate for Nuclear Safety and Radiation Protection
ISPRA	Institute for the Environmental Protection and Research
LEU	Low Enriched Uranium
LWR	Light Water Reactor
NEA	Nuclear Energy Agency of OECD
OECD	Organisation for Economic Co-operation and Development
PWR	Pressurised Water Reactor
QA	Quality Assurance
SOGIN	Company for the Nuclear Installations Management
TS	Technical Specification
WENRA	West European Nuclear Regulators Association

Annex B List of legislation, regulations, guides and standards

a) *Statutes and Legislative acts*

Act n° 1860/1962 published in the Italian Republic's Official Journal n° 27 of 30 January 1963, as amended by the President's Decree n° 1704 of 30 December 1965 and by the President's Decree n° 519 of 10 May 1975.

Presidential Decree n° 1450/1971, which contains requirements and procedure for the acquisition of the operational personnel licences.

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

Act n° 225 of 24th February 1992, as modified by Legislative Decree 393 of 26th July 1996 promulgated in order to create National Service for the Civil Protection.

Act No. 10/1998: promulgated for the ratification of the Convention on Nuclear Safety

Act n° 368/2003 establishing the procedures for the site selection of a national repository for HLW.

Act n° 239 of 23rd August 2004 promulgated for the rearrangement of the energy sector extends the procedures established by the Act n°368 of 2003 also for the site selection of a national repository of LLW.

Decree of 2nd December 2004 of the Ministry of Productive Activities (now Economic Development) provides directives to SOGIN for the implementation of decommissioning and radioactive waste management activities. The Decree also charges SOGIN to explore the feasibility of sending all the spent fuel currently stored in ITALY to abroad for reprocessing.

Act n° 282/2005 promulgated for the ratification of Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Act No. 131/2008: which ratifies the additional protocol of Paris and Bruxelles Conventions on third liability in case of nuclear accidents in the field of nuclear safety.

Legislative Decree n° 23/2009 related to the transposal of EU Directive 2006/117/Euratom, on the supervision and control of shipments of radioactive waste and spent fuel

Legislative Decree n° 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 SOGIN.

Legislative Decree n° 41/2011 amended the Legislative Decree 31/2010 with reference to the future nuclear development in Italy.

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

Act n°75/2011, that modifies all the provisions given in the Act n°99/2009 and in the Legislative

Decree n° 31/2010, as amended by the Legislative Decree n°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 n° 230/1995, the Act n° 75/2011 slightly modifies the regulatory process by cancelling of the “Technical Commission on Nuclear Safety and Radiation Protection”.

Legislative Decree n° 185/2011 which transposes the EU Council Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations.

Act n° 27/2012 on the economic development, through the Art. 24, establishes a 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 n° 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. This Legislative Decree included also provisions for the establishment of a new Competent Regulatory Authority (Inspectorate for Nuclear Safety and Radiation Protection, ISIN) fully dedicated to the regulation and control in the nuclear field with strengthened independence and human and financial resources and based on the current ISPRA organization. The enactment of further legislative provisions is required for the full and formal establishment of the new Competent Regulatory Authority.

Act No. 58/2015: which ratifies the amendments to the Convention on the physical protection on nuclear materials and nuclear facilities.

Ministerial Decree of August 7th, 2015 from the Ministry of Economic Development and the Ministry of the Environment, established a new RW classification system.

Legislative Decree No. 28/2016: which transposes the directive 2013/51/Euratom laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption.

Act No. 153/2016: which ratifies a) the Council of Europe Convention on the prevention on terrorism, b) the International Convention for the suppression of acts of nuclear terrorism, c) the Protocol amending the European Convention on the suppression of terrorism, d) the Council Europe Convention on laundering, search, seizure and confiscation of the proceeds from crime and on the financing of terrorism, e) the additional protocol to the Council of Europe Convention on the prevention on terrorism.

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; 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.

b) *Technical guides - Selected ISIN TG addressed to Nuclear Installations' licensing*

Doc. DISP (87) 10 "General Design Criteria for PWR NPPs"

Doc. DISP (87) 11 "Design Requirements for the limitation of the worker exposure for the PWR NPPs"

T.G. n°1 "Content of the Preliminary Safety Analysis Report for NPPs, pursuant to article n°36 of the Legislative Decree n° 230/1995 "

T.G. n°2 "Procedure for the Authorisation of Changes in NPPs"

T.G. n°4 "Implementation of the article n°41 of the Legislative Decree n°230/1995 –Detailed Construction Designs"

T.G. n°8 "Quality Assurance Criteria for NPPs"

T.G. n°9 "Quality Assurance Description of the documentation required for design and construction phases prior to carry out nuclear tests"

T.G. n°11 "Criteria for the compilation of information reports on the operation of NPPs to be sent to DISP"

T.G. n°20 "Quality Assurance Description of the documentation required for operation phase of NPPs"

T.G. n°21 "Content of Operating Rules"

T.G. n°22 "Quality Assurance. Guide for collection, storage, preservation, and safekeeping of quality assurance records for NPPs"

T.G. n°23 "Quality Assurance. Guide for procurement of Items and Services for NPPs"

T.G. n°24 "Quality Assurance. Guide for Auditing on QA Programmes for NPPs"

T.G. n°25 "Quality Assurance. Guide for Applying on design activities for NPPs"

T.G. n°26 "Radioactive Waste Management"

T.G. n°29 "Siting criteria for a near surface disposal facility for low and intermediate level radioactive waste"

T.G. n°30 "Safety and radiation protection criteria for radioactive waste and spent fuel interim storage facilities"

c) *Technical Standards*

UNI standards related to radioactive waste management

In the framework of the National Standardization Organisation (UNI) activities, the following standards aiming to the standardisation of the procedures for radioactive waste management have been developed:

UNI 10621 (2011) "Radioactive waste packages characterization"

UNI 10704 (2011) "Radioactive waste classification"

UNI 10755 (2011) "Recording and labelling of RW packages"

- UNI 11784 (2012)** “Solid materials from nuclear plants - Radiological methods and procedures for the clearance”
- UNI 11196 (2006)** “Qualification of conditioning processes for cat. 2 packages”, that sets out the general requirements for the conditioning process qualification and the specific test to which the waste form and/or packages should be verified (mechanical and physical/chemical properties for homogeneous and heterogeneous waste form and for High Integrity Containers)
- UNI 11194 (2006)** “Radiological characterization of Cat.2 packages”, that establishes methods and requirements for radiological characterization of radioactive waste packages before their disposal (i.e. measurement system performances, typical radionuclides relevant for disposal to be measured, sampling preparation, correlation factors).
- UNI 11195 (2006)** “Information management system for the disposal of Cat. 2 packages”, that sets out the requirements and the methodologies for the management of the Surface Disposal Information Management System (i.e. data acquisition, waste reception plan, inspection and monitoring data base, long term management of the information system)
- UNI 11196 (2006)** “Containers for the final repository of Cat. 2 packages” That defines the requirements (dimension, mechanical characteristics) of the identified containers for LLW packages and qualification process.
- UNI 11197 (2006)** “Identification procedure and traceability of information for Cat.2 Packages”, that defines the requirements for building a suitable Data Base and for organising the information needed to appropriately manage radioactive waste packages at a near surface disposal facility.
- UNI 11279-1-2-3 (2008)** Engineered repository for Category 2 radioactive waste packages
 Part 1: Basic design criteria
 Part 2: Basic qualification criteria for engineered barriers
 Part 3: Surveillance and monitoring basic criteria
- UNICEN 11784 (2020)** Radioactive waste packages – Containers for solid medium level radioactive waste – Characteristic and requirements

Annex C Additional information on Safety & Radiation Protection rules

As specified in section E, 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, importation, 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 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 Countries members of the European Union 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 no 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 critical groups 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 ≥ 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 reference groups of the population are well below primary dose limits.

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 maximum dose levels not to be exceeded to the relevant reference groups of the populations.

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.

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.

Radioactive Waste Management

Legislative Decree n° 101/2020 contains more precise provisions regarding radioactive waste management. Article 150, establishes that radioactive waste must be managed in accordance with the rules of good practice and the instructions set out in authorization documents; also, any person producing, treating, handling, using, dealing in or storing radioactive substances has to conduct assessments concerning the disposal of solid, liquid or gaseous radioactive waste in order to ensure that the limits and the other conditions governing disposal into the environment are observed [Article 151]. Radioactive waste discharges must be licensed, as a rule, by the authorities responsible for licensing the installations where the waste is produced and discharged; in other words the licence for the installation also cover waste discharges from that installation.

Legislative Decree n° 101/2020 has also incorporated Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel. In particular, Article 57 requires prior authorisation of transfer, import, export and transit of radioactive waste, in compliance with the Directive.

Legislative Decree 101/2020 introduces new provisions regarding the management of radioactive waste: all operators in the sector (transport activities, radioactive waste production, treatment and storage) have to register on the ISIN institutional site and to transmit information relating to each operation carried out, the type and quantity of the sources involved in the operation and all relevant information on the radioactive waste transported, produced, treated or stored.

Other technical and administrative obligations are prescribed in the event of any serious contamination of the environment in connection with the use and disposal of radioactive substances. In that case, the Prefect, other competent bodies in the region and ISIN must be informed of the occurrence of any incident and there is an obligation for the authorized party to take all the measures required to restrict contamination and to prevent any risk to individuals and the public [Article 149 of Legislative Decree n° 101/2020].

Legislative Decree n° 31/2010 establishes the procedures for the siting, construction and operation of the National Repository.

The Legislative Decree n° 45/2014 establishes amendments to Legislative Decree n° 31/2010 in relation to the National Repository siting procedure and licensing procedures for the closure of the related disposal facility.

The Legislative Decree n° 45/2014 also establishes provisions for the updating of the waste classification system, taking into account the international standards, and the development of the National Programme for spent fuel and radioactive waste management from generation to disposal.

Natural Radiation Sources

Natural radiation sources are regulated in Title IV of Legislative Decree n° 101/2020.

Regarding radon exposition, the following reference levels are provided:

- 300 Bq/m³ or 6 mSv/year of effective dose for radon in workplaces.

Regarding work activities with radioactive substances of natural origin, the following exemption levels are provided:

- 1 Bq/g of activity concentration and 1 mSv/year effective dose for workers or 0,3 mSv/year of effective dose for members of the public.

Regarding air crews, the reference level is 1 mSv/year of effective dose.

Industrial sectors involving naturally occurring radioactive materials identified as worthy of concern in Annex II Legislative Decree n° 101/2020 are, the ones listed in directive 59/2013/Euratom.

In relation to practices with natural radioactive substances identified as worthy of concern in Annex II of Legislative Decree n° 101/2020, undertakings are obliged to carry out relevant measurements, using dosimetry services, and to assess, using the radiation protection expert, doses to workers and, where appropriate, to reference groups of the public. Depending on the results of the assessment of doses three cases may occur:

- 1) in the event that the results of the measurements are not higher than 1 Bq/g in terms of activity concentration, the undertaking repeats the measurements every three years and in any case in the case of significant variations in the production cycle or in the radiological characteristics of the incoming materials;
- 2) in the event that the results of the measurements are higher than 1 Bq/g in terms of activity concentration, the undertaking shall assess the effective dose effective to workers and the representative individual resulting from the practice. In the event that the effective dose assessments do not exceed the exemption levels for workers and the representative individual (1 mSv/year and 0,3 mSv/year), the undertaking shall repeat the measures referred to in paragraph 1 every three years and in any case whenever significant changes occur in the production cycle or in the radiological characteristics of the incoming materials;
- 3) if the assessed effective doses exceed either 1 mSv/y for workers or 0,3 mSv/y for representative individual, the undertaking shall notify the practice to the Ministry of Labour and to ISIN, and shall fulfil the expected duties for the radiation protection of the workers and the members public.

Annex D Recent activities at facilities under decommissioning

CAORSO NPP



Figure 15: Caorso NPP

Caorso site has completed in 2010 the nuclear spent fuel removal and shipment to the reprocessing plant. SOGIN has obtained the authorization for decommissioning operations in 2014 with the following conditions: before starting the dismantling of the reactor the treatment of the resins deriving from past operational activities must be completed, and the waste treatment systems and the interim storage facilities must be upgraded to most recent standards. In 2015 underwater decontamination of fuel racks inside the fuel pool has been performed, followed by radiological monitoring; the racks have been extracted and positioned in the dry storage pool, waiting for authorization for subsequent treatment and clearance; the suppression pool has been emptied, and monitored, to complete the radiological characterization of systems and components inside reactor building.

In 2019, an addendum to the decommissioning authorization has been approved to temporarily move waste drums from one of the existing storage building into containers, in order to accelerate the refurbishment of the building.

AUXILIARY COOLING TOWER

In 2007 and 2008 the partially dismantling of the auxiliary cooling tower produced 3.100 m³ from civil structure and 300 ton from components removal.

BOP

The dismantling of the turbine and BOP started in 2009 and ended in 2012. More than 6500 tons of metallic materials were dismantled, about 700 tons were decontaminated and 5500 released.

OFF GAS

The dismantling of components of the off-gas system ended in 2010. The building was completely dismantled in 2013.



Figure 16: Caorso NPP - Off-gas building dismantling

EXHAUST RESINS

About 4000 200 l drums containing ion exchange exhausted resins have been characterized in 2016 by gamma spectrometry. Sorting, monitoring, clearance or compacting of material resulting from disassembling of exhausted filter ventilation has been performed in 2016.

After the testing and the setting up of the foreign treatment plant for incineration located in Slovakia, the conditioning process has been authorized and the shipments for the transfer of waste drums are ongoing.

OTHER WASTE TREATMENT

About 600 drums of technological wastes were supercompacted by Nucleco in the years 2008 and 2009. In the years 2011-2013 about 350 tons of low level waste (oil, charcoal, polymer, carbon steel, technological waste) were treated by Studsvik in Sweden, producing 208 drums of final packages.

OTHER ACTIVITIES

Another current activity is Turbine Building refurbishment as a buffer area for radioactive waste and to host a Waste Treatment Facility after the civil works completed in June 2017, in 2019 has been installed and tested the drum supercompactor and in 2020 started the installation of the cranes and the plant system.

Asbestos removal from diesel generators has been completed in September 2017.

TRINO NPP



Figure 17: Trino NPP

GENERAL INFORMATION

Trino site has completed the decommissioning activities related to the decommissioning of the secondary circuit and of the uncontaminated plant parts, by dismantling the emergency cooling systems, the diesel buildings and the cooling towers. The decommissioning authorization has been obtained in 2012. Following the flood events in 2000, the dam on the Po River has been removed and new specifically designed system has been realized to fulfill the current water need of the plant.

The shipment of the nuclear spent fuel to the reprocessing plant of La Hague was completed in 2015.

The new company strategy, reviewed in 2017, aims at anticipating some activities concerning the reactor pressure vessel and its internal structures. Three main phases have been foreseen: 1) vessel characterization improvement; 2) vessel head, barrel and internals dismantling; 3) vessel dismantling. The Nuclear Safety Inspectorate (ISIN) authorization for phase 1 is expected by the end of 2020.

A program of supercompaction of solid low-level radioactive waste began in 2013 and continued in the first months of 2014. The number of drums processed was 1487 and the volume reduction factor was 2,86. The activity was carried out by Nucleco, which is 60% owned by SOGIN, through a supercompaction system operating at 2000 tons.

During 2013 the removal of contaminated components was completed in the radioactive waste storage building in order to install a system for treatment of spent ion-exchange space resins by wet oxidation technology. The total quantity produced was 61 tons of carbon steel and 45 tons of stainless steel drums.

Further radwaste treatment & supercompaction campaigns have been performed since 2015 in order to treat all the radioactive waste coming from the operating phase of the plant; only sludges and resins coming from past operation period remain to be treated and conditioned.

From about initial 5000 different volume & size drums coming from operation and post-operation, the plant store now about 2000 overpacks containing about 10000 supercompacted "pizzas". The overall volume reduction factor is about 2.

PRIMARY SYSTEM

The primary system was decontaminated, the insulation materials containing asbestos were removed, and in 2015 the contract related to the primary system decommissioning project was signed.

In the following years, due to several difficulties arose in the design phase and taking into consideration the change in the decommissioning strategy in order to explore the possibility to dismantle primary system and vessel in parallel, the contract was closed.

The current project foresees different contracts for dismantling of the large components (such as steam generators, pressurizer, etc.) in place and the dismantling of the remaining parts such as piping, valves, etc.

EXHAUST RESINS

Within the framework of the "resin project", the gaseous effluents treatment system was dismantled, the electrical equipment no more in use was removed and pilot tests of the resin treatment plant were operated, achieving promising results for the construction of the industrial plant.

An innovative dedicated facility called WOT relying on Wet Oxidation process has been developed in collaboration with Ansaldo Nucleare in order to treat these resins. Conditioning of the residues will be performed by a mobile modular facility called SICOMOR that is currently under licensing.

The project related to the realization of the WOT facility received ISIN approval on August 2020 while the approval for SICOMOR is expected next year.

FUSION DECONTAMINATION FOR WASTE MANAGEMENT

The initial Waste Management Facility (WMF) project is under review due to the availability of a specific contract for decontamination of metals by fusion. By this way it is possible to reduce the amount of material to be treated in WMF and improve the on Site management of decommissioning radioactive waste waiting to be shipped to the National Repository.

GARIGLIANO NPP



Figure 18: Garigliano NPP

GENERAL INFORMATION

Following the decommissioning license in 2012, the Garigliano NPP has been able to launch substantial decommissioning activities. All the nuclear spent fuel was removed in the 80's and large part of operational waste already conditioned.

INTERIM STORAGE FACILITIES

A new radioactive waste interim storage building (about 10,000 m³) named D1 entered into operation on 31/01/2014.



Figure 19: Storage facility "D1"

The adaptation of the emergency diesel generator building, as an interim waste storage facility, was completed. The current state is fully loaded.



Figure 20: Storage facility “ex Diesel”

STACK

The demolition of the plant stack (95 m), after radiological characterization and scarification was completed at the end of 2017.

After the demolition of the old stack, Sogin installed a new stainless-steel stack, about three times lower, designed for the decommissioning activities



Figure 21: Garigliano NPP plant stack

Reactor building

Currently preliminary activities for dismantling the Vessel and internals inside the reactor building are ongoing. These activities include the Auxiliary Systems revamping inside the Reactor Building, in particular:

- ✓ Fire-extinguishing system
- ✓ Ventilation system
- ✓ Electrical system
- ✓ Radiological monitoring system
- ✓ Lifting system
- ✓ Pool revamping

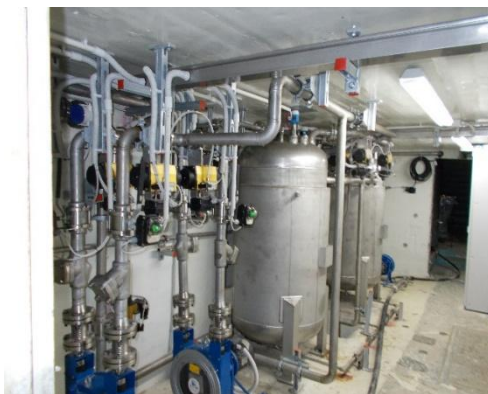


Figure 22: Garigliano NPP reactor auxiliary systems

In order to open the Vessel, all the equipment disposed in reactor cavity when the plant was put in safe isolation condition, have already been removed.

TRENCHES

Important activities were carried out in the external areas, where the clean-up and remediation of two out of three radioactive waste disposal trenches was completed, including extraction and treatment of radioactive wastes stored underground coming from former operation phase. The remediation activities of the third trench are ongoing and all the waste buried will be removed within the end of this year.

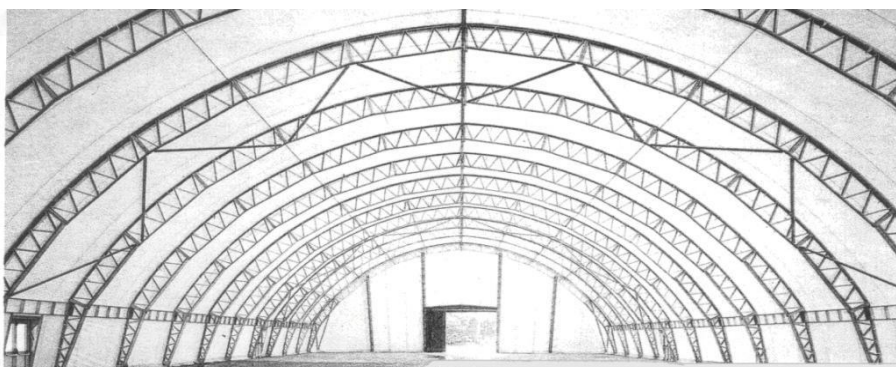


Figure 23: Trenches containment building



Figure 24: Trenches remediation activities

TURBINE BUILDING

In 2015 dismantling activities inside the turbine building were started. In particular, the alternator was dismantled after the asbestos remediation. Currently the activities for the revamping of the ventilation system are ongoing.



Figure 25: revamping of the ventilation system

NEW RADWASTE

The new system for treatment of liquid waste (radwaste) based on evaporation technology, is in advanced stage of development.



Figure 26: new systems of treatment of liquid waste

LATINA NPP



Figure 27: Latina NPP

GENERAL INFORMATION

The Ministry of Economic Development (MiSE) has recently (May 20th, 2020) granted the Authorization Decree for the execution of the decommissioning operations.

Due to the presence of about 2000 tons of irradiated graphite and the current unavailability of the National Repository the decommissioning strategy by SOGIN is based on two phases:

- Step 1: Plant footprint reduction and safestore: activity steps are: dismantling of the six boilers, reactor sealing inside the biological shield, lowering of reactor building roof to the "secondary floor" and pool decontamination. Radioactive wastes generated at this stage will be conditioned and stored on site in existing buildings and new buildings whilst waiting for the availability of the National Repository.
- Step 2: Dismantlement of the nuclear island (reactor included) and final restoration of the Site.

The last stage of the reactor and internal dismantling will be subjected to the availability of the National Repository.

Almost all activities for safe storage condition of the nuclear island had been performed, according to the previously selected strategy (SAFESTORE). Further activities have been carried out, by taking advantage of specific authorization acts.

At present, the main activities or tasks already completed are the following:

- Spent fuel removal and shipment to nuclear reprocessing (Sellafield, UK),
- Clean-up and decontamination of two of the three cooling pools of the Pond,
- Complete dismantling of the primary coolant circuit ducts,
- Demolition of the turbine building,
- Reduction of the seawater circulation system,
- Construction of a new LLW/ILW temporary repository,

- Construction of the Radioactive Sludge Conditioning Facility (LECO facility).

The main ongoing activities are as follows:

- Final tests for the commissioning of the Radioactive Sludge Conditioning Facility (LECO facility),
- Drainage and decontamination of the Pond (central pool and spent fuel transfer channel),
- Removal of the concrete shields of the upper primary circuit ducts,
- Construction of the Material Treatment Facility (a.k.a. "Cutting Facility"),
- Construction of the new Radioactive Liquid Effluents Treatment Facility.

INTERIM STORAGE FACILITY

A new radioactive wastes interim storage building (20,000 m³), in which also the sludge resulting from the past operation of the plant will be stored after cementation, has been completed.

LECO

A plant for the extraction and conditioning of the sludge resulting from the past operation, has been constructed and is currently in the commissioning phase.

OTHER ACTIVITIES

The removal of the primary circuit ducts has been fully completed, including the dismantling of the residual blowers' casings.

The concrete structures of the Material Treatment Facility (Cutting Facility) are finished. Auxiliary systems are currently under installation.

The foundations' structures of the new Radioactive Liquid Effluents Treatment Facility are under construction

The removal operations of the concrete shields of the upper primary circuit ducts are 40% completed.

EUREX PLANT (SALUGGIA SITE)



Figure 28: EUREX plant

GENERAL INFORMATION AND DECOMMISSIONING STATUS

Since 2004, the programs of the Eurex plant have been conducted with the aim of increasing the safety level of the radioactive waste management and developing the new infrastructures for the storage and treatment of the radioactive waste.

In the past years the following main projects have been performed:

- Construction and operation of a storage building of the tanks containing the high activity liquid waste resulting from the first extraction cycle (NPS – Nuovo Parco Serbatoi);
- Purification and emptying of the storage pool water and removal of the contaminated equipment and metal components;
- Construction and operation of a water supply system (NSAI – Nuovo Sistema Approvvigionamento Idrico)
- Radiological characterization campaign of the EUREX plant;
- Transferring of the fissile material to USA during the GTRI campaign (Global Threat Reduction Initiative);
- Construction and operation of a temporary storage building for the radioactive solid waste (Deposito D2);
- Construction and operation of an electrical transformer cabin, integrated with the emergency system in case of blackout (NCE – Nuova Cabina Elettrica);
- In advanced stage the treatment and conditioning program of the historical solid waste known as IFEC and RIBA.

Currently, the most important project of Saluggia site is related to the treatment and conditioning of the historical radioactive liquid waste by a homogeneous cementation plant known as CEMEX complex.

The construction of the facility Cemex has being launched in 2015.

After a temporary interruption of the program of about two years, in 2019 the project has being restarted with the construction of the storage building (Deposito D3) and the review of the overall design.

This year, an European public procurement has been released with the aim to complete the construction of the CEMEX complex.

The Overall Decommissioning Plan is currently in the stage of developing of the main projects:

- Decommissioning of the Plutonium Conversion Unit;
- Waste Management Facility for the treatment of the historical solid waste and waste deriving from decommissioning activities;
- Integrated system for the treatment and conditioning of the resins and sludge;
- Treatment of the organic liquid waste;
- New temporary storage buildings in order to increase the storage capacity in the next years.

The overall strategy plan has been outlined in the documentation submitted for the Decommissioning authorization.



Figure 29: Temporary waste storage building D2

ITREC (TRISAIA SITE)



Figure 30: ITREC plant

GENERAL INFORMATION AND DECOMMISSIONING ACTIVITIES

Several important activities related to waste management preliminary to decommissioning are in progress. In particular, the main ongoing activities already authorized or whose authorization process was started under the current Operating License, and that will continue and will be completed during the decommissioning, are summarized below:

- recovery of the buried Pit 7.1;
- realization and operation of the cementing plant of the “Prodotto Finito” (ICPF) and related storage deposits, DMC3 and DTC3;
- dry storage of Elk River fuel;
- treatment and conditioning of the historical and legacy waste - *SIRIS*;

The above mentioned Pit 7.1 is a prismatic structure of reinforced concrete “*Monolith*” (6 x 6 x 1.5 m) built during the past operation of the plant. Inside the monolith, four “wells” with a square section have been obtained, where radioactive waste of different nature was stored.

In order to remove the Pit, the following structures have been realized:

- an hydraulic barrier, in secant piles, to limit the entry of groundwater around the monolith (completed in October 2007);
- a confinement building for the subsequent excavation activities, survey and cutting (Jun 2012 - December 2013).

The activities of excavation, surveys and the safeguarding of the monolith have been completed in the end of 2015.



Figure 31: Itrec - Irreversible Pit 7.1

The reclamation activities continued with the design of components and auxiliary tool and their manufacturing.

The activities on site were conducted according to the following steps:

- Step 1** - Assembly of sliding structure, semi-containers and stabilization systems. The semi-containers and their lids are in stainless steel, they have a gasket system and air-tight carter.
- Step 2** - Horizontal cutting of Monolith, it is carried out with tangent core drilling and disposable carrot installations with their fixing to the semi-containers. The main function of the disposable carrots is to support the entire load of the well; these carrots will be fixed to the container, by bolting to the lower flange of the container.
- Step 3** - Vertical cutting of Monolith, it will take place within a further dynamic confinement "SAS". It will take place in successive steps of 1 m, proceeding from the top to the bottom, with removal according to the cutting progress of the connecting pins between the semi-containers.
- Step 4** - Assembly of semi-containers lower lids.
- Step 5** - Assembly of the side half-lids.
- Step 6** - Lifting, extraction and transfer of the wells to the storage building (Capannone 9.3).

In December 2019 all the wells were extracted from the pit.

The remediation activities will continue with the removal of the structures, systems and components used. Subsequently the pit will be backfilled and the area made available for other decommissioning activities, in particular for the construction of the facility devoted to the solidification of the so called "Prodotto Finito".



Figure 32: Activities on site

The project “Solidification of the “Prodotto Finito” and U-Th solution not irradiated” involves:

- the designing and the realization of the cementation plant of the “Prodotto Finito” and the DMC3 and DTC3, which will respectively host the cemented waste produced and the casks for the irradiated Elk River fuel;

- the qualification of the concrete matrix;
- the qualification of the package (composed by the conditioned waste, the drum and the overpack);
- the qualification of the chemical process through the implementation of the mock-up cementation cell in scale 1:1.

The realization has been divided into two phases:

- the first concerns the realization of DMC3 / DTC3 deposits;
- the second one concerns the construction of the ICPF plant.

The construction of the storage facility has been recently suspended for contractual issues between SO.G.I.N and the contractors.



Figure 33: DMC3 and DTC3 construction

The dry storage strategy foresees the loading of the 64 Elk River fuel elements in 2 dual purpose casks model TN 24 ER (licensed both for transport and storage) to be placed inside the Dry Storage Deposit for Irradiated fuel (DTC3) in the framework of the solidification project of the “Prodotto Finito”. In the project are also included the activities preparatory to the fuel loading in the casks, such as:

- the repackaging of the fuel elements into the new fuel cans (arrived in site in December 2016);
- the necessary interventions on the pool systems building, such as cleaning of the pool bottom (completed in October 2016) and adjustment of the decontamination cell for the cask;
- adjustment of the lifting systems (completed in December 2014);
- Procurement of the containers for the old capsules.
- Procurement of the 2 casks dual purpose TN24ER



Figure 34: Capsules for the fuel repackaging



Figure 35: Cleaning of the bottom pool

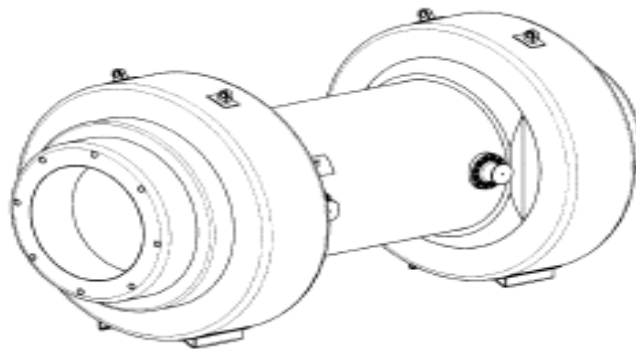


Figure 36 : TN24 ER (cask)

The fuel elements will be stored in two casks belonging to the AREVA TN24 supply chain, designed and manufactured according to internationally recognized standards, meeting the specific safety requirements for the destination sites and qualified as type B (U) containers in accordance with the IAEA regulations. for the transport of radioactive materials.

The SIRIS (Settlement of Solid Waste) project relates to the treatment and conditioning of:

- radioactive waste coming from the previous operation of the plant;
- radioactive waste produced during the safety maintenance of the plant.

The waste treated comprise:

- several kilometers of disused pipeline of the old tube for the discharge to the sea;
- 18 containers containing the equipment of the former warm cell;
- 1.200 repackaged drums containing contaminated ground stored in the facility deposits.

The cleaning activities of the local corridor are ongoing.



Figure 37: SIRIS Project

An application for the decommission license has been submitted. The Overall Decommissioning Strategy consists of three phases:

- Phase 1: realization of the necessary infrastructures, such as Deposit called New Storage Building (NSD), Radiological characterization lines and Waste Management Facility (WMI), and preparatory operations to the dismantling activities;
- Phase 2: dismantling of the plant systems and conditioning of all radioactive waste produced and transport of the waste to the National Repository;
- Phase 3: radiological characterization of the remaining structures and environmental monitoring in order to release the site without radiological constrains.

BOSCO MARENGO SITE



Figure 38: Bosco Marengo site

GENERAL INFORMATION AND DECOMMISSIONING STATUS

The decommissioning licence was granted in 2008.

The dismantling plan was divided into 2 phases: the first step included the dismantling of the fuel assembly fabrication equipment and its accessories, and the auxiliary systems such as ventilation, decontamination systems and liquid waste treatment plants; the second phase includes the shipment of the waste to the National Repository and the unconditional release of the site.

On March 2011, ISPRA, the Competent Regulatory Authority at that time, approved the SOGIN plan of operation for the dismantling of the auxiliary systems. Works started at the beginning of September 2011 with the dismantling of the first sections of the ventilation pipes. During 2013 the decommissioning activities of the ventilation system were completed.

In June 2014 about 90% of the dismantling activities were completed.



Figure 39: Before dismantling



Figure 40: After dismantling

In 2012, 611 overpacks were treated and placed in the provisional local buffer station with other incombustible waste.

Due to two minor fire events occurred during the treatment operations of the dismantled materials operations were interrupted for some months.

The dismantling of the last parts of the auxiliary systems and equipment is in progress.

The treatment and conditioning of the last part of radioactive waste (in 220 liters drums) stored in the provisional local buffer is going to finish. The activity will end with the conditioning of the last drums produced by the final dismantling.

From the dismantling of the plant about 380 tons of metallic materials were produced and released. Concerning the radioactive waste about 485 overpacks (380 litres drums) were produced and stored in the provisional local buffer.

In 2019, the activities to refurbish the existing building B106 as interim storage facility were completed and the commissioning of the systems is currently ongoing.

The *brown field* configuration is planned to be reached by the end of this year.



Figure 41: BLD 11



Figure 42: Refurbishing activities of building B106

CASACCIA SITE



Figure 43: Casaccia site

GENERAL INFORMATION AND DECOMMISSIONING ACTIVITIES

Casaccia site presently consists of three nuclear facilities: Plutonium plant, former MOX fabrication laboratory, where some preliminary decommissioning activities are in progress; OPEC-1 hot cell facility, relicensed as irradiated fuel store; OPEC-2 facility, now in operation as Pu-contaminated radioactive waste storage facility.

The decommissioning plan of Plutonium plant is based on a 2-phases strategy, while for OPEC-1 a single-phase approach is adopted, depending on the availability of the National Repository.

One major activity for Plutonium plant was the characterization and stabilization of nuclear materials (HEU and MOX) performed in 2013-14, by means of 3 new glove boxes installed in the Plutonium plant, with subsequent repatriation to the USA, under strict security measures.

One of the key activities currently ongoing is the dismantling project of 56 obsolete glove boxes used in past for MOX fuel fabrication. Redundant glove boxes have been classified in four levels of increasing complexity (level I to level IV), according to size, installed equipment and glovebox layout. At present (2020), all Level I, II and III glove boxes have already been dismantled, whereas the decommissioning of those of level IV is in progress with the last units. A limited number of other glove boxes remains operational until removal of all residual nuclear materials and will be dismantled later.

Other current decommissioning activities are related to the conditioning of radioactive liquid waste by means of a cementation equipment installed within a new glove box; removal of other redundant equipment and some refurbishment works (renovation of the drum storage system of the existing nuclear store, remake of

the existing electrical system), functional to the conduct of decommissioning operations; design of an alpha-waste volume reduction facility and of a new interim storage building for the conditioned waste from dismantling operations.

Characterization, treatment and conditioning of operational radioactive wastes from OPEC and Plutonium plants are also permanently ongoing processes, in the framework of a detailed and comprehensive waste management strategy, developed and updated according to the national waste management plans.

For OPEC-1, a prominent activity related to decommissioning is the remediation of the area of the former underground tank system (“Waste A&B”), used for collecting the liquid wastes produced during the past hot cells operations. Part of the system suffered a contamination accident in the early operation years. Therefore, after removal (2015-16) of contaminated residues, slabs, tanks, piping, pumps and other equipment (transferred to Nucleco for treatment and final dismantling), a radiological survey of Waste A and Waste B underground structures was performed. Updated survey data became the basis for the design and planning of the next phase of decontamination of the underground structures and final remediation of the area, to be performed in 2021-22. One additional activity related to the decommissioning is the characterization of the radioactive wastes presently stored in the facility.

In 2018, OPEC-2 obtained the authorization to be operated as interim storage of maximum 2325 drums (maximum activity 14,71 TBq) of plutonium contaminated, not conditioned, solid wastes. The facility, originally intended as post irradiation examination laboratory but never entered in operation, underwent heavy refurbishing works for structural qualification against natural external events (in particular earthquake, tornado winds and related missiles), and high-standards safety systems (storage system, electrical system, forced ventilation, fire prevention and extinguishing system, radiological monitoring system, supervision and control system, drainage system). After completion of the safety trials (functional and combined tests) and final review by the Safety Authority, OPEC-2 started its operational life in September 2019 with the first loading campaign of Plutonium waste drums from Nucleco stores. In the next future, other loading campaigns will be performed with waste from Plutonium plant.



Fig. 44 Waste A&B – activity of radiological survey



Fig. 45 Glove box dismantling at Plutonium plant



Fig. 46 OPEC-2 – waste drums in the storage room

ISPRA-1 PLANT (JOINT RESEARCH CENTRE SITE)



Figure 47: ISPRA-1 plant

GENERAL INFORMATION AND DECOMMISSIONING STATUS

Ispra-1 is a research reactor with a power of 5 MW, last version of Chicago-Pile developed by Enrico Fermi. It was the first Italian research reactor. It was built between 1957 and 1958 by Consiglio Nazionale Ricerche Nucleari and worked since 1959 to 1973.

After establishment of European Community of Atomic Energy in 1957, the nuclear center of Ispra (Varese) was assigned by Italy, for a period of 90 years, to the European Community of Atomic Energy in 1959, while Ispra-1 reactor was assigned to EURATOM since 1963.

Following the decision of European Community of Atomic Energy to dismantle old nuclear facilities, on November 27th, 2009 an agreement between Italian Government and European Community of Atomic Energy was signed in order to re-assign Ispra-1 reactor to Italy for decommissioning.

According to the agreement, the area will be given back to European Commission without radiological constraints after decommissioning carried out by the Italian public operator.

Liability of radioactive waste produced during decommissioning activities is in charge of European Commission which provides to characterization, conditioning and interim storage waiting for disposal in the Italian national repository.

Italian Law 205/2017 identifies Sogin as national operator in charge of decommissioning of Ispra-1 reactor and on September 26th, 2019 management transfer between Sogin and Joint Research Center has been completed together with the Site Support Agreement.

Thus, Sogin has started, as first activity, the pool clearance project in order to empty the water volume of around 200 cubic meters. The emptying of the pool will be done after water purification through filtering and treatment system, based on ionic exchange resins able to select residual radionuclides and already adopted with success by Sogin for pool clearance of EUREX facility in Saluggia site.

An application for decommissioning licence has been submitted on April 2020.

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