ITALY

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

Fifth Italian National Report

October 2017

The present report has been prepared, on behalf of the Italian Government, by the National Centre for Nuclear Safety and Radiation Protection of the Institute for the Environmental Protection and Research (ISPRA) 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 fifth 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 2015 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 2015 review meeting

Within the Country Group n. 6 at the 5th 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:

- Completion of the siting process for the National Repository LLW disposal and ILW-HLW interim storage with public confidence;
- Transfer abroad of the remaining SF (approximately 30 tHM) for reprocessing is in progress, to be completed in 2016;

- New Technical Guides on RW management, decommissioning, as well design, construction and operation of disposal and interim storage facilities, currently under preparation, to be established through a consultation process;
- Additional human resources for the Regulatory Body to be implemented

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

No good practice has been identified in the 5th Review Meeting.

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 fifth review meeting

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

It has first to be highlighted that from January 2017 the Nuclear Department of ISPRA, entitled with the role of competent regulatory authority, has changed its denomination in National Centre on Nuclear Safety and Radiation Protection. From now in this report the “National Centre for Nuclear Safety and Radiation Protection of ISPRA” is simply indicated as “ISPRA”.

On the legislative side the Legislative Decree n.137/2017 has been enacted to transpose the new EU Directive on nuclear safety. This new decree has provisions which strengthen the licensing process for the decommissioning of nuclear installations and the operation of spent fuel management facilities. Provisions are also included in the Decree to enhance the independence from other governmental entities of the new regulatory body (ISIN – Inspectorate for Nuclear Safety and Radiation Protection), established with the Legislative Decree n. 45/2014 issued to transpose into the national legislation the EU directive 2011/70/EURATOM on the safe management of spent fuel and radioactive waste. In particular, the Decree establishes additional financial resources and the increase of human resources, from 60 to 90 units (juridical and administrative personnel). It has to be noted that until the new Inspectorate will become operative, i.e. when its Organizational Rules will enter into force, functions and duties of the regulatory body will continue to be exploited by the National Centre for Nuclear Safety and Radiation Protection of ISPRA.

On August 7, 2015 the joint decree by the Ministry of Environment, Land and Sea Protection and the Ministry of Economic Development, concerning a revised radioactive waste classification more in line with IAEA classification scheme, has been issued, replacing the old classification provided by the Technical Guide No. 26 ENEA-DISP dating back to 1987. The description of the new classification is given in Section B.

In accordance with the Legislative Decree n. 45/2014, the preliminary version of the National Programme for the implementation of the management of spent fuel and radioactive waste policy was issued and the Strategic Environmental Assessment (SEA) procedure initiated. The foreseen phase of public consultation has been concluded in September 2017. Final issue of the National Programme is envisaged in the first quarter of 2018.

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/ILW[1] (herein after referred as disposal facility) and a facility for the interim long term storage of ILW[2]/HLW (here in after long term storage facility). In relation to the siting of the National Repository, on July 2015 ISPRA, according to the procedure defined in the Legislative Decree n. 45/2014, completed the verification and the validation of the National Chart of Potentially Eligible Sites (CNAPI) prepared by SO.G.I.N., as national operator, and transmitted the National Chart, together with the results of its assessment, to the Ministry of Economic Development and the Ministry of Environment, Land and Sea Protection. When SO.G.I.N. will be authorized by the Ministries to public the National Chart a process of public consultation with all the involved parties will start. The Government has taken the decision to grant the authorization for publishing the National Chart once the Strategic Environmental Assessment procedure will be completed.

In relation to the remaining spent fuel to be shipped abroad for reprocessing, in November 2015 the shipment from Trino NPP to France was completed. The remaining 13 tHM are stored at Avogadro AFR storage facility. Discussions are in progress among French and Italian Authorities to complete the shipments programme with the transfer in Frace of the remaining fuel elements.

On the implementation side the commissioning and the progress in construction of interim storage facilities in several sides can be highlighted.

An Integrated Regulatory Review Service (IRRS) mission hosted by ISPRA took place in Italy in November 2016. The IRRS mission was a full scope one covering modules on responsibilities and functions of the Government, global nuclear safety regime, responsibility and functions of the regulatory body, management system of the regulatory body. It has been addressed to radiation sources, research reactors, radioactive waste facilities and NPP under decommissioning. The mission provided useful recommendations and suggestions for improvements and the final report has been published. Details of the IRRS mission is reported in Section K.

In July 2017 an ARTEMIS mission addressed to the decommissioning programme of SO.G.I.N. as national operator was also conducted. Details on the ARTEMIS mission are reported in Annex D.

[1] ILW suitable for being disposed off in a near surface disposal facility
[2] ILW not suitable to be disposed off in a near surface disposal facility

A.1.2 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 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 on going. 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	Activities of SOGIN financed through levy on electricity tariff.	Total decom 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 took 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 (National Center for Nuclear Safety and Radiation Protection of ISPRA, (here in after ISPRA) are also considered.

The legislative and regulatory framework, established since the early ‘60s, envisages, a system of licensing of nuclear installations and activities as well as regulatory control. This system fully applies to spent fuel and radioactive waste management activities and in particular to decommissioning activities.

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 the Competent Regulatory Authority whose role is currently exploited by the National Centre for Nuclear Safety and Radiation Protection of ISPRA.

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 a strengthened independence from other governmental bodies and increased human and financial resources, based on the current structures and staff of ISPRA, has been established in 2014 but it is not yet operative. Legislative Decree n. 137/2017 recently enacted, establishes provisions that further strengthen financial and human resources as well as enforcement power of ISIN.
Until the moment in time in which ISIN will became operative with the entering into force of its organization rules, the role of competent regulatory authority will continue to be performed by ISPRA.

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 strategic and operational directives are given to SOGIN by the Ministry of Economic Development.

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, a National Repository consisting of a LLW/ILW disposal facility and an ILW-HLW long term storage facility have 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 June 2014 ISPRA issued the Technical Guide No.29 on siting criteria for the identification of potential suitable area. According to the time schedule foreseen by Legislative Decree n° 31/2010, in January 2015 SOGIN submitted a list of potential suitable area, called the National Chart and on July 2015 ISPRA transmitted the reviewed National Chart of Potentially Eligible Sites (CNAPI) to the Ministry of Economic Development and the Ministry of Environment, Land and Sea Protection. 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.
The government has taken the decision to authorize the publication of the National Chart after the SEA on the National Programme for spent fuel and waste management will be completed.

It has to be mentioned that the National Programme for the implementation of the policy for the management of spent fuel and radioactive waste was issued in July 2017 and submitted, with the related Environmental Report, to the process of public consultation under the process of Strategic Evaluation Assessment. The issue of the National Programme as a decree of the President of the Council of Ministries is envisaged in the first quarter of 2018.

An **Integrated Regulatory Review Service (IRRS)** mission, hosted by ISPRA, was received in November 2016. The IRRS mission was a full scope one covering modules on responsibilities and functions of the Government, global nuclear safety regime, responsibility and functions of the

regulatory body, management system of the regulatory body, and has been addressed to radiation sources, research reactors, radioactive waste facilities and NPP under decommissioning. The mission provided useful recommendations and suggestions for improvements and the final report has been published. The IRRS mission report is published in IAEA and ISPRA websites.

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. ISPRA 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 on-going activities on the nuclear sites for treating, conditioning and storage of the existing waste as well as to complete the transfer abroad the spent fuel for reprocessing. With regard to challenges identified in the 5th RM, some step 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 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 (abot 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 on-going process for conditioning existing waste and to improve some aspects of the existing regulations attaining the safe management of spent fuel and of radioactive waste is also recognised.

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.

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 advance. 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 that in July 2017 has been submitted to the consultation process envisaged by the Strategic Environmental Assessment (SEA). The issue of the National Programme as a decree of the President of the Council of Ministries is envisaged in the first quarter of 2018.

B.2 Background historical information on national nuclear programmes

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) had 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 strategic and operational directives are given by the Ministry of Economic Development.
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.

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.

This new 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 ISPRA, at that time 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 Legislative Decree of March 17, 1995, n. 230.

Due to the current unavailability of a National Repository the national decommissioning strategy is articulate 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 temporary stored in dedicated interim storage facilities in 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 sites have been released without radiological constraints.

According to the plan of the national implementer decommissioning activities are expected to be concluded in 2035. 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 condition that the proposed subdivision into phases is shown to be part of an overall decommissioning plan leading up to a final site 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 in the sites, also by the refurbishment of existing buildings.

The decommissioning licences for Trino and Garigliano NPPs has been issued in 2012, and for the Caorso NPP in February 2014. For Latina NPP the decommissioning license is foreseen to be granted by 2018. The decommissioning licence for Bosco Marengo LEU fabrication facility was granted in November 2008 and the *brown field* configuration is expected to be reached two years time .

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 the procedure for authorising plant modifications.

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.

After the political decision to stop all nuclear power activities, the policy of reprocessing the spent fuel was abandoned, even though the last shipment took place in 2005 as closure of the service agreements signed in the past.

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 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.

The only fuel that will not be reprocessed is represented by the 1,7 tHM of Uranium/Thorium fuel, which is stored in the ITREC experimental reprocessing facility, located in the southern Italy. For this fuel the transfer into dual-purpose dry cask storage is now envisaged.

Pending the completion of the transfer abroad for reprocessing, the spent fuel will continue to be stored in the pools as detailed in Sections D and G. Its safe management will continue to be performed according to existing licence conditions and technical specifications.

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.

The national strategy for the long term management of radioactive waste envisages the construction 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.

In connection with the national repository, several preparatory studies were conducted in the past. It is worth to mention the so called *"Site Task Force"* coordinated by ENEA, which conducted its activities in 1999-2000 with the mandate to prepare a list of potentially national qualified sites, and the work done by a Parliament/Region Commission charged to prepare a document aimed at proposing a possible path to identify a site and to reach the necessary consensus.

The Acts December 24, 2003, n° 368 and August 23, 2004, n° 239 issued provisions for the location of national sites to build repositories for the disposal of low, intermediate and high level waste. Their implementation however met strong difficulties.

It has to be noted that the Act n° 368/2003 also establishes that until the National Repository will be operative, the local municipalities where the nuclear installations are located will receive a financial compensation based on the radiological inventory of the actually stored spent fuel and radioactive waste. This part of the Act has been implemented.

In connection with the mentioned Agreement 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.

In March 2008, the Ministry of the Economic Development appointed a Committee with representatives of Ministries, Regions, ISPRA and ENEA, having the mandate to define the procedures for identifying suitable areas and for selecting a national site for the storage of radioactive waste. A report from this Committee was issued in September 2008.

It was however in 2010 that specific legislative provisions were established to regulate the siting, the construction and the operation of a National Repository, trough 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 assigns 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 and IAEA and subsequently validated by the Competent Regulatory Authority itself (ISPRA).

After this preliminary selection (9 months), a period for a public consultation is foreseen. A public debate will be organized by SOGIN in this period 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 site (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 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 Competent Regulatory Authority (he Nuclear Department of ISPRA at that time), the validated chart has been sent in July 2015 to the Ministries of Economic Development and to the Ministry of Environment, Land and Sea Protection. After the authorization by the two Ministries to the publication of the National Chart, SOGIN will start a national debate with the aim to find an agreement with the Regions involved. The Government has taken the decisions to publish the chart after the completion of the in progress SEA on the National Programme on spent fuel and radioactive waste management..

Waiting for the availability of the National repository, the radioactive waste will continue to be stored in the nuclear installations of origin. Interventions 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 has been in place. A new classification system has been established by a 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. 1, paragraph 2 of Legislative Decree n. 230 of 17 March 1995. 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. 33 of Legislative Decree n. 230 of 17 March 1995, 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 Article. 30 and Art. 154, paragraph 3-bis of the Legislative Decree n. 230 of 17 March 1995. This waste shall be stored in facilities suitable for temporary storage or management of wastes for disposal, such as those authorized by the art. 33 of Legislative Decree n. 230 of 17 March 1995.

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 e) 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.

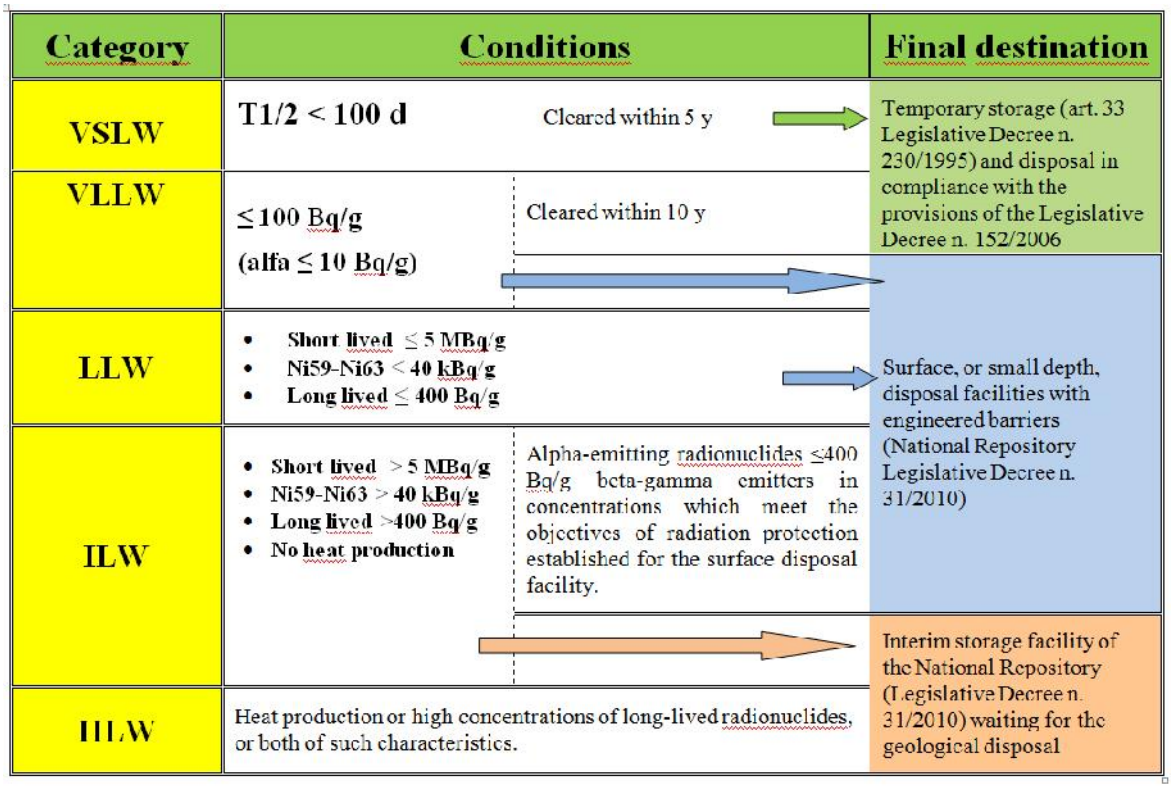
High level waste.

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 e) of Legislative Decree n. 31 of 15 February 2010.

The following scheme shows the new classification system established in Italy



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.

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

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

- producer;
- dimension and weight;
- beta, alpha and gamma total activity;
- main radionuclides concentration;
- irradiation level 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 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.

Criteria for solid materials release

A general exemption criterion is in force in Italy, established by Legislative Decree n° 230/1995, regarding both activity concentration and radioactive half life:

- activity concentration ≤ 1 Bq/g, and
- half-life < 75 days.

If even one condition above is not complied with, a specific authorisation is required for the unconditional release of the materials.

The authorisation is given on a case-by-case basis provided the compliance with the basic 'below regulatory concern' criteria, fixed in the European Union directive n° 96/29:

a) effective dose ≤ 10 μSv/year, and

b) either effective collective dose ≤ 1 man·Sv/year or demonstration that clearance is the optimised.

In order to demonstrate the compliance to the above criteria, a general reference is made to the European Commission Radiation Protection recommendations.

Specific clearance levels for unconditional releases have been issued with the decommissioning licence of Trino, Garigliano and Caorso NPPs. For Latina NPP, Eurex and Itrec reprocessing plants clearance levels have been granted in the framework of the existing operational license. Clearance levels have been established taking into account European Union directives and recommendations.

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.

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) Italy, which is party to the Treaty on Non-Proliferation of Nuclear Weapons, does not have any radioactive waste or spent fuel from military or defence programmes subject to the Convention.

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.

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 cleanup 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 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.

In 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 will be removed and transferred for dry storage in a refurbished hot cell of the ESSOR research reactor. The commissioning of this transfer operation is currently in progress (Figure 3). The spent fuel pots will be stored in a carousel located inside the ESSOR hot cell. 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, 2015 amounts to a total of about 15,67 tHM, as detailed in Table D.1

Table D.1 - Total inventory of the spent fuel stored in Italy				
Facility	**Fuel Type**	**N° of fuel elements**	**Mass (tHM)**	**Activity (TBq)**
AVOGADRO AFR Facility	PWR - TRINO UO_2	1	0,31	1.650
	BWR-GARIGLIANO MOX	63	12,88	44.400
	Garigliano Rod	1	0,00132	n.a.
	CIRENE Rods	4(*)	0,00588	n.a.
ITREC	ELK RIVER U-Th	64	1,68	3.160
OPEC-1		581 (*)	0,116	88,94
JRC Ispra		-	0,68	4.272(**)
TRIGA Mark II		9	0,0017	6
TRIGA RC-1		12	0,0023	8,04
TOTAL		**-**	**15,677**	**53.585**

(*) 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 m^3 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. A new conditioning campaign is in progress.

As result of an international tender, the thermal treatment and conditioning of operational radioactive waste has been assigned to a qualified Slovak operator. At the moment the qualification of the waste package that will result from the treatment and conditioning operations is ongoing. Also the licensing process in Italy and in Slovak Republic is in progress.
In accordance with the approved decommissioning plan, the upgrading of the turbine building as storage facility and waste management station is in progress. Subsequently refurbishing of the three existing storage facilities on the site will be carried out.

Figure 4: Caorso NPP – ERSBA 2 storage facility

In the **Trino** NPP, the radioactive waste is at present stored in the two storage facilities of the NPP site. Some semi-liquid radioactive waste is still to be conditioned.

The detailed project for the conditioning of resins (Figure 5) and sludges is now under licence approval by ISPRA.

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 that will derive from dismantling activities. By the end of 2017, the Test Tank buffer building will be operating to allow the refurbishment of the two storage facilities.

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

The **Garigliano** 160 MWe BWR, sited in Southern Italy, was operated by ENEL from 1963 to 1978. All spent fuel has been removed from the plant since many years, the radioactive waste is stored in different buildings of 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.

These facilities will host a large part of the waste existing in the site in improved safety conditions, also including the very low level waste currently embedded in trenches realised in the ’60.

The principal activity now on-going is the remediation of the mentioned trenches and the radiometric characterization of the waste before its storage in the interim facilities.

The chimney demolition is in progress and it is foreseen to be finished by the end of 2017.

Auxiliary systems installation (cranes, electrical power system, ventilation etc.) for the dismantling of nuclear island is undergoing. A super compaction campaign of radioactive asbestos is in progress.

The construction of a new facility the treatment of effluents before being discharged is under construction. Dismantling operations of the thermal cycle components located in the turbine building have been recently licensed .

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. All spent fuel has been removed from the plant; the primary circuit has been filled with dry air, and blowers and portions of the primary circuit outside the reactor building have been dismantled, (see Figure 7).

At present, the radioactive waste is stored in different storage facilities of the NPP site.

The construction of a new waste storage facility is completed and it is expected to host the waste resulting from a project for the extraction and conditioning of the sludges already licensed and from a project for the extraction and conditioning of the Magnox residues (splitters).

This latter project will be part of the decommissioning projects that will be the included in the decommissioning license (Phase 1) which is expected to be issued in 2018.

In recent times, the Turbine building has been dismantled, and other activities have been authorized:

- Dismantling of the blowers casings;
- Spent fuel pools decontamination;
- Construction of the waste management facility “Cutting Facility”;
- ITEA – Active liquid effluent treatment facility.

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 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. Most of the nuclear material has been removed from the site and the operational dry radioactive wastes have been super compacted. The decommissioning license was granted in November 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 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 overpacks with other unconditioned waste are now located in a buffer station in the wait to b 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. Works started at the beginning of September 2017.

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

As said, it is expected that the plant will reach the “brown field” configuration in the next two years.

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 m^3 ILW

and some 100 m^3 LLW). This liquid waste represents in terms of activity the largest part of waste present in Italy. The liquid waste is currently stored in a dedicated storage facility located in a bunkerized building in the site. This waste will be conditioned by cementation. Qualification of the cementation matrix is at a well advanced stage. The project of the cementation facility has been approved in 2015. A first part of the civil structures has been constructed. Construction activities are currently suspended due to contractual problems among the operator and the contractor.

Construction for a new interim storage facility, denominated D2 was licensed in 2012 (see Figure 8).

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).

An extensive review of the existing authorization of the installation was carried out and an updated set of licensing conditions to regulate activities preliminary to decommissioning was issued in 2006. 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 and approved by ISPRA. In order to remove the concrete block the project envisages to cut it into four main pieces that after removal will be located in one of the storage facilities of the site. Operation to cut the concrete block and to remove it are expected to start by the end of 2017.

The conditioning process for the 3,3 m^3 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 of the radioactive liquid solution will start after the removal of the underground pit.
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.

For the implementation of dry storage strategy related to the spent fuel the related project is under regulatory review.
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.
Application for the decommissioning licence has been presented.

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 m^3 of plutonium bearing liquids) will be carried out.
Application for the decommissioning licence has been presented.

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 in 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 construction of an interim storage facility on the site has been recently completed.

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 currently under commissioning tests. 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 Sicurad).

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 9). 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.
The situation as a whole is a case of application of the provisions of art. 26-bis of Legislative Decree no. 230/1995, which provides that, in situations involving a prolonged exposure due, inter alia, to the effects of a practice no longer in effect, that the competent authorities for interventions under Law no. 225/1992 to take the appropriate measures.

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.

The Extraordinary Commissioner, in implementation of art. 126 bis of Legislative Decree 230/95, has undertaken the obligation to implement the prescribed provisions of law and has entrusted the SO.G.I.N. Spa for the transport, characterization and disposal of waste contained in the Cemerad storage facility, with final radiological remediation without radiological constraints.

SO.G.IN., in turn, in order to perform the intervention has commissioned through a specific service contract, the Nucleco company to execute the operational phases.
Part of the material, in particular radioactive sources, has been already removed.
The Plan of Operations is currently being approved by the Extraordinary Commissioner based upon an advise of ISPRA.

Figure 9: 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 in Italy is continuously updated by ISPRA. 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 2015, as follows: 9.810 m^3 of VLLW, 15.570 m^3 of LLW and 2.470 m^3 of ILW. This inventory includes the wastes of European Joint Research Centre.

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 m^3 of vitrified HLW arising from reprocessing of spent fuel that will be returned from Sellafield in the UK. Similar amount of HLW will have to return in Italy from the reprocessing of the 235 t of spent fuel in France. In addition, some 30.000 m^3 of VLLW and L-ILW from decommissioning of nuclear facilities.

Table D.2 – Activity Inventory of the radioactive waste and spent sources stored in Italy (December 2015)

Facility	VLLW	LLW	ILW	Spent sources
	Activity (GBq)	Activity (GBq)	Activity (GBq)	Activity (GBq)
Caorso	18,87	2185,66	0,00	0,02
Garigliano	12,76	22329,65	352901,70	0,00
Latina	1,47	15206,43	5785,62	0,00
Trino	10,07	1058,29	10535,83	0,00
Eurex	7,62	266,20	2299271,18	8,94
Itrec	71,22	3085,34	276289,63	0,02
Impianto Plutonio	0,00	0,00	20969,70	0,00
OPEC 1	0,00	54,46	3612,12	1305,01
Bosco Marengo	0,32	33,13	0,12	0,00
Nucleco	312,52	7351,31	416,50	1075409,40
JRC Ispra	1,66	447,37	96586,76	261,00
Avogadro	6,85	436,58	0,00	0,00
Others *	21,79	309,58	342,84	68.479,6
Total	**465,15**	**52.764**	**3.066.712**	**1.145.464**

* 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 2015)				
Facility	VLLW	LLW	ILW	Total
	Volume (m^3)	Volume (m^3)	Volume (m^3)	Volume (m^3) **
Caorso	733,75	1722,82	0,00	2456,57
Garigliano	1269,24	1431,58	90,00	2790,82
Latina	595,78	1076,54	14,02	1686,34
Trino	599,90	506,54	72,28	1178,72
Eurex	1402,92	908,79	530,43	2842,14
Itrec	2553,66	284,30	221,64	3059,6
Impianto Plutonio	0,00	0,00	149,86	149,86
OPEC 1	0,00	2,73	6,50	9,23
Bosco Marengo	132,73	343,52	1,47	477,72
Nucleco	806,96	5619,23	207,30	6633,49
JRC Ispra	797,00	2845,00	1128,00	4770
Avogadro	76,01	4,30	0,00	80,31
Others *	845,23	821,13	44,79	1711,15
Total	**9813,18**	**15566,48**	**2466,29**	**27.845,95**

* 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 but one (Latina) the decommissioning license has been granted. For Latina NPP, regulatory review for the decommissioning license is in progress.

For each NPP an environmental impact assessment related to decommissioning activities has been 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 two years time. For ITREC the decommissioning plan has been submitted for authorization in 2011. For EUREX, PLUTONIUM have been recently filed. Preliminary dismantling activities are however performed on the basis of "ad hoc" authorizations.

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.

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.

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 Institute for the Environmental Protection and Research – ISPRA continue to develop, as in the past, 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 the EU Council Directive 2011/70/Euratom establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste with the Legislative Decree n. 45/2014. According to this decree a National Programme has been prepared and the SEA is in progress.

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, ISPRA, 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.

ISPRA 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. Other guides on waste storage facilities and decommissioning have been developed and will be issued for 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.

18.1 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.

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 relative 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 alias, 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 and the Legislative Decree n. 45/2014.
- Act n° 393/1975, which contains Administrative rules on the selection of the sites for NPPs.
- Presidential Decree n° 1450/1971, which contains requirements and procedure for the acquisition of the operational personnel licences.
- Legislative Decree n° 230/1995, which has been in force in Italy since January 1st 1996, replaces the Presidential Decree n° 185/1964 and implements 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 e 2014/87/Euratom) and refers for detailed regulations and quantitative values to a series of Government and Ministerial Decrees. Legislative Decree n° 230/1995 regulates radioactive waste disposal in a more precise manner than Presidential Decree n° 185/64. In particular, 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 ISPRA or by the Prefect. Article 102, establishes that waste must be managed in accordance with the rules of good practice and the instructions set out in the disposal 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 103].
- Legislative Decree n° 241/2000, which has transposed directive 96/29/Euratom laying down basic safety standards for the radiation protection of workers and the public; the standards laid down in the directive incorporate the 1990 Recommendations of the International Commission on Radiation Protection (ICRP) into EU radiation protection legislation. Legislative Decree n° 241/2000 has modified and integrated Legislative Decree n° 230/1995; the latter constitutes, as described above, the main piece of legislation laying down radiation protection requirements for workers and the public.

- Legislative Decree n° 257/2001 was promulgated in order to modify certain details in Legislative Decree n° 241/2000 concerning requirements for notification and authorisation of non nuclear installations where ionising radiation sources are used for industrial, research and medical purposes.
- Legislative Decree n. 52/2007 which transposes EU directive 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources; Legislative Decree n. 52/2007 integrates the licence or request a prior authorisation for such sources granted in accordance with the Act n° 1860/1962 and the Legislative Decree n° 230/1995.
- 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.
- 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° 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.

A series of Governmental and ministerial decrees have also been made in implementation of the Act n° 1860/1962 and the Legislative Decree n° 230/1995.

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.
- 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.
- Legislative Decree n° 185/2011 which transposes the EU Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations. Legislative Decree n° 185/2011 has modified and integrated Legislative Decree n° 230/1995.
- Act n° 214/2011 that abrogates the Nuclear Safety Agency (created with the Act n° 99/2009, but never applied) and the functions have been temporary assigned to ISPRA (that in fact continue its work as nuclear authority) waiting for a definitive asset of the regulatory organization.
- Act 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.
- 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 is 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.

The main functions of the Competent Regulatory Authority, as better identified under article 20, were in the past entrusted to the Directorate for Nuclear Safety and Health Protection (DISP), originally part of the National Committee for Nuclear Energy (CNEN) changed in ENEA (Agency for new technologies, energy and sustainable economic development). In 1994 the functions of DISP, together with its staff, technical structures, equipment and financial resources, were transferred to ANPA, a new Agency for the protection of the environment. That transfer definitively resolved the problem of the independency and separation of the Competent Regulatory Authority from any function of research, development and promotion of nuclear energy, which were performed by other units of ENEA. Moreover, ANPA was under the administrative surveillance of the Ministry of the Environment and no longer under the Ministry of Industry, now Ministry for the Economic Development, which gives the strategic address and surveillance over the public utility.

In 2002 ANPA was merged in a new Agency, APAT, with the governmental Technical Services competent for geology, hydrology and seismology.

Finally, in 2008, the Institute for the Environmental Protection and Research (ISPRA) has been established through the merging of APAT and two other institutes working in the areas of marine research and wildlife.

As said in other parts of the report duties and functions of the competent regulatory authority for nuclear safety and radiation protection have been exploited by the Nuclear, Technological and Industrial Risk Department of ISPRA until December 2016. Since January 2017 they are exploited by the National Centre for Nuclear Safety and Radiation Protection of the Institute until ISIN will become operative.

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), is now assigned to ISPRA by Article 153 of the Legislative Decree n° 230/1995.

Technical guides, issued by ISPRA pursuant to art. 153 of the legislative decree n. 230 of 17 March 1995 and subsequent amendments are regulatory documents with which ISPRA discloses best practices on operational and technical measures to implement legislative previsions 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, 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 fire fighting, 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 Chapter VII of the Legislative Decree n. 230/1995, based upon the technical advice of ISPRA, 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 52 of Legislative Decree n. 230/1995, which requires a specific authorization to be granted by the Ministry of Economic Development, based upon the technical advice of ISPRA, Ministries of Labour, Interior and Health..

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 legislative 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 ISPRA 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 advise of ISpra 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 55-56 of the Legislative Decree n. 230/1995.

As far as the radioactive waste management associated with decommissioning activities are concerned, Articles 55-56 of Chapter VII of the Legislative Decree n° 230/1995 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 ISPRA 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 Regulatory Authority.

Figure 10 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.

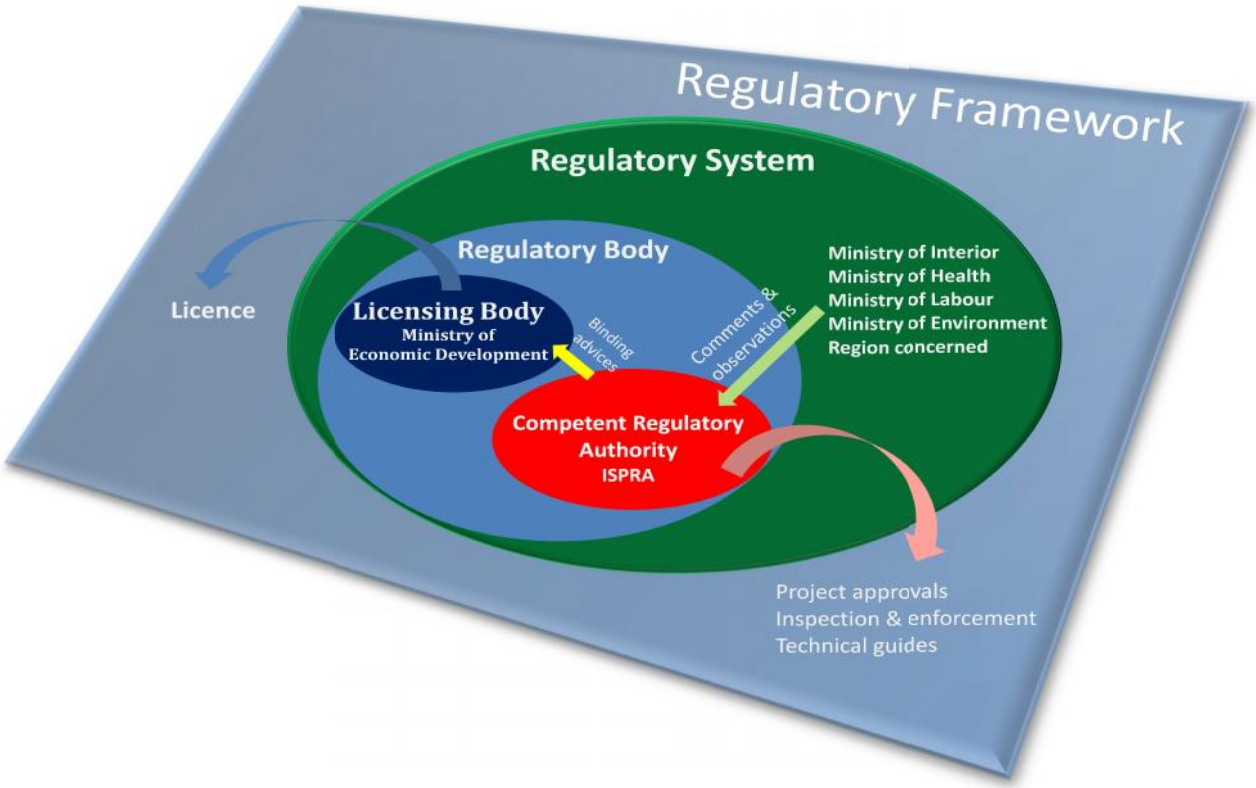


Figure 10: Regulatory system in the field of nuclear safety and radiation protection for decommissioning activities

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 27, 28 and 29 of Legislative Decree n° 230/1995. A specific implementation Decree to be enacted according to art. 33 of the above mentioned Legislative decree n° 230/1995 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 ISPRA. For minor facilities, authorization is granted by Prefect of the province where the installation is located..

The most important requirements for storage facilities are identified in Technical Guide n°26, issued by the Competent Regulatory Authority. As already mentioned, an updating of this guide is in progress taking into account lessons learned and recent regulatory experiences.
A first issue related to storage requirements is under preparation and takes into account IAEA safety guides requirements and WENRA harmonised “reference levels”. Above criteria are however already adopted in the safety assessment and regulatory review related to the licensing of new radioactive waste storage facilities.

19.1.4 Institutional Control and Regulatory Inspection

With regard to the system of institutional control and regulatory inspection the Legislative Decree n. 230/1995 establishes that regulatory inspection activity on the general compliance with the provisions established by the Legislative Decree is performed by ISPRA inspectors. On the bases of Legislative Decree n. 230/1995 and of its institutive Act, ISPRA 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 Chapter XI of Legislative Decree n° 230/95, taking into account that Article 10 of Legislative Decree n° 230/1995 gives to ISPRA 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. ISPRA inspectors are entitled to report any violation to the public attorney of the jurisdiction the nuclear installation belongs to.

Moreover, Articles 35 and 58 of Legislative Decree n° 230/1995 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, ISPRA 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.

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 Regulatory Authority ISPRA – Institute for the Environmental Protection and Research. Some uthorizations are granted in agrement 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) ISPRA is the Governmental body entrusted with the role of 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. ISPRA operates under the aegis of the Ministry for the Environment. Any licence/authorization issued by the Ministry of Economic Development is based on the technical advice and specifications formulated by ISPRA, 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. ISPRA 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, ISPRA 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. ISPRA 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 is entrusted with the same functions and duties currently carried on by ISPRA and more specifically 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.

ISIN has a Director and an Advisory Board, nominate 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 advise of competent parliamentary Commissions.

ISIN can have access to fees paid by applicants and external independent technical support.
The Director and the Advisory Board have been nominated but not taken office yet.
The new Inspectorate will become operative when the organizational rules will be approved and entered into force.
Until this moment in time, the role of competent regulatory authority will continue to be performed by the National Centre for Nuclear Safety and Radiation Protection of ISPRA..
The recruitment of new personnel to ensure the continuity and the effectiveness of regulatory functions in the near future is an issue to be addressed, as also pointed out by the IRRS mission..
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, as well as to nuclear safety related activities required by a new regional and international context followed to the Fukushima accident and to the strengthening of regulatory control on radiation sources.
In this regard, it has to be considered that the above reported needs on the ISPRA's human and financial resources should be met by the establishment of the new Regulatory Authority, ISIN, which, as required by the Legislative Decree n° 45/2014 referred under the Article 19, as amended by the Legislative Decree n.137/2017 , will be largely based on personnel coming from ISPRA and additional personnel coming from other administrations for a total of 90 units of which 60 will be technical experts and 30 legal and administrative experts.

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 ISPRA. 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 ISPRA itself, which also grants directly the approval for the detailed designs and plans of operations.

ISPRA is a Governmental Institution endowed with a full autonomy under the administrative aegis of the Ministry of Environment, 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 ISPRA internal organisation, finance matters,

policy and in the decision making process of the Institute; moreover the Institute's budget is mainly funded by the State.

In relation to the new Inspectorate the level of independence from authorized parties is fully maintained and the independence from other administration of the State further enhanced.
The IRRS mission has not raised any issue related to the independence of the Regulator.

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.

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 and operation having direct influence on safety.

The principle of prime responsibility for safety of the license holder is clearly stated in article 58-bis of Legislative Decree n. 230/1995 and subsequent amendments. In particular, 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 ISPRA 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 (at. 126 bis of the Legislative Decree n. 230/1995, 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

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 recent 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 (about 1000 units at the end of 2016) 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 provides an overall training for its employees of around 50,000 hours a year. The RMS delivers a larger fraction of these hours (about 30,000 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 11 shows the trend of participation (in terms of number of hours) to about 80 training courses delivered by RMS in recent years.

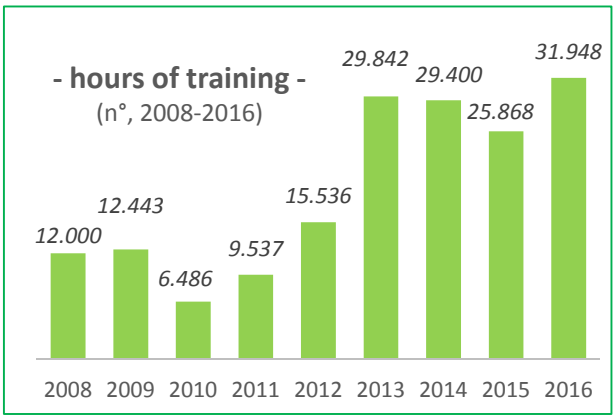


Figure 11: Training provided by SOGIN Radwaste Management School

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 May 2017, during the IAEA Peer Review. The review indicates an amount of about € 7,2 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 € 3,081 billion), the spent fuel reprocessing and nuclear material management related costs (about € 1,789 billion), the costs related to Mandatory Costs (Safety and Security Management) (about € 1,350 billion), General Management Costs (Overheads and Site Electrical Power Costs (about € 0,98 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 constrains (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. 230/1995.

(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 are fulfilled.

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.

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.

24.1 Undertaken steps

Legislative Decree n° 230/1995 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 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.

Legislative Decree n° 230/1995 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° 96/29/Euratom issued on the basis of the ICRP recommendations since the Publication n° 60. 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, in installations subject to authorisation, 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 subject to technical specifications to be included in the authorisation provisions. 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 96/29/Euratom – and, to this aim, shall take into account directives, recommendations and technical positions provided by the European Union. 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 96/29/Euratom in the Legislative

Decree n° 230/1995, 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.

25.1 On-site and off-site emergency plans

Emergency planning at nuclear installations is regulated by the provisions reported in Articles 115 to 135 of the Legislative Decree n° 230/1995 and subsequent amendments. In addition, the general legislation governing emergency preparedness and response provisions in all cases of accidental events and disasters, as reported in the Act n° 225/1992, is applicable.

With regard to *on-site emergency planning* above provisions are complemented with those reported in Articles 46, 47 and 49 of the Legislative Decree n° 230/1995 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, to be submitted to the competent regulatory authority, which includes a section reporting instructions and procedures for exceptional

situations and identifies operating personnel which must be assigned to emergency tasks in case of occurrence of exceptional situations;

- the Plant Safety Committee, approved by the competent regulatory authority, has different tasks including, among other duties, 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 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 116 of the Legislative Decree n° 230/1995, is prepared under the authority of the Prefect of the province where the installation is located, following provisions stated in Articles 118, 119 and 120 of the same legislative decree.

According to article 117 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 Act n° 225/1992 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 remove 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 star, according to the art. 125 of Legislative Decree 230/1995 and subsequent amendment and to the relative Governmental regulation laying down the emergency planning guidelines for transport of spent fuel and radioactive material.

For cases in which potential consequences of postulated reference events could invest larger parts of the national territory, provisions of Article 121 of the Legislative Decree n° 230/1995, related to National Plan on Radiological Emergencies, apply, as discussed in the following point.

National Plan against Radiological Emergency

Provisions of Article 121 of the Legislative Decree n° 230/1995 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 occurring at an Italian installation or at an installation located in a neighbouring country, as well as for emergency situations of undetermined location in the territory.
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.

On February 2017, the National Department of Civil Protection announcing the intention to start the updating of the National Plan, requested to the competent regulatory authority the revision of the hazard assessment on which the plan is prepared.

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 worth to mention the participation in

March 2016 to the INEX-5 regional exercise played together Slovenia, Austria, Croatia and Hungary. Within the framework of bilateral agreements in place, the participation is extended to the national exercises organized by neighbouring countries (participation to Swiss national exercise of nuclear emergency in 2013, 2015 and 2017, and to Slovenian national exercise in 2014).

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 fulfill 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 ISPRA 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 ISPRA

A cooperation agreement between the French and Italian nuclear safety Authorities (ASN and ISPRA) 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 ISPRA

Likewise the aforementioned French agreement, a second arrangement was ratified on May 2010 by the ISPRA 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 first meeting under ISPRA-SNSA agreement was held in October 2016.

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.

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 ISPRA 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 55 - 57 of the Legislative Decree No. 230/95.

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. 55 of the Legislative Decree No. 230/95 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 the 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 constrains 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 ISPRA;
- taking into account the above comments and the results of its own review and assessment activities, ISPRA 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 ISPRA may formulate to the applicant requests of clarifications and additional information;
- ISPRA transmits its technical report to the involved administrations which should formulate and send to ISPRA their final observations;
- ISPRA 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 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 ISPRA.

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 under the article 55 of the Legislative Decree No. 230/1995.

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 ISPRA before performing specific activities. The decommissioning project 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 ISPRA 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), dose optimization analysis, etc.

Furthermore art. 57 of Legislative Decree No. 230/1995 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 ISPRA 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. 148 of the Legislative Decree No. 230/1995, 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 12 and 13.

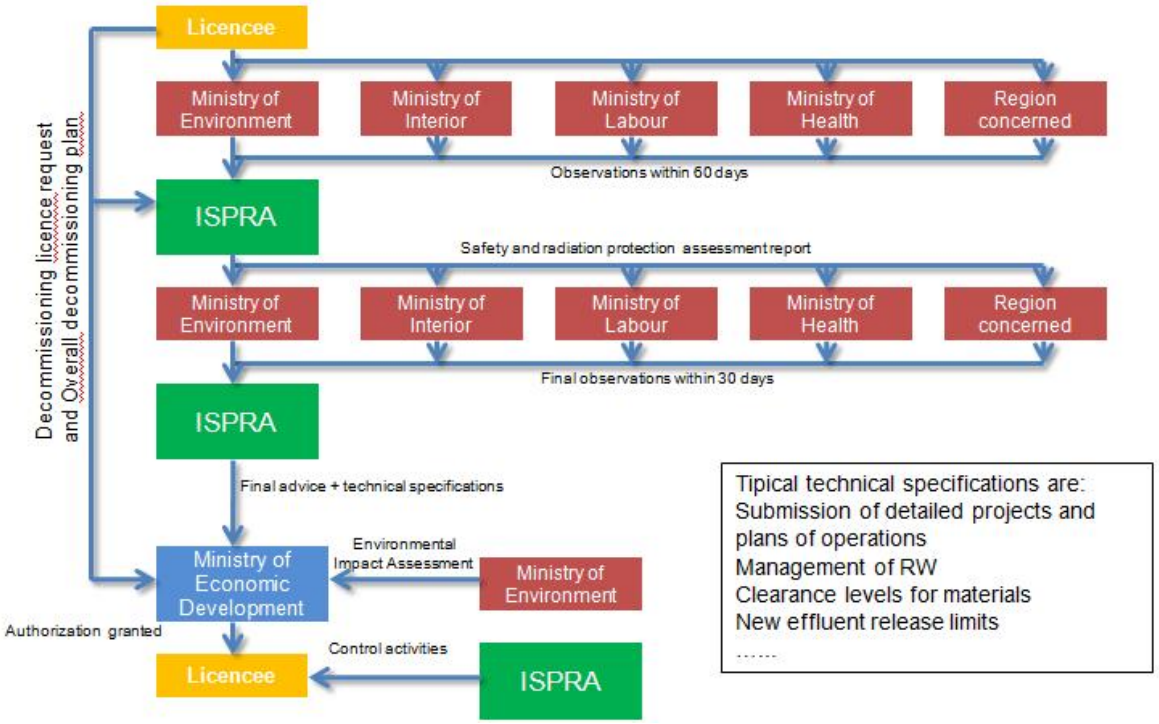


Figure 12: Decommissioning licensing process

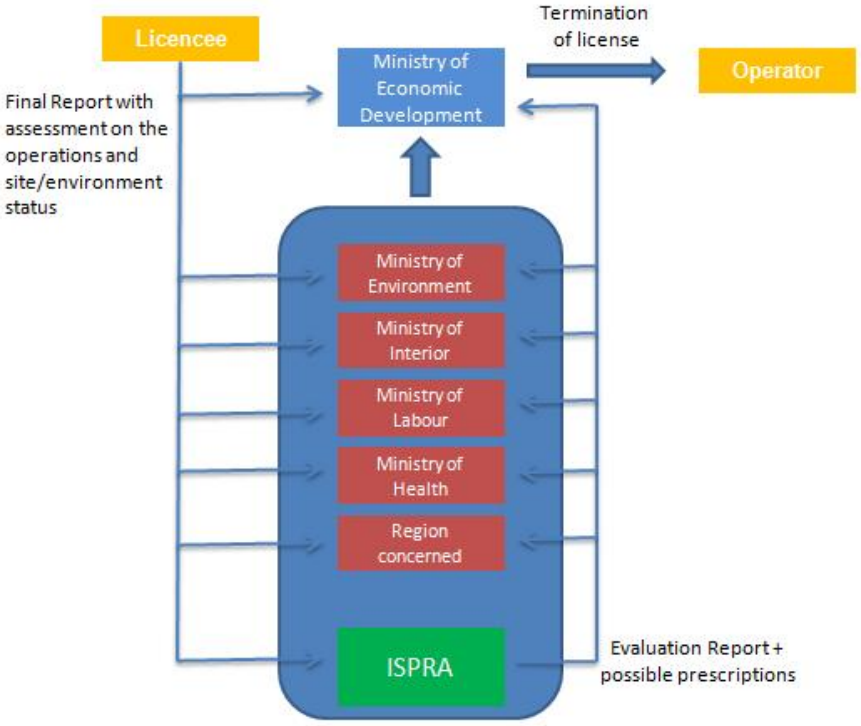


Figure 13: Licensing procedure for site release after decommissioning

(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 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° 230/1995 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 e 2014/87/Euratom)

  In particular, according to art. 58, par. 1 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 most exposed member of the critical group 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 element[3] 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.

[3] 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.

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 than 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 stored in the pools of the individual facilities and partly in a specifically devoted wet storage facility. With the exception of the Elk River spent fuel in ITREC plant, 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..

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° 230/1995, 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 draft National Programme for spent fuel and waste management to be issued as Decree of The President of the Council of Ministers.

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.

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 ISPRA 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.

Trino NPP

As said the decommissioning licence as been granted in 2012 and the shipment of all fuel elements from the plant was concluded in 2015.

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

research facility, other nuclear installation):	
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[4]
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 cleanup system, to maintain the required chemical, physical and radiological conditions (e.g. normal water activity concentration of 37 Bq/l from ^{137}Cs against a maximum allowed by technical specifications about 10^3 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.

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

[4] 2 FAs were dismantled: 1 FA remained with 11 rods and 1 FA with 23 rods

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 recently conducted, a numerical analysis have 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.

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 details:

- 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[5]
Cladding material	Zr 2
Fuel material	1 modified BWR[6], 54 UO_2 + MOX[7], 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, 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:

1) The structural conformity of the pool and the containment building has been demonstrated, according to current Italian regulation (NTC 2008)

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

[5] some FAs were modified during irradiation: 2 FAs remained without 1 fuel pin, 3 FAs without 2 fuel pins

[6] after last irradiation cycle in the FA were inserted 4 MOX and 2 UO_2 non irradiated fuel pins segments

[7] in 4 FAs only the spacer capture rod is a UO_2 pin

coming years. Due to its old design, the installation remains however 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 ISPRA 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 prescriptions 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 current national spent fuel management strategy envisages the transfer abroad for reprocessing of the limited amount of spent fuel remaining in the national installation with the subsequent return to Italy of the resulting radioactive waste. The construction of new spent fuel storage facilities on the site is therefore not envisaged. The only exception is represented by an onsite facility for the interim dry storage of the spent fuel in the ITREC experimental reprocessing facility. Due to the difficulties for reprocessing the particular fuel (U-Th), it is in fact currently envisaged that the very small amount of spent fuel at ITREC plant (64 elements) will be temporary in situ dry stored (1 or 2 metallic casks) waiting for further developments.

In the licensing procedure for the construction of spent fuel dry storage facility all pertaining safety assessment evaluations will be performed, including site related factors potentially affecting the new facility. The licensing in process of the dry storage facility is in progress. Interested members of the public are 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.

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

No new fuel management facilities are foreseen to be constructed on the sites of existing installations with the only exception of a dry storage facility for the spent fuel located in the ITREC plant, for which the licensing process is ongoing, and the dry storage facility in ESSOR reactor for the JRC of Ispra already built to be commissioned. 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.

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 spent fuel storage facilities is therefore not envisaged, with the only exception indicated in article 6.1 (dry storage on the site of the limited amount of ITREC spent fuel).

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 ISPRA.
The related project has been submitted by the operator SOGIN and it is under regulatory review. A safety case, including demonstration of protection against external event has been submitted.

The technical review process will take into account the general principle of reducing exposures to the lowest practicable value (Legislative Decree n° 230/1995 art. 2), the need to facilitate future decommissioning activities and the suitability of the technology as required, either by specific technical guides issued by the Regulatory Authority or by making reference to international standards.

It has also to be taken into account that a specific, detailed technical position related to the design of dry spent fuel facilities has been already issued by the Regulatory Authority when the dry storage of spent fuel on the sites was selected as the strategy to be applied, specifying the acceptable requirements for the most important 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 exception mention in article 6.1. In the frame of the related licensing procedures for the dry storage facility at the ITREC installation, all measures to limit possible radiological impacts on individuals, society and the environment will be taken into consideration in the safety case to be prepared.
Limited impact to decommissioning aspects can be singled out for such dry storage facility.

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).

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 - will be 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 has to be filed by the applicant. Technical Guides issued by the Regulatory Authority specify more in detail licensing requirements to be applied.

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° 230/1995 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.

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 VII of the Legislative Decree n° 230/1995 which include also the spent fuel management facilities existing on the site.

Specific requirements are addressed in Chapter VII of the Legislative Decree n° 230/1995 and in relevant technical guides as following:

(i) the relevant documents to be produced, which include the safety report, are covered in Articles 36 and 44,

(ii), (iii) the requirement to issue an Operating Manual and Technical Specifications containing operating limits and conditions [OLC] is given in article 44; the contents of such documents are better specified in Article 7. In particular, the fist issue of the OLC is required before the performance of the nuclear tests (Article 44), the final issue has to be attached to the operating license (Article 50). 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 44); it has to incorporate all the procedures related to the operation, maintenance, and also in view of accident or emergency conditions.

(iv) Articles 44 and 46 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 55 to 57, which require also the description of the plant state as results from the previous operations as well as the review by the 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 for the very limited amount of spent fuel of one installation (namely ITREC plant) the dry interim storage on the site is currently envisaged.

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.

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. 230/1995 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 draft 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.

12.1 Undertaken steps

As already explained in Section D, the only 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 L-ILW there are a few authorised operators. Among them NUCLECO has also on site capabilities for treatment, volume reduction, 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 the Garigliano, Latina NPPs, Eurex plant, JRC of Ispra, Casaccia research centre (Rome) The Garigliano 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.

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 Regulatory Authority;

(ii) Radiation protection of the public has to be considered in the license application under the requirements of Legislative Decree n° 230/1995; 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;

(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 storage facility it is expected that consultation of other Contracting Parties will takes 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.

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 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 ISPRA. 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 as to be approved by the Competent Regulatory Authority (ISPRA).

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° 230/1995. In order to further improve existing requirements art. 33 of the Legislative Decree n.230/1995 envisage a specific implementation decree, under preparation.
Licensing procedure for the construction of a national, near surface repository is reported in the new Legislative Decree n. 31/2010 as subsequently amended.

(i),(ii) The applicant has to submit to the Ministry of Economic Development and to ISPRA a detailed design showing compliance with safety and radiation protection objectives as stated in the Legislative Decree n° 230/1995. 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 low. 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 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 ISPRA 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 as stated in document “Waste and Spent Fuel Storage Safety Reference Level Report – Version 2.2 – April 2014”

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).

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 as specific authorization is requested. A safety assessment is

included in the documentation submitted by the applicant. It is than 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 than 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 requirement 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.

16.1 Undertaken steps

(i) 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 VII of the Legislative Decree n° 230/1995. 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 Regulatory Authority, has to be conducted.

(ii) 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 7 of Chapter VII of Legislative Decree n° 230/1995.

(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 ISPRA. Implementation is subject to regulatory authority supervision.

(vi) As far as reporting of incidents important to safety is concerned, Article 122 of Chapter X of Legislative Decree n° 230/1995 establishes that the manager of the nuclear installation is responsible to notify any event relevant to safety to the 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 Authority Regulatory. 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.

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;

   (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.

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 17 March 1995, n°230 as amended, 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, 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 17 March 1995, n°230 as modified).

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, based upon the advise of the competent regulatory authority and other Ministries.

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.

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° 230/1995.

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 ISPRA 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 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° 230/1995, 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 ISPRA;
- 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;
- a record of all commercial transactions relating to such radioactive materials shall be kept, contracting parties and activity of the sources shall be indicated in the records, in the lines given by a ministerial decree of 1964.

An authorisation by the Ministry of Economic Development for transport of the radioactive materials is required as well, pursuant to Act n° 1860/1962. Carriers shall transmit to ISPRA, within 15 days of the end of each calendar quarter, a summing up of records concerning transport operations carried out, in accordance with a Decree of the Ministry of Economic Development.

Ad hoc provisions of the new Legislative Decree n° 52/2007 establish that the holder of high-activity sealed radioactive sources shall integrate the licence or request a prior authorisation for such sources (granted in accordance with the Act n° 1860/1962 and the Legislative Decree n° 230/1995) with the demonstration 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.

Legislative Decree n° 52/2007 establishes specific provisions in order to identify the duties of two subjects which may take the charge of the disused sources management:

National Operator responsible, in particular, for the long term storage (50 years) of spent sources;

Integrated Service which may grant all the phases of the spent sources management.

Legislative Decree n° 52/2007 states specific provisions for the import and export of IAEA Categories 1 and 2 sealed sources; pursuant to Legislative Decree importation and exportation activities are subject to prior authorisation by the Ministry of Economic Development and the Ministry of Environment, with the advice of ISPRA. Such provisions are established on the basis of the essential requirements of the IAEA Code of Conduct and supplementary Guidance.

ISPRA plays a central role in the regulatory system. Apart from nuclear installations, which are always subject to ISPRA review, ISPRA is required by law to express advice and lay down technical specifications for installations which are authorised by the Ministry of Economic Development; moreover ISPRA 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 ISPRA inspectors are vested with police powers, that is, they even have power of seizure on

sources or installations inspectors 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.

At the Casaccia Research Centre there is a storage facility for radioactive wastes operated by Nucleco S.p.A., a commercial company jointly owned by ENEA (40%) and SOGIN (60%). Its services 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

With regard to the challenges identified at the end of the fifth review meeting, the related actions which have taken in place are described as following:

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

After the fifth review meeting the national chart of areas potentially suitable for the siting of the National Repository was prepared by SO.G.I.N., as national implementer, and verified by ISPRA in 2015. According to the procedure established in the Legislative Decree n. 31/2010 the National Chart will be published to start the public consultation and participation process after the authorization of the Ministry of Economic Development and the Ministry of Environment. The government has taken the decision to authorize the publication of the National Chart after the conclusion of the SEA process foreseen by the end of 2017.

Additional human resources for the Regulatory Body to be implemented.

Legislative Decree n. 137/2017, recently enacted to transpose the EU Directive n.2014/87/EURATOM on nuclear safety introduces an amendment to the Legislative Decree n. 45/2014 according to which the total number of the envisaged staff units for the new Inspectorate is increased of 30 units (from 60 to 90) of legal and administrative personnel. Additional funding resources are also identified. The possibility to exploit contests to recruit new young technical personnel when the new Inspectorate will become operative is also envisaged.

Transfer abroad of the remaining SF (approximately 30 tHM) for reprocessing is in progress, to be completed in 2016.

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, decommissioning, as well design, construction and operation of disposal and interim storage facilities, currently under preparation, to be established through a consultation process.

This action is still in progress.

An **Integrated Regulatory Review Service (IRRS)** hosted by ISPRA has been carried out in Italy in November 2016.

The IRRS mission was a full scope one covering modules on responsibilities and functions of the Government, global nuclear safety regime, responsibility and functions of the regulatory body, management system of the regulatory body, and has been addressed to radiation sources, research reactors, radioactive waste facilities and NPP under decommissioning. The mission provided useful recommendations and suggestions for improvements and the final report will be soon published. As conclusions of the IRRS mission the following good practices and recommendations were identified:

Good practices:

- the use of the *"state of the art"* standards in the field of decommissioning and waste management;
- the development and use of a comprehensive data base and the related tools for extracting and analysing transport safety issues;
- the Italian system for education and training of qualified experts which is of high quality in radiation protection.

Recommendations:

The Government should:

- provide the regulatory body with sufficient competent staff for the proper and timely implementation of its assigned responsibilities;
- continue the efforts to develop a national policy and strategy for safety and national policies and strategies for decommissioning and management of radioactive waste including disposal;
- complete the legal framework in regards to approval of technical services, establishment of national data bases related to safety and improvements in aspects of the authorization process.

The Regulatory Body should:

- establish and implement an integrated management system;
- strengthen the regulatory framework for review and assessment - including periodic safety review, authorization, inspection, emergency preparedness and response, and for the occupational and public exposure control;
- improve existing communication strategies.

An Action Plan for the implementation of the recommendations to be completed in the upcoming years was developed and provided to the IRSS Team. It resulted consistent with the mission outcomes and it will be issued and updated following the official transmission of the IRRS report.

The IRRS report is published either in the IRRS portal of IAEA web site and in the ISPRA web site.

From the operator side, SOGIN, in July 2017 hosted an ARTEMIS mission with the objective to identify opportunities to improve SOGIN decommissioning overall plan. More details on it are reported in Annex D.

It is the case to mention that on the implementation side some important steps forward have been undertaken to start the operation of interim waste storage facilities on the sites and for the remediation of some legacy waste (Garigliano NPP tranches, buried waste pits in ITREC plant, Latina NPP sludges). Some important dismantling activities have been progressed (Garigliano NPP, chimney). Relevant projects for the treatment and conditioning of liquid waste as well as sludges and resins (EUREX and ITREC plants liquid waste, Trino and Caorso NPPs resins) are in progress and for them there is the need to accelerate in their implementation.

Some progress have also been made for the siting of the National Repository for the near surface disposal of LLW – ILW and the long term storage of ILW-HLW. The National Chart of potentially suitable sites has been developed and verified by the competent regulatory Authority. The subsequent steps leading to the site identification, consisting in the publication of the chart and in the organization of public debate have to be undertaken.

Figure 14: Historical picture of burial of radioactive waste in pits at the ITREC facility in the years ‘70s.

Figure 15: The chimney of the Garigliano NPP under dismantling

Fig. 16 – Remediation of waste trenches at Garigliano NPP

Section L. Annexes

Annex A List of Abbreviations and Acronyms

AFR	Away From Reactor
ALARA	As Low As Reasonably Achievable
ARPA	Regional Agency for the Environmental Protection
APAT	National Agency for Environment Protection and Technical Services
BWR	Boiling Water Reactor
CEVaD	Centre for Data Elaboration and Evaluation
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	Inspectorate for Nuclear Safety and Radiation Protection
ISPRA	Institute for the Environmental Protection and Research
ISS	Italian National Institute of Health
LEU	Low Enriched Uranium
LWR	Light Water Reactor
NEA	Nuclear Energy Agency of OECD
OECD	Organisation for Economic Co-operation and Development
OPCM	Ordinance of Prime Minister
PWR	Pressurised Water Reactor
QA	Quality Assurance
RESN	Radiological Environmental Surveillance Network
SOGIN	Company for the Nuclear Installations Management
TS	Technical Specification
US NRC	United States Nuclear Regulatory Commission
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° 185 of 1964: *"Safety of plants and protection of workers and general public against the risk of ionising radiation associated to the peaceful use of nuclear energy"*, implementing the first EURATOM Directives and replaced by the Legislative Decree n° 230/1995, described below.
Act n° 393/1975, which contains Administrative rules on the selection of the sites for NPPs.

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.

Legislative Decree n° 230/1995 implementing EURATOM Directives on radiation protection and nuclear safety. The Decree replaced the previous DPR n°185 issued in 1964 and establishes radiation protection requirements for workers, public and environment.

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

Legislative Decree n° 241/2000 transposing EU (European Union) directive 96/29/Euratom laying down basic safety standards for the radiation protection of workers and the public; the standards laid down in the directive incorporate the 1990 Recommendations of the International Commission on Radiation Protection (ICRP) into EU radiation protection legislation. Decree n° 241 has modified and integrated Legislative Decree n° 230/1995.

Legislative Decree n° 257/2001 promulgated in order to modify certain details in Legislative Decree n° 241 of 2000 concerning requirements for notification and authorisation of non nuclear installations where ionising radiation is used for industrial, research and medical purposes.

Prime Minister Decree of 14th February 2003 declaring the emergency status in relation to the decommissioning and radioactive waste management activities in those regions involved.

Ordinance of the Prime Minister n° 3267 of 7th March 2003 establishes the measures for the implementation of provisions aimed at enhancing the level of protection of Nuclear Installations.

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.

Legislative Decree n. 52/2007 which transposes EU directive 2003/122/Euratom on the control of high-activity sealed radioactive sources and orphan sources.

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

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 Regulatory Body. As already mentioned, the Agency will be made by the resources of the Nuclear Department of ISPRA and by resources from the Agency for New technologies, Energy and sustainable development (ENEA). The full establishment of this new Safety Authority has, however, still to be completed.

Legislative Decree 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. 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° 214/2011 that abrogates the Nuclear Safety Agency (created with the Act n° 99/2009, but never applied) and the functions have been temporary assigned to ISPRA (that in fact continue its work as nuclear authority) waiting for a definitive asset of the regulatory organization.

Act 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 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.

b) Technical guides - Selected ISPRA 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° 2301995 "
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"

c) Technical Standards

UNI standards related to decommissioning

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

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

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

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

The standard is not applicable to:

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

UNI 9498/1 - General criteria

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

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

The scope of the standard begins at the decision of the owner/operator to permanently shut down the plant, and terminates when a situation without radiological constraints is reached. The status of the plant taken as a reference in the present standard is the configuration existing at the moment the decision is made to permanently shut down. The radioactive substances considered are those associated with the normal operation of the plant itself. The standard does not deal with decommissioning activities following severe accidents.

The aspects related to processing, conditioning, transportation and disposal of radioactive wastes are not included in the scope of the standard. The numerical definition

of radioactivity limits for materials free from radiological constraints are also not included. Nor the management, accounting and administrative aspects. The standard does not exempt the user from observing the rules and authorising procedures in force.

UNI 9498/2 - Decontamination techniques

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

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

UNI 9498/3 - Storage and surveillance

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

UNI 9498/4 - Dismantling of structures and components

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

UNI 9498/5 - Radioactive inventory

This section specifies the methodologies to be followed in the evaluation of the remaining radioactivity and of the associated radiation fields in order to carry out the radiological characterisation of the nuclear plants to be decommissioned. Such methodologies must be programmed and performed in a checked and documented way.

UNI 9498/6 - Radiological characterisation and classification of materials

This section deals with the factors which have to be taken into account to characterise and classify the materials produced during the decommissioning of nuclear plants. It provides the criteria against which the most appropriate methodology for characterisation and

classification of materials as a function of their type is to be chosen, as well as provides guidance for the choice of measurement instrumentation appropriate to define the radiological state of the materials.

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

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

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

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

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

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

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

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

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 (2004) “Radioactive waste packages characterization”

UNI 10704 (2004) “Radioactive waste classification”

UNI 10755 (2004) "Recording and labelling of RW packages"

UNICEN 189 (2001)* "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.

UNICEN 214-1 (2003)* "Category 2 Radioactive Waste Engineered Repository", that is structured as follows:

- Part 1: Basic Design Criteria
- Part 2: Basic Qualification Criteria for Engineered Barriers
- Part 3: Surveillance and Monitoring basic criteria

*** Waiting for the final approval**

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 n° 230/1995, Legislative Decree No. 52/2007, Legislative Decree No. 31/2010 and Legislative Decree No. 45/2014.
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.

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.

One of the most relevant provisions in Legislative Decree no. 230/1995 is the distinction between practices and intervention, as defined in EU directive 96/29/Euratom in accordance with the Recommendations of ICRP Publication 60: the basic principles of justification and optimization (the latter being also called ALARA, i.e. requiring doses to be kept as low as reasonably achievable) apply both to practices and to intervention although the wording is somewhat different. As far as the third principle of dose limitation is concerned, in cases of intervention on the contrary such principle does not apply, intervention levels being used in its stead.
The Legislative Decree 230/1995 clearly state that the operator of a nuclear installation or non nuclear installations or facilities making use of radioactive materials, must implement all the safety and protection measures suitable to keep the exposures of workers and population as low as reasonably achievable, social and economic considerations being kept into account. The

implementation of the optimization principle by the operator must be demonstrated firstly at the design stage and subsequently along the plant operation and decommissioning.

As far as situations concerning unplanned or uncontrolled releases of radioactive material into the environment are concerned, it has been a practice in the authorisation 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. Following the transposition of the Directive 96/29/Euratom in the Legislative Decree 230/1995, an analogous provision was introduced also for non nuclear installations.

Practices

In accordance with the provisions of Legislative Decree no. 230/1995, a practice is subject to radiation protection requirements if certain thresholds of activity and concentration are exceeded:

- 1 Bq/g in activity concentration for all radionuclides, and
- relevant activity values for each radionuclide from Euratom directives 84/467 and 96/29, whichever the lesser.

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 and in collective doses as well as provisions for unrestricted release of radioactive materials from installations have also been formally introduced into Italian legislation according to the following basic 'below regulatory concern' criterion, both conditions of which must be met:

a) effective dose $\leq$ 10 μSv/year, and
b) either collective effective dose committed in one year of performance of the practice not greater than about 1 man·Sv or the relevant analysis demonstrates that exemption is the optimum option.

From an administrative viewpoint, practices can be subject to the mutually exclusive requirements either of notification or of authorisation. In accordance with the new provisions of Legislative Decree no. 230/1995.a practice is subject to notification requirements starting from defined thresholds in activity and activity concentration as far as radioactive materials are concerned; the relevant thresholds are those laid down in Annex I of EU directive 96/29/Euratom. 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 authorisation.

The Legislative Decree's provisions state that a practice is subject to notification insofar as

requirements for authorisation do not apply. In particular, nuclear installations do not require notification since they continue being subject to the ad hoc authorisation requirements laid down in Legislative Decree no. 230/1995, which have not been modified by the transposition of EU directive 96/29/Euratom.

For non nuclear installations using ionising radiation for medical, industrial and research purposes the Italian authorisation system is based, as in the past, on a two tiered structure: authorisation of the more important installations is the competence of the of Ministry of Economic Development which issues authorisations in accordance with other relevant Ministries; the advice of APAT 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 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 Regions, which are responsible for health in the Italian system.

A Technical Annexe to Legislative Decree no. 230/1995 lays down thresholds in order to determine which installations are authorised 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 Annexe also lays down the technical features of the radiation sources and of the installation which must be specified in the application.

A general criterion is in force in Italy for unrestricted release from any installation subject to either notification or authorisation requirements. Radioactive materials from such practices can be unconditionally released from regulatory control if the radionuclides concerned comply with conditions regarding both activity concentration and radioactive half life:

- activity concentration $\leq$ 1 Bq/g, and
- half-life $<$ 75 days.

If conditions above are not complied with, an authorisation is required for release, reuse and recycle of radioactive materials from the installation concerned and specifications to that effect are established in the licence. The authorisation 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 the case where the practice is not subject per se to authorisation requirements, as for instance in the case where notification applies, a special authorisation for release is provided for. The clearance levels to be specified in the prescriptions, must comply with the basic below regulatory concern criterion for practices – also established in the European Directive 96/29/Euratom – and, to this aim, must take into account directives, recommendations and technical positions provided by the European Union. The contravention to prescriptions included in the authorisation acts is opposed by ad hoc sanctions.

Intervention

As regards intervention in cases of emergency, it must be stated beforehand that requirements for detailed emergency 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 have been introduced in Legislative Decree no. 230/1995 by transposing EU directive 96/29/Euratom providing for intervention in cases of radiological emergencies in non nuclear installations 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.

In the Chapter X of Legislative Decree No. 230/1995 are established the general principles for interventions that must be meet 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.

Given that nuclear installations proper continue to be subject to a special separate regime as in the past, ad hoc provisions introduced into Legislative Decree no. 230 of 1995 by Legislative Decree no. 241 of 2000 require for each non nuclear installation subject to authorisation by the Ministry of Economic Development that evaluations of potential exposures should be made by the applicant seeking an authorisation and submitted to licensing authorities so that an intervention plan can be prepared by emergency preparedness and management Authorities.

For those non nuclear installations which require authorisation by the Prefect or by the Regions, licensing authorities will review evaluations of potential exposures made by the applicant and will decide whether such potential exposures are likely to exceed 1 mSv of effective dose; in this case an intervention plan can be prepared by emergency preparedness and management Authorities as well. No new installation can start operations before approval of an intervention plan if the former is required under the new rules.

A Technical Annex in Legislative Decree no. 230/1995, also introduced by Legislative Decree no. 241 of 2000, lays down indicative intervention levels in terms of effective, equivalent and absorbed doses for purposes of planning and intervention in case of emergency; broadly, the levels established are in accordance with the European Commission’s guidelines (Radiation Protection 87 "Radiological protection principles for urgent countermeasures to protect the public in the event of accidental releases of radioactive material") and with criteria in IAEA Safety Series no. 109 ("Intervention criteria in a Nuclear or Radiological Emergency").

Dose limits

The transposing of the EU directive 96/29/Euratom in Legislative Decree no. 230 of 1995 has also led to establishing a new dose limit for exposed workers of 20 mSv in a calendar year. Instead of Annual Limits on Intake (ALI), age dependent coefficients relating a unit of intake of a radionuclide

to committed effective dose for workers and members of the public are now in use in accordance with the EU directive mentioned above.

A) WORKERS

The following limits shall not be exceeded for exposed workers:

- an effective dose of 20 mSv in any single (calendar) year;
- a dose equivalent of 150 mSv per year to the lenses of the eyes;
- a dose equivalent of 500 mSv per year to skin, forearms, hands, feet and ankles.

However, in exceptional circumstances, recourse can be made to specially authorised exposures for medically fit category A workers (as hereinbelow defined) if exceeding dose limits cannot be avoided; such exposures can be incurred only by voluntary workers and must not exceed twice the yearly limits laid down for exposed 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.

Special provisions ensure that workers having exceeded the effective dose limit of 20 mSv for any reason whatever must not be exposed in excess of 10 mSv per calendar year as long as their yearly averaged exposures are 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, forearms, hands, feet and ankles;

   (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 limits indicated in a).

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 45 mSv, or
- an equivalent dose to skin, forearms, hands, feet and ankles of 150 mSv.

Category A workers must be individually monitored, both for external and internal exposures while for category B workers area monitoring is used, as a rule, in order to assess doses and to verify compliance with ALARA constraints and, of course, with dose limits.

Category B workers: occupational exposure of any worker shall be so controlled through area monitoring that the previous dose levels for purposes of classification are not exceeded.

Other special provisions are laid down in Legislative Decree no. 230 of 1995 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.

According to EURATOM directive no. 90/641, special provisions were established in the Legislative Decree no. 230/1995 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;
- a equivalent dose to the lenses of the eye of 15 mSv per year;
- a 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 authorised 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 a particular person, the qualified experts, whose technical qualification is recognised 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 qualified 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 specialised physicians whose capacity to act as approved medical practitioners is recognised by means of State examinations. Every member of the work force must be recognised 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 qualified experts 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. ISPRA 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 Inspectors with regional bodies 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 2 of Legislative Decree no. 230 of 1995, together with the principles of justification and of dose limitation. It must be remembered that the optimisation 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 no. 230/1995;
- 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 optimisation 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 organisations involved,
- the good independent prevention role played by qualified experts;
- the support role by the NPP Council of Delegates;
- the system for verification of compliance.

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 no. 230/1995, namely Articles 92 and 100.
In case of accidents, or incidents that could result in an exposure to workers above dose limits, according to article 92 of the Legislative Decree no. 230/1995, the operator is requested for notification as soon as possible, but not later than 3 days after, to the following Institutions:

- Competent Regulatory Authority (ISPRA);
- Local Labour Inspectorate (Province);
- Local Offices of the National Health Services.

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 100 of the Legislative Decree no. 230/1995). 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 Services;
- Competent Regulatory Authority (ISPRA).

Furthermore, the operator has to 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° 230/1995 contains more precise provisions regarding radioactive waste management. Article 102, 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 103]. 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° 230/1995 has also incorporated Directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel. In particular, Article 32 requires prior authorisation of transfer, import, export and transit of radioactive waste, in compliance with the Directive.

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 ISPRA 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 100].

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

The Legislative Decree n° 45/2014, which transposes the EU Directive 2011/70/Euratom, establishes some amendments to Legislative Decree n° 230/1995 related for example to definitions, transboundary movements of spent fuel and radioactive waste and authorization procedures for temporary storage facilities. The Legislative Decree n° 45/2014 establishes amendments also 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

Some of the most important provisions introduced in the Italian regulatory system by the transposal of Directive 96/29/Euratom concern work activities which involve the presence of natural radiation

sources, such as radon, ores and cosmic rays, leading to a significant increase in exposure of workers or members of the public; given the impact of the changes introduced into the regulatory system a gradual implementation has been provided for.

As regards natural radiation sources a new Title (III-bis) was introduced into Legislative Decree n° 230/1995 by the transposition of Directive 96/29/Euratom. In the transposition of the directive the relevant European Commission's recommendations and guidance (Radiation Protection (RP) 88, RP 95 and RP 107) were followed, action levels being provided for concerning e.g. the following work activities:

- 500 Bq/m^3 or 3 mSv/year effective dose for radon;
- 1 mSv/year effective dose for workers or 0,3 mSv/y effective dose for members of the public in work activities with radioactive substances of a natural origin;
- 1 mSv/year effective dose for air crews.

Work activities with natural radioactive substances identified as worthy of concern in an Annex to Legislative Decree n° 241/2000 are, broadly, the ones listed in European Union Radiation Protection 95.

In relation to work activities with natural radioactive substances identified as worthy of concern in Annex I-bis of Legislative Decree No. 230/1995, undertaking are obliged to carry out relevant measurements and to assess, with the Qualified Experts. 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) if the assessed effective doses do not exceed 0.8 mSv/y for workers or 0.24 mSv/y for reference groups of the public (80% of the action levels, i.e, 1 mSv/y for workers and 0.3 1 mSv/y for the public) the undertaking is only required to keep his activity under control; in particular he is required to repeat measurements and assessments every three years or to review the situation if there are significant variations in the production process;
2) if the assessed effective doses are higher than 80% of Action Levels, but does not exceed 1 mSv/y for workers and 0.3 mSv/y for reference groups of the public, measurements and assessments must be repeated the next year;

3) if the assessed effective doses exceed either 1 mSv/y for workers or 0.3 mSv/y for reference groups of the public, the undertaking is required to investigate the work processes to evaluate the exposure of workers and of reference groups of the public. He is required to submit a report to the local Authorities and to adopt intervention measures within a three year time limit, with a view to keeping exposures below action levels. If, despite the adoption of remedial actions, the assessed effective dose remains higher than the action level for workers or for reference groups of the public, the undertaking must adopt some specific provisions provided in Chapters VIII and IX of the Legislative Decree No. 230/1995 for health protection of workers and for public (for planned exposure situations).

Annex D International Peer Review on the Decommissioning and Radioactive Waste Management Programme of SOGIN

Decommissioning is a complex and multi-disciplinary process of the final phase in the lifecycle of nuclear facilities involving both technical and non-technical aspects. The activities to be put in place to segregate or remove radioactive contamination from and to dismantle the facilities with the aim that they may be released from regulatory control require timely and effective management.

SOGIN, which is among the first operators worldwide to implement a global decommissioning program at national level, has set up an articulated technical and organizational program and estimated its costs, based on the government mandate, legislative and regulatory framework and existing boundary conditions.

Nevertheless, a such industrial activity taking place over a period of years has a certain degree of uncertainty and requires risk management. So SOGIN, although a long-term program has already been implemented, recognizes that for completing the plan it is necessary to have a much better understanding of the uncertainties, in order to increase the robustness of the technical program and to have more confidence in cost estimates.

The ARTEMIS project of the International Atomic Energy Agency is an integrated expert peer review service for radioactive waste and spent fuel management, decommissioning and remediation programmes, whose reviews provide independent expert opinion and advice, drawn from an international team of specialists convened by the Agency. Reviews are based on the IAEA safety standards, technical guidance and international good practices (for further information https://www.iaea.org/artemis/).

By letter on February 3rd, 2017 SOGIN, through the Permanent Representation of the Italian Government to the United Nations Organization in Vienna, put forward an official request to the IAEA for an international Peer Review of the overall decommissioning programme, within ARTEMIS. The objective of the Peer Review was to identify opportunities for improvement to SOGIN's decommissioning overall plan.

The identified sites to be considered within the review were following: four Nuclear Power Plants in Trino (Vercelli), Caorso (Piacenza), Latina and Garigliano (Caserta) and four additional Nuclear Fuel Cycle Research Facilities, two in Casaccia (Roma), one in Saluggia (Vercelli) and one in Trisaia (Matera). The fuel fabrication plant at Bosco Marengo was out of the scope of the ARTEMIS Peer Review as the work on the site is close to the completion.

Specific Terms of References (ToR) for the review were developed by the IAEA coordinators in conjunction with the SOGIN counterpart. The terms of reference included, among other things, scope of the review, specification of documentation to be provided in advance of the review meeting, and provision for sending the counterparts questions in advance of the review meeting.

The topics addressed in the Peer Review are the following:

- considerations of the methodology, quality and content of decommissioning cost estimates including the contingency and allowances estimation;
- evaluation of the sequence and overall approach to decommissioning and waste management;
- focus on the decommissioning techniques and technologies utilized within the nuclear islands of Trino and Garigliano plants (including reactors' vessels dismantling).

SOGIN developed comprehensive Site Task Dossier (delivered to the Agency at the preparatory meeting in Rome, 29-30 May 2017) and later was provided with several questions in advance of the Peer Review mission to facilitate a more efficient exchange of information for the brief period that the review team was in country.

The Peer Review mission conducted from 2 to 13 July 2017 and involved six international experts from France, Germany, the Russian Federation, the United Kingdom and the United States of America. Experts were supported by the IAEA Coordinators. The mission consisted of meetings in SOGIN Headquarters in Rome and site visits.

The Peer Review mission included the following:

- a day-long briefing on SOGIN's operations and site-specific decommissioning arrangements to open the review meeting on Monday, 2 July 2017;
- four days of site visits to seven nuclear sites in Italy (typical Agenda of any site visit included introductory presentation(s), visit of the site facilities and Q&A session);
- review team meetings at SOGIN Headquarters to formulate findings and recommendations;
- presentation of the major findings and recommendations to SOGIN for fact checking; and
- acloseout meeting at SOGIN Headquarters on Thursday, 13 July 2017.

The major findings and recommendations of the review were delivered to the counterpart for fact checking before the closeout meeting at SOGIN Headquarters. The team presented the draft Peer Review report with findings and recommendations to SOGIN for discussion on the final day of the mission.

The principle of independence was strictly observed throughout the peer review – from formulation of the terms of reference to presentation of the final report. The findings and recommendations were formulated by the review team and presented to SOGIN for fact checking only. It should be noted that SOGIN demonstrated complete transparency throughout the review process – SOGIN complied with all requests for additional information and provided thorough answers to queries from the international experts.

Beyond the availability of the National Repository as an essential tool for nuclear decommissioning, the Peer Review team found that SOGIN has a sound foundation and capacities in place. The review allowed the experts to identify several good practices while also making recommendations and

suggestions aimed at improving safety, efficiency and reliability in decommissioning.

A summary of the main findings and recommendations is as follows.

Findings:

- at the time of the review, SOGIN has demonstrated, with its present organisational structure and skills, their knowledge and capability to deliver the Italian decommissioning and radioactive waste management programme;
- to prepare for nuclear decommissioning in years to come, SOGIN has launched its 'Young talents initiative' to secure specific skills for the future;
- SOGIN has recognised the need to have a strong safety culture, which should be fostered going forward, particularly to deal with the increasing number of subcontractors;
- the team acknowledged that the care and maintenance of the facilities and sites were of a high standard;
- SOGIN applies a robust and thorough cost estimating process in accordance with the recognized international practices. In addition they have also demonstrated their continuous improvement in project controls and financial reporting;
- SOGIN is using proven and well tested technologies and approaches for decommissioning;
- SOGIN is developing preliminary Waste Acceptance Criteria and is adopting a procedure for accepting waste at the future National Repository in line with the current best practices and international standards.

Recommendations to Italian System:

- the Government of Italy give high priority to establishing a National Repository for disposal of radioactive waste;
- the Government of Italy implement efforts to strengthen the capacity of the regulatory body for safety, consistent with Legislative Decree 45/2014;
- strengthen strategic governance at SOGIN to minimise the effect of the frequent changes at the Board level;

Recommendations specific to Sogin:

- a more proactive stance be taken by SOGIN with the safety regulator and other relevant bodies in order to make the authorization processes faster and more efficient, ensuring that prompt and detailed information is provided to support decommissioning licenses and other authorizations;
- increase confidence in the total cost and completion dates, by the use of strategic risk modelling at SOGIN;
- waste package inventories in storage facilities continue to be screened to identify material eligible for clearance;
- opportunities be pursued to release parts of sites for reuse once their decommissioning has been completed;

- SOGIN adopt the terminology of interim and end states in their strategies and plans instead of ambiguous usage of the term brown field.

During the Peer Review the team also identified several good practices which are detailed in the final Peer Review report issued at the end of September 2017.

Finally, the IAEA Peer Review team members acknowledged SOGIN's significant efforts and professionalism during the preparation and conduct of the Peer Review mission. Recalling that the aim of this IAEA Peer Review was to assess the Italian decommissioning programme, SOGIN's complete transparency and responsiveness to questions, at all levels of the organization, allowed the team to conduct their review in an efficient and effective manner which resulted in the conclusion that SOGIN can reliably execute the programme.

Annex E Recent activities at facilities under decommissioning

CAORSO NPP

Figure 17: Caorso NPP

GENERAL INFORMATION

Caorso site has completed the nuclear spent fuel removal and the decommissioning of the external infrastructure of the nuclear island.

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.

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 18: Caorso NPP - Off-gas building dismantling

EXHAUST RESINS

A project for the incineration of the exhaust resins abroad will be performed in the near future. The authorization process is still in progress. 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.

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: civil works have been completed in June 2017.
Asbestos removal from diesel generators has been completed in September 2017.

TRINO NPP

Figure 19: Trino NPP

GENERAL INFORMATION

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

Following the Decommissioning Licence obtained in 2012, and the completion of the nuclear spent fuel shipment to the reprocessing plant of La Hague in 2015, the site has been able to launch other major activities on the nuclear island.

WASTE TREATMENT

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 disposal building in order to install a system of 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.

PRIMARY SYSTEM

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

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 was operated, achieving promising results for the construction of the industrial plant. The detailed project for the conditioning of resins and sludges is now under regulatory review by ISPRA.

GARIGLIANO NPP

Figure 20: Garigliano NPP

GENERAL INFORMATION

Following the decommissioning licence in 2012 the Garigliano NPP has been able to launch substantial decommissioning activities. Al the nuclear spent fuel had been removed in the 80s and large part of waste already conditioned..

INTERIM STORAGE FACILITIES

A new radioactive waste interim storage building (about 10,000 m^3) named D1 entered into operation on 31/01/2014.

Figure 21: Storage facility “D1”

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

Figure 22: Storage facility “ex Diesel”

STACK

The demolition of the plant stack (90 m), after radiological characterization and scarification is ongoing ant it will be finished by the end of 2017.

Figure 23: Garigliano NPP plant stack

TRENCHES

Important activities were carried out in the external areas, where was completed the clean-up and remediation of two out of three radioactive waste disposal trenches. The third one will be cleaned up and remediated within the next three years The activities for the remediation of the "trenches" are including extraction and treatment of radioactive wastes coming from former operation and currently stored underground, was completed.

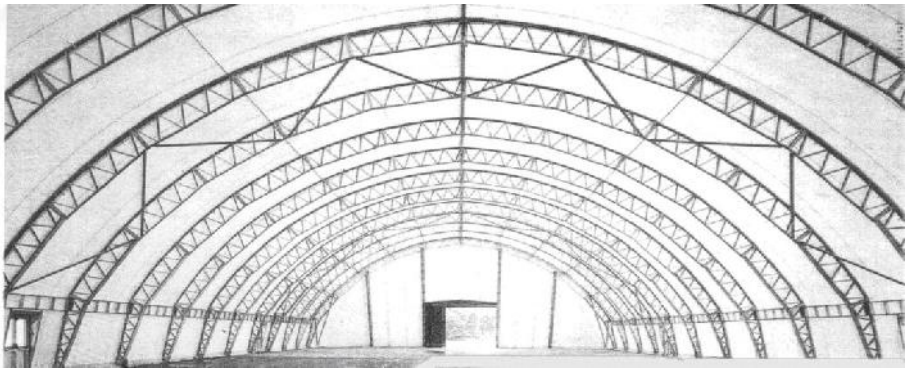


Figure 24: Trenches 2 and 3 containment building

Figure 25: Trenches remediation activities

PRIMARY AND SECONDARY STEAM CIRCUIT

In 2015 were started the activities regarding the dismantling of components of the thermal cycle (heaters, turbine, ect) in the turbine building. In particular, up today the turbine is under dismantling. In 2017 were started also preliminary engineering activities on vessel and internals dismantling.

OTHER ACTIVITIES

Currently other relevant activities are ongoing:

- treatment and decontamination facility adaptation,
- new radwaste construction
- revamping of reactor auxiliaries components.

LATINA NPP

Figure 26: Latina NPP

GENERAL INFORMATION

The decommissioning licence is expected to be granted in the coming months, However, several important activities connected to decommissioning have been carried out or are in progress on the basis of “ad hoc” authorizations.

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 and auxiliary buildings

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

INTERIM STORAGE FACILITIES

A new radioactive wastes interim storage building (20,000 m^3), 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 design of CO_2 ducts dismantling was completed and the tender procedure for the dismantlement of the blower's casings was launched.

In the frame of the demolition of conventional structures, the dismantlement of the concrete structure of the pier and the building (about 100,000 m^3) that housed the turbines and other components of the BOP has been finalized.

The tender procedure for the construction of a waste management facility, called "Cutting Facility" is in progress. The Plan of Operations necessary for the removal of components in the spent fuel pool and its decontamination has been recently approved by the Regulatory Authority.

The construction of a new system for the treatment of effluents is envisaged.

EUREX PLANT (SALUGGIA SITE)

Figure 27: EUREX plant

GENERAL INFORMATION AND DECOMMISSIONING STATUS

Since 2004, the program of plant management has been focusing on the radioactive waste management, construction of the waste storage building and development of the facilities for the treatment and conditioning of the various wastes, stored in the Site.

The following tasks have been performed:

- all the fissile material has been removed from the Site in the frame of the Global Threat Reduction Initiative;
- removal of components from the pool and pool decontamination;.
- construction of the new interim storage of the radioactive liquid waste, named NPS.
- construction of the electrical supply cabinet, including emergency system in case of blackout, named NCE.
- start up of the construction of the facility for the treatment and conditioning of the radioactive liquid waste generated from the past reprocessing activities named Cemex;.

The most important activity to be realized in the site is the above mentioned facility for the treatment and conditioning by cementation of the intermediate radioactive liquid waste currently stored in the NPS and in the area 800. The construction of the facility, named Cemex, has been recently suspended for contractual litigation between SO.G.I.N and the contractors.

Moreover, in accordance with the decommissioning planning, the following tasks are in the phase of design feasibility:

- Facility for the treatment and conditioning of the solid waste with intermediate activities, named WMF
- System for the treatment and conditioning of the resins and sludge with intermediate activities.
- Process definition of the treatment for the organic liquid waste

Figure 28: Waste storage facility “D2”

An application for decommissioning licence has been submitted.

ITREC (TRISAIA SITE)

Figure 29: 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 Irreversible 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 7.1 Irreversible Pit is constituted by a vertical development of 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.

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).

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

The procurement of the equipment for the future cutting activities of the monolith in four wells is ongoing. After the cutting, the wells will be extracted, packaged in a dedicated structure and transferred in one of the interim storage facilities of the site.

Figure 30: Itrec - Irreversible Pit 7.1

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 31: 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.

The licensing for the repackaging of the fuel elements is ongoing.

Figure 32: Capsules for the fuel repackaging

Figure 33: Cleaning of the bottom pool

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 34: SIRIS Project

An application for the decommission licence 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 (NSB), Radiological characterization lines and Waste Management Facility (WMF), 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 35: 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 authorized SOGIN to proceed with 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 36: Before dismantling

Figure 37: 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 radioactive waste (in 220 liters drums) currently stored in the provisional local buffer is starting.. The activity will end with the conditioning of the last drums produced by the final dismantling.

It is estimated that, from the dismantling of the plant, about 270 tons of materials will be released and about 500 drums (220 liters each) of radioactive waste will be produced.

Activities to refurbish the existing building B106 as interim storage facilities for the *brown field* .

The *brown field* configuration is envisaged to be reached in the coming two years.

Figure 38: Bld 11

Figure 39: Refurbishing activities of building B106

CASACCIA SITE

GENERAL INFORMATION AND DECOMMISSIONING ACTIVITIES

The decommissioning project of 56 obsolete Glove Boxes (GB's) of the Plutonium Plant, used in past for MOX fuel fabrication, was started in December 2010; and is in progress. Redundant gloveboxes have been classified in four levels of increasing complexity (level I to level IV), according to size, installed equipment and glovebox layout. Dismantling of level I, II and III gloveboxes has been already completed, whereas the decommissioning of those of level IV started at the end of 2016 and it is still ongoing.
Characterization and stabilization of nuclear materials (HEU and MOX) have been performed in 2013-14, by means of 3 new GB's installed in the Plutonium plant. Treatment and conditioning of operational radioactive wastes from OPEC and Plutonium plants are in progress.

The remediation of the underground liquid effluents system (Waste A&B) of OPEC-1 has been also conduted. In order to avoid any spread of contamination, a containment structures was built above the affected area. The first activities consisted in opening tank A (Waste A), removing piping, pumps and other installations, which were transferred to Nucleco for treatment and final dismantling. After removing the upper and intermediate slabs of Waste B, the contaminated liquids were removed from tank B, and then the tank itself, which was also transferred to Nucleco for future treatment. After removal of all components, radiological survey of Waste A and Waste B was performed in order to plan the decontamination and remediation of the underground structures. Radiological survey is underway to investigate possible soil contamination.

In 2010, an authorization has been granted to modify the structure of OPEC-2 facility (originally designed as post irradiation examination facility but never entered in operation) as interim storage building for plutonium contaminated solid wastes. Main works included seismic upgrading and other

installations (electrical system, forced ventilation, fire prevention and extinguishing system, drainage system, radiological monitoring system, supervisory and control system). In 2016, final testing with the contractor was completed.

In July 2017 commissioning tests were successfully conducted under the supervision of the competent regulatory Authority. The operating license for OPEC-2 as storage facility is expected to be issued by the end of this year.

An application for decommissioning licence has been submitted.

Fig. 40 Waste A&B dismantling facility at OPEC-1 plant

Fig. 41 Glove box dismantling at Plutonium plant

Fig. 42 New OPEC-2 store completed and waiting for operating permit

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