ITALY

Convention on Nuclear Safety

Seventh Italian National Report

2016

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Nuclear Safety

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This National Report has been prepared on behalf of the Italian Government by the Nuclear, Technological and Industrial Risk Department of the Institute for Environmental Protection and Research (ISPRA), which carries out the functions of national competent regulatory authority for nuclear safety and radiation protection

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Section A. Introduction

Introductory Remarks

This Report is intended to provide an updating of the Italian sixth National Report issued in 2013. To organize its content, the following aspects have been considered:

- the changes in policy as well as in national nuclear safety legislation, regulations and practices since 2013;
- the topics identified during the sixth Review Meeting;
- information on technical issues related to the implementation of Vienna Declaration principles, as applicable;
- information on how to address the challenges identified by the Special Rapporteur as referred to in the Summary Report of the 6th review meeting, by national and international activities.

The above considerations led to prepare a self standing document. To this aim, the Report provides a general update of the "article-by-article review", as applicable to the Italian scene, with Annexes integrating the pieces of information provided in the main text.

Italy's Nuclear Activities Policy

Since the abandonment of the national programme to use nuclear energy for electricity production followed to the referendum of November 1987 and the consequent definitive shut-down of the four Italian nuclear power plants (i.e. Garigliano, Latina, Trino and Caorso), no significant changes of policy occurred on the matter until 2009, when the Government decided to reopen the nuclear option by envisaging the construction of new installations in the coming years. A new legislation was promulgated in July 2009 (Act No. 99/2009), followed by an implementation decree (Legislative Decree No. 31/2010), in order to regulate the process to start a new nuclear programme. In the aftermath of the Fukushima Daichi NPP accident and as result of a national Referendum, the process to start a new nuclear programme was stopped and the new legislative provisions consequently amended.

Taking into account that no plans to built NPPs exist, this report will therefore deal with the situation related to existing nuclear power plants and to the associated decommissioning programmes.

In the past years specific policy statements were issued by the Government to address the need of keeping up-to-date competences and capabilities on nuclear safety related matters by National R&D organisations, as well as by the competent regulatory authority, Universities, State owned Companies and selected Industries. These policies were essentially aimed at

maintaining effective nuclear infrastructures suitable to ensure a safe conduct of the decommissioning activities, safe management of spent fuel and radioactive waste, investigation of safer nuclear plants concepts and participation in international debate on nuclear safety so as to contribute to improve the global nuclear safety regime. In addition, a proper consideration was given to keep up structures and technical competencies in order to maintain adequate emergency preparedness capabilities, in particular in relation to nuclear accidents potentially affecting reactors located in the neighbouring countries.

The decommissioning of the four Italian NPP's definitely shutdown in the '80s is managed, since 1999, by SO.G.I.N. (Società Gestione Impianti Nucleari) S.p.A., whose single shareholder is the Ministry of Economy. In 2003 also the fuel fabrication and the experimental fuel cycle installations licences were transferred to SO.G.I.N.. The primary mission of SO.G.I.N. is the decommissioning of all Italian nuclear installations according to a single step strategy up to the final state with the unconditional release of the sites (green field), as well as the safe management of the spent fuel and radioactive waste. Strategic and operational directives are given to SO.G.I.N. by the Italian Government.

According to Legislative Decree No. 31/2010, SO.G.I.N. has been also entrusted of siting, construction and operation of the national radioactive waste repository. A special fund allocation for financing all these activities is ensured by means of a specific levy on the price of the electricity.

Until 1999, a safe enclosure strategy had been adopted for the decommissioning of the NPP's after their definitive shutdown. Following the subsequent governmental decision to move into a decommissioning strategy until the unconditional release of the sites in a 20 years period, new plans were submitted by the licensee to the involved authorities for approval and authorization.

At present, the decommissioning licensing processes have been completed for three NPP's and for the remaining Latina NPP the related licence is expected to be granted soon.

The status of the decommissioning activities at the four NPPs is reported in the Annex 1.

Figure 1: Location of Italian NPPs[1]

An important factor to implement the defined decommissioning strategy is represented by the construction and operation of a National Repository for the L-ILW disposal and long term storage of HLW.

As discussed in the previous Reports, difficulties were encountered in the past years in finalising the siting of a National Repository.

Taking this fact into account, in the context of the authorization process of the NPPs decommissioning plans, the competent regulatory authority took the position that before the start up of dismantling activities of the nuclear island, in the case of unavailability of a national facility for radioactive waste storage, the licensee will have to provide adequate on site interim storage capacity for the amount of waste foreseen to be produced. In the absence of a defined perspective on long term radioactive waste management, some local Administrations opposed the construction of on-site temporary radioactive waste storage facilities. This has caused some delay in the timing of the decommissioning and dismantling activities. The legislative decree No. 31/2010 - issued also with the purpose to overcome above mentioned difficulties and in connection with the road map associated to the Agreement on the reprocessing of spent fuel with French Government, described below, identified new general procedures and licensing steps for the implementation of the National Repository for radioactive wastes, providing in

[1] In figure 1 the Latina NPP is indicated as a NPP in shutdown condition according to the definition of the Convention as the decommissioning licence has not been granted yet. It has however to be taken into account that according to national legislation several preliminary decommissioning activities have been conducted or are in progress at the Latina site and that the decommissioning licence is expected soon.

particular a detailed siting procedure with visible milestones of public and stakeholders involvement.

The Legislative decree No. 31/2010 refers to a National Repository of radioactive waste for the disposal of low and intermediate waste and the long term interim storage of high level waste, to be included in a Technological Park.

Policy Developments

Decommissioning policy

No significant changes in the decommissioning policy occurred since the last review meeting.

The current national decommissioning policy was established in 2004 when the Ministry of Economic Development (i.e. Ministerial Decree of December 2004) updated strategic objectives assigned to SO.G.I.N. according to the following main actions:

a) treatment and conditioning into certified form of all liquid and solid wastes, ready to be delivered to the national repository;
b) completion of all the actions needed for satisfying existing spent fuel reprocessing contracts;
c) feasibility evaluation of temporary export of the spent fuel still present in NPPs' for its reprocessing and of interim storage on the sites - evaluation of the short and long term costs, of the safety and environmental protection requirements and of the time needed - implementation of the necessary actions;
d) a single step decommissioning of all nuclear power plants and nuclear fuel cycle facilities pending the operation in due time of a national facility for disposal and long term storage of radioactive waste.

As said, the decommissioning regulatory processes have been completed for three NPPs and for the remaining one, the Latina NPP, the authorization for decommissioning operations is expected to be granted soon.

It is to be noted that the Italian legislation regulates the decommissioning of nuclear installations as a comprehensive set of actions and the authorisations can be granted either in several steps (phases) accomplished in planned and definite intermediate states or in a single phase. The multiple phase approach, however, is accepted on condition that the proposed subdivision into phases is shown to be part of an overall decommissioning plan leading up to the unconditional release of the site (green field) and defining, inter alia, the destination of resulting radioactive

waste. In addition, current regulations require that the decommissioning plans are authorised only after the positive closure of the environmental impact assessment procedure.

On the other hand, the experience resulting from the management of NPP's shutdown since many years clearly indicated some priorities before starting the bulk of the dismantling activities, in particular the need to remove the spent fuel still present in the pools and to manage operational waste (conditioning and storage) already existing on the sites. To this aim, as discussed more in detail in the following sections, the transfer abroad for reprocessing of the spent fuel originated by the past operation of NPPs is close to be completed and several projects aimed at conditioning existing waste are in progress and new interim waste storage facilities on the sites have been realized or planned. These facilities are in several cases also intended to accommodate decommissioning waste for the period between the completion of their conditioning process and their transfer to the National Repository fo radioactive waste to be sited and constructed.

Legislative provisions establish the possibility to authorize specific activities related to decommissioning and dismantling before the approval of the overall decommissioning plan (decommissioning licence), provided that benefits to safety and radiation protection are properly demonstrated and the overall decommissioning plan has been submitted. On this basis, several preliminary decommissioning activities have been therefore conducted on the sites before the granting of the decommissioning licence 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 modification of obsolete equipment to the preliminary dismantling of systems and components. They are however not related to the nuclear island whose dismantling is strictly connected to the availability of adequate storage capacity for the resulting materials. The building and operation of associated interim storage facilities is authorized according to the provisions of the national legislation.

For the NPPs for which the decommissioning licence has been granted several decommissiong projects are in progress or planned, as envisaged in the attachments to the licence.

A new Technical Guide on decommissioning of nuclear installations, based on WENRA Safety Reference Levels and IAEA standards, will be shortly issued by the competent regulatory authority. In this regard it is the case to mention that the compliance with WENRA Safety Reference Levels is however already required in the conditions attached to the decommissioning licences.

Spent fuel management policy

No significant changes in the spent fuel management policy occurred since the last review meeting.

Since the beginning of its nuclear programme, Italy had pursued the option of reprocessing abroad the spent fuel produced in its NPP's. After the political decision to stop all nuclear power activities, the shipments abroad of spent fuel for reprocessing were suspended with the last shipment to UK occurred in 2005, in the frame of a service agreement already in place.

The opposition of local communities to the adoption of an on-site dry storage strategy led the Government to consider again the option of reprocessing abroad the spent fuel still present (Directive of the Ministry of Economic Development, March 2006).

In particular, apart from the Uranium/Thorium fuel stored at the ITREC facility, SO.G.I.N. was charged to establish reprocessing agreements for all the remaining spent fuel presently stored in Italy, including the Italian part of spent fuel resulting from the Superphoenix experience.
Such a decision lead the Inter-Governmental Agreement signed with the French Government on November 26, 2006, which resulted into a contract that SO.G.I.N. S.p.A. assigned to Areva Nc on May 9, 2007. The Agreement envisages the return to Italy of the radioactive waste resulting from the reprocessing activity. In connection with the Agreement a road map has been also defined concerning the timing of the spent fuel transfer operations to France and the return of wastes to Italy, as well as the different actions to be implemented on the legislative and implementation side to make available a storage facility for the waste returning from France.
With regard to the NPPs, spent fuel had been removed from Garigliano and Latina NPPs since many years. The transfer campaign from the Caorso NPP to France for reprocessing was completed in June 2010. The transfer campaign from the Trino NPP site to France for reprocessing was completed in 2015. Spent fuel originated from past operation of NPPs, for a total amount of about 13 tHM, is still present in the Avogadro AFR storage facility and its transfer abroad is expected to be completed soon. Its safe management continues to be performed according to existing licence conditions and technical specifications.

Radioactive waste management policy

No significant changes in the radioactive waste management policy occurred since the last review meeting.

Most of the radioactive waste existing in Italy has been produced in the past operation of the nuclear installations. The main additional waste generated from the operation of NPPs to be managed in the future will come from the decommissioning activities, as well as from the re-entry in Italy of the conditioned high and intermediate level waste resulting from the reprocessing abroad of the spent fuel.

At present, waiting for the availability of a national repository, radioactive waste are being stored in the nuclear installations of origin. Action plans are in progress to enhance the safety level of waste by implementing specific treatment and conditioning projects, by refurbishing existing buildings or by realizing new storage facilities on the sites. New facilities will also be used to ensure temporary storage capacity for waste resulting from decommissioning activities. The implementation status of the above referred action plans is reported in the Annex 1 (list and status of nuclear installations in Italy). In this context, a new Technical Guide on safety criteria for interim storage of radioactive waste and spent fuel will be shortly issued by the competent regulatory authority based on WENRA Safety Reference Levels and IAEA standards. A Technical Guide on safety criteria for near surface disposal facility is under preparation too.

Several initiatives have been taken in the past years to investigate the possible solutions for the siting of a National Repository for radioactive waste.

The already mentioned Legislative Decree No. 31/2010 (articles 27, 28 and 28-*bis*) establishes the following licensing processes:

1. approval of the National Chart of suitable areas
2. approval of the selected site
3. authorization for construction and operation
4. authorization for closure.

In relation to the first phase of *Approval of the National Chart of suitable areas* in June 2014 2014 ISPRA issued the Technical Guide No.29 (*Siting criteria for a near surface disposal facility of low and intermediate level waste*). The guide was issued after a peer review conducted by IAEA and the results of technical exchanges with competent regulatory authorities of France, Belgium, Switzerland and Slovenia. According to the Legislative Decree No. 31/2010, SO.G.I.N., the national implementer responsible for the siting, construction and operation of the National Repository, taking into account the criteria established by ISPRA in the Technical Guide No. 29 (*Siting criteria for a near surface disposal facility of low and intermediate level waste*) and by the IAEA, has prepared a proposal of a national chart of potentially suitable areas. In 2015 this proposal has been verified and validated by ISPRA, which has transmitted the results of its review and assessment to the Ministry of Environment, Land and Sea Protection and to the Ministry of Economic Development. On these bases, and considering any

remark under their own competence, the above Ministries will release to SO.G.I.N. the authorization to publish the proposed chart.

Once the Ministries will grant to SO.G.I.N. the authorization to publish the proposed chart, a national debate will start with the aim to find an agreement with the involved regions. The proposed chart will be published with a preliminary proposal of the National repository project. Within 120 days from the authorization SO.G.I.N. will promote a National Seminar to which all the involved stakeholders will be invited to participate. The Seminar will give the opportunity to discuss in detail all technical aspects related to the National Repository and its associated Technological Park, with particular reference to the compliance of the identified areas with the siting criteria established by the IAEA and ISPRA, as well as all aspects related to the protection of workers, public and the environment.

Taking into account the seminar's outcomes SO.G.I.N. will update its proposal of National Chart and will submit it to the Ministry of Economic Development. With a decree of the Ministry of Economic Development, in agreement with the Ministry of Environment, Land and Sea Protection and the Ministry of Infrastructure and Transport, based upon the technical advice of the competent regulatory authority, the National Chart of suitable areas will be approved.
Based upon the results of detailed investigation carried out, with the supervision of the competent regulatory authority, on one or more sites for which the involved Region/s will have shown a declaration of interest, the implementer will propose a site suitable to host the National Repository which will be submitted for an authorization procedure .

Moreover, 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, also in relation to international standards, has been issued, replacing the old classification in force in Italy provided by the Technical Guide No. 26 ENEA-DISP dating back to 1987, and came into force on August 20, 2015.

Institutional and regulatory framework

In the past three years the following developments regarding the legislative and institutional framework took place.

In 2014, in the context of the transposition into the national legislation of the Council Directive 2011/70/EURATOM, establishing a Community framework for ensuring responsible and safe management of spent fuel and radioactive waste to avoid imposing undue burdens on future generations, the Legislative Decree No. 45 has been issued. With this decree a new competent regulatory authority in the field of nuclear safety and radiation protection has been established, which is the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN), fully

dedicated to the regulation and control in the nuclear field. ISIN is entrusted with the following functions and duties:

- conduct technical assessment connected to licensing procedures and oversight activities of nuclear installations no longer in operation and in decommissioning, of research reactors, of facilities and activities related to the management of radioactive waste and spent fuel, of nuclear materials, of passive physical protection of nuclear materials and facilities, of radiation sources and transport of radioactive materials;
- issue certifications for the transport of radioactive materials foreseen by the in force legislation;
- issue of technical guides and provide support to the competent Ministries for the elaboration of legislative acts;
- provide technical support to the civil protection authorities in the field of radiological and nuclear emergency planning and response;
- implement environmental radioactivity monitoring as envisaged by the current legislation;
- ensure the fulfillment of the obligations of Italy stemming from the international safeguard agreements;
- ensure, in relation to its competencies, the participation in the activities performed by the international organizations and by the European Union, as well the participation to the international and European peer reviews related to the nuclear safety of nuclear installations and to the spent fuel and radwaste management in other countries.

In relation to the structure of ISIN the Legislative Decree n. 45/2014 envisages:

- a *Director,* nominated with a decree of the President of the Republic, designated by the Council of Ministers on the proposal of the Minister of the Environment, Land and Sea Protection in agreement with the Minister of Economic Development, and following the positive advice of Parliamentary Commissions;
- *An Advisory Committee* of 3 members, nominated under the same procedure;
- *Staff of 60 units* of technical personnel, mainly from the Nuclear, Technological and Industrial Department of ISPRA.

The procedure to nominate the Director and the Advisory Committee of the new Inspectorate has been started by the Government and it is envisaged to be completed in the coming months.

According to the same Decree, until the entry into force of ISIN, the functions of competent regulatory authority shall continue to be carried out by the Nuclear, Technological and Industrial Risk Department of ISPRA.

With regard to regulatory and legislative point of view the already mentioned issuing in June 2014 of the Technical Guide n.29 on the siting criteria of a near surface low and intermediate waste disposal facility and of the Ministerial Decree of August 7, 2015, establishing the new classification system of radioactive waste, have to be mentioned.
The ratification in 2015 (Act.No. 58/2015) of the Amendments to the Convention on Physical Protection of nuclear materias and Nuclear Installations has also to be mentioned.
In 2015 Italy has transmitted the first national Report describing how the obligations of the Directive 2009/71/Euratom have been met.

List of Nuclear Installations in Italy

A short description of the status of the four NPPs is reported in Annex 1.

Background historical information on Italian Nuclear Programme are summarised in Annex 2.

Italian Participation in International Activities to Enhance Nuclear Safety

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

Competent Regulatory Authority

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

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

In its Competent Regulatory Authority institutional role, ISPRA is member of ENSREG and actively participates in all the ENSREG activities. In this regard the active participation of ISPRA in the process of the post-Fukushima Peer Review on the Stress Tests is to be mentioned.

In relation to the CNS developments in the post-Fukushima a significant contribution to the Vienna Declaration adopted at the CNS Diplomatic Conference on February 2014 came from the work done by ISPRA under the Italian Presidency in the second semester 2014 at the WPAQ of the Council.

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

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

ISPRA also expects that on next years the production of national nuclear regulation, even remaining a national responsibility, will be largely driven by regional and international contexts. The need of ensuring international participation and the work on correspondingly reviewing the national regulation will require an increase of national resources. Major international references for pursuing the establishing of common safety standards and regulatory practices (global nuclear safety regime) are the IAEA through its policy and the recently established action plan and other international organizations such the OECD/NEA. At EU level, the reference is represented by the current nuclear Safety Directive (2009/71) and the management of spent fuel and of radioactive waste Directive (2011/70). The revision process of the EU Safety Directive proposed by the Commission in the light of the Fukushima accident started on June 2013 led to the amendment of the Directive on July 2014 with the aim of:

- strengthening the role of national regulatory authorities by ensuring their independence from national governments having sufficient legal powers, staff, and financial resources,
- creating a system of peer reviews to be performed every six years on common nuclear safety topics chosen by Member States every six years,
- requiring a safety re-evaluation for all nuclear power plants to be conducted at least once every 10 years,

- increasing transparency between operators and the public to release information both in times of normal operation and in case of incidents.

The deadline for the transposition of the amendment in the national legislation is the mid of August 2017.

It is expected that the Fukushima accident will increase the role of the EU in the nuclear regulatory field. In fact the potential trans-boundary radiological consequences of a nuclear accident could exceed the emergency preparedness and response capability of an even effective cooperation and mutual assistance established between neighbouring countries. This would therefore require both the enhancing of emergency preparedness and response provisions in place in the Member States as well as an appropriate coordination on a large scale which can be ensured only at regional and international level. In our view the EU should take such a regional coordination role to be conceived so to fit with the IAEA international role in the field of emergency preparedness and response.

Among the actions initiated after the Fukushima accident, it should be noted that Italy will host an IRRS mission in the period November 21st – December 2nd 2016. Such a decision responds to the need to comply with the obligation established in the EU Nuclear Safety Directive and with the willing to submit to a third party review the national regulatory system as a tool to promote continuous improvement.

International support programmes

Italy has continued an active technical participation in international cooperation programmes such as the INSC program promoted and funded by the EC - which replaced the former PHARE and TACIS Programs launched on early 90 in the post-Chernobyl - extended to third countries of other regional areas (Balkans, Mediterranean, Latin America, Asia).

Among recent or in progress examples of ISPRA technical participation in such a program, participations in Mexico, Belarus and Kosovo projects in the area of decommissioning and waste management, radiation protection, emergency preparedness and response, knowledge management and communication are to be mentioned. In the same context, training and tutoring activities on decommissioning and waste management performed by ISPRA in the last years at its head quarter and at NPPs sites are also reported.

Equal importance has been traditionally assigned by Italy to bilateral cooperation. In this regard cooperation agreements established in 2010-11 with Regulatory Authorities of Switzerland/ENSI, France/ASN and Slovenia/SNSA in the field of nuclear safety and EP&R are in place. As a relevant example of a long lasting tradition in international bilateral cooperation, a cooperation arrangement on nuclear safety matters with the US.NRC, in place since 1975, has to be mentioned. Later complemented by an Implementing Agreement in nuclear safety research (i.e.

CAMP and CSARP), the latest five-year renewal of such a cooperation took place respectively in 2015 (the Arrangement) and in 2014 (the Implementing Agreement).

In addition to the ISPRA cooperation in the regulatory assistance projects, the national nuclear industry participated both in realisation activities (e.g.: ANSALDO for Cernavodă units in Romania) and for the supply of major components to new reactors (e.g. AP 1000 under construction) and in international tenders for the realisation of new nuclear installations (e.g. ENEL for Bulgarian Belene and Romanian Chernavoda) and of NPPs on-site assistance programmes (e.g. SO.G.I.N. for Armenia/Medzamor, Mexico/Laguna Verde).

ENEL participation in abroad nuclear activities includes 92% of ENDESA, Spain.

A further significant participation of the Italian industry to an international project is represented by CIMOLAI of Pordenone, a steel manufacturing company which fabricated and supplied the arch elements of the NSC for the Chernobyl sarcophagus. The national participation in the international nuclear research projects is primarily ensured by ENEA, involved in particular in EU research programmes.

Section B. Executive Summary

Executive Summary

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

This Report is the seventh National Report. It represents a revision to the sixth Report submitted by Italy on 2013 for the sixth Review Meeting of March 2014. This seventh National Report was prepared in accordance with the *"Guidelines Regarding National Reports under the Convention on Nuclear Safety"*. It contains updated information on matters covered in the previous Reports, noting significant changes occurred in national legislation and practices. It also provide an updated "article-by-article" review. In compliance with the Vienna Declaration adopted by all the Contracting Parties at the Diplomatic Conference held on February 2015, this Report develops also considerations on the applicability to the Italian situation of the safety principles set out in the Declaration, taking into account that all Italian NPPs are in shutdown conditions since the mid-80s. This Report also addresses topics of interest identified in relation to the previous Report during the sixth Review Meeting and provides information on technical issues related to the implementation of the IAEA Action Plan on Nuclear Safety, as applicable to the state of the nuclear installations in Italy.

This report takes into account, in the "article by article" review, also the challenges identified by the Special Rapporteur on post Fukushima issues during the 6th Review Meeting .
Moreover, to answer the questions on Vienna Declaration as listed by Special Rapporteur, in Section E specific considerations are developed, taking into account that no NPP is into operation in Italy and there is no plan to construct new NPPs.

Nuclear installations covered in this National Report are land based civil nuclear power plants under the jurisdiction of the Republic of Italy complying with the definition given under the Article 2i. It has to be considered that such compliance is quite formal; in fact all the four Italian NPPs (Garigliano, Latina, Trino and Caorso NPPs) were definitively shut down about 30 years ago and all the fuel elements have been permanently removed from the plants. At present, the decommissioning licensing processes have been completed for three NPP's and for the remaining Latina NPP the related licence is expected to be granted soon.

Among major developments occurred since the 6th Report it is to be mentioned the establishment by the Legislative Decree 45/2014 of a new Inspectorate for Nuclear Safety and Radioprotection based upon the structures of the Nuclear, Technological and Industrial Risk Department of ISPRA. In the transition period until the new Inspectorate will become operative, functions and duties of the competent regulatory authority for nuclear safety and radiation

protection continue to be performed by the Nuclear, Technological and Industrial Risk Department of ISPRA.
The procedure to nominate the Director and the Advisory Committee of the new Inspectorate has been started by the Government and it is envisaged to be completed in the coming months.

It is expected that in the context of such institutional reorganization the current need to increase the human resources of the competent regulatory authority, in relation to the necessary turn-over of senior experts and the expected increase of regulatory activities, will be addressed .

Among major regulatory developments since the sixth Report, it is reported that authorisation of the overall decommissioning plan has been granted in 2014 for the Caorso NPP. In the light of the above referred authorization, only the Latina NPP still fall under the definition given in Article 2i of the Convention. It is to be noted that several preliminary decommissioning activities are however in progress at the Latina site and that the authorization of the overall decommissioning plan is expected to be granted by the end of the year.

As described in the Report, planned measures on each NPP site, highlighted in the past Review Meeting, are in progress. Decommissioning licences regulate the development of different activities according to specific decommissioning and dismantling projects to be approved by ISPRA. Several activities are reported as being in progress or planned in the NPPs to treat, condition and store radioactive waste.

The updating of Technical Guides by ISPRA to regulate such activities has been conducted; in particular three Technical Guides related to storage of radioactive waste, decommissioning operations and criteria and methodology for clearance of materials are under finalization. They reflect the experience gained in the licensing activities already performed and take into account WENRA reference levels, which are however referred to in the authorization documents. These Guides will be issued following the procedure stated in the national legislation.

With reference to the siting process of the centralized radioactive waste storage and disposal facility, presented in the sixth Report, it is reported that in 2014 ISPRA published a Technical Guide (i.e. TG No. 29) on siting criteria of a near surface disposal facility of low and intermediate level radioactive waste. According to the Legislative Decree No. 31/2010, SO.G.I.N., the national implementer responsible for the siting, construction and operation of the National Repository, taking into account the above criteria and the IAEA recommendations, has prepared a proposal of a national chart of potentially suitable areas. In 2015 this proposal has been verified and validated by ISPRA, which has transmitted the results of its review and assessment to the Ministries of Environment, Land and Sea Protection and of Economic Development. On these bases, and considering any remark falling under their own competence, the above Ministries will release to SO.G.I.N. the authorization to publish the proposed chart.

Following this publication a consultation and participation phase of all involved stakeholders will start, in order to arrive at the identification of the site/s to be subject to detailed investigations and to the final selection of the site where to construct the facility.

A new radioactive waste classification system, more in accordance with international standards, was issued with the Ministerial Decree jointly issued by the Ministry of the Environment , Land and Sea Protection and by Ministry of Economic Development on August 7, 2015. The consequent update of the Technical Guide No.26 on the waste management will follow.

Finally, as strongly encouraged in chapter II item 18 of the INFCIRC/572/rev.5, an IRRS mission will be received by Italy and hosted by ISPRA in the period November 21st - December 2nd 2016 and the related feedback will be reported during the 7th review meeting.

This National Report was prepared on behalf of the Italian Government by the Department for Nuclear, Technological and Industrial Risk of the Italian Institute for the Environmental Protection and Research (ISPRA), which carries out the functions of the national competent regulatory authority in the field of nuclear safety and radioprotection.

Special Rapporteur challenge on how to engage all countries to commit and participate in international cooperation:

Italy is involved in international activities with the aim to engage other countries to commit and participate in international cooperation activities. In this context the initiative launched by the Nuclear Safety and Security Group (NSSG) of G7 to enhance participation in the Convention on Nuclear Safety by all those countries that do not fulfil obligations has to be mentioned.

Section C. Compliance with articles 4 to 19

Article 4. 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 Italian Legislative and Regulatory framework has been long in force (since the early 60^{ties}), as discussed in detail in the first six Reports and summarized in the present Report. It is considered that this framework is quite complete and updated according to the national nuclear programme and EU Directives, taking into account the Vienna Declaration principles. Considering that existing NPPs are in decommissioning and that there is no plan to build new NPPs, no further steps are necessary to implement the obligations of the Convention.

Article 5. Reporting

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

The present Report constitutes the seventh Italian Report issued in compliance with Article 5 of the Convention.

Article 6. Existing Nuclear Installations

Each Contracting Party shall take the appropriate steps to ensure that the safety of nuclear installations existing at the time the Convention enters into force for that Contracting Party is reviewed as soon as possible. When necessary in the context of this Convention, the Contracting Party shall ensure that all reasonably practicable improvements are made as a matter of urgency to upgrade the safety of the nuclear installation. If such upgrading cannot be achieved, plans should be implemented to shut down the nuclear installation as soon as practically possible. The timing of the shut-down may take into account the whole energy context and possible alternatives as well as the social, environmental and economic impact.

6.1 Overview of major events since the last Report

As indicated in all previous Report, Italy decided the shutdown of all its NPPs in 1987. The installations were not shutdown for specific safety reasons but following a decision of the Government taken on the basis of the results of a national referendum.

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

More information on the state of activities performed at NPPs is reported in Annex 1.

For the NPPs of Trino, Garigliano and Caorso the decommissioning license has been granted. The related licensing procedure for Latina NPP is expected to be completed soon.

In the context of the licensing process the overall safety status of the installation is reassessed taking into account the decommissioning operations to be conducted. The decommissioning license also establish specific conditions according to which activities having relevance for nuclear safety and radiation protection have to be approved by the competent regulatory authority on the basis of specific Detailed Projects or Operational Plans with the pertaining safety analysis. The SAR report is also requested to be maintained updated.

On the bases of what is reported in this section, due to the status of the Italian NPPs, which are in decommissioning or in a shutdown condition since many years, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable in the national situation.

Special Rapporteur challenge on how minimize gaps between CP's safety improvements: Italy has actively participated and is still active in many international context to minimize gaps between Contracting Parties safety improvements.

ISPRA, as a member of the Western European Nuclear Regulators Association (WENRA) has actively participated for issues related to decommissioning and waste management in the definition of harmonized safety reference levels and in the associated national benchmarking of its member countries, as basis for harmonisation of basic safety regulations.

ISPRA, as a member of the European Nuclear Safety Regulators Group (ENSREG) has actively participated in many activities as the post-Fukushima Peer Review on the Stress Tests.

Italy has continued an active technical participation in international cooperation programmes, such as the INSC program promoted and funded by the EC, extended to third countries of other regional areas (Balkans, Mediterranean, Latin America, Asia), in the field of decommissioning, waste management, radiation protection, emergency preparedness and response, knowledge management and communication.

Article 7. Legislative and Regulatory Framework

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

7.1 Nuclear safety legislation and regulatory framework

The current Italian legislative and regulatory framework related to nuclear safety and radiation protection is the result of an evolution of rules and provisions that begun in the early 60^{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 Italian regulatory system is made up of three types of rules of different legal force depending on their origin:

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

7.1.1 Legislation and ministerial decrees.

In the Italian regulatory system the source of legally binding rules must be either an Act of Parliament or a Legislative Decree issued by the Government thus empowered by Parliament. The Government can also issue governmental or ministerial decrees binding in law. The practice of laying down numerical limits and minute regulations in decrees issued by the Executive is very frequent in particular areas relative to Radiation Protection. An important feature of legally binding rules concerning Nuclear Safety and Radiation Protection in Italy is that contravention to obligations by operators and/or users constitutes a misdemeanour and

entails a penal sanction; compliance can be enforced by means of criminal proceedings after due process of law.

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

- **Act No. 1860 of 31 December 1962:** published in the Italian Republic's Official Journal No. 27 of 30 January 1963, as amended by the President's Decree No. 1704 of 30 December 1965 and by the President's Decree No. 519 of 10 May 1975;
- **Presidential Decree No. 185 of 1964:** "Safety of plants and protection of workers and general public against the risk of ionising radiation associated to the peaceful use of Nuclear Energy replaced in 1996 by the Legislative Decree No. 230/1995, described below;
- **Act No. 393/1975:** which contains Administrative rules on the selection of the site for NPPs;
- **Presidential Decree No. 1450/1971:** which contains Requirements and procedure for the acquisition of the operational personnel licences;
- **Presidential Decree No. 519/1975:** "Civil responsibilities in the field of nuclear safety";
- **Legislative Decree No. 230/1995:** published in the Supplement to Italian Republic's Official Journal No. 136 of 13 June 1995, which has been in force in Italy since January 1st 1996 - and replaces the Presidential Decree No. 185/1964, the previous radiation protection act -, implements six EURATOM Directives on radiation protection (EURATOM 80/836, 84/467, 84/466, 89/618, 90/641 and 92/3). Legislative Decree No. 230/1995 needs a series of Government and Ministerial Decrees;
- **Legislative Decree No. 241/2000**: which has transposed European Union (EU) directive 96/29/Euratom laying down basic safety standards for the radiation protection of workers and the public; the standards laid down in the directive incorporate the 1990 Recommendations of the International Commission on Radiation Protection (ICRP) into EU radiation protection legislation. Legislative Decree No. 241/2000 has modified and integrated Legislative Decree No. 230/1995, the latter constitutes the main piece of legislation laying down radiation protection requirements for workers and the public;
- **Legislative Decree No. 257/2001:** which modified certain details in Legislative Decree No. 241/2000 concerning requirements for notification and authorisation of non nuclear installations where ionising radiation is used for industrial, research and medical purposes;
- **Legislative Decree No. 23/2009**: which has transposed EU directive 2006/117/Euratom on the supervision and control of shipments of radioactive waste and spent fuel; Legislative Decree No. 23/2009 has modified pertinent administrative provisions previously contained in Legislative Decree No. 230/1995 concerning the transboundary

shipments of radioactive waste. Legislative Decree No. 230/1995 now contains new provisions on the supervision and control of shipments of spent fuel.

- **Act No. 99/2009,** related to the process to start a new nuclear programme, in Article 29, establishes a new Nuclear Safety Agency with the role of Regulatory Body. As already mentioned, the Agency will be made by the resources of the Nuclear Department of ISPRA and by resources from the Agency for New technologies, Energy and sustainable development (ENEA). As said the new Safety Authority has been cancelled in 2011 before becoming operative.
- **Legislative Decree No. 31/2010** The Decree includes provisions for the site selection procedure of the national repository for the long term radioactive waste management, giving the responsibility to SO.G.I.N. and defining the relevant authorization procedure.
- **Legislative Decree No. 185/2011** which transposes the EU Directive 2009/71/Euratom establishing a Community framework for the nuclear safety of nuclear installations. Legislative Decree No. 185/2011 has modified and integrated Legislative Decree No. 230/1995.
- **Law No. 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 strenghtened involvement of local administrations.

- **Legislative Decree No. 45/2014** which transposes the EU Directive 2011/70/EURATOM establishing a community framework for the responsible and safe management of spent fuel and radioactive waste. Legislative Decree No. 45/2014 establishes the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN) as the new competent regulatory authority in the field of nuclear safety and radiation protection and establishes the roadmap for the development of the National Program for radioactive waste and spent fuel management.

- **Joint Ministerial Decree 7/8/2015** which establishes a new classification for radioactive waste more in line with the recommendations of the IAEA standards.

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

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

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

- **Law No. 75/2011** that modifies all the provisions given in the Law No. 99/2009 and in the Legislative Decree No. 31/2010, as amended by the Legislative Decree No.41/2011, concerning the development of new NPP in Italy, relinquishing the nuclear development in Italy. The provisions for the development of the national site for LLW disposal and ILW-HLW interim storage has been confirmed. Furthermore, the Law No. 75/2011, abrogating the Article 9 of the Legislative Decree No. 230 of 1995, slightly modifies the regulatory process by cancelling of the "Technical Commission on Nuclear safety and Radiation Protection". This Commission was entitled to formulate an independent technical advice to ISPRA during the assessment process connected to the granting of licences, authorizations and approval of detailed designs.
- **Law No. 214/2011** that abrogates the Nuclear Safety Agency (created with the Law No. 99/2009, but never applied) and the functions have been temporary assigned to ISPRA (that in fact continue to exploit competent regulatory authority functions) waiting for a definitive asset of the regulatory organization.

A series of Governmental and Ministerial Decrees have also been issued to implement the Act No. 1860/1962 and the Legislative Decree No. 230/1995.

The main functions of the Regulatory Body, as better identified under article 8, were in the past entrusted to the Directorate for Nuclear Safety and Health Protection (DISP) of CNEN, later on ENEA. Such functions, together with staff, technical structures, equipment and financial resources of DISP, were transferred to ANPA and to APAT, now ISPRA, which is therefore now discharging the main functions of national competent regulatory authority, among its other duties concerning the Environmental Protection field.

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

- **Act No. 933/1960:** on the establishment of the National Committee for Nuclear Energy (CNEN);
- **Act No. 84/1982:** on the establishment of the State Agency for new technologies, energy and environment (ENEA);
- **Act No. 61/1994:** on the establishment of the National Agency for the Environment Protection (ANPA).
- **Legislative Decree No. 300/1999 and President of the Republic Decree No.207/2002:** on the establishment of APAT, by merging ANPA with other national Technical Services;
- **Act No. 286/2006:** on the reorganisation of APAT as a legal entity of public administration, endowed with new institutional Organs;
- **Act No. 133/2008:** on the establishment of the Institute for the Environmental Protection and Research (ISPRA);

- **Legislative Decree No. 45/2014:** on the establishment of the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN) as the new competent regulatory authority in the field of nuclear safety and radiation protection.

7.1.2 Technical guides

Issuing of technical guides is assigned to ISPRA, according to article 153 of the Legislative Decree No. 230/1995.

Technical guides set up technical criteria to be taken into account by Operators in the siting of nuclear installations, submittal of specific projects for approval, conduct of operations as well as rules of good practice. Technical guides do not have a mandatory character but, in case of non compliance, the licensee is requested to demonstrate that the safety case fulfil alternative equivalent requirements. Compliance with Technical Guides is assessed during licensing process and inspection activities. A set of 28 technical guides have been issued on Safety and Radiation Protection matters ranging from licensing procedures to detailed technical guidance.

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

The list of the most important Technical Guides is reported in Annex 3. A programme to update these technical guides is under implementation, essentially based on the national action plan established in the framework of WENRA activities related to the development of safety reference levels. The Technical Guide on safety criteria for the siting of a near surface disposal facility for low and intermediate level radioactive waste was issued in June 2014. Draft Technical Guides for decommissioning activities, waste storage and clearance have been developed taking into account past regulatory experience and are expected to be issued by the end of this year according to the procedure defined in the Legislative Decree n. 230/1995 and will be used for regulatory review and assessment activities. A Technical Guide on safety requirements for disposal is also foreseen to be published in the next year.

7.1.3 Technical standards

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

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

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

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

Moreover, in the design, construction and operation of nuclear installations, other rules such as the ones concerning fire fighting, pressure components integrity, labour and health are applied. Among the other, foreign technical standards are often adopted and endorsed, on a case by case basis.
A wider list of the main different rules which comprise national Legal and Regulatory framework is reported in Annex 3.

7.2 National safety requirements and regulations for radiation safety

Information reported under article 7.1 and in Annex 4 provide a comprehensive picture of the national safety requirements and regulation for radiation safety.

7.3 Licensing System

Article 6 of Act No. 1860/1962 establishes that the operation of nuclear installations has to be authorized by the Ministry of Industry (now Ministry of Economic Development). Authorization is granted according to provisions established in Title VII of the Legislative Decree n. 230 of 1995, based upon the technical advice of ISPRA, which is formulated as result of the assessment of the safety case developed by the applicant. Title VII also define the licensing procedure relevant for each phase of the nuclear installation life (i.e. from siting to decommissioning). In relation to the current status of all the nuclear installations, the decommissioning licensing procedure is hereinafter described in detail.

7.3.1 Licensing process for decommissioning

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

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,Land and Sea Protection, 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, 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 licence 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.

Scheme in figure 2 shows the licensing process for the decommissioning of nuclear installations.

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 structure, 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 (DP) and Plans of Operations (PO)* to be approved by ISPRA before performing specific activities. The decommissioning project list can be updated if necessary.

The information to be included in DPs and POs are described in Technical Guide No. 4 issued by ISPRA and 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 to ISPRA one or more reports describing the performed activities and the final state of the site;
- the Ministry of Economic Development, in consultation with ISPRA and other involved administrations, issues a Decree with technical specifications related to the status of the installation and the site at the end of the operation.

After an application for the decommissioning licence 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.

7.4 Regulatory Inspection and Assessment

The purpose of the regulatory inspections during the NPPs life (from the construction to the decommissioning) is to verify the fulfilment of the rules coming from the Legislative Decree No. 230/1995 and of the technical specifications which are part of the licence conditions for the specific plant.

According to Art. 10 of the Legislative Decree No. 230/1995, inspections are performed by ISPRA inspectors having the authority to enter any area of the installation, as well as to have access to any relevant documentation. In case of infringement of specific rules of the nuclear act and licence conditions, including technical specifications, ISPRA inspectors are entitled to report to the public attorney of the jurisdiction which the installation belongs to. The purpose of such inspections is to verify the fulfilment of binding rules having legal relevance. Plant walk-down are also frequently performed by other ISPRA technicians with the purpose of achieving data, information and other technically relevant elements to be evaluated with respect to technical regulations. Inspection activities may be ordinary (planned in advance for each technical area) or extraordinary.

ISPRA is entrusted with general inspection powers for 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 installations deemed to be non compliant with relevant provisions laid down in law.

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

The Italian compliance and inspection system is based upon the fact that legislation provides for penal sanctions in cases of non compliance; inspectors are required under law to communicate every case of non compliance to the Office of Public Prosecution.

Review and assessment of applicant documentation are performed by ISPRA that formulate binding technical specifications taking into account observations of other relevant ministries (Ministries of Environment, Interior, Labour and Health) and the Region concerned.

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

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

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

The review and assessment of the documentation submitted is performed through national and international safety standards and national regulations (IAEA, ISO, UNI, ASME, IEEE, ASTM, NUREG, National Technical Guides), and the implementation of the their outcomes are verified by frequent surveillance walking down on the plant and onsite inspections.

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

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

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

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

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

7.5 Enforcement

Article 58 of Legislative Decree No. 230/1995 establishes 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.

Enforcement of applicable regulations and of licence conditions is ensured on the bases of the sanction system as established in Title V of the Law n. 1860 and in Title XI of Legislative Decree 230/1995. According to Art. 10 of Legislative Decree No. 230/1995, ISPRA Inspectors have the authority to request any information they deem relevant to ascertain the compliance of the activities performed at the nuclear installations with the requirements established in the Legislative Decree and in the licence conditions. Inspectors are entitled to report the results of their inspections to the public attorney of the jurisdiction the nuclear installation belongs to.

7.6 Assessment of Compliance

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

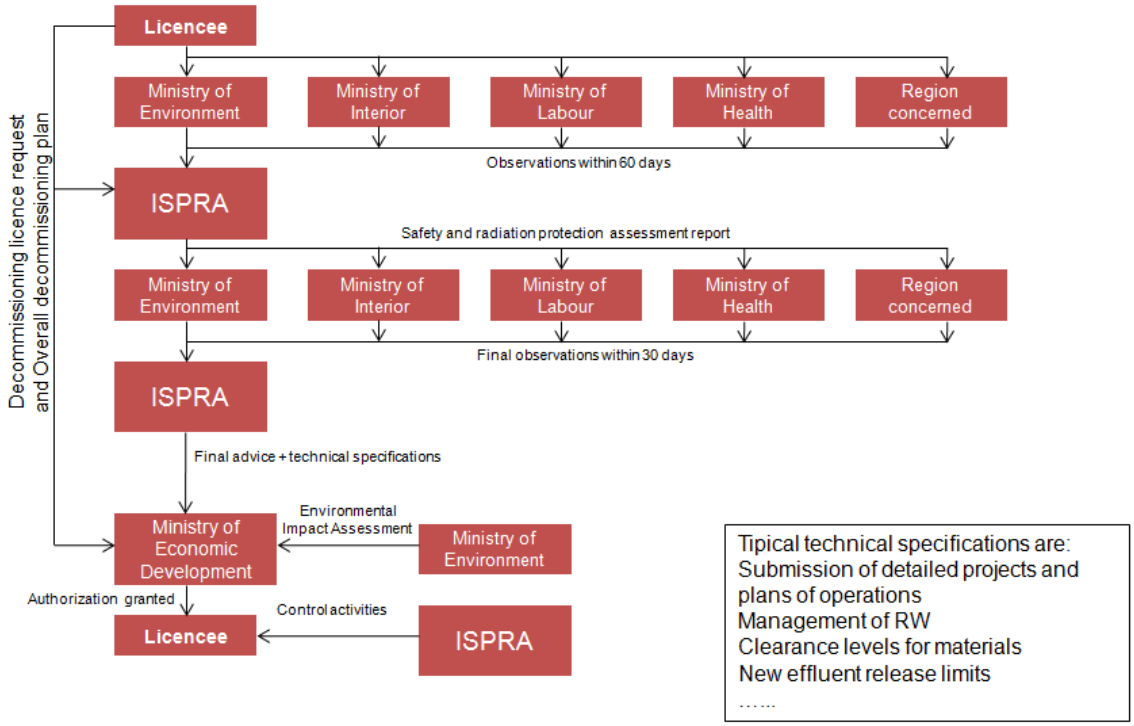

Figure 2: decommissioning licensing process for the nuclear installations

Article 8. Regulatory Body

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

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

8.1 Authorities responsible for the application of the legislative framework

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

a) The Ministry of Economic Development, in this report defined as the Licensing Body, is the authority which grants the licence/authorization for nuclear installations (from the design and construction to the decommissioning). Authorizations are granted on the basis of the technical advice provided by the competent regulatory authority (Nuclear, Technological and Industrial Risk Department of ISPRA – National Institute for Environmental Protection and Research) and in agreement with the Ministries of Environment, Land and Sea Protection, Interior, Labour, Health and the Region concerned, after the issuing of the environmental compatibility statement by the Ministry of the Environment, Land and Sea Protection, when applicable;

b) The Nuclear, Technological and Industrial Risk Department of ISPRA, in this report defined as the competent regulatory authority, is the governmental body currently responsible for the assessment and the inspection activities on nuclear installations, as well as for approving detailed designs of specific activities, which are part of authorizations granted by the Ministry of Economic Development, for the construction of nuclear facilities and the implementation of a their modifications, as well as the implementation of decommissioning projects as established in the decommissioning licence. ISPRA supervises the compliance with the requirements established in the legislation and the conditions and specifications established in the Ministerial authorization decrees throughout its inspection activity. 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.

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

In the following scheme the current national regulatory system in the field of nuclear safety and radiation protection is showed (Figure 3).

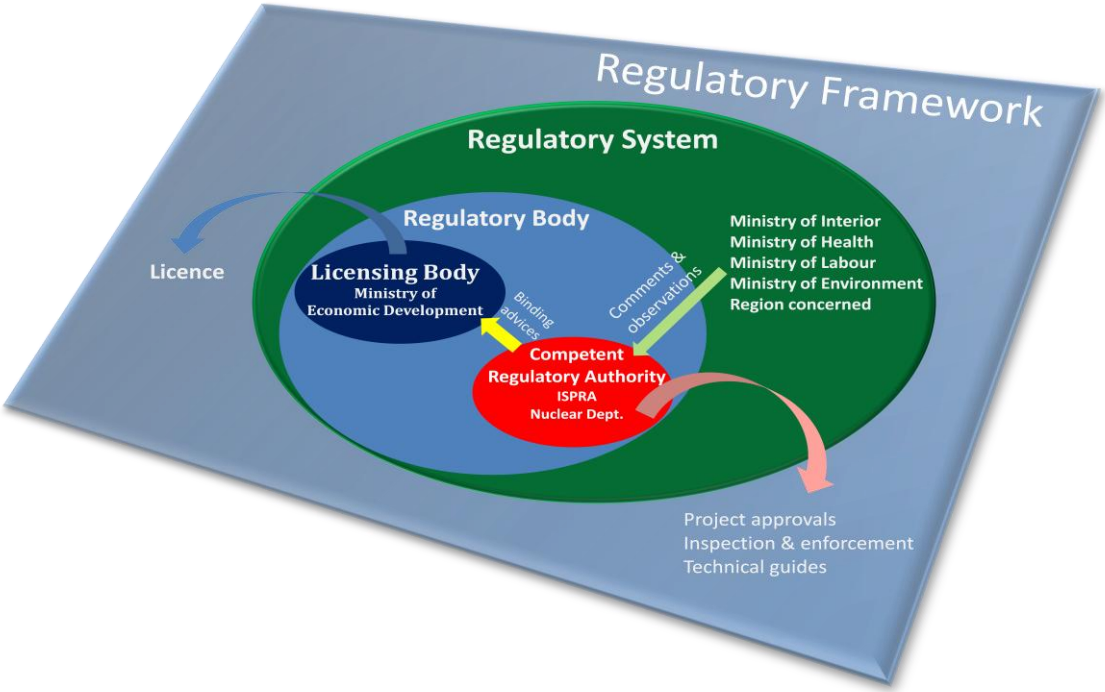

Figure 3: Regulatory system in the field of nuclear safety and radiation protection

As said in Section A of this Report, in 2014 the Legislative Decree No. 45 established a new competent regulatory authority in the field of nuclear safety and radiation protection, which is the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN), fully dedicated to the regulation and control in the nuclear field.

In relation to the structure of ISIN the Legislative Decree n. 45/2014 envisages:

- a *Director,* nominated with a decree of the President of the Republic, designated by the Council of Ministers based upon the proposal of the Minister of the Environment in agreement with the Minister of Economic Development, and following the positive advice of Parliamentary Commissions
- *An Advisory Committee* of 3 mambers, nominated under the same procedure
- *Staff of 60 units* of technical personnel, mainly from the Nuclear, Technological and Industrial Department of ISPRA

ISIN will have regulatory, operational and administrative independence and the possibility to get technical support of third, independent, expert organisations (in particular ISPRA and regional agencies for environmental protection). The new Inspectorate financial resources will consist of the resources currently allocated to the Nuclear, Technological and Industrial Risk Department of ISPRA, and the resources coming from the fees that ISIN is authorized to apply and collect from the licence holders for the exploitation of its regulatory functions.

The procedure to nominate the Director and the Advisory Committee of the new Inspectorate has been started by the Government and it is envisaged to be completed in the coming months. In the transition period until the new Inspectorate will become operative, functions and duties of the competent regulatory authority for nuclear safety and radiation protection continue to be performed by the Nuclear, Technological and Industrial Risk Department of ISPRA.

In relation to the key role played by competent regulatory authority in the licensing process and in the oversight of nuclear activities, and taking also into account the significant effort planned at national level in the fields of spent fuel and radioactive waste management and decommissioning, as well as nuclear safety related activities required by a new regional and international context, also as a consequence of the Fukushima accident, there is the need to increase existing human resources. Actions in this regard need to be implemented in the near future for primarily coping with a process of retirement of the current senior experts, so as to ensure the preservation of existing competencies as well as to ensure an adequate coverage in the future of all the regulatory functions relevant for the safe management of radioactive waste and decommissioning and for the increased regional and international obligations on nuclear safety and radiation protection matter.

This increase is expected to take place in the context of the envisaged institutional reorganization mentioned above.

8.2 Independence of the regulatory function

The national nuclear Implementer involved in the decommissioning and in the spent fuel and radioactive waste management is SO.G.I.N. S.p.A., whose only shareholder is the Ministry of Economy and Finance, while the strategic and operational directives are given by the Ministry of Economic Development.

As previously said, licences are granted by the Ministry of Economic Development on the basis of the binding technical advice of ISPRA. ISPRA performs its regulatory functions in a fully independent and autonomous manner. ISPRA is, in fact, an institute reporting to the Ministry of Environment, Land and Sea Protection and is independent from any entity involved in the promotion and use of nuclear energy.

Moreover, any approval of specific safety related technical designs and operations are granted by ISPRA, which may establish technical specifications.

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

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

For the future institutional asset when ISIN will become operative, the procedure of nomination of the Director and of the members of the Advisory Committee envisages a positive advice of the Parliamentary Commissions and a decree of the President of the Republic, which by itself implies a “de jure” further strengthening of the independence of the competent regulatory authority. As said, ISIN has regulatory, operational and administrative autonomy and is responsible of nuclear safety and radiation protection in the national territory. ISIN is also entitled to transmit a yearly report to the Government and the Parliament on the status of nuclear safety.

8.3 Assessment of Compliance

On the bases of what is reported in this section it may be concluded that Italy has adequate provisions to fulfil its obligations under Art. 8 of the Convention related to independence of the competent regulatory authority.

With regard to financial and human resources assigned to the competent regulatory authority, specific actions to increase the number of available personnel are expected to be undertaken in the context of the planned institutional reorganization.

Special Rapporteur challenge on how to improve regulator's independence, safety culture, transparency and openness

The current institutional allocation of the competent regulatory authority (Nuclear Department of ISPRA) meets the requirements of independence of the regulatory functions from any other body concerned with the promotion or utilization of nuclear energy. Moreover, it is expected that the independence of the competent regulatory authority from undue pressure on its decision making process will be further strengthen with the establishment of the new Inspectorate on Nuclear Safety and Radiation Protection, whose Board will be nominated with a Decree of the President of the Republic, on the basis of the positive advise of Parliamentary Commissions.

As referred in the previous Reports and in the introductory session of this Report, Italy has traditionally been active in international nuclear cooperation within IAEA, OECD/NEA, G7, EU and FORATOM as well as in bilateral contexts. An active contribution to these activities is considered to be important for the promotion and the updating the nuclear safety culture at national level.

Moreover, to accomplish the obligations of public information and transparency different tools are used by ISPRA to ensure public information and transparency the Regions concerned in nuclear activities promote periodic meetings (so called "Transparency meetings") between the stakeholders (licensee, regulator, local communities and nongovernmental organizations) to update ongoing projects on the site and to answer questions from local communities and nongovernmental organizations. ISPRA actively participates to these meetings to report about the results of its regulatory activities and on the status of the safety of each installation. Relevant information are also published in the web site.

Article 9. Responsibility of the licence holder

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

9.1 Responsibility of the licence holder

According to Act No. 1860/1962 and the Presidential Decree No. 519/1975, the primary responsibility for safety is assigned to the licence holder. This is more clearly stated by art. 1 of the Legislative Decree No. 185/2011, which transposed the EU Directive on nuclear safety into the national legislation by amending the Legislative decree n. 230/1995.

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

The regulatory system in place also ensures that appropriate supervision activity is exploited by ISPRA to verify that the licence holder properly meets its responsibility.

9.2 Ensuring that the licence holder meets its responsibility for safety

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

1. the analysis of the safety reports and other relevant documents, the analysis on the results of tests and measurements, the performance of additional or repeated tests;
2. the inspection system, in order to verify compliance with applicable rules and constraints at all stages from design to operation of facilities as well as during the phases of decommissioning and during all stages of the management of the spent fuel and radioactive waste;
3. the performance of periodic audits to the Applicant and to the Licensee for the purpose of verifying, inter alia, that Licensee maintains the capability in terms of staffing and competences adequate to completely undertake the activities during the lifetime of the facility from siting to decommissioning. Periodic audits to manufacturers, and suppliers in general were also conceived as an indirect tool of control of the Applicant and of the Licensee activities;
4. the sanctions in case of non compliance either with provisions in Law or prescriptions in the licensing acts range from penal to administrative measures. The former may entail deprivation of freedom and fines, the latter consists in suspensions or revocation of the licences in worst cases. The penal sanctions are applied by Courts following reports from Inspectors entitled as police officers in the Italian system. 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 technical specifications.

9.3 Assessment of compliance

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

Article 10. Priority to safety

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

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

All the national Organisations have continued to operate with the only aim of maintaining the safety of the shut-down nuclear installations in view of their decommissioning.
The principle of priority to safety is clearly addressed in art. 58-*bis,* paragraph 1 of Legislative Decree No.230/1995 as amended.

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

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

- Legislative Corpus itself, which imposes a multi-step licensing process;
- General design criteria, requiring, inter alia, the application of the defence in depth principle;
- Regulatory guides, as referred in Annex 3;
- Preliminary, Intermediate and Final Safety Reports;
- Detailed designs;
- Quality Assurance Programmes;
- Safety relevant works Operational Rules;
- Technical Specifications;
- Operating Manual (e.g.: Procedures for normal and emergency condition);
- State exams for Operator Licences and State Certification for Plant Managers;
- Periodic assessment and reporting of performances;
- Inspections.

Since the inception of the Italian Nuclear Programme, the licence holder operates, maintains and modifies the systems of the nuclear power station by assigning the highest priority to the nuclear safety and so keeping the consequential risk to the public as low as reasonably achievable, economic and social considerations being taken into account; this basic principle was implemented even before it was laid down, significantly in art. 2 of Legislative Decree No. 230/1995. On the operation side, the license holder is required by Law to set up a special Plant Safety Committee at each nuclear installation site, which has the responsibility to examine all the relevant decisions (e.g.: plant hardware or procedures modifications), in order to identify their safety relevance.

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

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

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

10.1 Assessment of compliance

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

Article 11. Financial and human resources

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

11.1 Financial resources

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

Every year SO.G.I.N. shall submit to the National Regulatory Authority for the Electricity, Gas and Water an updated report on technical and economic plans for the decommissioning projects. The yearly reports have also to contain an update of the decommissioning plans and of cost estimates. The levy on kWh, paid by the final users, is adjusted every 3 months. In this way, possible additional costs due to changes of strategies and the activities needed for safety reasons, can be endorsed by the National Regulatory Authority for the Electricity, Gas and Water. Efficiency criteria related to the program management and to the progress of activities are taken into account in performing such adjustments. In the second quarter of 2016 the levy has been about 1 % of the kWh price and equal to about 6 Euro/year to the average electrical consumer.

The main component of the total decommissioning costs is the waste management and, in particular, the waste disposal cost, which strongly depends on the fees that will be required for

the disposal in the final repository. The following activities were taken into account in the decommissioning scope:

- Site care and safe management
- Project management and licensing
- On-site interim storage of spent fuel;
- Structure, systems and components decontamination aiming at maximizing conditional and unconditional recycling, re-use or free release;
- Radioactive waste treatment including volume reduction (e.g. compaction) ;
- Conditioning and packaging of historical/operational waste, e.g. sludge, ion-exchange resins as well as decommissioning waste;
- Dismantlement of power reactor/fuel cycle facility civil structures;
- Dismantlement of conventional plant buildings, e.g. turbine hall;
- Radioactive waste disposal;
- Disposal or recycling of non-radioactive waste material;
- Final site surveys;
- De-licensing of the site.

11.2 Human Resources

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

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

National Laws state that the operating personnel for the NPPs must follow an appropriate training programme and their capacity to operate in a nuclear installation must be certificated. Qualified positions in the staff of the NPPs are approved by the Regulatory Body together with the Operation Rules. To certificate the operator qualification, many examinations must be passed by each person. The qualified expert must be recorded in the national professional register of qualified experts at level 3 (the highest one) as defined in annex V of Legislative Decree 230/95

Implementation of additional concepts associated to the SMS will be required by ISPRA through the updating of pertinent Technical Guides.

Today, staff qualification requirements for decommissioning and radioactive waste and spent fuel activities are the main focus of human resources management. Technical and operating staff undertake training regarding technical and legal issues, according to the specific policy of

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

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

RMS has been operating since 2008, providing education and training to the staff of SO.G.I.N. Group and external companies. in accordance with international safety standards and requirements established by the Italian Safety Authority. In this way SO.G.I.N. intends to achieve thehighest levels of safety in the field of decommissioning and radioactive waste management.

The Radwaste Management School aims to:

- train SO.G.I.N. 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, the Radwaste Management School has developed a series of partnerships with certified national and international training organizations, research & development institutes, universities and scientific associations in order to integrate educational programs.

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

For the educational and training of the SO.G.I.N. Group staff, RMS currently provides around 80 courses, for a total of about 30,000 hours, in the following technical and scientific subjects: Nuclear Safety and Security, Decommissioning and Waste Management, Radiation Protection, Environmental aspects of decommissioning, Safety Compliance, Nuclear Plant Technology.

11.3 Assessment of compliance

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

Article 12. Human factors

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

12.1 Methods to prevent, detect and correct human errors

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

Safety relevant work Organization Rules

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

Procedures development

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

Operator Training

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

Good understanding and clarity of Technical Specifications (TS)

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

12.2 Managerial and organizational issues

According to the Italian law, the licence holder has to submit to the approval of the competent regulatory authority the organisational rules related to safety relevant works to be carried out in the installations. This document has to specify the organisation and functions of the staff under both normal and abnormal conditions, including the physical and medical surveillance of radiation protection at all modes of operation.

The competent regulatory authority has defined a Technical Guide on the contents of the safety relevant work Organisation Rules with several specific criteria for the approval of the Operator's document.

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

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

12.3 Safety culture and Safety Management System (SMS) and associated surveillance rules

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

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

Promotion and share of adequate behaviors among the personnel are the fundamental goals of SO.G.I.N.'s Radwaste Management School. In particular, in 2008 SO.G.I.N. first set up, after a Safety Culture Survey, a training course focused on safety culture among workers and managers in order to improve knowledge about human and organizational factors related to work and nuclear safety. This is a dynamic course, based on an interactive approach where teachers become coordinators of brainstorming sessions during which students, divided into work groups, participate in simulations aimed at making players aware of their roles in improving the organization's safety culture. The training course lasts two and half days. Participants are around 15 for each class. Involvement of managers and workers and of technical and administrative people gives classes the chance to interact in an actual and effective way in order to exploit team's potentialities to address complex challenges represented by safety culture continuous improvement.

At the end of the course, students take part in a collective discussion in which each of them expresses his/her feelings and opinions about simulations, role-playing and interactions with the other participants and the actions he/she is thinking of taking to contribute to the improvement of his/her organization's safety culture.

The main goal of courses is to enhance knowledge and develop awareness of the importance of each individual's personal contribution to safety culture improvement among workers and

managers. Contractors are also involved in training sessions focused in particular on waste management, radiation protection and safety issues related to decommissioning activities.
Training courses on Operational Experience Feedback are also carried out in order to provide SO.G.I.N.'s personnel tools and methods suitable for Root Cause Analysis according to SO.G.I.N.'s Safety Management System.
Furthermore, SO.G.I.N.'s Radwaste Management School is going to implement a Knowledge Management System - based on international best practices - which will facilitate sharing of information, technical expertise and analysis methodologies with a particular focus on safety issues. In this way, SO.G.I.N. guarantees continuous improvement and updating of know-how and capabilities within the organization management systems.
Finally, SO.G.I.N.'s safety experts and trainers participate to workgroups and technical meetings organized by IAEA and other international agencies and scientific associations with the aim to be continuously updated about safety issues and share assessment and improvement methodologies with nuclear experts of different countries. A short list of some examples of international participations is shown below:

- October 2009 Participation at annual meeting of Incident Reporting System IAEA-NEA coordinators
- June 2010 Participation in IAEA Conference on Operational Experience Feedback
- October 2011 Participation in Technical Meeting on Safety Culture Improvement Methodologies and in Workshop on Methods on Safety Culture Self Assessment organized by IAEA
- May 2013 Presentation of speech "Interactive training: a methodology for improving Safety Culture" at International Experts' Meeting on Human and Organizational Factors in Nuclear Safety in the Light of the Accident at the Fukushima Daiichi Nuclear Power Plant organized by IAEA
- November 2013 Presentation of speech "Training labs: a way for improving Safety Culture" at Topical Embedded Meeting "Risk Management for Complex Socio-Technical Systems" organized by the American Nuclear Society (ANS) within the ANS National Meeting
- November 2015 Chairing and presentation of speech "Complexity and safety. Training methodologies for developing a systemic vision" at the Technical Meeting on Developing Improvement Programmes for Safety Culture organized by IAEA
- November 2015 Presentation of speech "Training methodologies for safety and security culture continuous improvement" at the 2nd International CBRNe Workshop "IW CBRNe 2015" organized by Tor Vergata University of Rome, Italy
- February 2016 Presentation of paper "Knowledge management methodologies for improving safety culture" at the International Conference on Human and Organizational

Aspects of Assuring Nuclear Safety – Exploring 30 Years of Safety Culture organized by IAEA

12.4 Role of the Competent Regulatory Authority and of the Operator regarding Human Performances issues

The competent regulatory authority, in the frame of its general duties, is also responsible for the controls on the training system and conducts the examinations on SO.G.I.N. operators working in nuclear installations.
ISPRA established criteria for a self-corrective quality system, that has to be effective at various levels along the vertical axis of the operating organisation.

Plant Management Level

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

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

Also the recent safety strategic project to be performed by the Implementer SO.G.I.N. for responding to ISPRA requirements, will ensure that the capabilities and potential drawbacks in human performance are properly taken into account, with special regard to decommissioning activities to be performed in the future.

12.5 Assessment of compliance

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

Article 13. Quality assurance

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

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 since 70's and 80's, in the frame of a more general programme of development of technical guides to support the regulation of installations of the national nuclear programme. On the bases of the requirements established in the technical guides, licensees developed proper QA General programmes for conduct of operation and/or Quality Procedures Guidelines/Instructions under the supervision of the competent regulatory authority. Reference to a list of the major Technical Guides developed by the competent regulatory authority in matter of Quality Assurance is reported in Annex 3.

For installations which have submitted the request of licence for the decommissioning plan, conditions attached to the licence will establish the requirements for the licensee to perform the decommissioning activities according to a QA programme to be submitted and approved by the competent regulatory authority.

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 No. 4 related to the standard content of applications for detailed design of relevant parts of nuclear installations) are applied. In particular, an adequate demonstration with regard to quality assurance related aspects is requested to be provided by the licensee in the specific safety case, developed according to the Technical Guide No. 1, submitted to support the authorization.

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

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

Also for the establishment and the implementation of Q.A. safety requirements, the process put in place in Italy is a development process similar to the other safety requirements.

13.1 Regulatory control

In addition to the issuing of the above listed Technical Guides, the regulatory control during the licensing process is based on the analysis and review of QA Programmes submitted by the Applicant.

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

13.2 Assessment of compliance

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

Article 14. Assessment and verification of safety

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

i. comprehensive and systematic safety assessments are carried out before the construction and commissioning of a nuclear installation and throughout its life. Such assessments shall be well documented, subsequently updated in the light of operating experience and significant new safety information, and reviewed under the authority of the regulatory body;

ii. verification by analysis, surveillance, testing and inspection is carried out to ensure that the physical state and the operation of a nuclear installation continue to be in accordance with its design, applicable national safety requirements, and operational limits and conditions.

It has to be said that in relation to the decommissioning state of all NPPs, the preservation of high level safety conditions remains one of the key objectives of the regulatory oversight activity. In addition to that special attention is devoted by the competent regulatory authority to verify that the licensee performs in due time waste conditioning, final spent fuel management and dismantling activities relevant to improve safety, perform any activity in compliance with safety and radiation protection requirements and produces adequately conditioned radioactive wastes.

It has to be highlighted that following their definitive shutdown, preservation of high level safety conditions was primarily based on maintaining of rules established for operation, even though progressively adapted, according to a graded approach, as required by the new plants' state. As previously referred, the decommissioning license has been granted for Trino, Garigliano and Caorso NPPs while the authorisation process for Latina NPP will follow in 2016-17. In particular, due to said uncertainties on the availability of a national radioactive waste repository in short times, ISPRA, in the framework of the authorization process, has clearly underlined the need for the identification, with the associated feasibility demonstration, of a clear strategy concerning the management and safe storage of radioactive wastes already existing and estimated to be generated during decommissioning activities. Among the alternative solutions to the current unavailability of a national facility for radioactive waste management, the construction of interim storage facilities for radioactive waste on site or the shift to a safe enclosure state of the remaining structures (e.g. as in the case of the Latina NPP core graphite structure) have been considered.

On that basis, being the programmes of decommissioning structured in three main stages (Annex 5) primarily addressed to safety priority interventions and preliminary operations, dismantlement of the nuclear island, final radiological survey and site release, the respective authorizations are granted as:

- a general permit to pursue the overall decommissioning in the frame of a specific set of criteria and constraints;
- specific permits for well defined short term activities;
- a request to present specific decommissioning projects for the subsequent relevant activities, for which a detailed definition is not yet available.

In this respect, the safety case documentation submitted for the decommissioning is addressed to define the selected decommissioning strategy, to provide a description of the plant state, the radiological characterization of the plant as well as the safety assessment in relation to abnormal events or accidents, the demonstration of technical feasibility of the proposed operations in compliance with nuclear safety and radiation protection requirements are presented. This is considered to be at the appropriate level of detail for a licensing process involving Authorities such as Ministries and Local Administrations, in accordance with the applicable articles of the Legislative Decree No. 230/95 and taking into account the long lasting time necessary for the development of decommissioning operations**.**
Taking that into account the decommissioning license establishes:

- a set of conditions and limits “specifications” either at management and technical level which will regulate the performance of the decommissioning operations up to their completion;
- a number of safety relevant decommissioning projects to be submitted to the approval of the regulatory authority.

In particular, a decommissioning project can be articulated in a “Detailed Project”, in the case of new installations necessary for the implementation of the authorized decommissioning strategy are concerned (e.g. new RW storage facilities, RW on-site treatment facilities, etc.). In case dismantling activities are concerned specific “Plans of Operations” are requested to be submitted to the competent regulatory authority’s approval.

Licensing documentation related to detailed projects and operational plans has to contain specific sections on safety assessment of pertaining decommissioning activities.

Taking also into account that the planned decommissioning operations will have a long lasting time of development, it is envisaged the need of defining those safety related activities whose detailed designs, with associated safety analysis, have to be submitted to ISPRA for approval. In fact, for instance, the acceptability of design requirements for facilities to be built (i.e. storage facilities and systems), as well as of dismantling techniques and methods in line with the international state of the art, deserves adequate in depth review.

In this regard, on the basis of the lessons learned from Fukushima, it is mentioned that for the new interim waste storage facilities under construction at the NPPs sites a verification of existing margins against seismic events and an increased protection against flooding are requested in the licensing process.

A meaningful example refers to the complexity of the issue of the unconditional release of materials resulting from decommissioning; it is recognised that this activity must be duly prepared, well in advance, both from regulatory and licensee side. Appropriate clearance levels are identified and specific radiological characterization plans and procedures for radiometric verifications established. Qualified measuring laboratories have to be selected or set up in some cases and on site measuring capabilities have to be timely prepared.

Given the specific situation, it is also considered of outmost importance to maintain large margins for on-site waste storage capacity. In fact, the routine waste production for long periods, the possible unexpected needs of interventions on aged structures, the possible interventions on the wastes themselves (re-treatment/conditioning) call for the availability of large spare areas.

With the aim to provide an updating on the measures in place ensuring the maintenance of the safety and radiation protection provisions on all installations, specific information are reported in the Annex 1.

14.1 Assessment of compliance

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

Article 15. Radiation protection

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

15.1 Legislation and Regulatory Framework

The main Acts that regulate radiation protection matters is the Legislative Decree No. 230/1995 and subsequent modifications, as previously described in Article 7.1.

It must be said beforehand that the text of Legislative Decree No. 230/1995 was written in 1990s in order to enact the transposition of six EURATOM directives previously issued by the European Union and to profit from the wealth of past operational experience in radiation protection. During the preparation of Legislative Decree No. 230/1995, the International Commission for Radiological Protection (ICRP) issued its new recommendations in Publication No. 60 of 1991, of which one of the most important features was new dose limits for workers and public. The Italian Authorities decided to enact the new dose limits recommended by ICRP Publication No. 60 even though the European Union had not yet issued at the time a directive to that effect.

Legislative Decree No. 230/1995 was modified by Legislative Decrees No. 241/2000 and No. 257/2001, in order to implement the Euratom Directive 96/29. The Legislative Decree regulates every aspect of the radiation protection in nuclear installations and in non nuclear installations or facilities (accelerators, irradiators, hospitals and other medical uses of radiation sources); it contains thirteen Technical Annexes. A series of Governmental and Ministerial Decrees have also been issued in implementation of the Legislative Decree No. 230/1995.

The Law established the ALARA principle as required by Euratom Directives and fixes dose limits for workers and public even more restrictive than those required by such a Directive.

In relation to NPPs decommissioning activities all operations as described in the decommissioning plan, and in more detail in the implementation Detailed Projects and Plans of Operations have to contain specific sections on the envisaged radiation protection programme, including doses evaluation and proper demonstration of the implementation of ALARA principle.

A detailed description of the Italian radiation protection system is provided in the Annex 4.

15.2 Assessment of compliance

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

Article 16. Emergency preparedness

i. Each Contracting Party shall take the appropriate steps to ensure that there are on-site and off-site emergency plans that are routinely tested for nuclear installations and cover the activities to be carried out in the event of an emergency.
   For any new nuclear installation, such plans shall be prepared and tested before it commences operation above a low power level agreed by the regulatory body.

ii. Each Contracting Party shall take the appropriate steps to ensure that, insofar as they are likely to be affected by a radiological emergency, its own population and the competent authorities of the States in the vicinity of the nuclear installation are provided with appropriate information for emergency planning and response.

iii. Contracting Parties which do not have a nuclear installation on their territory, insofar as they are likely to be affected in the event of a radiological emergency at a nuclear installation in the vicinity, shall take the appropriate steps for the preparation and testing of emergency plans for their territory that cover the activities to be carried out in the event of such an emergency.

16.1 On-site and off-site emergency plans

The off-site emergency planning at nuclear installations as far as that at national level are regulated in Italy by the provisions reported in Articles 115 to 135 of the Legislative Decree No. 230/1995 and subsequent amendments. In addition, the Act No. 225/1992 and subsequent amendments, which establishes the National Service of Civil Protection and is the general legislation governing emergency preparedness and response management in all cases of accidental events and disasters of any nature, is also 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 No. 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 Operational Manual of the plant, 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 Committee of delegates for plant safety, 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.

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

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 Article 116 of the Legislative Decree No. 230/1995 and subsequent amendments, 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 (hazard assessment) are established by the Licensee and reviewed by the competent regulatory authority. The plan is prepared taking into account the provisions reported in the Law No. 225/1992 and subsequent amendments.

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, as well as for the presence of foreign nuclear powered vessels in the Italian harbours.

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

For the nuclear installation under the decommissioning process, the off-site emergency plan shall be periodically reviewed and resized with reference to the progress of the different phases of the decommissioning process until its final withdrawal.

A first updating of the off-site emergency plan is performed in the initial phase of the decommissioning process, following the authorization of the decommissioning plan, and in any case, following the removal of spent fuel from the site. This updating is based on safety analysis of the accident scenarios postulated for all the activities provided for the authorized whole decommissioning process.

It should also be mentioned that specific emergency plans are prepared, under the coordination of the Prefect of the province from which the transport will start, for the activity of transport abroad of spent fuel for reprocessing, 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 where potential consequences of postulated reference events could affect larger parts of the national territory, provisions of the article 121 of the Legislative Decree No. 230/1995 and subsequent amendment concerning the National Plan on Radiological Emergencies, apply as discussed in the following paragraph.

16.2 National Plan against Radiological Emergency

Provisions of Article 121 of the Legislative Decree No. 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 of emergency situations at undetermined location in the territory.

The rationale behind the updating of the nuclear national planning, the postulated reference scenario and the assessment of the accident consequences, as well as the main features of the revised plan and the emergency response organization provided for were described in the previous 6th National Report (2013).

It has to be mentioned that the current version of the national emergency plan has been developed taking into account information provided by the neighbouring countries authorities. Italian organisations involved in the implementation of the national plan, regularly participate in emergency exercises organized at international level by EU (ECURIE), IAEA (EMERCON) and OECD/NEA (INEX). Within the framework of bilateral agreements, the participation is extended to the national exercises organized by neighbouring countries (participation to Swiss national exercise of nuclear emergency in 2013 and 2015, 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 also established proper provisions to

fulfil the requirements of European Union Council Decision No. 87/600/Euratom regarding the urgent exchange of information in case of radiological emergency.

16.3 Bilateral Cooperation

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

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

Agreement with Switzerland

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

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

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

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

Arrangement between ASN (France) and ISPRA

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

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

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

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

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

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

Arrangement 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 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.

16.4 Assessment of compliance

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

Special Rapporteur challenge on how achieve harmonized emergency plans and response measures:

Italy considers the harmonization of the emergency response to a nuclear accident with transboundary effects, the key challenge for the upgrading of the current national and international emergency arrangements.

In this regard, the participation to the initiatives that international organization as well as the nuclear safety and radiation protection communities are promoting to this purposes, is assured by the competent regulatory authority.

With reference to the national framework, ISPRA is committed to making the so called HERCA-WENRA Approach known among organizations having a role in the national radiological emergency plan. In particular, with the civil protection authorities as a preparatory activity for the next review of the national plan.

On the international field, this matter will be discussed within the framework of the bilateral agreements with neighbouring countries. To this aim, the establishment of bilateral arrangements based on the HERCA document “Guidance for bilateral arrangements” will provide the bases for the implementation of the HERCA-WENRA Approach.

Moreover, very valuable has to be considered the participation to the national nuclear emergency exercises of the neighbouring countries. The accident scenarios played in this

exercises should reproduce the condition requiring cross-border response in order to put under test the coordination level of the response provided by the different national plans and the harmonization extent of the bilateral and multilateral arrangements.

As far as the European Union, countries are committed in transposing and implementing the new EU Basic Safety Standards, Council Directive 2013/59/Euratom. This process provides an opportunity to improve the existing arrangements, enhancing international cooperation concerning the management of an emergency with cross-border consequences and achieving thus greater coherence of EPR in the EU.

Article 17. Siting

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

i. for evaluating all relevant site-related factors likely to affect the safety of a nuclear installation for its projected lifetime;
ii. for evaluating the likely safety impact of a proposed nuclear installation on individuals, society and the environment;
iii. for re-evaluating as necessary all relevant factors referred to in sub-paragraphs (i) and (ii) so as to ensure the continued safety acceptability of the nuclear installation;
iv. for consulting Contracting Parties in the vicinity of a proposed nuclear installation, insofar as they are likely to be affected by that installation and, upon request providing the necessary information to such Contracting Parties, in order to enable them to evaluate and make their own assessment of the likely safety impact on their own territory of the nuclear installation.

Due to the status of the Italian NPPs, which are in a shutdown condition since many years, the requirements set out in the Convention are not directly applicable. It has however to be mentioned that existing legal provisions (namely Law 1860 of 1962 and the Legislative Decree No. 230 of 1995), provide the adequate basis to comply with the requirements established in this Article of the Convention.

Article 18. Design and construction

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

i. the design and construction of a nuclear installation provides for several reliable levels and methods of protection (defence in depth) against the release of radioactive materials, with a view to preventing the occurrence of accidents and to mitigating their radiological consequences should they occur;

ii. the technologies incorporated in the design and construction of a nuclear installation are proven by experience or qualified by testing or analysis;

iii. the design of a nuclear installation allows for reliable, stable and easily manageable operation, with specific consideration of human factors and the man-machine interface.

Due to the status of the Italian NPPs, which are in decommissioning or in shutdown condition since many years, the requirements set out in the Convention are not directly applicable. It has however to be mentioned that that existing legal provisions (namely Law 1860 of 1962 and the Legislative Decree No. 230 of 1995), provide the adequate basis to comply with the requirements established in this Article of the Convention. On the bases of what is reported in this section, the principles stated in the Vienna Declaration adopted on 9 February 2015 are not directly applicable in the national situation.

Article 19. Operation

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

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

Due to the status of the Italian NPPs, which are in decommissioning or in shutdown condition since many years, the requirements set out in the Convention are not directly applicable. It has however to be mentioned that that existing legal provisions (namely Law 1860 of 1962 and the Legislative Decree No. 230 of 1995), provide the adequate basis to comply with the

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

Special Rapporteur challenge on how to make better use of operating and regulatory experience, and international peer review services:

Italy participates in many international peer review services/activities:

- experts from ISPRA participate actively in the IRRS missions;
- Italy will receive an IRRS mission, hosted by ISPRA, in the period November 21st – December 2nd 2016. Such an activity responds to the need to comply with the obligation established in the Safety Directive and with the willing to submit to a third party review the national regulatory system;
- Italy participates in the EU ENSREG activities and, in this regard, the active participation of ISPRA in the process of the post-Fukushima Peer Review on the Stress Tests has to be mentioned.

Section D. Topics of interest from the 6th review meeting

D. Topics of interest from the 6th review meeting

1. Transition of the regulatory functions from ISPRA to the new Inspectorate for Nuclear Safety and Radiation Protection (ISIN)

In 2014, Legislative Decree No. 45 established a new competent regulatory authority in the field of nuclear safety and radiation protection, which is the National Inspectorate for Nuclear Safety and Radiation Protection (ISIN), fully dedicated to the regulation and control in the nuclear field. The enactment of further legislative provisions is required for the full and formal establishment of the new competent regulatory authority. The procedure to nominate the Director and the Advisory Committee of the new Inspectorate has been started by the Government and it is envisaged to be completed in the coming months.

According to the same Decree, until the entry into force of ISIN, the functions of competent regulatory authority shall continue to be carried out by the Nuclear, Technological and Industrial Risk Department of ISPRA.

It has to be considered that the new competent regulatory authority ISIN will be established on the basis of ISPRA Nuclear Department existing structure which has operated for many years as competent regulatory authority. It is expected that this will help in the transition process.

2. Complete the process of siting and construction of national waste repository for disposal of low and intermediate level waste and long term storage of high level waste

In June 2014 ISPRA has issued the Technical Guide No. 29 *"Siting criteria for near surface disposal facility for low and intermediate level waste*". Based on this criteria and also taking into account the IAEA recommendations, SO.G.I.N. the national implementer has prepared a national chart of potentially suitable area for the siting of the National Repository. Following the procedure laid down in the Legislative Decree No. 31/2010 as amended, in 2015 the proposed chart has been verified and validated by ISPRA, which has transmitted the positive results of its assessment to the Ministries of Environment, Land and Sea Protection and Economic Development. On these bases, and considering any remark falling under their own competence, the above Ministries will release to SO.G.I.N. the authorization to publish the proposed chart.

After the publication, a consultation phase with the public and all involved stakeholders, including a national seminar, will take place. It is envisaged to reach the selection of one or more sites to perform detailed investigation, following a procedure based on a declaration of interest by involved Regions.

A Technical Guide on safety criteria for near surface disposal facility is under preparation.

3. Generation transition and knowledge management

Legislative Decree n.45/2014 art.6 par. 6 states the ISIN's resources of personnel amount to 60 persons of proven competence in the fields relevant for the Inspectorate's functions.

The Legislative Decree also states that ISIN ensures, through appropriate educational and upgrading tools, the preservation and development of the competences of its own personnel in the field of nuclear safety and radiation protection, giving them also the possibility to follow, if necessary, specific upgrading training courses, to face the needs of the National Program for the management of spent fuel and radioactive waste referred to under Art. 7.

It is expected that the generation transition issues will be addressed once ISIN will be established.

At the present ISPRA is taking care of knowledge management of the current personnel based upon training on the job and participation on activities of international fora.

4. Preparation of IRRS mission

Italy will receive an IRRS mission, hosted by ISPRA, in the period November 21st – December 2nd 2016. With this mission Italy will also comply with the obligation established in the EU nuclear Safety Directive and with the willing to submit to a third party review the national regulatory system. The Nuclear, Technological and Industrial Risk Department of ISPRA has completed the IRRS Self-Assessment and the advanced Reference Material will be transmitted to the AIEA before mid of September 2016.

Section E. Questions from the Special Rapporteur on the implementation of the Vienna Declaration

E. Answers to the questions from the Special Rapporteur on the implementation of the Vienna Declaration

As mentioned in the previous sections of the report, due to the status of the four Italian NPPs, to be decommissioned, for three of them (Trino, Garigliano and Caorso) the decommissioning licence has been granted according to the national legislation, for Latina NPP the related licensing process is close to be completed. In the mean time several preliminary activities have been conducted or are in progress.

Taking also into account that the construction of new NPPs is not foreseen (a Referendum held on June 2011 definitely sanctioned the abandon of the nuclear power development programme in Italy), it is considered that the Vienna Declaration principles are not directly applicable.

However, to maintain high safety levels, safety assessment of existing NPP are performed every time changes on SSCs are performed and applied taking into account the development of decommissioning activities. The assessments are performed taking into account national and international standards and national regulations (ISO, UNI, ASME, IEEE, ASTM, NUREG, National Technical Guides), and the implementation of the their outcomes are verified by frequent surveillance walking down on the plants and onsite inspections.

Section F. Lessons learned from Fukushima nuclear accident

F.1 Lessons learned from Fukushima nuclear accident

On the basis of the lessons learned from Fukushima accident, no further improvements have been introduced respect those described in the previous 6th National Report.

Section G. List of acronyms

AFR	Away From Reactor
ALARA	As Low As Reasonably Achievable
ANPA	National Environmental Protection Agency
APAT	National Agency for the Environment Protection and Technical Services
BWR	Boiling Water Reactor
CEI	Comitato Elettrotecnico Italiano
CEVaD	Centre for Data Elaboration and Evaluation
CIPE	Inter-Ministerial Committee for Economic Planning
DISP	Nuclear Safety and Health Protection Directorate
ENEA	Agency for New Technologies, Energy and Environment
ENEL	National Electricity Company
GCR	Gas Cooled Reactor
IAEA	International Atomic Energy Agency
ICRP	International Commission on Radiological Protection
ISPESL	National Prevention and Workers Safety Institute
ISPRA	National Institute for Environmental Protection and Research
LWR	Light Water Reactor
NEA	Nuclear Energy Agency of OECD
OECD	Organisation for Economic Co-operation and Development
PUN	Italian Nuclear Unified Project
PWR	Pressurised Water Reactor
QA	Quality Assurance
SCART	Safety Culture Assessment Review Team
SO.G.I.N.	Nuclear Installations Management Company
SMS	Safety Management System
TC	Technical Commission for Nuclear Safety and Health Protection
TMI	Three Mile Island NPP
TS	Technical Specification
UNI	Ente Nazionale Italiano di Unificazione
WENRA	Western European Nuclear Regulators Association

Section H. Annexes

Annex 1 – List and status of nuclear installations in Italy

The main general data of the four Italian nuclear installations are reported in the following table.

Name & Location	Type	Owner and licensee	(MWe)	Date of start up		Shut down
				First criticality	Comm. Operation	
Garigliano[2]	BWR	(Enel) SO.G.I.N.	160	05/06/1963	01/01/1964	08/08/1978
Latina	**GCR**	**(Enel)** SO.G.I.N.	**210 (160)[3]**	**27/12/1962**	**01/01/1964**	**26/11/1986**
Caorso[1]	BWR	(Enel) SO.G.I.N.	882	31/12/1977	28/11/1981	24/10/1986
Trino[1]	PWR	(Enel) SO.G.I.N.	270	21/06/1964	01/01/1965	21/03/1987

A.1.1 Garigliano NPP

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

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

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

In 1985-1987, the nuclear fuel (about 300.000 TBq) was moved from the plant, to the independent Avogadro pool in Saluggia (VC), for long term wet storage. Furthermore, extensive radwaste management activities related to low level solid technological contaminated radwaste were accomplished through treatment processes based on compaction and supercompaction, the high activity level liquid process radwaste (from the reactor water chemical cycle) through conditioning by cementation, and activated solid wastes through cementation. The generated wastes have been stored in the turbine building and in other structures on the plant site.

[2] Even if no longer considered as nuclear installations, information regarding Garigliano, Trino and Caorso NPPs is reported for seek of completeness

[3] the power was reduced with respect to the design value

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

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

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

In September 2012 the overall decommissioning licence has been granted to Garigliano NPP based on the immediate dismantling, single step strategy.

The following activities have been completed in the site:

- new access to controlled area,
- removal of asbestos from the containment,
- refurbishment of the pre-existing diesel generator building in a structure for interim storage of radioactive waste,
- realization of the “D1” new 1-module structure for interim storage of radioactive waste (as a modification of the 4-modules project previously mentioned),
- remediation of two (out of three) underground trenches used for storage of very low level technological radwaste.

Implementation in progress of the following projects:

- demolition of the old stack and erection of a new one,
- construction of a new radwaste system to manage the future decommissioning operations waste,
- realization of a new water supply system in order to demolish of the piezometric tower,
- completion of the remediation of remaining underground trenche used for storage of very low level technological radwaste,
- adjustment and recovery of reactor building systems needed for decommissioning,

- adjustment and recovery of turbine building systems needed for dismantling of thermal cycle and electric system components (turbine, generator, condenser, heater, steam pipes and valves,..);

The realization projects of new radioactive waste storage facilities by refurbishments of existing buildings are under regulatory assessment.

Other relevant activities made in regard of plant decommissioning or maintaining the plant safety include: updating of the plant SAR, fire prevention and protection programme, updating of plant operation and management documentation, improvement or replacement or restoration of obsolescent equipment (i.e. fire lines and pumps, liquid radwaste discharge line, change of on-site electrical power sources).

A.1.2 Trino NPP

The “Enrico Fermi” NPP**,** a 270 MWe PWR plant supplied by Westinghouse, is located in the northern Italy, in the territory of Trino Vercellese (VC), on the left bank of the PO river. It was operated by Enel from 1965 to 1987. Its operation was smooth, with the exception of two prolonged interruptions for implementation of important safety upgrades. After final shutdown, imposed by the Government after the Chernobyl accident, the decision was taken to put the plant in the safe storage condition in view of future decommissioning. In 1992 the reactor was defuelled. All fresh fuel and most of irradiated fuel was successively removed from the plant. The remaining limited amount of spent fuel, about 15 tHM, has been transferred abroad for reprocessing in 2015.

In August 2012 the overall decommissioning licence, based on one phase strategy until the unconditional release of the site has been granted to the Trino NPP.

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

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

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

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

The following activities have been completed in the site:

- shipment of all remaining spent fuel abroad,
- restoration of reactor building ventilation system,
- treatment of LLW.

The realization of a radioactive waste buffer building by demolition of an existing building is in progress.

The following projects are under regulatory assessment:

- refurbishment of the two existing interim storage facilities,
- treatment by Wet Oxidation process of the primary system resins and subsequent conditioning by cementation of the waste resulting from the oxidation process.
- upgrading of the radwaste system to manage the future decommissioning operations.

A.1.3 Caorso NPP

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

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

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

The following activities have been completed in the site:

- decontamination of the circulation loops and of the clean up system has been completed on February 2004,
- dismantling activities of RHR towers were competed in 2009 while the dismantling of thermal cycle and electric system components (turbine, generator, condenser, heater, steam pipes and valves,..) in turbine building and off-gas system respectively ended in 2009 and 2013,

- in May 2010, ISPRA granted the permission to put into operation the Phadec plant for the chemicals decontamination of metallic materials, deriving from the dismantling inside the turbine and Off-Gas buildings,
- in June 2010 the activities for removal and transport of all the spent fuel that were started in December 2007 for a total of 1032 spent fuel elements were completed,
- the over reduction of volumes of about 600 drums of technological radioactive wastes with 1.2 GBq of total radioactivity,
- on the bases of an international contract signed from SO.G.I.N. with Sweden company (Studvick) for the supply of treatment and conditioning services for operational radioactive wastes, in the period between July 2011 and May 2012, was carried out sending 355 ton of low activity wastes (1.84 GBq) of Caorso NNP to be incinerated and put up in the cement matrix. In August 2013 wastes treated and conditioned returned to the site.

At present the radioactive waste (about 2490 m^3, 2065 m^3 of which is still to be conditioned) is stored in the three storage facilities of the NPP site. 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, a new conditioning campaign has to be performed. The relevant general project has been approved by the competent regulatory authority.

Implementation has to begin for the following approved projects:

- realization of the waste management facility and storage buffer area in the turbine building.

The following main projects/plans of operations are under regulatory assessment:

- treatment and conditioning of resins and sludge by incineration and subsequent conditioning of the waste resulting from the incineration process;
- refurbishment of existing interim storage facilities.

A.1.4 Latina NPP

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

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

About decommissioning strategy, the initial safe storage strategy has recently switched to two phases decommissioning. The first phase foresees the putting in conservation of reactor building and the filling of the new temporary repository.

The second phase, to be implemented only after the siting and construction of the national repository, foresees the dismantling of all plant structures with the purpose to reach the green field end state.

The plant is currently operated under a licence issued in 1991 that establishes the procedures for the operability of safety relevant systems, radwaste management, public and workers radiological protection and environmental monitoring.

An overall plan for the decommissioning of Latina was applied by SO.G.I.N. and is currently under review by ISPRA. The licensing procedure is expected to be completed by 2016.

Some dismantling activities have already been performed in the last few years:

- commissioning of an the interim storage facility;
- removal of large components stored in the spent fuel pond.

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

- construction of LECO facility for conditioning of radioactive sludge,
- repackaging of rock wool,
- removal and decontamination of shells blower.

The following projects are under regulatory assessment:

- construction of a station for the treatment of materials derived from dismantling activities,
- new radwaste facility (ITEA),
- spent fuel pool sludge and water processing,
- spent fuel pool decontamination.

The decommissioning licence is expected to be granted in 2017.

Annex 2 – Background historical information on the past Italian nuclear programme

Commercial utilisation of nuclear power in Italy started in 1964 and within 1981 four nuclear power plants, namely the NPPs of Garigliano (BWR), Latina (Gas Grafite), Trino (PWR) and Caorso (BWR), and a LEU fuel fabrication installation (Fabbricazioni Nucleari S.p.A.) had been commissioned.

During that period, an extensive R&D programme on the nuclear fuel cycle was developed by the Nuclear Energy Research Agency (CNEN) - now the National Agency for New Technology, Energy and the Environment (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 definively shut down based on a governmental decision which in such a way interpreted the results of a national referendum called upon after the Chernobyl accident. The NPP of Garigliano had been already shut down in 1978, for technical reasons.

At the same time, the nuclear programme was closed, the Interministerial Committee for the Economical Planning (CIPE) required the National Electricity Company (Enel S.p.A.) to start the decommissioning of the NPPs and a “safe storage” (IAEA level 1/2) option was adopted.

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

The spent fuel and the largest part of the radioactive waste to be managed in Italy derive from the operation of the above mentioned NPPs and fuel cycle facilities. As far as spent fuel is concerned, part of that has already been transferred abroad for reprocessing (namely the fuel of Latina and part of the fuel of Garigliano and Trino NPPs). In the framework of the Inter-Governmental reprocessing agreement referred in the policy section (2006-07) the transfer abroad of the remaining amount of fuel still in Italy is close to be completed. According to said agreement, the treated and conditioned waste resulting from the reprocessing will be returned to Italy.

The technical guidance and standards that at the early 60ties were initially assumed as reference for the design, construction and operation of NPPs were essentially the ones developed in the Country where the specific technology was originated. The reasons for that are easily understandable if one thinks that NPPs had a US and UK origin.

A long process of assimilation into the main stream of the industrial and regulatory practices has been taking place since the inception of the Italian nuclear program. The results of that assimilation process developed into an indigenous conception of the safety and radiation protection criteria. In this context it must be remarked that radiation protection concepts such as justification and optimisation were long in use even before the formal introduction into the legislative corpus of rules. Moreover, in the 80ties, some specific Italian requirements were introduced into a new homogeneous corpus establishing general criteria and requirements applicable to pressurised light water reactors. That process lead to an approach that resulted in establishing integration between safety and radiation protection requirements. Full use of probabilistic assessments was required by applicants for demonstration of having met the radioprotection objectives in terms of doses to members of the public for the entire spectrum of operational scenarios (including transients and accidents).

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

Annex 3 – List of acts, decrees, regulations, guides and standards

a) Acts and Decrees

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

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

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

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

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

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

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

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

Legislative Decree No. 230 of 17 March 1995: published in the Supplement to Italian Republic's Official Journal No. 136 of 13 June 1995, which has been in force in Italy since January 1st 1996 - and replaces the Presidential Decree No. 185/1964, the previous radiation protection act - implements six EURATOM Directives on radiation protection (EURATOM 80/836, 84/467, 84/466, 89/618, 90/641 and 92/3). Legislative Decree No. 230 needs a series of Government and Ministerial Decrees;

Act No. 10 of 19th January 1998: promulgated for the ratification of the Convention on Nuclear Safety;

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

Legislative Decree No. 241 of 26th May 2000: which has transposed EU (European Union) directive 96/29/Euratom laying down basic safety standards for the radiation protection of workers and the public; the standards laid down in the directive incorporate the 1990 Recommendations of the International Commission on Radiation Protection (ICRP)

into EU radiation protection legislation. Decree No. 241 has modified and integrated Legislative Decree No. 230 of 1995, the latter constitutes the main piece of legislation laying down radiation protection requirements for workers and the public;

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

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

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

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

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

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

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

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

Act No. 99/2009, related to the process to start a new nuclear programme, in Article 29, establishes a new Nuclear Safety Agency with the role of Regulatory Body. As already mentioned, the Agency will be made by the resources of the Nuclear Department of ISPRA and by resources from the Agency for New technologies, Energy and sustainable

development (ENEA). The full establishment of this new Safety Authority has, however, still to be completed.

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

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

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

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

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

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

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

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

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

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

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

b) Technical guides - Selected APAT 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. No. 1	"Content of the Preliminary Safety Analysis Report for NPPs, pursuant to article No.36 of the Legislative Decree No. 2301995 ";
T.G. No. 2	"Procedure for the Authorisation of Changes in NPPs";
T.G. No. 4	"Implementation of the article No.41 of the Legislative Decree No.230/1995 --Detailed Construction Designs";
T.G. No. 8	"Quality Assurance Criteria for NPPs";
T.G. No. 9	"Quality Assurance Description of the documentation required for design and construction phases prior to carry out nuclear tests";
T.G. No. 11	"Criteria for the compilation of information reports on the operation of NPPs to be sent to DISP";
T.G. No. 20	"Quality Assurance Description of the documentation required for operation phase of NPPs";
T.G. No. 21	"Content of Operating Rules";
T.G. No. 22	"Quality Assurance. Guide for collection, storage, preservation, and safekeeping of quality assurance records for NPPs";
T.G. No. 23	"Quality Assurance. Guide for procurement of Items and Services for NPPs";

T.G. No. 24	"Quality Assurance. Guide for Auditing on QA Programmes for NPPs";

T. G. No. 25	"Quality Assurance. Guide for Applying on design activities for NPPs";
T. G. No. 26	"Radioactive Waste Management;
T. G. No. 27	"In-service Inspection";
T. G. No. 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 a 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, that 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";
UNI11193 (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 aquisition, 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.

Annex 4 – Additional information on safety and radiation protection rules

As referred in Article 15, the radiation protection in Italy is regulated by the Legislative Decree 230/1995 and its modifications.

It has to be considered that in 2017 the COUNCIL DIRECTIVE 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom, will have to be transposed in the National legislative system.

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.

A.4.1 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.

A.4.2 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.

As previously said, since the promulgation in 1964 of the first Radiation Protection Decree it had been a practice in the authorisation 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").

A.4.3 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.

A.4.4 Radiological safety objectives and Authorised 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.

A.4.5 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.

A.4.6 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.

A.4.7 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.

A.4.8 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:

The 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;

The 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.

Annex 5 – Structure of the comprehensive decommissioning plan

According to the reference legislative provisions, the comprehensive decommissioning plan that SO.G.I.N. has submitted for each NPP, covers the operations lasting from the preliminary activities until the site release and is structured in three main stages as hereinafter summarized.

First stage:

a) interventions, partly already in progress, aimed at improving safety conditions, such as:

- enhancing physical protection;
- removing spent fuel from nuclear island;
- treating and conditioning of radioactive waste generated during past operation;
- removing structures and material implying conventional risks (e.g. asbestos, unsafe structures).

b) design and implementation of activities which can facilitate subsequent decommissioning operations, such as:

- dismantling parts of the plants not contaminated or with low contamination;
- construction of temporary storage repositories;
- installation of new ventilation systems;
- refurbishment of safety systems revealing ageing problems.

Second stage: dismantling of the nuclear island, decontamination of buildings, completion of waste treatment; interim storage of waste in the site

Third stage: following the availability of the National Repository, completion of buildings' demolition, performing the final radiological survey and site release.

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