The Italian Activities in the Field of Nuclear Waste Management - 12439

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ABSTRACT

The Italian situation in the field of nuclear waste management is characterized by a relative small quantity of wastes, as a consequence of the giving up of energy production by nuclear generation in 1986. Notwithstanding this situation, Italy is a unique case study since the country needs to undertake the final decommissioning of four shut-down NPPs (size 100-200 MWe), each one different from the others. Therefore all the regulatory, technical, and financial actions are needed in the same way as if there was actual nuclear generation. Furthermore, the various non-power generating applications of nuclear energy still require management, a legal framework, a regulatory body, an industrial structure, and technical know-how.

INTRODUCTION

Electrical energy production in Italy from nuclear power was stopped in 1986 following an emotional vote in a referendum after the Chernobyl nuclear accident, which led to the decision of an interministerial commission to stop the production in the units which were in operation, and to suspend the building activities in Montalto di Castro, a 1000 MWe BWR, which was 80% complete. This decision had as the consequence that nuclear technology was abandoned without any economic consideration, of whether the fleet had to be under operation for at least the amortization period, to generate positive cash flows to pay decommissioning and the waste storage and disposal costs.

At that time, four nuclear power plants (NPPs) were in operation. They were designed with different processes and their power was small compared to the present NPPs size, i.e. Trino, a 270 MWe PWR, connected to the grid on 10/22/64, Garigliano, a 160 MWe BWR, 1964 and stopped in 1978, Latina, a 210 MWe GCR Magnox, 05/13/63 stopped in July 1986, Caorso a 840 MWe BWR, 05/23/78, which was considered the first real commercial Italian NPP but was operated for 7 years and produced 29 TWh of electric energy.

The amount of low-activity waste both from decommissioning activities and non-nuclear power activities (e.g. hospitals, industry) to be disposed in a surface repository is about 80-90.000 m^3 wastes. As far as high activity wastes are concerned, 5-6.000 m^3 would need to be disposed of in a geologic facility. Both types would require interim storage.

At the moment, the country has no interim storage facility. This should be implemented within the next few years, and will require good progress of the regulatory framework and the involvement of our well-known internationally firms in the business of the waste management area.

DISCUSSION

Wastes from nuclear power production

The waste quantities to be managed are currently still on the same sites from which they were generated (see Fig.1). Some spent fuel was sent abroad for reprocessing and the resulting vitrified high level waste returned to Italy. Table 1 lists the quantities etc.

Fig 1. Map of the sites in which nuclear wastes are stored.

Table I. Spent fuel under SOGIN responsibility [1].

Spent fuel under SOGIN responsibility (courtesy of SOGIN)					
Owner		**Q.ty n° Elem.**	**tHM**	**Act. Location**	**Destination**
Ex ENEL	TRINO	47	14,5	TRINO NPP	Reprocessing
	TRINO	49	15,1	Saluggia-Avogadro	Reprocessing
	Garigliano	259	53,3	Saluggia-Avogadro	Reprocessing
	Garigliano	63	12,9	Saluggia-Avogadro	Reprocessing
	Caorso	1032	190,4	Caorso NPP	Reprocessing
	Superphenix	Ca. 252	62	Superphenix NPP	Reprocessing

Ex-ENEA	Elk-River	64	1,7	Trisaia-Itrec	
	Trino	52	2,0	Saluggia-Eurex	Reprocessing
	Garigliano	1	0,06	Saluggia-Avogadro	Reprocessing
	Vario	bars	0,17	Casaccia	Reprocessing
Total			352,13		

Under the Italian Legislative Decree 79/99, the so-called “Bersani” law regarding the liberalization of the electricity market, SOGIN (SOcietà per la Gestione Impianti Nucleari) was created in November 1999 which included ENEL (the main Italian electric utility, the second in Europe) nuclear experience and the ownership of the four NPPs. Since 2003, SOGIN took over the responsibility of the previous ENEA (Italian National Agency for New Tecnologies, Energy, and Sustainable Economic Development) plants for fuel cycle activities.

The SOGIN mission is 1) decommissioning of the power plants and the installations and the closing of the fuel cycle, 2) keeping in safe condition during the decommissioning phase, 3) developing activities in the area of interest with other stakeholders.

SOGIN is a state-owned company. Its shares are owned by Ministry of Economic Affairs and the Company is supervised by Ministry of Economic Development, while the activity programs are approved by the Electricity and Gas Authority, and is funded through a percentage of the electricity bills. The company manages funds transferred by ENEL, accumulated during the previous NPP operations to finance the decommissioning phase.

The preliminary projects for decommissioning have been completed and submitted to the various institutions. Whilst approval of the projects and procedures for dismantling the “nuclear islands” are awaited, the demolition of the conventional systems has started. It involves buildings and components (e.g., the Latina turbines and Trino cooling towers) and, in some cases, with specific permits, contaminated components and auxiliaries of the thermal cycle.

The actual situation is:

- Italy currently has no final repository for LILW and HLW;
- Generally, wastes are stored temporarily on-site. Medical and industrial LLW are stored at several locations.
- Spent fuel is being reprocessed in the UK and in France. ENEA initiated efforts for siting and designing a national repository since the ‘90s and created a Task Force that produced a large number of studies.
- In 2003, in a wider effort to address nuclear issues, the Italian Government started a siting process (Scanzano Ionico was identified as appropriate site), but the initiative could not reach the objective due to local opposition.

- The urgent need for Italy to possess a disposal site, at least for LILW, led Government to restart the process.
- The two most important legislative acts are: Law 99/09 and legislative Decree 31/2010. After one year of intense debate, the Italian Parliament approved the Law 23 July 2009, n. 99.

Law 99/2009, that entered into force on 15 August 2009, contained the fundamental principles of the new Italian nuclear legal framework:

- Art. 25 The Government is entitled to establish legislative procedure for the Italian NPPs siting and licensing.
- Art. 26 CIPE (National Committee for Economic Planning) defines the types of plants for the new NPPs and the criteria to promote the constitution of consortia.
- Art. 29 Creation of an independent Nuclear Safety Agency.
- Art. 27/37 Reorganization of SOGIN and ENEA.
- Art. 38 Promotion of innovation in the nuclear sector.

The Legislative Decree 31 of 15/02/2010 “Location, realization, and operation discipline of nuclear power plants, nuclear fuel production plants, irradiated fuel and radioactive wastes storage systems…”

The main points are:

- The new Agency for Nuclear Safety (ASN) will be responsible for the definition of the characteristics of suitable sites for nuclear power plants, in collaboration with ISPRA, ENEA and Universities.
- SOGIN has to draft a “disposal site chart“ based on IAEA and the Agency for Nuclear Safety criteria.
- The Ministry for Economic Development (MSE), with other authorities, will approve the draft chart.
- SOGIN will propose an agreement with the interested local authorities.
- MSE will approve the final chart.
- SOGIN will start the technical analysis of suitable sites.
- Transparency is a “must” for any activities.
- MSE will issue the final site authorization.
- Local communities will receive an economical benefit to increase the advantages linked to the repository.
- Sogin will realize and operate the National Repository for spent fuel and radioactive wastes in the framework of a wider Technologic Park.

This frameworkwas partly reduced by a popular referendum which was held in the late spring of 2011 and resulted in the cancellation of those clauses which regulated the location of new NPPs on the national territory, leaving those which regarded the temporary storage facility and the creation of the national regulatory body (ASN) for the nuclear safety. ASN will be responsible for the issue of the criteria to define the suitable sites for the interim storage repository.

Just to give an idea of the dimensions of the problem, figures on the quantities to be stored are enclosed in Table 2.

Table 2. Estimated waste from decommissioning of Nuclear plants.

Estimated waste from decommissioning of nuclear plants (III cat.) Source ISPRA	
Plant	HLW (m^3)
Latina	4.097 (3.338 graphite)
Trino	29
Garigliano	4
Caorso	331
SOGIN-ENEA	881
CISAM	9
CCR-ISPRA	390
Total	5.901

Non-nuclear power. The Integrated Service.

Under an act of the Italian parliament (i.e. Legislative Decree 52/2007) issued in May 2007, ENEA is responsible for providing an Integrated Service able to manage the collection and the storage of low and medium activity radioactive materials, including disused radioactive sources.

The wastes which are of interest are specified in the document “Guida Tecnica n.26”, issued by ISPRA, the body currently having regulatory functions and supervised by the Ministry of the Environment.

As it is well known, depending to their characteristics, radioactive materials are used in a variety of applications, e.g.:

- Diagnosis and medical therapy (radiotherapy, diagnosis of osteoporosis, scintigraphy, blood sterilization of surgery instruments, radiography, CAT).
- Irradiation of non-medical devices (e.g., food preservation).
- Diagnostics, industrial measures, and material analysis (i.e. thickness, density measurements, inspection and non-destructive testing of weldings in the joints of the pipelines).

Even if the management of the radioactive sources is regulated by laws to which the owners have to strictly comply, the national Authorities have to consider the case when the sealed sources are discovered in unguarded places with potential hazard to population and environment.

In this context, the Integrated Service is responsible, under the directive of the above mentioned act, to keep in safe conditions sources occasionally discovered (the so-called orphan sources, or high activity sealed ones). These events can occur 1) when the owner is unknown or 2) in the case in which some industry goes bankrupt, or 3) for citing a real case, if a radiologist passes away and the heirs renounce to the legacy. The final destiny of the sources is left to the decision of the courts.

The 2007 act, which takes in the European Directive 2003/122/CE Euratom, now obliges those who require the authorization for operation of these devices to stipulate one of three kinds of agreements: with banks, or public bodies, or return to the manufacturer, to constitute a fund for management and final disposal. The situation now is far better than before, but old sources may appear and have to be managed one by one.

Apart from this, there is a normal flow of low activity wastes coming from hospitals and other medical organizations is present in Italy. These are managed through ENEA's operator NUCLECO (ENEA owning the 40% of its shares),

NUCLECO runs all the conditioning plants and storage facilities of which ENEA is the owner, and has legal responsibility for the collection and the management of medium and low activity radioactive wastes. The company has a permit issued by the Ministry of Economic Development which defines types, quantities, and volumes of solid and liquid wastes to be processed and finally stored.

In total, the non-nuclear power wastes which are stored in this temporary facility located in Casaccia Research Center are about 4.500 m^3 and the annual rate coming from the Integrated Service is about 200 m^3 (fig.2).

Other companies which have authorizations issued by the Ministry are allowed to apply to join the Integrated Service. All of these qualified and authorized firms may undertake their work under ENEA supervision, which coordinates and supervises the various phases.

Cooperation with other bodies is undertaken, especially with customs, police departments, and fire fighters, to comply with the Safeguard Agreements which are the practical enforcement of the Non Proliferation Treaty. It is also done to disseminate know-how, prevent the illicit trafficking of nuclear materials and provide technical support to the Ministry to revise the export applications of the national industries, to prevent the risk of penalties in case firms decide to export those materials, i.e. lasers, package units, motors and other devices which are suitable for dual-use.

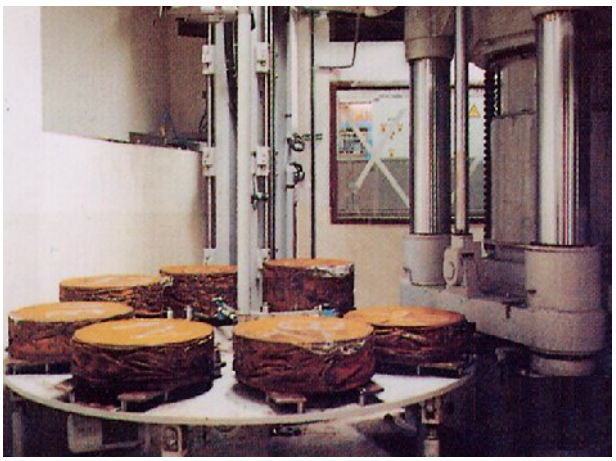

Fig 2. Conditioning process of solid radioactive medium and low activity wastes.

CONCLUSIONS

Notwithstanding the absence of energy production from nuclear sources, the country has the burden of radioactive waste management from the previous nuclear operations, which obliges it to implement at first a robust legislative framework, then to explore all the complex procedures to achieve the localization of the national interim storage facility, not excluding the chance to have a European regional facility for geologic disposal, under the clauses of the Council Directive of 19 July 2011 “Establishing a Community Framework for the Responsible and Safe Management of Radioactive Waste”. Then, as far as industrial, medical and R&D aspects, the improvement of the legislative picture, the creation of a regulatory body, is a good start for the future, to achieve the best efficiency of the Italian system.

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