EUROPEAN COMMISSION
DIRECTORATE-GENERAL FOR ENERGY AND TRANSPORT

DIRECTORATE H - Nuclear Energy
Radiation Protection

TECHNICAL REPORT

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35 OF THE EURATOM TREATY

LATINA - NPP

LAZIO
ITALY

15 to 19 May 2006

Reference: IT-06/4B

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35
OF THE EURATOM TREATY

FACILITIES:	Installations for monitoring and controlling radioactive discharges and for surveillance of the environment in the region of Lazio and in the surroundings of the Latina nuclear power plant.
SITE:	Latina NPP, Italy.
DATE:	14 to 19 May 2006
REFERENCE:	IT-06/4B
VERIFICATION TEAM:	Mr C. Gitzinger (Head of team) Mr E. Henrich Mrs. A. Godeanu-Metz
DATE OF REPORT:	2008-09-18

SIGNATURES:

[signed]

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[signed]

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E. Henrich

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1 ABBREVIATIONS

ADSL	Asymmetrical Digitaöl Subscriber Line (telecommunication)
ANPA	*Agenzia Nazionale della Protezione dell' Ambiente* (National Environmental Protection Agency)
APAT	*Agenzia per la Protezione dell'Ambiente e per i Servizi Tecnici* (Agency for Environmental Protection and Technical Services)
APPA	*Agenzia Provinciale Per l'Ambiente* (Provincial Environmental Agency)
ARPA	*Agenzia Regionale di Protezione Ambientale* (Regional Agency for Environmental Protection)
DG	Directorate General
EC	European Commission
CD-ROM	Compact Disk Read Only Memory
CEVaD	Data Processing and Evaluation Centre
ECURIE	European Community Urgent Radiological Information Exchange
EURDEP	EUropean Radiological Data Exchange Platform
ENEA	*Ente per le Nuove tecnologie, l'Energia e l'Ambiente* (National Agency for New Technology, Energy and Environment)
ENEL	*Ente Nazionale per l'Energia Elettrica* (National Electric Power Company)
GAMMA	The national on-line gamma dose rate monitoring network (part of the national early warning system)
HEPA	High Efficiency Particulate Air (filter)
HPGe	High Purity Germanium (gamma detector)
IAEA	International Atomic Energy Agency
ICRAM	*Istituto Centrale per la Ricerca scientifica e tecnologica applicata al Mare* (Central Institute for Marine Research)
INMRI	*Istituto Nazionale di Metrologia delle Radiazioni Ionizzanti* (National Institute of Ionizing Radiation Metrology; of ENEA)
ISDN	Integrated Services Digital Network (telecommunication)
ISO	International Organization for Standardization
ISPESL	*Istituto Superiore Prevenzione e Sicurezza sul Lavoro* (National Institute for Occupational Prevention and Safety)
LN_2	Liquid Nitrogen
MAGNOX	Magnesium Alloy Graphite Moderated Gas Cooled Uranium Oxide (nuclear reactor)
MATTM	*Ministero dell'Ambiente e della Tutela del Territorio e del Mare* (Ministry of the Environmental and Protection of Territory and of the Sea)
MH	*Ministero della Salute* (Ministry of Health)
MoU	Memorandum of Understanding
NPP	Nuclear Power Plant
OJ	Official Journal
PC	Personal Computer
PVC	PolyVinyl Chloride
QA / QC / QM	Quality Assurance / Quality Control / Quality Management
REMRAD	*Rete nazionale di Monitoraggio della RADioattivitá* (Automated national network for the on-line monitoring of airborne radioactivity; part of the national early warning system)
RESORAD	*Rete nazionale di Sorveglianza sulla RADioattività ambientale* (National Environmental Radioactivity Surveillance Network)
SMOD	Sedimentable Mineral Organic Detritus
SOGIN	*Società Gestione Impianti Nucleari* (Nuclear Plant Management Co.)
TL	Thermo Luminescence

TLD	Thermo Luminescent Dosimeter (radiation detector)
TREN	Transport and Energy
UKAS	United Kingdom Accreditation Service
UPS	Uninterruptible Power Supply
ZnS	Zinc sulphide (radiation detector)

2 INTRODUCTION

Article 35 of the Euratom Treaty requires that each Member State shall establish facilities necessary to carry out continuous monitoring of the levels of radioactivity in air, water and soil and to ensure compliance with the basic safety standards [(1)].

Article 35 also gives the European Commission (EC) the right of access to such facilities in order that it may verify their operation and efficiency.

For the EC, the Directorate-General for Transport and Energy (DG TREN) and more in particular its Radiation Protection Unit (TREN H4) is responsible for undertaking these verifications.

The main purpose of verifications performed under Article 35 of the Euratom Treaty is to provide an independent assessment of the adequacy of monitoring facilities for:

- Liquid and airborne discharges of radioactivity into the environment by a site (and control thereof).
- Levels of environmental radioactivity at the site perimeter and in the marine, terrestrial and aquatic environment around the site, for all relevant pathways.
- Levels of environmental radioactivity on the territory of the Member State.

Taking into account previous bilateral protocols, a Commission Communication has been published in the Official Journal on 4 July 2006 with a view to define some practical arrangements for the conduct of Article 35 verification visits in Member States.

A verification team from DG TREN visited (15 to 19 May 2006) the site of the Latina nuclear power plant located in the Lazio region.

The visit also included meetings with representatives of the national authority having competence in the field of radiation protection. A closing meeting was held, with all parties involved during the visit, on the premises of the Agency for Environmental Protection and Technical Services (hereafter APAT).

The present report contains the results of the verification team's review of relevant aspects of the radiological environmental surveillance on and around the site of the Latina nuclear power plant, as well as the regional radiological surveillance in the Lazio region.

The present report is also based on information collected from documents received and from discussions with various persons met during the visit.

3 PREPARATION AND CONDUCT OF THE VERIFICATION

3.1 PREAMBLE

The Commission's decision to request the conduct of an Article 35 verification was notified to the Italian Permanent Representation to the European Union by letter TREN.H4 CG/ab D(2006) 202557 dated 20 February 2006.

It was decided to split the verification activities over two independently operating teams. One team would visit the Latina nuclear power plant (in the Lazio region), the other would focus on the Caorso

[1] Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation. (OJ L-159 of 29/06/1996 page 1).

nuclear power plant (in the Emilia Romagna region). It should be noted here that both nuclear power plants were shut down in the 1980s.

Subsequently, practical arrangements for the implementation of both verifications were made with the Italian competent authority (APAT).

The present report covers the verifications in the Lazio region only.

3.2 PROGRAMME OF THE VISIT IN THE LAZIO REGION

On 15 May an opening meeting was held at the Latina NPP site where, in conjunction with the Italian competent authority and the operator of the Latina NPP, the programme of verification activities was discussed and finalized, based on a Communication by the EC[2], setting out the framework and modalities within which Article 35 verifications may be conducted.

The agreed programme comprised:

- The verification of liquid and gaseous radioactive discharges from the Latina NPP (sampling and monitoring systems, analytical methods, quality assurance and control aspects, reporting);
- The verification of the Latina site-related environmental radiological monitoring programmes as implemented by the operator of the NPP;

  The verification addressed technical aspects of monitoring and sampling activities, analytical methods used, quality assurance and control, archiving and reporting.
- Verification activities at the APAT laboratory, addressing infrastructure, analytical methods, quality assurance and control aspects, reporting. At the same time the monitoring and sampling provisions located on the laboratory premises were also subjected to verification.
- Verification of the REMRAD national surveillance network station located at APAT.

A summary overview of the programme of verification activities is provided in Appendix 2 to this report.

The verifications were carried out in accordance with the programme.

3.3 DOCUMENTATION

In order to facilitate the work of the verification team, a package of information was supplied in advance by the Italian authorities. Additional documentation was provided during and after the visit. All documentation received is listed in Appendix 1 to this report. The verification team notes the comprehensiveness of all presentations made and documentation provided.

The information thus provided has been extensively used for drawing up the descriptive sections of the report.

3.4 REPRESENTATIVES OF THE COMPETENT AUTHORITY AND THE OPERATOR

During the verification visit, the following representatives of the national authority, the operator and the other parties involved were met.

[2] Verification of environmental radioactivity monitoring facilities under the terms of Article 35 of theEuratom Treaty – Practical arrangements for the conduct of verification visits in Member States (OJ 2006/C 155/02).

NPPLatina

Ms. Irene Zammuto	Engineer, Chemistry and Health Phisics Department
Mr. Massimo Bartolomucci	Technician, responsible for the operative monitoring
Mr. Renato Bragagnolo	Technician, operator in the main control room
Mr. Giuseppantonio Castegini	Technician, sampling and monitoring
Mr. Raffaele Pettisano	Technician, samples treatment
Mr. Graziano Parente	Technician, controller in the gamma spectrometry laboratory
Mr. Antonio Imparato	Chem.Doc., Qualifed Expert responsible for Safety and Radioprotection at NPP Latina
Mr. Luigi Gabriel	Responsible for the Chemistry and Health Physics Department

Agency for Environmental Protection and Technical Services (APAT), Rome

Mr. Giancarlo Torri	Engineer, responsible for the Control Service of the environmental radiation
Mr. Oreste Contino	Nuclear Inspector, responsible for the Technical Department
Mr. Rino Caporali	Engineer, responsible for "Ufficio progetto Centrale di Latina"
Ms. Carmelina Salierno	Engineer, responsible for the Ocupational and Radiation protection of the NPPs
Mr. Paolo Zeppa	Engineer, responsible for Nuclear and Radiological Emergency Department
Ms. Rita Ocone	Engineer, responsible for Artificial Radioactivity Department
Mr. Giuseppe Menna	Engineer, responsible for the Monitoring Department

Nuclear Plant Management Company (SOGIN)

Mr. Gino Ghioni	Engineer, responsible for Safety and Radioprotection for the SOGIN Company at Sogin Headquarters, Rome

4 COMPETENT AUTHORITIES AND NUCLEAR LEGISLATION

4.1 THE LEGAL BASIS

The main legislative act, establishing the responsibilities of the various actors in environmental radioactivity monitoring, in the radiological surveillance of foodstuffs and in emergency preparedness is Legislative Government Decree Nr. 230 of 17 March 1995 (amended by Legislative Decrees 187/2000, 241/2000, 257/2001 and 151/2001; the latter implementing European Directives 89/618/Euratom, 90/641/Euratom, 92/3/Euratom and 96/29/Euratom).

Decree Nr. 230, in Article 54 specifies that:

- Operators of authorised nuclear installations shall supply and operate the equipment necessary for permanent surveillance of the level of radioactivity of the atmosphere, waters, soil and foodstuffs, both within the site perimeter and within the surveillance area around the site.

Decree Nr. 230, in Article 104 specifies that:

- The responsibility for monitoring environmental radioactivity in Italy is with the Ministry of Environment and Territorial Protection (hereafter MATTM).
- The responsibility for the radiological surveillance of foodstuffs and feedingstuffs is with the Ministry of Health (hereafter MH).
- Both Ministries shall exchange radiological information gathered during the exercise of their respective responsibilities.
- Radiological surveillance shall be established through national and regional monitoring networks.

- The implementation and operation of regional networks is under full responsibility of the regional governments; the latter shall abide by directives issued at national level by both the MATTM and the MH. National directives shall aim at reaching harmonisation over the regions where it concerns the standardisation and comparability of methods and techniques for sampling and sample analysis.
- The national monitoring networks shall be operated by bodies, entities or organisations having the necessary competence in the field of radiological protection.
- An independent national radiological emergency network is under the responsibility of the Ministry of Home Affairs.

Council Decision n° 87/600/Euratom[3]

- APAT has the responsibility of two radioactivity alarm networks, the GAMMA network, consisting of 50 online gamma dose rate probes, and the REMRAD network, consisting of 7 automated on line monitoring stations for particulate matter distributed over the national territory.

4.2 COMPETENT MINISTRIES

4.2.1 Ministry of the Environmental and Protection of Territory and of the Sea (MATTM)

The Ministry of the Environmental and Protection of Territory and of the Sea is responsible for the radiolocical sourveillance of the environment (art. 104 – Legislative Decree 230/95). It has been established under the Law n.349 of 8 July 1986 and further modifications and integrations. It is organized in six directorates-general. APAT and ICRAM (*Istituto Centrale per la Ricerca scientifica e tecnologica applicata al Mare* – Central Institute for Marine Research) are scienetific and technical bodies to support the Ministry.

4.2.2 Ministry of Health (MH)

The Ministry of Health (MH) is responsible for the radiological surveillance of foodstuffs (art. 104 – Legislative Decree 230/95). It is the top level body of the national health system which also comprises bodies at regional level and involves the *Istituto Superiore de Sanitá*, the leading scientific and technical institution in Italy in this field, as well. MH, in accordance with Law n. 317 of 2001, was created by separation from the Ministry of Welfare. It has been attributed 'the functions of human and veterinary health protection, the coordination of the national sanitary system, as well as the hygiene and surveillance of foodstuffs'.

In order to fullfill its responsibilities and the requirements of protection and promotion of health of the citizens and of veterinary health, MH is organized in directorates-general and in departments. The Directorate-General of Sanitary Prevention is – among other tasks – responsible for the radiological surveillance of foodstuffs.

[3] 87/600/EURATOM. Council Decision of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency (OJ L-371 of 30 December 1987, page 76)

4.3 THE AGENCY FOR ENVIRONMENTAL PROTECTION AND TECHNICAL SERVICES (APAT)

4.3.1 Introduction

ANPA, the former National Environmental Protection Agency, was established by Art. 38 of Legislative Decree Nr. 300 of 30 July 1999.

APAT was created in 2002 by merging ANPA with the Department for National Technical Services of the Presidency of the Council of Ministers (provision of Presidential Decree Nr. 207 of 8 August 2002).

APAT is technically, scientifically and financially autonomous and reports directly to the Ministry of Environment and Territorial Protection. APAT operates in three-year programmes which are annually updated. These programmes aim at the implementation of directives issued by MATTM, by setting objectives, defining priorities and allocating resources.

4.3.2 Main statutory responsibilities

The main duties and statutory responsibilities of APAT as Nuclear Safety Authority, so as to fulfil the obligations laid down in Decree Nr. 230 (as amended) are:

- Controls and inspections on existing nuclear installations.
- Licensing of new nuclear installations.
- Controls and inspections on the possession, commerce, transport, use and release of radioactive materials.
- Controls and inspections on radioactive waste management.
- Radiation protection of workers, the public and the environment.
- Nuclear emergency preparedness.
- Fulfilment of international agreements on control and surveillance of nuclear materials.
- Promotion of international co-operation in the field of nuclear safety and radiation protection.
- Promotion of actions aimed at maintaining and improving the national know-how and the national safety culture in the field of nuclear safety and radiation protection.

In addition to these duties, APAT has also to:

- Support the national administrations (environment, health, home affairs, industry) to issue decrees that implement primary nuclear legislation.
- Issue specific technical guidance.
- Realise a national database on all nuclear applications.
- Assess the safety analysis carried out by the operating organisation.
- Inspect equipment and materials during the design, construction and operational phases (systematic operational safety verification).
- Enforce actions to remedy any failure to meet the licensing conditions and/or operational safety criteria.

In order to guarantee homogeneity of survey criteria, and following the directives of both the Ministry of Health and the Ministry of Environment and Territorial Protection, APAT

- Co-ordinates measurements carried out by the agencies and institutions belonging to the national network in order to assure uniform techniques and methodologies of sampling and analysis.
- Promotes the installation of sampling and measurement stations whenever this is necessary for the achievement of an appropriate network of survey on national scale.
- Transmits the collected data to the European Commission.

4.4 THE REGIONAL ENVIRONMENTAL PROTECTION AGENCIES (ARPA-APPA)

4.4.1 Introduction

Concerning the environmental protection in Italy there are nineteen administrative regions and two autonomous provinces. Each of them has its own environmental protection agency (ARPA/APPA), established by special regional laws and responsible to the local government. The ARPA/APPA are environmental control and technical support bodies for the regional/provincal, district and local authorities. Generally, the competences of the regional agencies are almost the same as those of the national one. Allthough sponsored by their regions/provinces the ARPA/APPA are administratively and technically independent. A list of all agencies can be found in Appendix 3.

APAT and ARPA/APPA are integrated into a network-type system, the Environmental Protection Agency System. It is an example of a consolidated federal system, which combines direct knowledge of the local area and local environmental problems with national environmental protection and prevention policies, in a way as to become a point of institutional and technical/scientific reference for the entire country.

The regional programmes still differ very much – there are remarkable differences of implementation of the programme proposed by APAT between North and South. Some regions in southern Italy have only very little environmental radioactivity monitoring (if any at all).

4.4.2 The Regional Environmental Protection Agency of Lazio (ARPA Lazio)

The *Agenzia Regionale per la Protezione Ambientale del Lazio*, has been established under the Regional Law n. 45 of 6 October 1998, and is operative since 2000.

5 THE LATINA NUCLEAR POWER PLANT (LATINA – NPP)

5.1 INTRODUCTION

The Latina NPP is located at Borgo Sabotino-Latina close to the Thyrrenian Sea. The nearest township is Latina with some 110.000 inhabitants. It is situated at 14 km north-east from the power plant. The nearest large urbanisations are Rome, the capital of Italy, at about 60 km north-west and Naples at about 150 km south-east. The Latina NPP site covers an area of 140 ha. It was the first NPP built in Italy. Construction started in October 1958 and was finished in 1962, the NPP was connected to the electric grid in May 1963.

The initial owner of the Latina NPP was *AGIP Nucleare* (a subsidiary of the former Italian national petroleum company *ENI*), then *SIMEA* (a private electric utility) and from 1964 onwards ENEL. When liberalisation of the energy sector occurred in November 1999, SOGIN was established and became the state owned company to share also the responsibility for dismantling activities of the Latina NPP. The plant was definitively closed down in December 1987 by an Italian Government decision following the national referendum about nuclear power. Since 1991, all nuclear fuel has been removed

from the reactor and shipped for reprocessing to Sellafield, UK. The reactor's primary circuit has been filled with dry air. Blowers and portions of the primary circuit outside the reactor building are being dismantled in anticipation to the approval of the global decommissioning plan.

5.2 TECHNICAL CHARACTERISTICS

The Latina NPP was a CO_2 cooled MAGNOX type reactor similar to the Bradwell NPP in UK, using 264 tons of metallic natural uranium as fuel and some 2100 tons of graphite as moderator. It had a nominal thermal power of 705 MW (later on lowered to 640 MW) and a net electrical output of finally some 153 MW. The primary circuit consisted of six cooling sub-circuits with individual gas blowers and boilers for gas/water heat exchange. The three steam operated turbines were driving three turboalternators (plus two auxiliary ones) for electricity generation.

Seawater from a ca. 1 km long inlet canal was (and still is) pumped in. During the operational period it was used for cooling and liquid discharge mixing, the latter purpose still being effective.

The whole area owned by SOGIN covers some 1.4 million m^2, of which approx. 500.000 m^2 are dedicated as industrial area and 200.000 m^2 are the fenced-in NPP area.

The definitive dismantling of all 4 NPPs and of the 5 nuclear fuel cycle installations in Italy was decided by Parliament and government following the referendum on nuclear energy in 1987. For Latina, at the moment, completion of dismantling and full usability of the site for any purpose is foreseen for 2020.

Decommissioning and dismantling of the Latina NPP is performed in several steps.

In a first step passive protection measures were applied and SOGIN was charged with setting up the safe enclosure and the subsequent dismantling programme.

Reactor defuelling and shipment of spent fuel to Sellafield for reprocessing took place from 1988 to 1991. After this, plant systems, components and structures were radiologically characterised, followed by decontamination and dismantling of systems and components (1992 – 1996). From 1996 to 1999 the spent fuel pond was decontaminated to a large extent. After that, dismantling of primary circuit ducts and components was started with a view to reach safe enclosure conditions by the end of 2006.

At the time of the verification visit decontamination and dismantling took place in several areas which had either room ventilation or housed special ventilated tents.

5.3 CONTROL OF RADIOACTIVE DISCHARGES

5.3.1 General

Based on the control system for radioactive discharges during the operation of the NPP, an adapted system has been set up for discharge monitoring during decommissioning operations. This takes into account that no nuclear fuel elements are present anymore and that large parts of the facility have been and currently are being dismantled. In particular, equipment in the lower part of the ventilation stack buildings (east and west, equal system layout) were removed and the gaseous effluent monitoring system could be considerably changed and reduced.

The authorisation for discharges was given in Decree VII-305 from 13 April 1991 issued by the Ministry of Industry.

5.3.2 Provisions for monitoring/sampling airborne discharges

During operation of the NPP, discharges to the atmosphere were channelled through two stacks (east and west). Monitoring was split in two parts:

(A) 'CO_2 line': Altogether 3 ducts were operated for measuring and sampling. A NaI(Tl) detector was installed as direct reading monitor. Cold traps, oil separators and particle filters were used for sampling. The gas stream was finally fed into the main ventilation stacks (east and west) at 57.40 m above sea level.

(B) 'Aerial discharge line': For total aerial discharge monitoring isokinetic bypass systems were used branching off each main stack (east and west) at 57.40 m above sea level. In each system an online monitor with a NaI(Tl) detector and a particulate filter sampling device were operated. This system monitored any emissions from various ventilated locations and from the reactor vessel/biological shield area. The air from this bypass was fed back into the main stack below the CO_2 line inlet point. Previously, isokinetic sampling was used to determine e.g. iodine and particulates. From these, monitoring of particulates is the only task which is still kept as routine.

In 1993 releases to the atmosphere from the reactor vessel were stopped and the damper flaps were closed. Original ventilation was stopped in 1998, but the piping is still open because hot cell sites are still used for cutting of equipment during dismantling. Resulting airborne discharges are fed into the two main ventilation stacks.

The above mentioned systems have been considerably adapted for monitoring during the current dismantling phase. In particular, direct monitoring devices and isokinetic sampling have been removed.

Currently monitoring in the 'CO_2 line' (A) is done in a branching from the reactor outlet pipe. A valve opens to the main 'CO_2 duct' (216 mm diameter) that leads to the main stack and contains the main filter. From this main duct a branching leads to a portable pump that allows sampling of particulates on a filter. This monitoring covers areas such as the reactor vessel, the gap between vessel and the biological shield, and the boilers. It is routinely performed once per year since at the moment there are no discharges from these areas.

Current monitoring in the 'aerial discharge line' (B) is done using part of the old ducts starting in the stack at 50.40 m above sea level. Under normal circumstances the air flow is led over a particulate filter (HEPA cellulose filter) to a volumetric counter. After the pump and an expansion vessel a flow signal transducer is built in to send an alarm to a panel in the control room in case of loss of air flow. After this device the air is led back to the main stack. In a bypass a reserve aerosol sampler (employing a 99% efficiency cellulose filter and a portable pump) can be operated.

If work with risk of aerial contamination is performed in other parts of the plant, dedicated ventilation and monitoring has to be set up (using HEPA filters) with the aim to determine occupational exposure. The concerned area usually is covered by a tent which is vented into the main ventilation stack below the aerial sampling bypass.

In the waste storage building, compacting of waste into drums is foreseen. A separate ventilation system is in place.

The previously dedicated control room is now out of function. It has been replaced by a smaller control room.

For this system there is no redundancy foreseen, as during dismantling discharges are authorised to continue for 60 days even at monitoring pump failure. After 60 days the portable backup system has to be started.

5.3.3 Provisions for monitoring/sampling liquid discharges

The discharge system for liquid radioactive substances is still active. It collects the decontamination water from dismantling activities, from the laundry and – under special circumstances – from the fuel pond.

The fuel pond consists of three different parts, two of which have already been decontaminated and cleaned up. The third part in half of its volume still contains contaminated water (200-300 m^3). It is foreseen to decontaminate this water, before transferring it to the discharge tanks. Such an operation has been performed some 10 years ago.

Depending on their origin discharge waters are intermediately stored in several tanks. Discharge is only authorised if the result of sample analysis are in line with discharge requirements, (taking into account tritium, Sr-90, Cs-137, Cs-134, gross beta, gross gamma and gross alpha activity). If during discharge the on-line measurement with a NaI(Tl) detector shows activity levels above a preset value (that corresponds to 1/10 of the above mentioned requirement) or the seawater pump is not running, the discharge pump is stopped and an alarm signal is generated (which can only be acknowledged in the control room). At a measurement value corresponding to 1/100 of the requirement a pre-alarm is generated.

Discharge water is sampled in the storage tanks. On average, per month, 5 to 6 tanks are discharged; i.e. about 200 to 300 m^3 per year. Prior to discharge, radioactive contamination is measured by gamma spectrometry (except for laundry water) in a sample taken from the discharge tank which is connected to the storage tanks. The discharge process is triggered according to these measurements. During discharge gamma radiation in the discharge pipe is monitored by direct measurement (3" x 3" NaI(Tl) detector in lead shield with NIM electronics and a Laben multichannel analyser). The possibility of taking a sample from the discharge-pipe before the security valve is given as well. An alarm function, connected to the control room, will stop the discharge pump and automatically close a valve in the discharge pipe, in case of surpassing an activity limit or water flow below a preset level (3 m^3/sec in the discharge channel). Calibration of this discharge control system is done every two years; controls are perfomed every two and six months. Environmental monitoring of radioactivity takes place in the discharge channel and in the sea (see chapters 5.4.1 and 5.4.2). The inlet and outlet channels, from and to the sea, have approximately 1 km length.

In a first storage tank the liquid phase is separated from the sludge which is transferred to a sludge storage tank. The sedimented sludge, currently stored in the sludge storage tank, shall in future be treated separately. Before disposal, the sludge shall be mixed with concrete. From the sludge storage tank the liquid part is re-transferred to the liquid tank to be discharged as well.

The above mentioned sludge has a volume of 12 m^3 and may comprise half a meter of water. There is no mixing system inside. For sludge storage there is an open shielded steel reservoir with a capacity of 150 m^3. Sludge in the storage tank was measured for alpha, beta, and gamma activity. In the future decommissioning process, 173 kg sludge shall be mixed with 432 kg cement. This process was approved by APAT considering the construction of a special plant for that purpose.

5.4 LATINA NPP: ENVIRONMENTAL RADIOACTIVITY MONITORING PROGRAMME

The surveillance of environmental radioactivity in Italy is organized at three different levels:

- local – site related (NPP's),
- regional and
- national level.

At local level, there is radioactivity monitoring at the site of the nuclear installation, even if the site is under decommissioning. This network is under the responsibility of the plant operator and the

monitoring programme has to be officially approved by APAT. A description of the regional and national networks is given later (chapters 7.2 and 7.3).

5.4.1 On-site monitoring programme implemented by SOGIN

On-site gamma dose rate
A gamma dose rate monitor is situated on the roof of 'the 'Centro Operativo' ('Operations Centre') building at a height of some 1.7 m above ground. The probe consists of an *ELEXIND* (Milano) detector. The device is mainly used for emergency purposes.

A UPS is dedicated to the electrical backup of the measurement systems.

Aerosol sampling
SOGIN operates an aerosol sampler near the 'Centro Operativo'. Air flow is estimated based on pump characteristics. The filter is changed every two days, on Monday, Wednesday, and Friday.

TLDs
TLDs are placed in various locations (15 points, 6 of them official) at the site. They are collected and measured every 4 months.

Precipitation
A precipitation sampler is situated on the on roof of the 'Operational Centre'. The surface of the device is 0.1 m^2. Registration of the amount of precipitation is done on paper strip. The precipitation container can hold up to 25 litres.

Ground water
Ground water samples (3 litres in 10 litre flasks) are collected near the sludge storage tank from a depth of 10 m and 30 m ('pozzo G').

Water sampling from the inlet and outlet sea-water channels
Sampling points are situated on the inlet and outlet seawater channels, the sampling devices being set up in a small building.

On each side (inlet and outlet) every hour a pump automatically samples 3 – 5 l, passing first a filter and then 2 resin-charged cartridges (*Chelex-yellow* resin and *KCFC-black resin* to trap Cs-137). Radionuclide analysis of the resins is done once per month (gamma spectrometry).

In addition, 3 litres of water are automatically sampled once a day, each day of the week. From these three litres, one litre is provided for measurements to the regional medical authority; the other two litres are transferred to a 50 litre container for the monthly analysis of tritium and Sr-90 by the operator.

Meteorological information (meteo tower):
The site houses a meteo tower located close to the laboratory building. Wind direction and speed are measured by sensors situated at 25 metres above ground.. Humidity, air pressure and temperature are measured at ground level. Every hour there is an automatic recording. The prominent wind direction is N-NW.

5.4.2 Off- site monitoring programme

Within a perimeter of 30 km a monitoring programme for environmental radioactivity has been implemented by SOGIN.

Seawater sampling:
A seawater sample of 100 liters is discontinuously collected through an automatic sampler and monthly measured.

Marine sediment sampling:
One sampling point for sediment is at the end of the seawater outlet channel (annual sample), one is in the sea at 20 meters depth (annual sample), and another one is at 1.5 km east from the NPP on the beach (every four months). Three kilograms of sediment are sampled.

Mussels
Sampling of mussels is performed on a concrete pier which extends close to the inlet/outlet channels into the sea (every six months).

Milk
Milk sampling is performed once per year by the NPP operator at a farm at Via Valmontorio.

Vegetables
The NPP operator buys fresh vegetable (approximately 10 kg) from a local sales stand at road Via S. Maria. "Local" vegetables of interest are sampled twice a year in April and in October (salad, zucchini, ruccola, eggplant, fennel, peas, chicory, artichoke).

Fish
Fish is bought from local fishermen twice a year.

5.4.3 Independent control by the regulator

APAT, as regulator, in accordance with the national legislation, verifies, through periodic visits by its inspectors, the operator activities concerning environmental surveillance: sampling devices, measuring techniques and result management. Even though no independent measurements are performed by APAT on a regular basis, a few specific independent verifications have been carried out on the area surrounding the NPP site.[4]

5.5 LATINA NPP – ANALYTICAL LABORATORY

The laboratory employs seven persons and operates all discharge samples from the NPP as well as the samples stemming from the environmental monitoring programm performed by the NPP. The laboratory has no ISO 17025 accreditation.

Alpha spectrometry and beta measurements

The laboratory is equipped with two alpha spectrometers (one *Ortec* 8-fold, 1200 mm^2; and one *Ortec* 1-fold, 300 mm^2). After measurements, the spectral data are transferred to another PC for data calculations which are performed by using *Ortec AlphaVision* software together with the NPP's own software (*MS Access* based).

The laboratory operates two *Berthold LB770* 10-sample changer systems for beta measurements.

Gamma spectrometry

The laboratory equipment consists of 5 HPGe detectors from *EG&G Ortec*, with relative efficiencies between 40% and 80% and a resolution of approx. 1.8 keV. These gamma spectrometers have been provided with a spectrum stabilizer system. The shields consist of lead with copper lining. Analysis of spectra is performed by using *Ortec GammaVision 6.0* installed on 2 PCs.

[4] Moreover, APAT informed the Commission that it is about to sign a memorandum of understanding (MoU) with ARPA Lazio with the main purpose of carrying out an independent site releated environmental radioactivity monitoring programme around the Latina NPP on a routine basis.

The supply with liquid nitrogen is performed automatically, the filling being based on weighing. The LN_2 supply tank is situated outside the building, on the NPP perimeter.

Radioactive sources

All sources are certified by UKAS. The majority of the solid sources are made by *Amersham* and provided by its Italian representative 'Campoverde'. All sources present on the NPP territory are recorded in a specific book in the laboratory and accounted. This book contains all data related to source history, technical description, manufacturer, corrections, and controls effectued. The calibration certificates are archieved also.

Environmental TLD laboratory

The reading of the environmental TLDs is performed every 4 months in a dedicated laboratory.

General

The NPP is equipped with an emergency diesel generator that starts within 30 seconds after power failure and the laboratory is equipped with a UPS battery with two extension lines. The UPS provides one hour autonomy.

6 LATINA NPP: VERIFICATION ACTIVITIES

The verification team visited:

- The rooms where the sampling devices for airborne discharges are located.
- The new operation control room.
- The discharge tanks and related monitoring/sampling devices for liquid discharges.
- The analytical laboratory for discharge and environmental samples.
- On-site and off-site environmental monitoring facilities.

6.1 VERIFICATION ACTIVITIES - RADIOACTIVE DISCHARGES

SOGIN applies general QM procedures to all work performed at Latina NPP. The verification team was informed that SOGIN plans to extend this QM approach to all decommissioning sites under its responsibility.

> *The verification team endorses the application of general QM procedures by SOGIN to all Italian NPPs.*

6.1.1 Verification findings – airborne discharges

The team visited the NPP's facilities for monitoring airborne discharges in the east stack. It was informed that air from the biological shield is transported by natural convection.

In case of high activities at workplaces (inside the special ventilated tent), the work has to be stopped immediately, workers are evacuated and an inspection takes place to determine the reason for the contamination.

The team received copies of relevant documentation (e.g. sampling line schematics).

The team was informed that in the context of decommissioning activities, due to the low levels of radioactivity involved, the NPP has an allowance of 60 days of gaseous discharges without control. Within this constraint, continuity of monitoring and sampling is guaranteed, by a back-up power supply which is available for the monitoring and sampling systems.

The verification team suggests considering re-installation of isokinetic sampling for aerial discharge monitoring in case a modification of the system is foreseen.

6.1.2 Verification findings – liquid discharges

The team visited and verified the existence and functionality of the monitoring and sampling provisions as defined in the regulatory obligations. The team also checked the sampling procedures, discharge lines, waste water discharge tanks and the sludge storage tanks. The team verified the existence and functionality of the sampling and on-line monitoring provisions as defined in the regulatory obligations and witnessed an alarm test. The team also checked the sampling procedures.

The verification activities performed do not give rise to particular remarks.

6.1.3 Verification findings – 'new' control room

The verification team noted that:

The 'old' control room is out of function. It has been replaced by a smaller one, which is still operational. Alarm signals are transmitted to this control room.

Beta and gamma activity values measured in the air at decommissioning work places are displayed at the monitor's workstation. The team verified that alarms from the online liquid discharge monitoring detector arrive in the control room. Acknowledgement of the alarm was done at the location of the detector electronics board.

The verification activities performed do not give rise to particular remarks.

6.2 VERIFICATION ACTIVITIES: LATINA NPP ENVIRONMENTAL RADIOACTIVITY MONITORING

6.2.1 Verification findings –On site environmental monitoring

<u>On site gamma dose rate monitor</u>
The verification team noted that the device is mounted somewhat higher than the 'standard' height of 1 m. Transmission of data to the laboratory is continuous; data are recorded on paper as well. A functionality check of the device is performed daily. Every two months the device is checked by using a certified gamma source. Calibration is performed every two years by a contracted service centre situated at Caorso having the appropriate accreditation. The calibration date is marked on the device and all data are registered in a control log-book together with signatures of the responsible persons.

Where the data are used also for purposes other than emergency response, the verification team suggests to lower the detector mounting to a height of 1 m above roof surface.

<u>Aerosol sampler</u>
The verification team noted that the device is already of age and that flow rate estimates are based on old tests. The filter holder ring vibrated strongly. Measured filters are stored for two years.

The verification team suggests regular checking of the air flow rate to ensure that flow rate estimates are reasonably accurate. It also suggests fixing the vibration problem.

<u>TLD's</u>
The team saw two probes inside the main office building mounted on the wall and noted that these were used for occupational control purposes.

The verification activities performed do not give rise to particular remarks.

Precipitation
The verification team noted that the sample container was not marked.

The verification team suggests marking sample containers with such information as date and time of sampling, sample type, sample location etc.

Ground water
The verification team was informed that ground water flow is from north to south. Sampling is performed by use of a pump previously purged during 10 minutes.

Verification did not give rise to any specific remarks.

Water sampling from the inlet and outlet sea-water channels
The verification team was informed that water sampling in the inlet channels is not anymore mandatory, it is just needed to have a supplementary control of the water in both channels.

A permanent maintenance of the pumps and valves is warranted by daily checks by the operator taking note of the sampled water quantities and of the technical functionality of the system (two technicians in two shifts). The verification team was present at a test of the pump functionality.

Electric power is supplied by the NPP system which also offers back-up in case of electrical failure.

Verification did not give rise to any specific remarks.

6.2.2 Verification findings – Off site environmental monitoring programme

Sea water and sediment sampling
The verification team visited the location of sea water sampling and noted its easy accessibility. Due to time constraints the location for sediment sampling could not be visited.

Mussels
The verification team was shown the location and the special device used for scratching mussels off the concrete pillars.

Milk
The verification team verified the milk sampling at a farm at Via Valmontorio. At the time of the visit the farm had 4 cows and some 50 sheep. The animals are fed with hay and are grazing the local pasture.

Vegetables
The verification team visited the fruit and vegetable stand at Via S. Maria at Borgo Sabotino. The owner confirmed that his products are of local origin.

Fish
The verification team saw some of the fishermen at the site of the mussels sampling. However, at the time of the visit no fish was caught that would have to be handed over to SOGIN.

The verification activities performed with regard to off-site environmental monitoring as put in place by SOGIN do not give rise to particular remarks.

6.2.3 Verification findings – Independent control by the regulator

The verification team was told that a full system of control by the regulatory body that would include monitoring of discharges and environmental media independently from the operator has not yet been set up.

> *The verification team strongly recommends setting up an independent monitoring system for discharges and environmental media.*

6.3 VERIFICATION FINDINGS – LATINA NPP ANALYTICAL LABORATORY

Sample reception

The verification team visited the analytical laboratory of the Latina NPP. It verified the sample registration and preparation. The discharge samples and environmental monitoring samples arrive at separate rooms in the basement, where they undergo weighting, homogenisation etc. as necessary. They are tagged with unique identifiers. From there, the samples are transferred upstairs to the sample registration room where they are registered. The team checked the sample register book and noticed that samples are correctly labelled. The registration information includes data on sample type, sampling period, date and time of sample arrival, sampling location, sample volume (or mass) etc..

The sample is then directed to the sample preparation unit and is treated physically and/or chemically. The parameters and results of the treatment are added to the sample registration document. After that, the sample goes to the radioactivity measurements department.

> *The verification team suggests transferring all registration data of the samples already at the sample reception in a log book and electronically in the laboratory data base.*

Sample measurement

The verification team was shown that each sample has its own folder with the description and a unique identification number. The measurement results are again added to the sample registration document. In most cases additional calculations are performed in order to derive the final activity value. The final calculations are made using *Excel* spreadsheets, where also all sample data are recorded. These files are used for electronic storage of the results, in parallel to the storage on paper. The measurement sheets contain signatures, these could be found also on the official reports which are prepared by the responsible person. Measurement results, updates and QC checks are recorded on paper.

> *The verification activities performed do not give rise to particular remarks.*

Laboratory equipment

The verification team verified the presence and operability of the laboratory instruments. The team verified the adequacy of the analytical systems in place, including various aspects of quality assurance and control (working instructions, methodologies, calibration, maintenance, bookkeeping of results, reporting etc.). The team noted that all the instructions and procedures were present and readily available at all workstations. The team noted the high level of expertise in the field of radioactivity measurement and the high level of motivation of all staff involved.

> *The verification activities performed do not give rise to particular remarks.*

Gamma spectrometry

The verification team noted that the laboratory is adequately equipped for fulfilling its regulatory obligations with respect to effluent and environmental samples' analysis. Calibration of the gamma

spectrometers is done once every 3 years. Background measurements are performed once a week; short background tests are performed before every measurement (to check for any contamination). For energy drift checking control charts built-in into the *Ortec GammaVision* software QA module are used every week (based on the peaks of K-40, Ra-226, Co-60 and/or Cs-137 in the samples). The team noted that the laboratory uses approximatly 15 different geometries. The detector end caps are protected against contamination by cling film. They are not provided with sample centering devices. At the time of the visit a written procedure for energy checks was not available at the measurement place.

The verification team advises setting up written procedures for energy checks and making them available at the workplace.

Alpha spectrometry and beta measurement

The verification team acknowledged the existence and functionability of the alpha detectors. After measurement (spectrum collection with *Ortec AlphaVision* software on PC), the spectra are transferred to another PC for manual peak evaluation. Activity calculations are then done using an NPP proprietary software (based on *MS Access*), inputting data manually. Before and after each measurement, a background determination is performed.

For beta measurements the calibration is done with Sr-90.

Procedures and certificates were available at the working places.

The verification activities do not give rise to particular remarks.

Calibration sources

The verification team checked the availability of the sources' information sheets and certificates for 2005 and 2006. The team acknowledged that revision of all data concerning the physical presence of the sources and their technical features is performed on a yearly basis by the laboratory. Both, the liquid and solid sources are locked in a safe in a protected room that can only be entered by people wearing protective clothes. The team noted the presence of shelves in the same room where samples taken from the discharge tanks, active components from the shielding, concrete, iron, etc. are kept. Many of the items are forseen to be sent to the laboratory for analysis.

The verification activities performed do not give rise to particular remarks.

Environmental TLD laboratory

The verification team witnessed the read-out of one TL dosimeter. The results are printed on paper, and manually transferred to a computer.

The verification activities performed do not give rise to particular remarks.

Quality assurance

The laboratory is not accredited; however, quality control is implemented through a compilation of comprehensive written working instructions and source documents. The team noted that all procedure manuals and data result sheets were available at all workstations. The verification team reviewed the written procedures for calibration of the gamma spectrometers. The team noted that these procedures are in place and contain data of periodical controls and measurements. It was also noted that the documentation is very complex and not easy to handle. For example, for gamma spectrometry, the calibration procedure is described in the same document as the periodical control procedure and the measurement procedure. The information is available in paper and electronically on PC.

The laboratory participates in the national proficiency programme organised by APAT.

The verification team suggests splitting the document containing the procedures for gamma spectrometry into several individual documents containing separately calibration, check and measuring information, thus allowing a better overview over the respective procedure.

The verification team was informed that SOGIN continuously updates the procedures and the guidelines both electronically and on paper for each NPP separately. Procedures for waste treatment installations are foreseen to be finalised in 2006, and for radionuclides measurements, sample collection and sample preparation in 2008. According to APAT harmonisation is foreseen for all radionuclide measurement laboratories in Italy.

Archiving

Excel spreadsheet files are used for electronic storage of the results, in parallel to the archive on paper. Gamma spectra are archived on CD-ROM (using *Ortec GammaVision* software) together with a paper copy of the analysis results. No written procedure for archiving was available. In addition, the air filters, and sediment samples are stored at least for 2 years in order to ensure comparison and/or reference capabilities.

The verification team suggests the development of a written procedure for archiving.

Traceability

The team performed the tracing of three historical samples. Within the laboratory, the verification team followed the chain of custody of three samples (aerosol, precipitation and sediment; dated from December 2005). All the sample information, from the measurement itself to the data reported as well as the archived samples could be traced by the team.

The verification activities do not give rise to particular remarks.

Reporting

SOGIN provides APAT every six months with an intermediate report. Once a year an annual report is submitted with the results of the airborne and liquid discharge control and of the environmental radioactivity monitoring. APAT collects these data in a national data base ('DBRad') and releases a national annual report. In most cases the final results are evaluated by APAT for compliance with the corresponding limits.

The verification activities performed do not give rise to particular remarks.

7 THE ENVIRONMENTAL RADIOACTIVITY MONITORING PROGRAMMES

7.1 INTRODUCTION

In compliance with the Italian legislation the surveillance of the environmental radioactivity in Italy is organized at three different levels:

At *local* or site related level, a radioactivity monitoring network at the site of the nuclear installation has to be operated even if the site is under decommissioning. This network is under the responsability of the plant operator. This site related environmental monitoring is described in chapter 5.4; the verification activities are explained in 6.2.

At *regional* level, there are 21 regional/provincial environmental radioactivity surveillance networks (see chapter 4.4), each of which is under the responsibility of the concerned region/autonomous province. Currently the related programmes are implemented by the laboratories of the regional/provincial environmental protection agencies (ARPA/APPA).

At *national* level three networks are in place:

- National network of environmental radioactivity monitoring (RESORAD). This network is basically a collection of a subset of data from the regional/provincial networks.
- National telemetric alarm networks (REMRAD and GAMMA) managed by APAT
- National network for the surveillance of gamma radiation under the responsibility of the Ministry of Interior. Data collected from this network are considered confidential and are not publicly available. This network was not part of the verification.

7.2 THE REGIONAL ENVIRONMENTAL RADIOACTIVITY MONITORING PROGRAMMES (ARPA/APPA)

The regional/provincial programmes for environmental radioactivity monitoring are under the responsibility of the regional/provincial government. Following the directives of the Ministry of the Health and of the Ministry of the Environmental Protection of Territory and of the Sea, the regional/provincial agencies for environmental protection (ARPA/APPA) propose and implement these programmes. These include the sampling and subsequent laboratory analysis of air (particulates), precipitation (fallout), various waters, soil and food (milk, 'pasta', mixed diet, meat, cereals, vegetables, fruit).

In the Lazio region the monitoring programme seems to be implemented in a very limited form. There is no evidence that ARPA Lazio carries out sampling and (nuclide specific) analysis of environmental media. However, APAT, through its laboratory and other laboratories of the RESORAD network, carries out and collects measurements on milk and sedimentable mineral organic detritus (SMOD) in the Lazio region.[5]

7.3 NATIONAL NETWORKS FOR ENVIRONMENTAL RADIOACTIVITY MONITORING

The national monitoring programmes for environmental radioactivity (art. 104 Legislative Decree 230/95) and for alarm are established and co-ordinated by APAT.

The national environmental radioactivity monitoring programme (RESORAD – details see chapter 7.3.1) is generally built up as a subset of the regional environmental radioactivity monitoring programmes and has been strongly adapted to the EU Recommendtion 2000/473/Euratom. The parameters belonging to it are selected by the national agency APAT which also considerably influences the regional implementation and the further development of the system. The RESORAD programme is implemented by the laboratories of the regional/provincial agencies system (ARPA, APPA) and other reliable and qualified institutions or bodies. However, the extent to which the regions/provinces implement the rather wide, general programme depends largely on the interests and possibilities of the respective region/province. Thus, the regional programmes differ considerably. In particular, the volume and variety of sample media analysed in the 'Northern' regions is generally much larger than in the 'Central' and 'Southern' regions.

[5] The regulator informed the Commission that ARPA Lazio is planning a new laboratory for radioactivity measurements, which consequently should allow the implementation of the regional environmental monitoring programme.

The automatic systems GAMMA and REMRAD have been implemented and are managed by APAT. The GAMMA network is connected to the European Radiological Data Exchange Platform (EURDEP) set-up by the European Commission in the framework of the system for the early notification of nuclear and radiological emergencies within the EU Countries (Emergency Community Urgent Radiological Information Exchange - ECURIE) in compliance with the EU Council Decision 87/600/Euratom.

The aim of the networks is the surveillance of the pattern of environmental and dietary contamination and the identification of anomalous variations of radioactivity as a result of a nuclear accident. They serve to assess the radiation doses which the Italian population may receive and to produce data for support to management and decisional processes in case of emergencies.

7.3.1 RESORAD network

The sampling network RESORAD has been set up in a way to give pertinent information on the average extent of environmental and dietary contamination. The 'ideal' sampling programme should provide representative samples able to reveal the average situation both in time and space. RESORAD is generally a subset of the regional/provincial sampling network with a selection of parameters to allow a picture on national level.

In order to guarantee that the laboratories participating in the RESORAD network perform measurements with a certain degree of accuracy and quality, APAT provides a reliability programme through the organization of intercomparison and interlaboratory exercises. The reliability programme is performed with the collaboration of the National Institute of Ionising Radiation Metrology (INMRI) of the Italian National Agency for New Technologies, Energy and the Environment (ENEA).

The sampling programme has been defined in accordance with the EU Recommendation 2000/473/Euratom[6] and in agreement with the organisations participating in the National Environmental Radioactivity Network. A general overview of the programme is shown in table 1.

Table 1: Sampling programme of the RESORAD network

Matrix	Sampling frequency	Measurement frequency
Air particulates	Daily	Monthly
Fallout	Monthly	Monthly
Aquatic Environment	Six-Monthly	Six-Monthly
Drinking water	Six-Monthly	Six-Monthly
Milk	Weekly	Monthly
Meat	Monthly	Three-Monthly
Cereal and by-product	Seasonal	Seasonal
Complete meal = mixed diet	Three-Monthly	Three-Monthly
Vegetable	Seasonal	Seasonal
Fruit	Seasonal	Seasonal

7.3.1.1 RESORAD – air sampling

7.3.1.1.1 Particulate matter

The sampling locations for particulate matter are shown in Appendix 5 together with information on the analysed radionuclides.

[6] 2000/473/Euratom. Commission Recommendation of 8 June 2000 on the application of Article 36 of the EURATOM Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole (OJ L 191, 27 July 2000, page 37 – 46).

The sampling equipment is generally composed of: a thermostatic filter box; a filter; a pump with constant flow rate and a volumetric counter.

Filters can consist of paper, glass fibre, or cellulose acetate or nitrate. They have a diameter of approximately 50 mm and meshes with medium diameter of 0.4 – 0.5 μm. Every laboratory can choose the type of material that is most suitable to its sampling requirements.

7.3.1.1.2 Gaseous radionuclides

In order to measure radioactive isotopes of gaseous iodine, cartridges with activated charcoal or silver impregnated zeolite are used. The pumps are flow regulated (minimal flow rate 50 l/min).

7.3.1.2 RESORAD – Precipitation (dry/wet deposition)

The sampling locations for deposition are shown in Appendix 6, together with the radionuclides analysed.

Usually the collector is located at approximately two metres above ground, in free and opened spaces (e.g. roofs, terraces, gardens, etc.), far from buildings and dusty areas with heavy traffic. If possible the dry/wet deposition collection is carried out close to the aerosol sampler. Moreover precipitation and meteorological data are recorded, in order to allow a correlation between rainfall and the amount of collected material.

Sample collection is carried out monthly in plastic containers. The number and the dimensions of the containers are not fixed, but a collection surface of at least 2 m^2 is recommended. Alternatively, one big box of stainless steel can be used. A protective net with a mesh of about 2-3 cm, is put on the mouth of the containers to avoid that extraneous material (leaves, paper, feathers etc.) can drop inside the devices.

The bottom of the containers is constantly covered by a layer (about 2 - 3 centimetres) of a solution of HCl or HNO_3 (until pH = 1).

7.3.1.3 RESORAD – Water sampling programme

7.3.1.3.1 Surface water (lake, river and sea water)

The sampling locations of the national monitoring network – RESORAD – for surface water sample collection together with details of radionuclides assessed are shown in Appendix 7.

Sampling locations have been chosen in rivers, in the middle of the river bed, and in lakes as far away as possible from the inflow and/or the outflow. For seawater collection, sampling locations have to be at least 5 km from the coast and the depth should be between 1 and 5 metres.

Preferentially weekly or else monthly samples of at least 25 litres are collected for the analysis of river or lake waters, whereas at least 100 litres are collected every six months for the analysis of seawater.

7.3.1.3.2 Drinking water

Sampling locations of the national monitoring network – RESORAD – for drinking water including details of radionuclides assessed are shown in Appendix 8.

Different sources of drinking water (ground water table, wells, lakes, rivers etc.) and distribution nets are taken into consideration for the choice of the sampling locations. They are chosen in order to be the most representative of the area, in relation to the number of people that use that drinking water supply. At least 25 litres of drinking water are collected at regular intervals of six months.

7.3.1.4 RESORAD – Soil and sediments sampling programme

Sampling locations of the national monitoring network – RESORAD – for soil and sediment including details of radionuclides assessed are shown in Appendix 9.

For *lake sediments* the sampling locations are chosen as far away as possible from the inflow and/or outflow, in order to avoid their influence.

Sea water sediments are collected where turbulence and water currents are weak. Sampling locations are preferentially chosen where other marine matrices are collected, in order to allow correlations and also to follow the distribution of the radioactivity in different compartments of the same micro-environment. Sampling is carried out yearly by use of a small device (mud snapper). At each location, at least two sites are sampled and 1 - 2 kg of superficial sediments are collected.

Soil sampling sites are located in the centre of flat open areas, far from buildings or trees, to avoid a screen effect during precipitations and thunderstorms. Moreover, they have to be placed at least at 100 m far from busy streets. Every three or six months about 10 samples are collected at different sites (at about 50 cm or 1 metre apart from each other) within each location, the total surface of collection is about 500 - 1000 cm^2.

If possible, a radionuclide profile is carried out to define the suitable sampling depth. This is strictly related to the characteristics of the ground; the aim is to collect at least 90 - 95% of the interesting radionuclides.

Specific devices are used for sampling: drills, split tube samplers, trenches, etc.

There is no specified periodicity. Soil sampling is often related to a specific monitoring sampling session. However, if possible, 6-month or 3-month sampling is carried out at least at one significant location to get information on the temporal evolution and migration of radionuclides.

Sedimentable mineral organic detritus (SMOD) is the solid phase in suspension in river water, which is sampled in proximity to the ground. It is an intermediate matrix compared to the suspended particulate and the river sediments.

Sampling locations are chosen in the main river bed, possibly in correspondence of big rocks and at a depth of at least 1 metre. They have to be easy to access and to identify to guarantee collection always at the same place.

The sampling device consists of two plastic bags, one inside of the other. On the face of the inner bag are three horizontal incisions, while on the external bag are three vertical cuts (approximately 20 cm length). Inside the inner bag three folded PVC strips of 10 x 100 cm are inserted. The bags are placed on the bottom of the river. This device allows the water to enter in the bags and the SMOD to deposit in the folds of the PVC strips. Sample collection generally lasts 6 days.

Sampling is carried out 4 times a year, generally, in the middle of February, May, August and November. Periods of drought or of flood are avoided.

7.3.1.5 RESORAD – Terrestrial and aquatic biota and flora (including mushrooms)

The sampling locations of the National monitoring network – RESORAD – for terrestrial and aquatic biota and flora (including mushrooms) are shown in Appendix 10.

Sampling locations for *aquatic vegetables* are, preferentially, chosen where other marine matrices are collected in order to allow correlations and also to follow the distribution of the radioactivity in different compartments of the same microenvironment. Sampling is carried out every six months by a dredge; at least 2 kg of sample is collected.

Sampling locations *for mosses* are chosen to be representative, as much as possible, of the whole area and possibly in the vicinity of meteorological stations. Once a year, 15 samples are collected at each location. Mosses growing on rocks or stones are selected, the thickness of the sample preferentially being about 1 cm. A horizontal surface of 100 cm^2 is collected. Mosses growing in vertical substrates and/or protected from rainfall are avoided.

7.3.1.6 RESORAD – Foodstuffs sampling programme

7.3.1.6.1 Milk

The sampling locations of the national monitoring network – RESORAD – for milk with location type (production or consumption) and radionuclides assessed are listed in Appendix 11.

Different types of location have been chosen: some of them are places of milk production and some of them of consumption; at least one location per region should be relevant for production of milk at regional or national level. At least 2 litres of milk are collected weekly (if possible) or monthly.

7.3.1.6.2 Mixed diet ('complete meal')

The sampling locations of the national monitoring network – RESORAD – for mixed diet (complete meal) are shown in Appendix 12, together with the radionuclides assessed.

Complete meal samples are collected by mixing all courses of a day of the typical meals taken in the main canteens, schools or hospitals. Samples are taken, generally, every three months.

7.3.1.6.3 Other foodstuffs

The list of foodstuffs that are collected within the RESORAD monitoring programme is reported in Appendix 13. Foodstuffs with high consumption by the population as essential part of the diet (e.g. milk and milk by-products, cereals and cereal by-products, cow meat, pork meat, chicken meat, eggs, fruit and vegetables) are preferentially collected and analyzed.

The most significant points of production and/or consumption at regional or national level are chosen as sampling locations.

The amount of sample to be collected and the recommended sampling frequency for each foodstuff are shown in table 2.

Table 2: List of foodstuffs, sampling frequency and amount of samples

Foodstuff	Sampling frequency	Minimum amount
Cereals and by-product	Seasonal	2 kg
Pasta	Three-Monthly	2 kg
Vegetables and fruit	Seasonal	2 kg
Cow meat	Monthly or Three-Monthly	5 - 6 kg
Pork meat – chicken	Three or Six-Monthly	5 - 6 kg
Shellfish	Six-Monthly	20 kg

7.3.2 National telemetric networks

The REMRAD and GAMMA automatic monitoring networks have been installed in compliance with the Council Decision 87/600/Euratom on the basis of the experience acquired after the Chernobyl accident.

The main tasks of these networks are to confirm the information produced by the international notification systems, in particular when the national territory is involved in a possible contamination situation, to generate an early warning in case if data exchange informations would not be available. They are also meant to inform about the actual radiation level following fallout of radioactivity due to the crossing of contamination on the national territory. Data from these networks are routinely transferred to the APAT data centre in Rome.

To fulfill the institutional duties related to the role of APAT in the emergency preparedness at national level, the Agency realized this integrated support system for decision making in the case of a nuclear emergency with functions of early notification and information exchange, early warning, prognosis of the possible evolution of the radioactivity released to the atmosphere and measurement of the actual contamination level on the national territory.

7.3.2.1 GAMMA network

In Italy external gamma dose rate monitoring is mainly performed by the national telemetric network GAMMA.

The GAMMA network consists of 51 gamma dose rate probes, mostly placed at sites of the National Forestry Corps (for map see Appendix 4). The installation of another 12 probes is under implementation. The measuring time of the devices is 1 min. Data are collected every 10 minutes and every hour. Data transmission to the centre is by ISDN and analogue lines (6 stations).

For protection the stations are fenced in. Local batteries provide a power buffer with a capacity of 72 hours.

Data collected by this network provide input to the European EURDEP platform, with a daily transmission in routine operational mode and with 10 minute transmission intervals under emergency conditions.

The network is designed to send spontaneously an alarm signal to the GAMMA network control centre at the APAT Emergency Centre enabling the operator to effectively supervise operation of the remote monitoring stations.

Each measuring device of the GAMMA network (manufacturer: *TECHNIDATA AG*) is composed of three GM counting tubes. Two redundant large volume tubes for low dose rate levels, allow the detection of minor changes in the radiation level. The third counting tube is for higher radiation levels.

A rain sensor (on/off type) is connected to the system in order to allow taking into account the increase of the dose rate with precipitation.

The measurement range is 10 nGy/h – 10 Gy/h for photon energies of 40 keV – 1.25 MeV.

The alert threshold level is set at 3 times the background value.

7.3.2.2 REMRAD network

REMRAD is a network of automatic monitoring stations, located in Air Force sites, performing measurements of airborne radioactive particulates. The network acts as an early warning system and includes 7 monitoring stations. They are located in places of meteorological relevance chosen with a view of covering the most probable access routes of radioactivity in case of an accident in a transboundary plant (map see Appendix 4). The REMRAD automatic stations are able to perform the following functions:

- air particulate sampling on a continuous fiber-glass filter tape;
- on-line measurement of the alpha/beta total and artificial component;

- delayed (5 days after the sampling) measurement of artificial alpha/beta;
- on-line high resolution gamma spectrometry analysis by an HPGe electrically cooled detector;
- ambient gamma dose rate measurement;
- measurement of local meteorological parameters.

The monitoring equipment is manufactured by *Perkin Elmer Berthold*. The air flow rate is 25 m^3/h nominal and the filter tape is advanced by means of a capstan which is provided with slits allowing the sampled air to pass through them to the collection area at close distance (4 mm) from the detector.

The alpha/beta detectors (prompt and delayed measuring unit) are ZnS/plastic sandwich scintillators coupled to 2" photo-multiplier tubes. Integration time for alpha/beta measurement is 60 min in routine condition and 10 min. in emergency mode. The detection limit for on-line artificial beta measurements is about 0.5 Bq/m^3.

For the high resolution gamma spectrometry devices, the spectrum analysis is performed every 2 hours on a sampling window of 24 hours. Besides, a daily sum spectrum is produced and analyzed. Detection limit of Cs-137 is less than 1 mBq/m^3 for the sum spectrum, a few mBq/m^3 on the 2 hours spectrum and less than 100 mBq/m^3 as early warning signal, after an aerosol sampling of 2 hours.

The dose rate detectors are not connected to the national dose rate monitoring system and thus also not to the EURDEP system.

Data transmission to the centre at APAT in Rome is by ADSL.

8 VERIFICATION ACTIVITIES – ENVIRONMENTAL RADIOACTIVITY MONITORING

8.1 VERIFICATION FINDINGS – REGIONAL ENVIRONMENTAL MONITORING

The verification team was informed that in some regions the agreed programme is implemented only in a very basic way. In particular, in Lazio, at present no regional monitoring programme is implemented and no samples are taken and analysed by ARPA Lazio (see also footnote [6]). However, APAT, through its laboratory and other laboratories of the RESORAD network, carries out and collects measurements on milk and sedimentable mineral organic detritus (SMOD) in the Lazio region.

Although on a technical level there is consent among the participants of the various national and regional agencies and a document has been drafted accordingly by APAT, in reality the monitoring situation is far from being satisfactory.

> *The verification team puts strong emphasis on the need to implement a regional monitoring programme as foreseen in the documents drafted by APAT.*

8.2 VERIFICATION FINDINGS – NATIONAL ENVIRONMENTAL MONITORING

8.2.1 Verification findings - Laboratory based system - RESORAD

The verification team visited the APAT premises at Castel Romano. It discussed the co-ordination work by APAT and was shown the laboratories involved in this task.

The verification team acknowledges that due to the fact that the national system consists of collecting data from regional programmes, a severe limitation exists as to the availability of such data to APAT. The team was informed that an automated system is being set-up giving the laboratories involved in the network the possibility to directly transfer their data to the national database 'DBRad' at APAT.

The verification team encourages the finalisation of the automatic data transmission system in particular with a view to speed up the data transmission process and to avoid manual input errors.

8.2.2 Verification findings - National telemetric networks

8.2.2.1 Verification findings – REMRAD

The verification team visited the premises at APAT, i.e. the data centre and the Lazio automatic air monitoring station in the top store of the APAT building and was given a demonstration. The presentation software does not include a Geographical Information System. The centre has a UPS for electricity supply.

The HPGe detector (*ORTEC*, electric cooling, 30% rel. eff., theoretical resolution 1.85 keV, real resolution 2.04 keV) for gamma spectrometry was not in operation and awaited maintenance.

Verification does not give rise to any particular remarks.

8.2.2.2 Verification findings - GAMMA

The verification team visited the premises at APAT, i.e. the data centre and one of the dose rate monitors mounted on the roof of the building. Altogether, in Lazio 4 devices are installed (Cittareale, Poggio Moiano, Priverno and Vetralla).

Verification does not give rise to any particular remarks.

9 CONCLUSIONS

All verifications that had been planned by the verification team were completed successfully. In this regard, the information supplied in advance of the visit, as well as the additional documentation received during and after the verification, was useful.

(1) The verification activities that were performed demonstrated that the facilities necessary to carry out continuous monitoring of levels of radioactivity in the air, water and soil around the Latina nuclear power plant site, as installed by the operator, are adequate. The Commission could verify the operation and efficiency of these facilities.

(2) The verification team strongly recommends the regulatory authority setting up a monitoring system for discharges and environmental media independent from the one run by the operator.

(3) A number of topical recommendations are formulated. These recommendations aim at improving some aspects of discharge monitoring from, and environmental surveillance around the Latina site. The recommendations do not discredit the fact that environmental monitoring around the Latina site is in conformity with the provisions laid down under Article 35 of the Euratom Treaty.

(4) Under the co-ordination of APAT a detailed monitoring programme for environmental radioactivity has been elaborated for the whole of Italy. As far as concerns the implementation of the regional/provincial programmes they are under the responsibility of the regional/provincial authorithies. The verification noted that the facilities for monitoring environmental radioactivity on a regional scale on the territory of the Lazio region are present only in a very limited form. On the basis of this verification finding the Commission requests the Italian authorities to correct this situation as a matter of high priority, i.e. to implement the said monitoring programme. This observation is valid as well for other regions that may not have yet implemented this programme in its full extent.

(5) The verification findings and ensuing recommendations are compiled in the 'Main Findings' document that is addressed to the Italian competent authorities through the Italian Permanent Representative to the European Union.

(6) The Commission services will closely follow up the progress made by the Italian authorities with respect to points (2) and (4).

(7) The present Technical Report is to be enclosed with the Main Findings.

(8) Finally, the verification team acknowledges the excellent co-operation it received from all persons involved in the activities it performed.

****

APPENDIX 1

DOCUMENTATION RECEIVED AND CONSULTED

1. Main Legislation

- Legislative Government Decree Nr 230 of 17 March 1995 transposing the European Directives 89/618/Euratom, 90/641/Euratom, 92/3/Euratom and 96/29/Euratom.
- Legislative Decree Nr 241 of 26 May 2000, amending Government Decree Nr 230.
- Legislative Decree Nr 257 of 9 May 2001, amending Government Decree Nr 230.
- Legislative Decree Nr 151 of 26 March 2001, amending Government Decree Nr 230.

2 Legislative acts regulating environmental radioactivity monitoring

- Treaty of Rome (1957) establishing the European Atomic Energy Community.
- Circular n. 2 of 3 February 1987 of the Health Ministry "Directives to the Regions for the execution of the controls on the environmental radioactivity".
- Legislative Decree 230/1995 modified to: Legislative Decree187/2000, Legislative Decree241/2000, D.Lgs 257/2001, Legislative Decree151/2001 "Implementation of EC Directives EURATOM 89/618, 90/641, 92/3/ and 96/29 on ionising radiation" Ordinary Supplement OJ, 13 June 1995, n.136.
- Commission Recommendation 2000/473/Euratom of 8 June 2000 on the application of Art. 36 of the Euratom Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole (Official Journal L 191, 27 July 2000, pg 0037 – 0046).

3 Legislative acts regulating the radiological surveillance of foodstuffs

- Treaty of Rome (1957) establishing the European Atomic Energy Community.
- Council Regulation EURATOM 3954/87 of 22 December 1987 laying down maximum permitted levels of radioactive contamination of foodstuffs and of feeding stuffs following a nuclear accident or any other case of radiological emergency (OJ L371, 30 December 1987, pg 11). Amended by: Council Regulation EURATOM 2218/89 of 18 July 1989 (OJ L211, 22 July 1989, pg 1).
- Council Regulation EEC 737/90 of 22 March 1990 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station (OJ L82, 29 March 1990, pg 1ff). Amended by: Council Regulation EEC 616/2000 of 20 March 2000 (OJ L75, 24 March 2000, pg 1).
- Council Regulation EURATOM 944/89 of 12 April 1989 laying down maximum permitted levels of radioactive contamination in minor foodstuffs following a nuclear accident or any other case of radiological activity (OJ L101, 13 April 1998, pg 17).
- Commission Regulation (ECC) 2219/89 of 18 July 1989 on the special conditions for exporting foodstuffs and feedingstuffs following a nuclear accident or any other case of radiological activity (OJ L211, 22 July 1989, pg 4).
- Commission Regulation (EC) 1661/99 of 27 July 1999 laying down detailed rules for the application of Council Regulation 737/90/EEC on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power-station (OJ L197, 29 July 1999, pg 17). Amended by: Commission Regulation (EC) n° 1621/2001 of 8 August 2001 (OJ L215, 9 August 2001, pg 18); Commission Regulation (EC) n° 1608/2002 of 10 September 2002 (OJ L243, 11 September 2002, pg 7).
- Commission Recommendation 2000/473/Euratom of 8 June 2000 on the application of Art. 36 of the Euratom Treaty concerning the monitoring of the levels of radioactivity in the environment for the purpose of assessing the exposure of the population as a whole. Official Journal L 191, 27 July 2000, pg 0037 – 0046).

- Commission Regulation (EC)1609/2000 establishing a list of products excluded from the application of Council Regulation 737/90/EEC the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl power station (OJ L185, 25 July 2000, pg 27).
- Legislative Decree 31/2001, "Implementation of EC Directive 98/83 on the quality of water intended for human consumption" (Ordinary Supplement OJ, 3 March 2001, n. 52).
- Commission Recommendation 2003/274/EURATOM of 14 April 2003 on the protection and information of the public with regard to exposure resulting from the continued radioactive caesium contamination of certain wild food products as a consequence of the accident at the Chernobyl nuclear power station (OJ L99, 17 April 2003, pg 55f and OJ L109, 1 May 2003, pg 27).

4 Main national guidance documents

- *"Raccolta dei risultati dell'attività dei Gruppi di Lavoro delle Reti Nazionali"*, ANPA, May 1995.
- CTN_AGF (AGF-T-RAP-99-13) *"Rassegna di Bioindicatori per la Radioattività Ambientale"*, 2000.
- CTN_AGF (AGF-T-RAP-00-13) *"Criteri per l'adeguamento degli insiemi di dati sulla radioattività ambientale"*, 2000.
- CTN_AGF (AGF-T-RAP-01-12) *"Assistenza all'ANPA per la revisione delle reti nazionali di controllo della radioattività ambientale"*, 2001.
- CTN_AGF (RTI CTN_AGF 2/2002) *"Guida tecnica sulle misure di radioattività ambientale"*, 2002.
- CTN_AGF (AGF-T-SFW-01-05) *"Sviluppo della banca dati delle reti nazionali di monitoraggio della radioattività ambientale"*, 2001.
- CTN_AGF (AGF-T-GTE-03-01) *"Guida tecnica sulle misure di radioatività ambientale: H-3 α e β totale in acque potabili, α e β emettitori artificiali e naturali in matrici ambientali"*, 2004.
- CTN_AGF (AGF-T-RAP-03-15) *"Adeguamento della rete nazionale della radioattività ambientale: completamento della proposta operativa e integrazione con la rete d'allarme"*, 2005.
- CTN_AGF (AGF-T-RAP-04-04) *"Definizione di standard informativi per la gestione del flusso di dati sulla radioattività ambientale"*, 2005.

5 Main international guidance documents

- IAEA (1985), "Survey of currently available Reference Materials for use in Connection with the determination of Trace Elements in Biological and Environmental materials", IAEA/RL/128 REP-1, IAEA, Vienna.
- IAEA (1989) "Measurement of radionuclides in food and the environment. A guidebook" Technical Report Series N° STI/DOC/010/295 TRS 295. IAEA, Vienna
- IAEA (1998) "Analytical Quality Control Services, AQCS Programme 1998, Intercomparison Runs, Reference Materials", IAEA, Vienna.
- National Council on Radiation Protection and Measurements (1978), "A Handbook of Radioactivity Measurements Procedures", Report n° 58, Washington D.C.
- WHO, (2004) "Guidelines for Drinking-water Quality",3rd edition

6. Documents received:

NPP LATINA/SOGIN:

- *"Elaborato LT RS 0033: Relazione Tecnica: verifica delle attività previste dall'articolo 35 del Trattato Euratom. Questionario informativo preliminare"*.
- *"Elaborato LT RS 0019, Allegato B: Calibrazione monitore effluenti"*.

- *"Elaborato LT RS 0019, Allegato E: Controllo bimestrale di funzionalità – Monitore effluenti liquidi".*
- *"Elaborato LT RS 0019, Allegato F: Controllo semestrale di buon funzionamento – Monitore effluenti liquidi".*
- Other technical descriptions , procedures and calibration methods as receved in the *"Elaborato LT RS 0019, Allegato A1, 2, 3, C, D, G".*
- *"Elaborato LT RS 0032: Rapporto sullo stato della radioattività nell'ambiente circostante la Centrale di Latina anno 2005"*; Version translated by the EC.
- *"Elaborato LT RS 0002: Procedura per la taratura e i controlli periodici delle catene spettrometriche gamma dei laboratori di chimica e Fisica Sanitaria".*
- *"Elaborato LT RS 0034"*, produced by the operator – SOGIN –, titled *"Richiesta di autorizzazione di scarico effluenti liquidi attivi"*. Version translated by the EC.
- *"Prelievo e pretrattamento di campioni ambientali e d'impianto"*
- *"Esercizio dell'impianto di scarico degli effluenti attivi liquidi"*.
- *"Sistema di monitoraggio effluenti gassosi. Nuovo assetto funzionale dei monitori effluenti gassosi".*
- Powerpoint presentation of the Latina NPP: *"Programma di sorveglianza ambientale e relativo impatto ambientale in termini di dose alla popolazione".*
- Powerpoint presentation of the Latina NPP: "General description".
- "Experiences and Techniques in the Decommissioning of Old Nuclear Power Plants", by Maurizio Cumo, University of Rome "La Sapienza", Department of Nuclear Engineering and Energy Conversion, Rome, Italy.
- Reply to European Commission preliminary information questionnaire in view of preparing the verification activities, 2006.

APAT:

- National environmental radioactivity monitoring networks in Italy – 2002 report.
- Reply to European Commission preliminary information questionnaire in view of preparing the verification activities.
- "National Monitoring Networks for Environmental Radioactivity in Italy". Document produced for the review of the sampling and measurement plan of the RESORAD network.
- Powerpoint presentation "The Italian monitoring network for the environmental radioactivity".
- Photos of the gamma network sites: Cittareale, Poggio Moiano, Priverno, Vetralla, Lazio.

7 Web sites consulted

1.	APAT	www.apat.gov.it
2.	ARPA	www.arpa.emr.it
3.	ENEA	www.enea.it
4.	Legislation	www.parlamento.it/leggi
5.	ISPESL	www.ispesl.it
6.	MH	www.ministerosalute.it
7.	SOGIN	www.sogin.it

APPENDIX 2

THE VERIFICATION PROGRAMME

Monday 15/05

1. Arrival at site at 09:30, site access formalities and opening meeting at Latina NPP premises (AM).
2. Opening meeting: introductions / presentations / programme of the visit (AM).
3. Verification of the provision for monitoring/sampling of radioactive discharges from the Latina NPP (airborne and liquid) and visit of the dismantling operations' control room (PM).

Tuesday 16/05

4. Verification of a representative set of environmental surveillance stations and sampling locations on and around the Latina site, as set-up by the operator (AM).
5. Verification activities at the analytical laboratories for discharge as well as environmental samples (PM).

Wednesday 17/05

6. Verification activities at the APAT laboratory at Castel Romano

Thursday 18/05

7. Verification of the national APAT environmental surveillance network:: REMRAD and GAMMA control centre in Rome

Friday 19/05

8. Closing meeting: Presentation of preliminary verification findings.

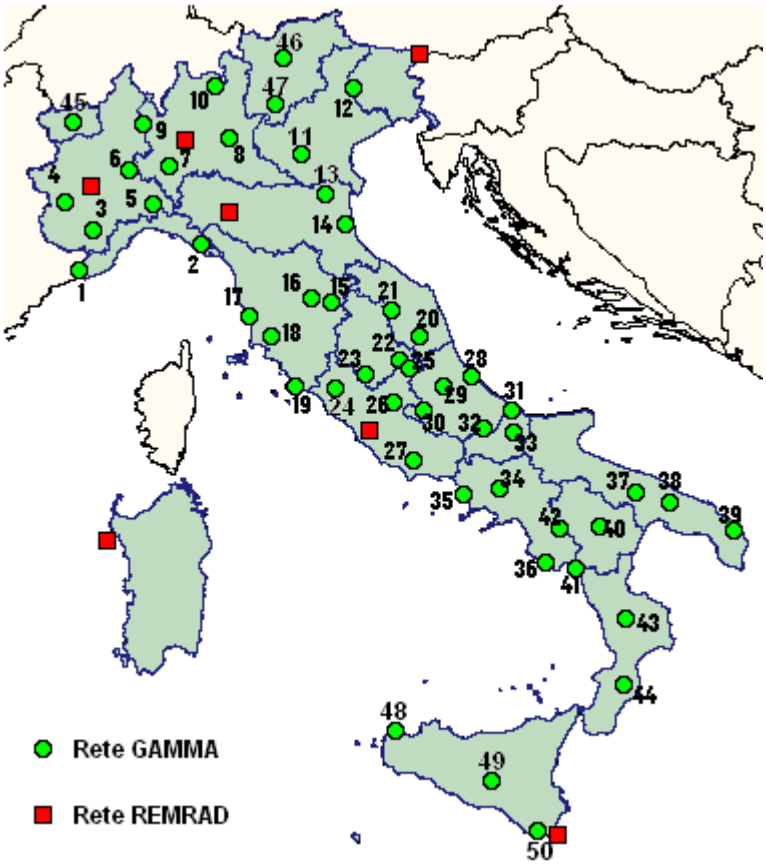
APPENDIX 3

Provincial and Regional Environmental Protection Agencies – APPA/ARPA Network

1. Agency for Environmental Protection and Technical Services- APAT
2. Provincial Agency for Environmental Protection – Bolzano
3. Provincial Agency for Environmental Protection – Trento
4. Regional Agency for Environmental Protection of Emilia-Romagna
5. Regional Agency for Environmental Protection of Veneto
6. Regional Agency for Environmental Protection of Calabria
7. Regional Agency for Environmental Protection of Campania
8. Regional Agency for Environmental Protection of Lazio
9. Regional Agency for Environmental Protection of Marche
10. Regional Agency for Environmental Protection of Molise
11. Regional Agency for Environmental Protection of Piemonte
12. Regional Agency for Environmental Protection of Puglia
13. Regional Agency for Environmental Protection of Toscana
14. Regional Agency for Environmental Protection of Umbria
15. Regional Agency for Environmental Protection of Basilicata
16. Regional Agency for Environmental Protection of Friuli Venezia Giulia
17. Regional Agency for Environmental Protection of Liguria
18. Regional Agency for Environmental Protection of Lombardia
19. Regional Agency for Environmental Protection of Sicilia
20. Regional Agency for Environmental Protection of Valle d'Aosta
21. Regional Agency for Environmental Protection of Abruzzo
22. Regional Agency for Environmental Protection of Sardegna

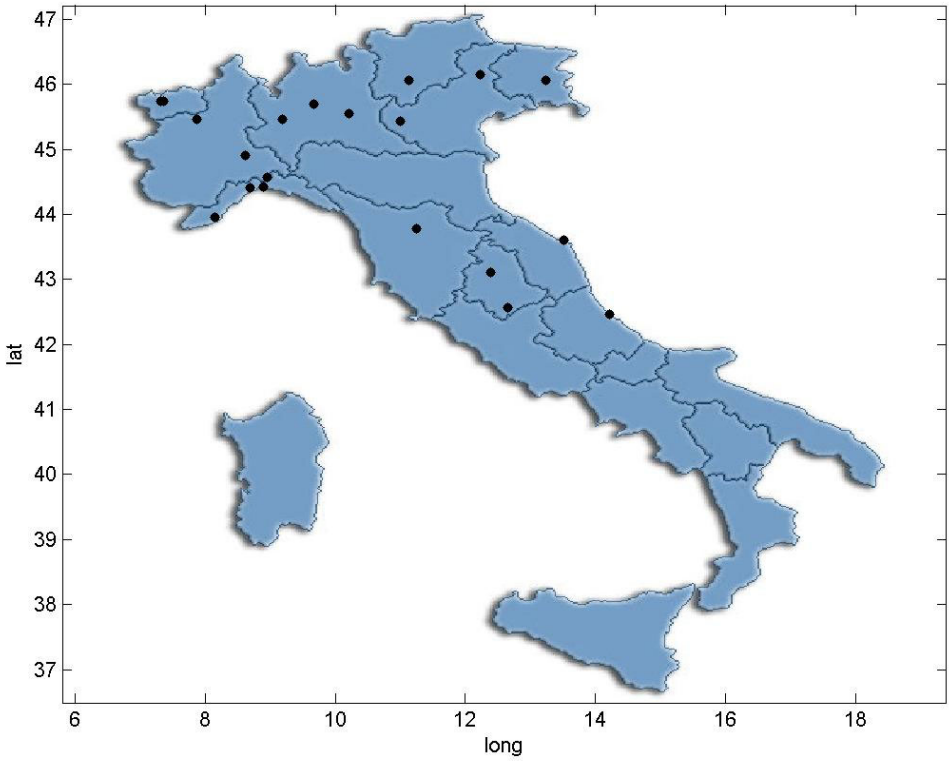
APPENDIX 4

GAMMA AND REMRAD NETWORK



APPENDIX 5

RESORAD - AEROSOL NETWORK

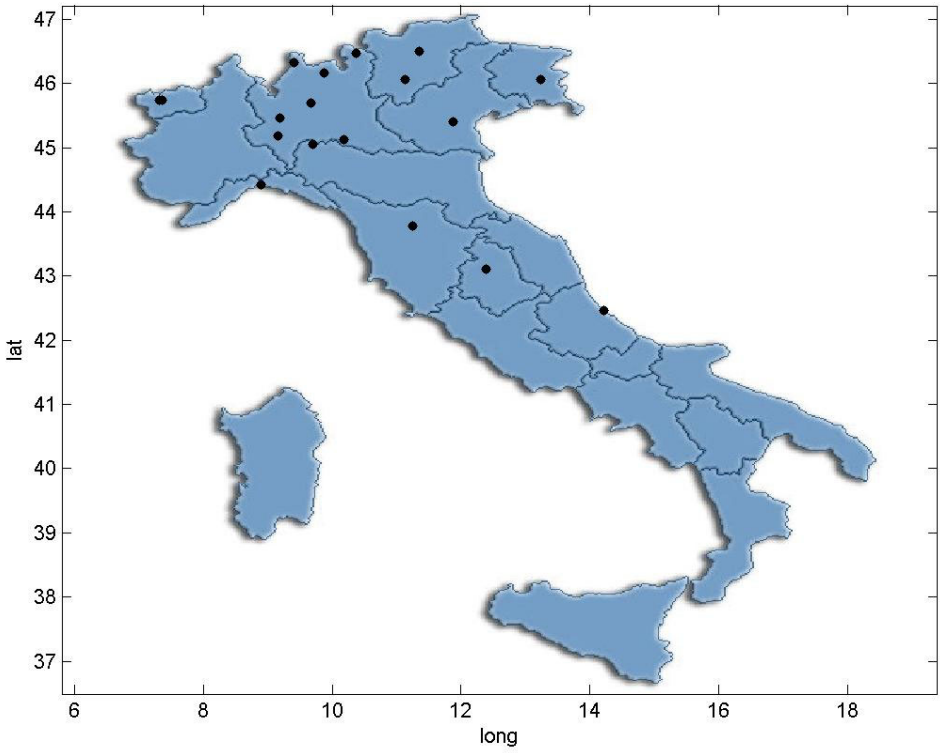


Sampling location list and radionuclides assessed for RESORAD aerosol samples

Region	Location	Prov	Radionuclides				
Veneto	BELLUNO	BL	CS-137		BE-7		
Veneto	VERONA	VR	CS-137		BE-7		
Friuli Venezia Giulia	UDINE	UD	CS-137		BE-7		
Trentino Alto Adige	TRENTO	TN				T-BETA	
Val d'Aosta	SAINT-CHRISTOPHE	AO	CS-137	I-131	BE-7	T-BETA	
Val d'Aosta	AOSTA	AO	CS-137	I-131	BE-7	T-BETA	
Lombardia	BERGAMO	BG	CS-137		BE-7		
Lombardia	BRESCIA	BS	CS-137		BE-7		
Lombardia	MILANO	MI	CS-137	I-131	BE-7		
Piemonte	ALESSANDRIA	AL	CS-137	I-131	BE-7		
Piemonte	ANDORA	TO				T-BETA	
Piemonte	IVREA	TO	CS-137	I-131	BE-7	T-BETA	T-ALFA
Liguria	BUSALLA	GE	CS-137		BE-7		
Liguria	ARENZANO	GE	CS-137		BE-7		
Liguria	GENOVA	GE	CS-137		BE-7		
Toscana	FIRENZE	FI	CS-137				
Marche	ANCONA	AN	CS-137			T-BETA	
Umbria	TERNI	TR	CS-137		BE-7	T-BETA	
Umbria	PERUGIA	PG	CS-137		BE-7	T-BETA	
Abruzzo	PESCARA	PS	CS-137		BE-7		

APPENDIX 6

RESORAD – DRY/WET DEPOSITION

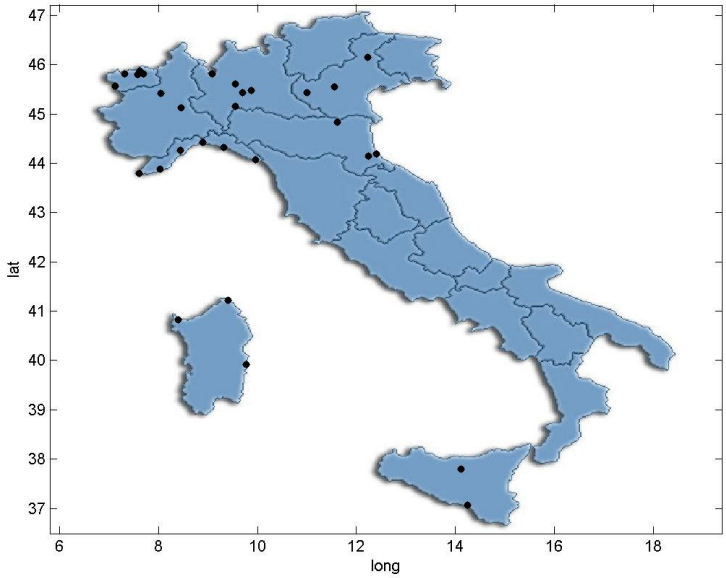


Sampling location list and radionuclides assessed in RESORAD dry/wet deposition samples

Region	Location	Prov	Lat	Long	Radionuclides		
Veneto	PADOVA	PD	45,406	11,876	CS-137		
Friuli Ven Giulia	UDINE	UD	46,063	13,236	CS-137	BE-7	
Trentino Alto Adige	TRENTO	TR	46,064	11,124	CS-137	BE-7	K-40
Trentino Alto Adige	BOLZANO	BZ	46,497	11,354	CS-137		
Val d'Aosta	AOSTA	AO	45,737	7,313	CS-137	BE-7	
Val d'Aosta	SAINT CHRISTOPHE	AO	45,746	7,356	CS-137	BE-7	
Lombardia	BORMIO	SO	46,468	10,372	CS-137	BE-7T-BETA	
Lombardia	CHIAVENNA	SO	46,321	9,402	CS-137	BE-7T-BETA	
Lombardia	BERGAMO	BG	45,694	9,670	CS-137	BE-7T-BETA	
Lombardia	MILANO	MI	45,464	9,189	CS-137	BE-7	
Lombardia	PAVIA	PV	45,189	9,160	CS-137	BE-7	
Lombardia	PIEVE SAN GIACOMO	CR	45,127	10,186	CS-137	BE-7	
Lomabardia	SONDRIO	SO	46,171	9,872	CS-137	BE-7T-BETA	
Liguria	GENOVA	GE	44,419	8,897	CS-137	BE-7	
Toscana	FIRENZE	FI	43,777	11,249	CS-137	BE-7	
Emilia-Romagna	PIACENZA	PC	45,052	9,692	CS-137SR-90		
Umbria	PERUGIA	PG	43,106	12,386	CS-137	BE-7	
Abruzzo	PESCARA	PS	42,464	14,214	CS-137	BE-7	

APPENDIX 7

RESORAD – SURFACE WATER

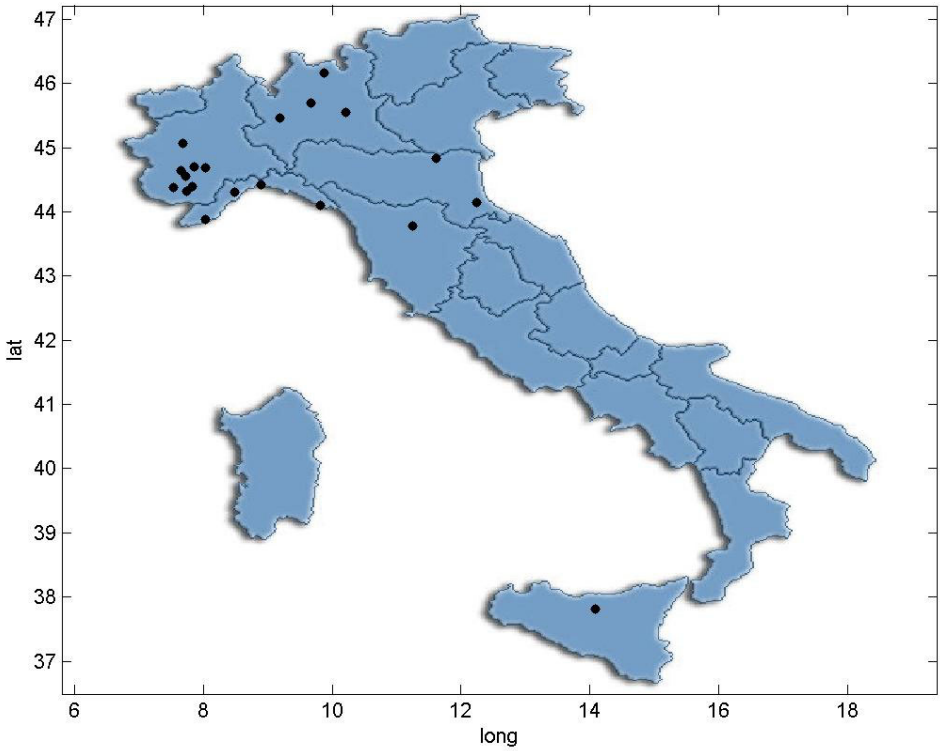


Sampling location list and radionuclides assessed in RESORAD surface water samples

Region	Location	Prov.	Long	Lat	Radionuclides					
Veneto	BELLUNO	BL	46,146	12,222	CS-137					
Veneto	VERONA	VR	45,438	10,994	CS-137					
Veneto	VICENZA	VI	45,549	11,549	CS-137					
Lombardia	BREMBATE	BG	45,603	9,557	CS-137					
Lombardia	COMO	CO	45,809	9,084	CS-137					
Lombardia	PUMENENGO	BG	45,479	9,869	CS-137					
Lombardia	ORIO LITTA	LO	45,157	9,554	CS-137					
Lombardia	SERGNANO	BG	45,427	9,704	CS-137					
Val d'Aosta	DOUES	AO	45,819	7,306	RN-222					
Val d'Aosta	AYAS	AO	45,812	7,688	RN-222					
Val d'Aosta	RHÊMES-NOTRE-DAME	AO	45,569	7,117	RN-222					
Val d'Aosta	TORGNON	AO	45,802	7,569	RN-222					
Val d'Aosta	VALTOURNENCHE	AO	45,876	7,623	RN-222					
Piemonte	VIVERONE	BI	45,424	8,051	CS-137	SR-90	CS-134	CO-60	I-131	PU-238	PU(239+240)
Piemonte	CASALE MONFERRATO	AL	45,132	8,450	CS-137	SR-90	CS-134	CO-60	I-131	PU-238	PU(239+240)
Liguria	VENTIMIGLIA	IM	43,790	7,608	CS-137					
Liguria	VADO LIGURE	SV	44,269	8,434	CS-137					
Liguria	GENOVA	GE	44,419	8,897	CS-137					
Liguria	GENOVA	GE	44,419	8,897	CS-137					
Liguria	IMPERIA	IM	43,885	8,027	CS-137					
Liguria	CHIAVARI	GE	44,317	9,322	CS-137					
Liguria	AMEGLIA	SP	44,066	9,960	CS-137					
Emilia-Romagna	PONTELAGOSCURO	FE	44,836	11,618	CS-137	SR-90	H-3			
Emilia-Romagna	CESENA	FC	44,139	12,243	CS-137					
Emilia-Romagna	CESENATICO	FC	44,197	12,405	CS-137					
Sardegna	LA MADDALENA	SS	41,217	9,411	CS-137	SR-90				
Sardegna	ARBATAX	NU	39,926	9,773	CS-137	SR-90				
Sardegna	PORTO TORRES	SS	40,832	8,402	CS-137	SR-90				
Sicilia	GELA	CL	37,071	14,240	CS-137	CS-134	K-40			
Sicilia	PETRALIA SOPRANA	PA	37,797	14,108	CS-137	CS-134	K-40			

APPENDIX 8

RESORAD – DRINKING WATER

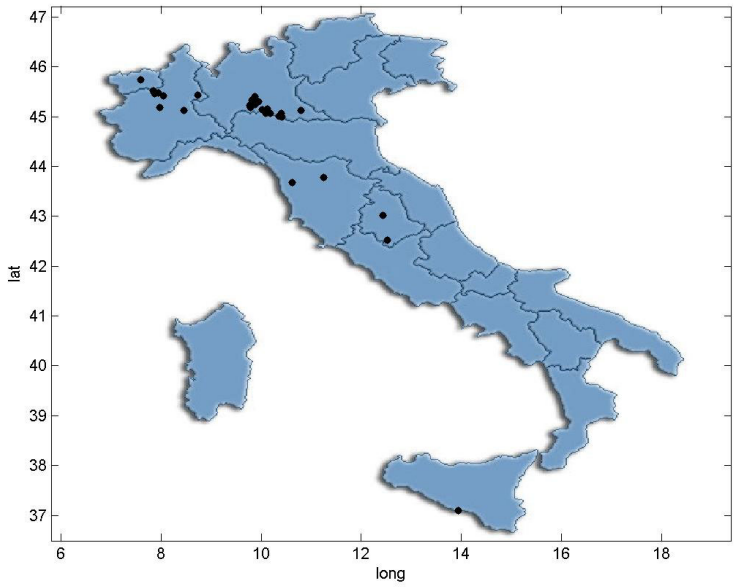


Sampling location list and radionuclides assessed in RESORAD drinking water samples

Region	Location	Prov	Long	Lat	Radionuclides				
Lombardia	SONDRIO	SO	46,171	9,872	CS-137				
Lombardia	BERGAMO	BG	45,694	9,670	CS-137				
Lombardia	MILANO	MI	45,464	9,189	CS-137	SR-90	H-3	T-ALFA	T-BETA
Lombardia	BRESCIA	BS	45,544	10,214	CS-137				
Piemonte	ALBA	CN	44,693	8,032	CS-137	CS-134	K-40	I-131	
Piemonte	BRA	CN	44,698	7,849	CS-137	CS-134	K-40	I-131	
Piemonte	MONDOVI'	CN	44,391	7,820	CS-137	CS-134	K-40	I-131	
Piemonte	ROCCAFORTE MONDOVI'	CN	44,317	7,744	CS-137	CS-134	K-40	I-131	
Piemonte	SAVIGLIANO	CN	44,647	7,655	CS-137	CS-134	K-40	I-131	
Piemonte	TORINO	TO	45,070	7,674	CS-137	CS-134	K-40	I-131	
Piemonte	CUNEO	CN	44,381	7,538	CS-137	CS-134	K-40	I-131	
Piemonte	FOSSANO	CN	44,550	7,721	CS-137	CS-134	K-40	I-131	
Liguria	IMPERIA	IM	43,885	8,027	CS-137				
Liguria	SAVONA	SV	44,307	8,480	CS-137				
Liguria	GENOVA	GE	44,419	8,897	CS-137				
Liguria	LA SPEZIA	SP	44,105	9,819	CS-137				
Toscana	FIRENZE	FI	43,777	11,249	CS-137				
Emilia-Romagna	CESENA	FC	44,139	12,243	CS-137				
Emilia-Romagna	PONTELAGOSCURO	FE	44,836	11,618	CS-137	SR-90			
Sicilia	PETRALIA	PA	37,806	14,091	CS-137	CS-134	K-40		

APPENDIX 9

RESORAD – SOIL AND SEDIMENT

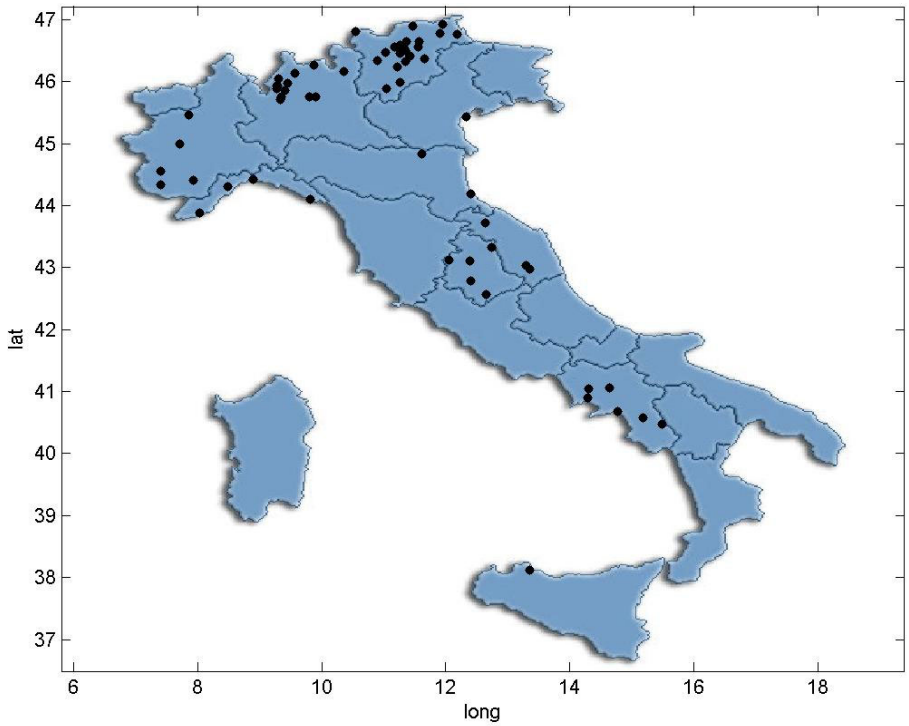


Sampling location list and radionuclides assessed in RESORAD soil and sediment samples

Region	Location	Prov	Lat	Long	Radionuclides						
Valle D'Aosta	PONTEY	AO	45,738	7,592	CS-137						
Lombardia	ANNICCO	CR	45,245	9,878	CS-137						
Lombardia	CAPPELLA CANTONE	CR	45,246	9,838	CS-137						
Lombardia	CASALMAGGIORE	CR	44,987	10,421	CS-137						
Lombardia	CASTELDIDONE	CR	45,069	10,405	CS-137						
Lombardia	CASTELVISCONTI	CR	45,306	9,941	CS-137						
Lombardia	CREMONA	CR	45,136	10,024	CS-137						
Lombardia	FORMIGARA	CR	45,223	9,769	CS-137						
Lombardia	GADESCO-PIEVE DELMONA	CR	45,157	10,116	CS-137						
Lombardia	GUSSOLA	CR	45,011	10,352	CS-137						
Lombardia	PIEVE D'OLMI	CR	45,089	10,125	CS-137						
Lombardia	PIZZIGHETTONE	CR	45,187	9,782	CS-137						
Lombardia	TRIGOLO	CR	45,329	9,814	CS-137						
Lombardia	VIRGILIO	MN	45,119	10,788	CS-137						
Lombardia	SAN DANIELE PO	CR	45,063	10,180	CS-137						
Lombardia	SONCINO	CR	45,399	9,874	CS-137						
Lombardia	STAGNO LOMBARDO	CR	45,074	10,089	CS-137						
Piemonte	VIVERONE	BI	45,424	8,051	CS-137	CS-134	SR-90	I-131	CO-60	PU-238	PU(239+240)
Piemonte	VEROLENGO	TO	45,190	7,968	CS-137	CS-134	SR-90	I-131	CO-60	PU-238	PU(239+240)
Piemonte	TRECATE	NO	45,431	8,735	CS-137	CS-134		I-131	CO-60		
Piemonte	QUASSOLO	TO	45,524	7,833	CS-137	CS-134	SR-90	I-131	CO-60		
Piemonte	CASALE MONFERRATO	AL	45,132	8,450	CS-137	CS-134	SR-90	I-131	CO-60	PU-238	PU(239+240)
Piemonte	BOLLENGO	TO	45,472	7,944	CS-137						
Piemonte	IVREA	TO	45,462	7,874	CS-137	CS-134	SR-90	I-131	CO-60		
Emilia-Romagna	PONTELAGOSCURO	FE	44,836	11,618	CS-137			I-131			
Toscana	CALCINAIA	PI	43,683	10,616	CS-137			I-131			
Toscana	FIRENZE	FI	43,777	11,249	CS-137			I-131			
Umbria	NARNI	TR	42,517	12,521	CS-137	CS-134		I-131			
Umbria	TORGIANO	PG	43,025	12,435	CS-137			I-131			
Sicilia	LICATA	AG	37,101	13,939	CS-137	CS-134	K-40				

APPENDIX 10

RESORAD – Terrestrial and Aquatic Biota and Flora Sampling



APPENDIX 11

RESORAD - MILK

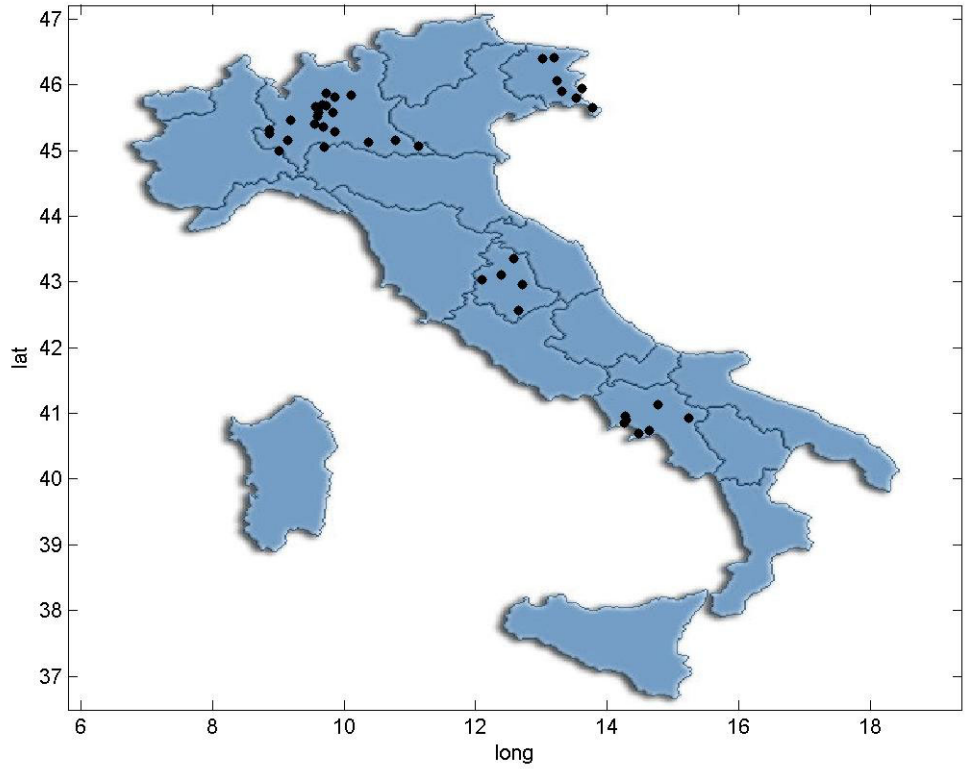
Sampling location list and radionuclides assessed in milk samples

Region	Location	Prov	Type of location	Radionuclides	
Trentino Alto Adige	FIAVE'	TN	production	CS-137	K-40
Trentino Alto Adige	TRENTO	TN	production	CS-137	K-40
Trentino Alto Adige	ROVERETO	TN	production	CS-137	K-40
Trentino Alto Adige	LAGUNDO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	MERANO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	BOLZANO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	VARNA	BZ	consumption	CS-137	K-40
Trentino Alto Adige	VIPITENO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	BOLZANO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	SESTO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	SAN CANDIDO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	BRUNICO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	DOBBIACO	BZ	consumption	CS-137	K-40
Trentino Alto Adige	FALZES	BZ	consumption	CS-137	K-40
Trentino Alto Adige	NAZ-SCIAVES	BZ	consumption	CS-137	K-40
Trentino Alto Adige	PERCA	BZ	consumption	CS-137	K-40
Friuli Venezia Giulia	TRIESTE	TS	consumption	CS-137	K-40
Friuli Venezia Giulia	GRADO	GO	consumption	CS-137	K-40
Friuli Venezia Giulia	GORIZIA	GO	consumption	CS-137	K-40
Friuli Venezia Giulia	S. CANZIAN D'ISONZO	GO	consumption	CS-137	K-40
Friuli Venezia Giulia	SAVOGNA D'ISONZO	GO	consumption	CS-137	K-40
Friuli Venezia Giulia	VILLESSE	GO	consumption	CS-137	K-40
Friuli Venezia Giulia	GEMONA	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	MALBORGHETTO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	OVARO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	ENEMONZO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	SUTRIO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	PAULARIO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	CIVIDALE DEL FRIULI	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	S.DANIELE DEL FRIULI	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	TAVAGNACCO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	UDINE	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	MUZZANA DEL TURGNANO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	POCENIA	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	CERVIGNANO	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	VILLA VICENTINA	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	PALMANOVA	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	LATISANA	UD	consumption	CS-137	K-40
Friuli Venezia Giulia	S.VITO AL TAGLIAMENTO	PN	consumption	CS-137	K-40
Friuli Venezia Giulia	VALVASONE	PN	consumption	CS-137	K-40
Friuli Venezia Giulia	CAMPOFORMIDO	PN	consumption	CS-137	K-40
Friuli Venezia Giulia	SPILINBERGO	PN	consumption	CS-137	K-40
Friuli Venezia Giulia	FONTANAFREDDA	PN	consumption	CS-137	K-40
Val d'Aosta	CHATILLON	AO	consumption	CS-137	K-40
Val d'Aosta	MORGEX	AO	consumption	CS-137	K-40

Val d'Aosta	ARNAD	AO	consumption	CS-137	K-40			
Val d'Aosta	FONTAINEMORE	AO	consumption	CS-137	K-40			
Val d'Aosta	ARNAD	AO	consumption	CS-137	K-40			
Val d'Aosta	CHATILLON	AO	consumption	CS-137	K-40			
Val d'Aosta	MORGEX	AO	consumption	CS-137	K-40			
Val d'Aosta	FONTAINEMORE	AO	consumption	CS-137	K-40			
Piemonte	IVREA	TO	consumption	CS-137	K-40	CS-134	I-131	CO-60
Piemonte	TORINO	TO	consumption	CS-137	K-40	CS-134	I-131	CO-60
Piemonte	MONDOVI'	CN	consumption	CS-137	K-40	CS-134	I-131	CO-60
Piemonte	RODDI	CN	consumption	CS-137	K-40	CS-134	I-131	CO-60
Piemonte	POCAPAGLIA	CN	consumption	CS-137	K-40	CS-134	I-131	CO-60
Piemonte	OLEGGIO	NO	consumption	CS-137	K-40	CS-134	I-131	CO-60
Piemonte	NOVARA	NO	consumption	CS-137	K-40	CS-134	I-131	CO-60
Liguria	LA SPEZIA	SP	consumption	CS-137	K-40			
Liguria	RAPALLO	GE	production	CS-137	K-40			
Liguria	MASONE	GE	production	CS-137	K-40			
Liguria	GENOVA	GE	production	CS-137	K-40			
Liguria	IMPERIA	IM	production	CS-137	K-40			
Liguria	SARZANA	SP	production	CS-137	K-40			
Liguria	BARDINETO	SV	production	CS-137	K-40			
Liguria	SAVONA	SV	production	CS-137	K-40			
Umbria	GUBBIO	PG	consumption	CS-137	K-40	CS-134	I-131	
Umbria	NARNI	TR	production	CS-137	K-40	CS-134	I-131	
Umbria	PERUGIA	PG	production	CS-137	K-40	CS-134	I-131	
Umbria	NORCIA	PG	production	CS-137	K-40	CS-134	I-131	
Umbria	LUGNANO IN TEVERINA	TR	production	CS-137	K-40	CS-134	I-131	
Umbria	ORVIETO	TR	production	CS-137	K-40	CS-134	I-131	
Umbria	ALLERONA	TR	production	CS-137	K-40	CS-134	I-131	
Marche	ASCOLI PICENO	AP	consumption	CS-137	K-40			
Marche	JESI	AN	consumption	CS-137	K-40			
Sardegna	ASSEMINI	CA	consumption	CS-137	SR-90			
Sardegna	CAGLIARI	CA	consumption	CS-137	SR-90			
Sardegna	CAPOTERRA	CA	consumption	CS-137	SR-90			
Sardegna	PULA	CA	consumption	CS-137	SR-90			
Sardegna	QUARTUCCIU	CA	consumption	CS-137	SR-90			
Sardegna	SELARGIUS	CA	consumption	CS-137	SR-90			
Puglia	MESAGNE	BR	consumption	CS-137	K-40			
Puglia	PUTIGNANO	BA	consumption	CS-137	K-40			
Puglia	SCORRANO	LE	consumption	CS-137	K-40			
Puglia	POGGIARDO	LE	consumption	CS-137	K-40			
Puglia	ALEZIO	LE	consumption	CS-137	K-40			
Puglia	TAVIANO	LE	consumption	CS-137	K-40			
Puglia	GIOIA DEL COLLE	BA	consumption	CS-137	K-40			
Puglia	PUTIGNANO	BA	consumption	CS-137	K-40			
Puglia	CORATO	BA	consumption	CS-137	K-40			
Puglia	BARI	BA	consumption	CS-137	K-40			
Abruzzo	SPOLTORE	PE	consumption	CS-137	K-40			
Sicilia	TRAPANI	TP	consumption	CS-137	K-40	CS-134	I-131	
Sicilia	CALTANISSETTA	CL	consumption	CS-137	K-40	CS-134	I-131	
Sicilia	PETRALIA	PA	consumption	CS-137	K-40	CS-134	I-131	
Sicilia	CATANIA	CT	consumption	CS-137	K-40	CS-134	I-131	
Sicilia	GIARRE	CT	consumption	CS-137	K-40	CS-134	I-131	

APPENDIX 12

RESORAD – MIXED DIET



Sampling location list and radionuclides assessed in mixed diet samples

Region	Location	Prov	Lat	Long	Radionuclides		
Lombardia	AMBIVERE	BG	45,719	9,548	CS-137		
Lombardia	ARCENE	BG	45,576	9,614	CS-137		
Lombardia	BERGAMO	BG	45,694	9,670	CS-137		
Lombardia	BONATE SOTTO	BG	45,666	9,561	CS-137		
Lombardia	COLZATE	BG	45,815	9,856	CS-137		
Lombardia	COSTA VOLPINO	BG	45,837	10,101	CS-137		
Lombardia	CREMA	CR	45,362	9,686	CS-137		
Lombardia	GAMBOLO'	PV	45,258	8,856	CS-137		
Lombardia	MANTOVA	MN	45,152	10,775	CS-137		
Lombardia	MILANO	MI	45,464	9,189	CS-137		SR-90
Lombardia	SAN MARTINO SICCOMARIO	PV	45,161	9,136	CS-137		
Lombardia	SERIATE	BG	45,682	9,723	CS-137		
Lombardia	SERINA	BG	45,872	9,729	CS-137		
Lombardia	SORESINA	CR	45,288	9,855	CS-137		
Lombardia	TREVIGLIO	BG	45,521	9,593	CS-137		
Lombardia	PIADENA	CR	45,130	10,367	CS-137		
Lombardia	PALOSCO	BG	45,586	9,835	CS-137		
Lombardia	PANDINO	CR	45,404	9,552	CS-137		
Lombardia	OSTIGLIA	MN	45,066	11,136	CS-137		
Lombardia	VIGEVANO	PV	45,316	8,856	CS-137		
Lombardia	VOGHERA	PV	44,992	9,009	CS-137		
Friuli Ven. Giulia	MOGGIO UDINESE	UD	46,406	13,196	CS-137	K-40	
Friuli Ven. Giulia	MONFALCONE	GO	45,805	13,529	CS-137	K-40	

Friuli Ven. Giulia	GORIZIA	GO	45,942	13,620	CS-137		K-40
Friuli Ven. Giulia	PALMANOVA	UD	45,904	13,310	CS-137		K-40
Friuli Ven. Giulia	TRIESTE	TS	45,656	13,784	CS-137		K-40
Friuli Ven. Giulia	UDINE	UD	46,063	13,236	CS-137		K-40
Friuli Ven. Giulia	TOLMEZZO	UD	46,398	13,019	CS-137		K-40
Emilia-Romagna	PIACENZA	PC	45,052	9,692	CS-137		
Umbria	FOLIGNO	TR	42,955	12,704	CS-137	CS-134	
Umbria	PANICALE	PG	43,028	12,099	CS-137	CS-134	
Umbria	PERUGIA	PG	43,106	12,386	CS-137	CS-134	
Umbria	GUBBIO	PG	43,351	12,577	CS-137	CS-134	
Umbria	TERNI	TR	42,561	12,647	CS-137	CS-134	
Campania	BENEVENTO	BN	41,129	14,777	CS-137		K-40
Campania	CASORIA	NA	40,905	14,290	CS-137		K-40
Campania	CASTELLAMMARE DI STABIA	NA	40,700	14,486	CS-137		K-40
Campania	FRATTAMINORE	NA	40,956	14,271	CS-137		K-40
Campania	MORRA DE SANCTIS	AV	40,928	15,244	CS-137		K-40
Campania	NAPOLI	NA	40,855	14,260	CS-137		K-40
Campania	NOCERA INFERIORE	SA	40,743	14,642	CS-137		K-40

APPENDIX 13

FOODSTUFFS

ANANAS	CORN, MAIZE	OLIVE OIL	COD
ANCHOVY	COURGETTES	ONIONS	COFFEE
ANIMAL FOOD	CRAB	ORANGE	CONGER
APPLES	CREAM - COW	OVINE MEAT	MUSHROOMS
APRICOT	CRUSTACEA	TURKEY	MUSSEL
ARTICHOKE	CUTTLEFISH	PASTA	OCTOPUS
ASPARAGUS	BREAD	POTATOES	WILDFOWL
ASPARAGUS OFFICINALIS	PASTA	PEACH (FRUIT)	YELLOW PLUM
AUBERGINES	WINE	PEANUTS	YOGHURT - COW
BANANA	DEER - MEAT	PEAR (FRUIT)	CHILDREN FOOD
BARLEY	DORY	PIKE	MULLET
BEANS	DRIED FIGS	PISTACHIO	WILD-BOAR MEAT
BEEF (VEAL) MEAT	PORK MEAT	PLUM	
BEET	SHEEP - LAMB MEAT	PORK MEAT	
BERRIES	RABBIT	PORK MEAT MUSCLE	
BILBERRIES	POULTRY	PORK MEAT, MUSCLE	
BLACKBERRIES	EGGS	POTATOES	
BLACKBERRY	HONEY	PRUNES	
BOAR	EGGS	RABBIT MEAT	
BOVINE MEAT	CREAM - COW	RAINBOW TROUT	
BRAN	MILK POWDER - COW	RED MULLET	
BREAD	FALLOW-DEER MEAT	RED PEPPER	
BROCCOLI	FENNEL	RICE	
BUTTER	FIGS	ROCKET	
LEAF AND STEM VEGETABLES	FISH	ROE-DEER MEAT	
LETTUCE	FLOUR	ROOTS	
CAULIFLOWER	FRESH WATER FISH	SALMON	
GREEN CABBAGE	FRUIT	SEA FISH	
CARROTS	FULL MEAL	SEMOLINA	
BEANS	GARLIC	SHALLOT	
FRIUT - JUICE	GOAT MEAT	SHEEP	
STRAWBERRIES	GRAIN, HARD	SKATE	
CHESTNUT	GRAIN, SOFT	SOLE	
WHEAT	GRAPE FRUIT	SOYA PRODUCTS	
CORN, MAIZE	HAZEL-NUT	SPELT	
FLOUR	HERRING	SPICES	
RICE	HONEY	SPINACH	
CABBAGE	KIWI	STRAWBERRIES	
CACAO POWDER	LAMB MEAT, MUSCLE	TEA	
CARROTS	LEAF AND STEAM VEGETABLES	TOMATOES	
CAULIFLOWER	LEMON	TROUT	
CELERY	LETTUCE	TURKEY MEAT	
CEREALS	LIME	TURNIP	
CERVO (SPALLA)	MAIZE	VEGETABLE OIL	
CHEESE - COW	MAKREL	VEGETABLES	
CHEESE - SHEEP	MANDARIN	WALNUT	
CHERRY	MARROWS	WHEAT	
CHESTNUT	MEAL	WHITE BREAD	
CHICKEN MEAT	MELON	WHORTLEBERRY	
CHICORY	MOLLUSCS, SHELL FISH	WHORTLEBERRY JAM	