EUROPEAN COMMISSION
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DIRECTORATE D – Nuclear energy, safety and ITER
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Verification under the terms of Article 35 of the Euratom Treaty

Technical Report

ROMANIA
Bucharest

Routine and emergency radioactivity monitoring arrangements
Monitoring of radioactivity in drinking water and foodstuffs

6-8 December 2017

Reference: RO 17-05

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35

OF THE EURATOM TREATY

FACILITIES:	Routine and emergency radioactivity monitoring arrangements Monitoring of radioactivity in drinking water and foodstuffs
LOCATIONS:	Bucharest, Romania
DATES:	6-8 December 2017
REFERENCE:	RO 17-05
TEAM MEMBERS:	Mr V. Tanner (team leader) Ms L. Budinova
REPORT DATE:	22 June 2018

SIGNATURES:

V. Tanner L. Budinova

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TECHNICAL REPORT

1 INTRODUCTION

Under Article 35 of the Euratom Treaty, all Member States must establish the facilities necessary to carry out continuous monitoring of the levels of radioactivity in air, water and soil and to ensure compliance with basic safety standards[1]. Article 35 also gives the European Commission the right of access to such facilities to verify their operation and efficiency. The radiation protection and nuclear safety unit of the European Commission's Directorate-General for Energy is responsible for undertaking these verifications. The Joint Research Centre Directorate-General provides technical support during the verification visits and in drawing up the reports.

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

- liquid and airborne discharges of radioactivity from a site into the environment;
- 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[2] describing practical arrangements for Article 35 verification visits in Member States was published in the *Official Journal of the European Union* on 4 July 2006.

2 PREPARATION AND CONDUCT OF THE VERIFICATION

2.1 PREAMBLE

The Commission notified Romania of its decision to conduct Article 35 verification in a letter addressed to the Romanian Permanent Representation to the European Union. The Romanian Government subsequently designated the National Environmental Protection Agency (NEPA) to lead the preparations for the visit.

2.2 DOCUMENTS

To assist the verification team in its work, the national authorities supplied an information package in advance[3]. Additional documentation was provided during and after the visit. The information thus provided was used extensively in drawing up the descriptive sections of the report.

2.3 PROGRAMME OF THE VISIT

The Commission and the NEPA discussed and agreed on a programme of verification activities in line with the Commission Communication of 4 July 2006.

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1 Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom (OJ L 13, 17.1.2014)

2 Commission Communication *Verification of environmental radioactivity monitoring facilities under the terms of Article 35 of the Euratom Treaty — Practical arrangements for the conduct of verification visits in Member States* (OJ C 155, 4.7.2006)

3 Replies to the preliminary information questionnaire addressed to the national competent authority, received on 10 November 2017

The opening meeting included presentations on Romania's new early warning network RADIS and other environmental radioactivity monitoring arrangements. The verification team pointed to the quality and comprehensiveness of all the presentations and documentation.

The team carried out the verifications in accordance with the programme in Appendix 1. It met the following representatives of the national authorities and other parties involved*:*

NATIONAL ENVIRONMENTAL PROTECTION AGENCY (NEPA)

- Ms. Elena SIMION, Director, National Reference Laboratory Directorate
- Ms. Ana Elena GHERASIM, Head of laboratory, National Reference Radioactivity Laboratory

LOCAL ENVIRONMENTAL PROTECTION AGENCY (LEPA), Bucharest

- Mr. Gabriel CIUIU, Head of laboratory, Monitoring and Laboratory Department

NATIONAL SANITARY VETERINARY AND FOOD SAFETY AUTHORITY (NSVFSA)

- Ms. Liliana AMARITEI, Counsellor, Food Safety of Non-Animal Origin Directorate
- Ms. Alisa POPA, Counsellor, Food Safety of Animal Origin Directorate

INSTITUTE FOR HYGIENE AND VETERINARY PUBLIC HEALTH (IHVPH)

- Ms. Rodica TANASUICA, Director of IHVPH
- Mr. Horia ALBU, Technical Director of IHVPH
- Ms. Cristina DUMITRESCU, Head of Chemical and Radioactivity Department of IHVPH
- Ms. Cristina SULEA, Physicist, Responsible of Radioactivity Laboratory
- Mr. Florin SIMION, Physicist, Radioactivity Laboratory

NATIONAL INSTITUTE OF PUBLIC HEALTH

- Dr. Laszlo TORO, Physicist, Coordinator of national surveillance programme for water and food stuffs, Radiation Hygiene Laboratory National Institute of Public Health, Timisoara Centre of Public Health
- Dr. Alexandra CUCU, MD, Head of Radiation Hygiene Laboratory, National Institute of Public Health, Bucharest Centre of Public Health

PUBLIC HEALTH DIRECTORATE, Bucharest

- Dr. Fulger CIUPAGEA MD, Head of Radiation Hygiene Laboratory, Public Health Directorate, Bucharest
- Dr. Florentina CONSTANTIN, Radiochemist, Radiation Hygiene Laboratory, Public Health Directorate, Bucharest
- Dr. Constanta APOSTU, Head of Radiation Hygiene Laboratory, Public Health Directorate, Galati
- Ms. Chem Violeta PINTILIE, Radiochemist, Radiation Hygiene Laboratory, Galati

GENERAL INSPECTORATE FOR EMERGENCY SITUATIONS (GIES)

- Captain Adrian-Ionuț TICU, CBRN officer, National Operational Centre

NATIONAL COMMISSION FOR NUCLEAR ACTIVITIES CONTROL (CNCAN)

- Ms. Daniela DOGARU, Head of Radiation Protection, Radioactive Waste and Transport Unit
- Mr. Petre MIN, Head of Nuclear and Radiological Emergency Unit
- Ms. Mihaela ION, Head of International Affairs Section

3 LEGAL FRAMEWORK FOR RADIOACTIVITY MONITORING

3.1 GENERAL

The following are the main general legislative acts regulating radioactivity monitoring in Romania:

- Order of the Minister of Health no. 431/2004 regarding the organization and functioning of Ministry of Health network of ionizing radiation hygiene laboratories and departments
- Order of the Minister of Health no. 381/2004 regarding the basic sanitary standards for the safe operation of nuclear activities
- Order of the Minister of Health no. 1078/2010 on organizing and functioning of Public Health Directorates
- Governmental Decision no. 1000/2012 and its subsequent amendments

3.2 ENVIRONMENTAL RADIOACTIVITY MONITORING

The following are the main specific legislative acts regulating environmental radioactivity and radioactive discharge monitoring in Romania:

- Emergency Ordinance no. 195/2005 on environmental protection, approved by Law no. 265/2006
- Order of the Minister of Environment no. 1978/2010 on regulation of the organization and functioning of the National Environmental Radioactivity Surveillance Network
- Law no. 111/1996 on the safe deployment, regulation, licensing and control of nuclear activities, republished with subsequent modifications and completions
- CNCAN Order no. 14/2000, published in the Romanian Official Bulletin, Part I no. 404bis of 29/08/2000, approving the Fundamental Radiological Safety Regulation (NSR-01)
- CNCAN Order no. 276/2005, published in the Romanian Official Bulletin, Part I no. 923 of 17/10/2005, approving the Regulations for the monitoring of radioactive emissions from nuclear and radiological facilities (NSR-21)
- CNCAN Order no. 275/2005, published in the Official Bulletin, Part I no. 923 of 17/10/2005, approving the Regulations for the monitoring of environmental radioactivity in the vicinity of a nuclear or radiological facility (NSR-22)

3.3 RADIOLOGICAL SURVEILLANCE OF FOODSTUFFS

The following are the main legislative acts regulating radiological surveillance of foodstuffs in Romania:

- Law no. 111/1996 on the safe deployment, regulation, licensing and control of nuclear activities, republished with subsequent modifications and completions, Article 39 "(1) *The Ministry of Public Health shall organize:.. the radioactive material contamination monitoring network for food products, on the whole food circuit, including the drinking water sources, as well as other goods intended for use by the population* (the law is under modification according to the process of the transposing Directive 2013/59/EURATOM)
- Order no. 1805/286/314/2006 of the MPH (MSP), NSVFSA (ANSVSA), NCNA (CNCAN) for the approval of instructions regarding the creation of a legal framework for the application of the Council and European Commission Regulations regarding the establishment of maximum levels for radioactive contamination for food and feeding stuffs after a nuclear accident or in a radiological emergency, for special conditions for export of food and feeding stuffs, following of a nuclear accident or other radiological emergencies as well as conditions that

are governing imports of agricultural products from other countries following the Chernobyl nuclear power-station accident, published in the Official Bulletin no. 41/19.01.2007

- Order of the Ministry of Health no. 377/2017 on the approval of the Technical Norms for the implementation of national public health programs for the years 2017 and 2018 that set up responsibilities and coordination of the activities carried out. According to its provision the National Institute of Public Health, through the Regional centre of Public Health Timisoara, elaborates the methodology and the county directorates are implementing the sampling and analysis

3.4 RADIOLOGICAL SURVEILLANCE OF DRINKING WATER

The following are the main legislative acts regulating radiological surveillance of drinking water in Romania which transpose Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption::

- Law no. 301/2015 laying down requirements for the protection of the health of the general public with regard to radioactive substances in drinking water (the Official Bulletin 904/7.12.2015)
- Order No V-1278 of the Minister for Health of the Republic of Romania of 11 November 2015 amending Order No V-455 of 23 July 2003 approving the Romanian hygiene standard HN 24:2003, 'Safety and quality requirements for drinking water'
- Order of the Minister of Health no. 764/2005 on registration of laboratories performing the official control of drinking water

3.5 EMERGENCY PREPAREDNESS

The following are the main legislative acts regulating radiological emergency preparedness in Romania:

- Government Decision no. 557/2016 regarding risk management
- Emergency Ordinance no. 21/2004 regarding the National Emergency Situation Management System
- Law no. 481/2004 regarding civil protection (the Official Bulletin 557/06.12.2004)
- CNCAN Order no 69/2014 regarding emergency preparedness and response requirements for licensee

3.6 INTERNATIONAL LEGISLATION AND GUIDANCE DOCUMENTS

The list below includes the Euratom and the European Union legislation and the main international legislation and guidance documents that form the basis for environmental radioactivity monitoring and the radiological surveillance of foodstuffs and feeding stuffs.

The Euratom and the European Union legislation

- The Euratom Treaty
- Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom

- Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of the health of the general public with regard to radioactive substances in water intended for human consumption
- Council Decision 87/600/Euratom of 14 December 1987 on Community arrangements for the early exchange of information in the event of a radiological emergency
- Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety
- Council Regulation (Euratom) 2016/52 of 15 January 2016 laying down maximum permitted levels of radioactive contamination of food and feed following a nuclear accident or any other case of radiological emergency, and repealing Regulation (Euratom) No 3954/87 and Commission Regulations (Euratom) No 944/89 and (Euratom) No 770/90
- Council Regulation (EEC) No 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 emergency
- Council Regulation (EC) No 733/2008 of 15 July 2008 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station
- Council Regulation (EC) No 1048/2009 of 23 October 2009 amending Regulation (EC) No 733/2008 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station
- Commission Regulation (EC) No 1609/2000 of 24 July 2000 establishing a list of products excluded from the application of Council Regulation (EEC) No 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power station
- Commission Regulation (EC) No 1635/2006 of 6 November 2006 laying down detailed rules for the application of Council Regulation (EEC) No 737/90 on the conditions governing imports of agricultural products originating in third countries following the accident at the Chernobyl nuclear power-station
- Commission Implementing Regulation (EU) 2016/6 of 5 January 2016 imposing special conditions governing the import of feed and food originating in or consigned from Japan following the accident at the Fukushima nuclear power station and repealing Implementing Regulation (EU) No 322/2014; amended by the Commission Implementing Regulation (EU) 2017/2058 of 10 November 2017
- Commission Communication Verification of environmental radioactivity monitoring facilities under the terms of Article 35 of the Euratom Treaty — Practical arrangements for the conduct of verification visits in Member States
- Commission Recommendation 2000/473/Euratom 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
- Recommendation of 18 December 2003 on standardised information on radioactive airborne and liquid discharges into the environment from nuclear power reactors and reprocessing plants in normal operation
- Commission Recommendation 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

International legislation and guidance documents, issued mainly by the International Atomic Energy Agency (IAEA)

- Radiation Protection and Safety of radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna, 2014
- Clearance of materials resulting from the use of radionuclides in medicine, industry and research, IAEA-TECDOC-1000, IAEA, Vienna, 1998
- Generic models for use in assessing the impact of discharges of radioactive substances to the environment, Safety Reports Series No 19, IAEA, Vienna, 2001
- Handbook of parameter values for the prediction of radionuclide transfer in temperate environments, Technical Reports Series No 364, IAEA, Vienna, 1994
- International basic safety standards for protection against ionizing radiation and for the safety of radiation sources, Safety Series No 115, IAEA, Vienna, 1996
- Management of radioactive waste from the use of radionuclides in medicine, IAEA-TECDOC-1183, IAEA, Vienna, 2000
- Regulatory control of radioactive discharges to the environment: Safety Guide, Safety Standards Series No. WS-G-2.3, IAEA, Vienna, 2000
- Sources and effects of ionizing radiation, United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR) 2000 Report to the General Assembly, Vol. I, United Nations, New York, 2000
- World Health Organisation (WHO), Guidelines on the quality of drinking water (Guidelines for drinking-water quality, 4th ed. 2011)

International Conventions

- Convention on Nuclear Safety
- Convention on Early Notification of a Nuclear Accident
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency

4 BODIES HAVING COMPETENCE IN RADIOACTIVITY MONITORING

4.1 INTRODUCTION

Romania is a country with a long history of nuclear activities. The inventory of nuclear facilities includes the whole nuclear fuel cycle excluding uranium enrichment (uranium mining, milling, fuel conversion, nuclear fuel manufacturing, CANDU nuclear power reactors and radioactive waste disposal). Some of the controlled facilities are in the phase of decommissioning, but several are still operating. The diversity in nuclear facilities is reflected in a complex regulatory structure involving several ministries and their subordinated agencies and a large network of radiological laboratories and emergency preparedness capabilities.

4.2 MINISTRY OF ENVIRONMENT

The Ministry of Environment (MoE), as a central authority for environmental protection, is responsible for the monitoring and surveillance of environmental radioactivity throughout the national territory, with the general aim of ensuring compliance with regulations and protecting the population and the environment against harmful exposure to radiation.

In order to fulfil its legal obligations regarding environmental radioactivity monitoring and participation to off-site emergency planning and response, MoE organises and operates under its authority the National Environmental Radioactivity Surveillance Network (NERSN).

4.3 NATIONAL ENVIRONMENTAL PROTECTION AGENCY

The National Environmental Protection Agency (NEPA) is one of the Romanian competent authorities responsible for the environmental protection at national level. Subordinated to the Ministry of Environment, the core central authority for environment protection in Romania, NEPA coordinates 42 county agencies acting together to improve the environment in Romania. It is organized and operates according to the Governmental Decision no. 1000/2012 and its subsequent amendments.

NEPA operates the nationwide system for radiological surveillance of the environment, including early warning systems. It is the national provider of environmental radioactivity data, including the off-site data in the event of an emergency. NEPA operates the National Reference Radioactivity Laboratory (NRRL), which assures the scientific and methodological coordination of NERSN. It comprises 38 laboratories (NRRL + 37 local laboratories named Environmental Radioactivity Surveillance Stations, ERSS), covering the entire Romanian territory and automatic stations (Figure 1). ERSS and the automatic stations operate under the local environmental protection agencies. The list of the 38 NERSN laboratories is presented in the Annex 2.

4.4 MINISTRY OF HEALTH

In accordance with Law no. 95/2006 on health reform, the Ministry of Health (MoH) is the central authority coordinating public health assistance. The legal responsibilities related to radioactivity issues are established according to the provisions of the Nuclear Law no. 111/1996 on the safe deployment, regulation, authorisation and control of nuclear activities, art 38 and 39. On this basis the MoH is responsible for organising the surveillance network of radioactive contamination of marketed food products, including drinking water, as well as other goods designated to be used by the population, except border control of imported foodstuffs.

MoH is responsible for monitoring radioactivity in water and surveillance of foodstuffs; in addition it regulates medical and occupational exposure and provides support in radiological emergency situations. It implements its task via 42 County Public Health Directorates, among which there are 18 with ionizing radiation hygiene laboratories. This network includes 18 laboratories of the County Public Health Directorates (CPHD) and four laboratories from the Regional Public Health Centres

(RPHC), which are part of the National Institute of Public Health (NIPH). These laboratories monitor radioactivity in mixed diet, drinking water etc. in particular around the nuclear fuel cycle facilities.

4.5 National Sanitary, Veterinary and Food Safety Authority

The National Sanitary, Veterinary and Food Safety Authority (NSVFSA) is a specialized institution of the central public administration and the regulatory authority in the area of sanitary, veterinary and food safety, being under Government subordination and under the co-ordination of the Prime Minister. It has the responsibility for official controls on radiological surveillance of food of plant and animal origin. There are 15 official Romanian laboratories of the NSVFSA involved in radioactivity monitoring of food and feed: the Institute for Hygiene and Veterinary Public Health (IHVPH) located in Bucharest and 14 other laboratories at county level within the Sanitary Veterinary and Food Safety Directorates (Arad, Bihor, Buzau, Calarasi, Constanta, Cluj, Dolj, Galati, Ialomita, Iasi, Satu-Mare, Suceava, Teleorman and Timis).

4.6 General Inspectorate for Emergency Situations

The General Inspectorate for Emergency Situations (GIES) under the Ministry of Internal Affairs is one of the principals bodies from Romania involved in nuclear and radiological emergency preparedness. According to the Romanian legislation, GIES has responsibilities in coordinating all the field actions and organising the national/local command centre in case of a nuclear/radiological emergency situation. GIES has one CBRN team in each county and one CBRN unit in Bucharest. At the national level GIES operates a special CBRN unit and a national centre for nuclear accident and radiological emergency situations. The CBRN teams/units have capabilities in nuclear and radiological monitoring/detection and can provide decontamination for people, vehicles, fields and roads.

GIES does not have analytical laboratories; it has first responders and CBRN vehicles in 24 counties and in Bucharest. They have mobile radiation monitoring systems and mobile systems for radionuclide identification.

4.7 National Commission for Nuclear Activities Control

The National Commission for Nuclear Activities Control (CNCAN) is a national public institution acting as a legal entity. It is the national competent authority in the nuclear field and functions under the direct coordination of the Prime Minister.

According with Law no. 111/1996 CNCAN is the nuclear regulatory authority having as main duties regulation, licensing and control of nuclear activities. It issues regulations and licences to all nuclear facilities. It reviews assesses and approves the emergency plans of each licensee and cooperates with the central authority for environmental protection, which controls the National Environmental Radioactivity Surveillance Network. CNCAN is the regulatory authority also for monitoring radioactive liquid and gaseous radioactive discharges from nuclear facilities.

5 RADIOACTIVITY MONITORING PROGRAMMES IN ROMANIA

5.1 INTRODUCTION

5.1.1 National Environmental Radioactivity Surveillance Network

The National Environmental Radioactivity Surveillance Network (NERSN, Figure 1) ensures the monitoring of the environmental radioactivity at country level, covering all types of geographical areas in Romania from seaside to mountains. During its routine monitoring programme NERSN collects and analyses samples of air (gamma dose rate, atmospheric aerosols and total deposition), surface water, uncultivated soil and vegetation. The programme includes also intensified monitoring in the areas where the radiation background is elevated due to nuclear activities.

The Early Warning System (EWS) for environmental radiation includes 86 gamma dose rate automatic stations as well as the screening total beta analyses performed daily by the 37 ERSS laboratories.

Figure 1 – National Environmental Radioactivity Surveillance Network (NERSN)

Green dot	-	Environmental Radioactivity Surveillance Stations (laboratories)
Blue triangle	-	Gamma dose rate automatic monitoring stations
Blue line	-	Water radioactivity monitoring stations (river Danube)

Data from the NERSN routine monitoring programme (gross beta and gamma dose rate values) are available on the NEPA[4] and LEPA websites as well as on the EURDEP platform. An annual report is prepared including the environmental radioactivity monitoring results. The report is available for the public on the website of the NEPA[5]. Data from NERSN and MoH are annually reported by NRRL - NEPA to the EC REM database.

5.1.2 Laboratories of the Ministry of Health

MoH network of ionizing radiation hygiene laboratories includes 18 laboratories of the County Public Health Directorates (CPHD) and four laboratories from the Regional Public Health Centres (RPHC), which are part of the National Institute of Public Health (NIPH). Typical staffing for each laboratory

[4] http://www.anpm.ro/date-furnizate-de-rnsrm

[5] http://www.anpm.ro/raport-de-mediu

includes a medical doctor, chemist, physicist and one or two technicians for lab and/or field activities. All the MoH laboratories have implemented a QA system based on ISO 17025 standard requirements, certified by the MoH through a registration process.

At the end of each year a report is prepared including the results referring to the radioactivity of drinking water, milk and mixed diet. The report is available for the public on the site of the NIPH (www.insp.gov.ro).

5.1.3 National Sanitary, Veterinary and Food Safety Authority

NSVFSA carries out its own annual program for official controls on radioactivity in food of plant and animal origin. This program is approved by the order of the NSVFSA president.

The NSVFSA annual program for official controls on radioactivity in food of plant and animal origin has two sections: a plan on monitoring of radioactive contamination in products of animal origin elaborated by the Food Safety of Animal Origin Directorate and a plan on monitoring of radioactive contamination in products of non-animal origin elaborated by the Food Safety of Non-Animal Origin Directorate.

The Sanitary Veterinary and Food Safety County Divisions are responsible for the implementation of the program. Annually some 2500 different samples are analysed (^{134}Cs, ^{137}Cs and ^{131}I) on vegetables, fruits, processed food, milk and dairy products, meat, fish, honey, feeding stuffs, forest fruits, mushrooms, food process water, etc. Sampling is carried out by local veterinary or state inspectors. All NSVFSA laboratories have high-resolution (HPGe) and low resolution (NaI(Tl)) gamma spectroscopy systems for carrying out the measurements.

Food Safety of Animal Origin Directorate

In accordance with EU legislation on radioactivity in products of animal origin, the Food Safety of Animal Origin Directorate implements a plan on the monitoring of radioactive contamination in products of animal origin. This plan takes into account the situation at the risk areas for air, water and soil contamination, reported by the MoE. The plan contains details of the number of samples to be taken, the time period, the matrices, the type and category of the radioactive element, the type of food establishments, as well as the county. Laboratory analyses are performed in designated sanitary, veterinary and food safety laboratories.

Food Safety of Non-Animal Origin Directorate

The Food Safety of Non-Animal Origin Directorate controls and ensures the monitoring of food products of non-animal origin for radioactive contamination through the National Annual Surveillance and Control Program for Food Safety in accordance with the EU and national legislation. The frequency of sampling and inspection is required to be risk based, meeting the following criteria:

- Origin of food: domestic, economic area, third countries
- food commodities with non-compliance rate in previous monitoring years
- sampling at different marketing levels (farm gates, wholesaler, import activities, border inspection activities, food processing and production units)
- capacity of laboratories, cost of the analysis

5.2 AUTOMATIC MONITORING OF EXTERNAL GAMMA DOSE RATE

5.2.1 Introduction

The National Environmental Radioactivity Surveillance Network (NERSN) operates automatic systems for monitoring gamma dose rate all over the country, particularly at locations close to the NPPs. There are two networks: one covering the areas close to nuclear sites (section 5.2.2) and one covering the whole country (section 5.2.1). Map with the gamma dose rate monitoring stations is presented in Figure 2.

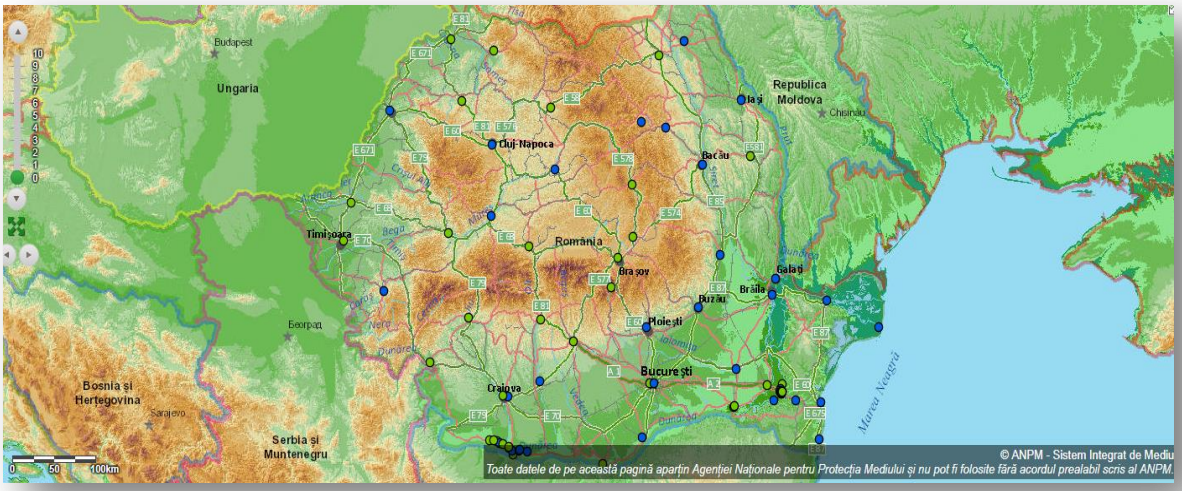

Figure 2. Automatic gamma dose rate monitoring stations in Romania

5.2.2 Automatic gamma dose rate network around the NPPs and Bucharest

There are 30 automatic gamma dose rate monitoring stations in the areas close to the Cernavodă NPP (Constanta, Calarasi and Ialomita counties), one at Bucharest and 15 automatic gamma dose rate monitoring stations close to the Bulgarian Kozloduy NPP (on the Romanian territory) in Dolj County. The technical specifications of these stations are the following:

- Manufacturer: Institute National des Radioelements (IRE), Belgium
- Operating range (LR/HR GM tubes): 10 nSv/h – 1 Sv/h
- Energy response (referred to ^{137}Cs): ± 15% (50 – 3000 keV)
- Calibration Accuracy: ± 5 % (^{137}Cs) typically
- Measuring units: µSv/h, mSv/h, Sv/h as standard
- Operating temperature: – 40 to + 55^{o}C

Gamma dose rate values are stored in the probes and in the Data Acquisition Module (DAM) of the automatic station, from where they can be retrieved in case of errors. Data are sent to NCC by GPRS, as the main data link, and by satellite (Orbcomm System) as back-up, and stored into the local data base. In normal conditions the system is sending a daily data package consisting of 24 values (hourly average). In alarm mode, the data can be sent with the frequency required by the operator. The system provides real time early warning in case of high values recorded.

5.2.3 Automatic gamma dose rate network all over the country

There is a network of 39 automatic gamma dose rate monitoring stations covering the whole national territory. The technical specifications of these stations are the following:

- Manufacturer: Umwelt- und Ingenieurtechnik GmbH, Dresden (UIT GmbH)
- Type: HNQ24 (low and high rate range GM tubes)
- Operating range: 0.03 µSv/h – 10 Sv/h (If dose rate is higher than 10 Sv/h up to 100 Sv/h the monitor will show a minimum of 10 Sv/h)
- Accuracy: ± 15 % typically
- Measuring units: µSv/h, mSv/h, Sv/h as standard

- Operating temperature: – 40 to + 70°C

Data are sent in real time (routine and alarm situations). Stations can store up to 4096 gamma dose rate values. Dose values and meteorological data are sent to the NCC by GPRS as the main data link and stored in to the local data base. Gamma dose rate values are sent to the NCC hourly in normal conditions and every 15 minutes in case of an alarm. In the NCC the data are checked, validated and made available to the public through the NEPA web-site and the EURDEP platform.

5.3 MONITORING OF RADIOACTIVITY IN THE ATMOSPHERE

5.3.1 Air

Radioactivity concentration in air is monitored by filtering large volumes of air through a fibreglass filter and then measuring the amount of radioactivity collected by the filter. The sampling devices are installed at the ERSS laboratory locations (Figure 1).

Romania received though project PHARE 2003 high volume aerosol samplers for collecting particulate matter for 18 ERSSs. The rest of the laboratories are using other air sampling devices from different manufacturers. Technical specifications for the 18 new VF high volume aerosol samplers are the following:

- Centrifugal pump provided with an induction motor which is operated by a processor
- Flow meter, control unit and keyboard included
- Suction and exhaust sections connected through a flange
- Back illuminated 2x16 character alphanumeric display which shows the current airflow, total sampled volume from the start of the system, sampled volume in selectable time interval, total number of operational hours from the start, temperature and pressure of the sampled medium, status and error messages and the real time
- Automatic adjustment of airflow rate by a built-in control unit
- Automatic start after power supply failure
- Connection to an external PC via an RS-485 interface
- Available negative pressure (airflow of 20 m^3/h) 10 kPa
- Weight 17 kg
- Power supply 24 VDC
- Maximum current approx. 7 A
- Operational temperature range -20°C to +50°C.
- Fiberglass filter (with retention higher than 90%)
- Filter exchange every 5 hours

^{222}Rn and ^{220}Rn are measured as part of the filter measurement, performed in each ERSS along with a gross beta measurement. Gamma nuclides[6] are determined by gamma spectrometry on monthly cumulated samples.

6 ^{7}Be, ^{40}K, ^{210}Pb, ^{212}Bi, ^{212}Pb, ^{228}Ac, ^{214}Bi, ^{214}Pb, ^{234}Th, ^{235}U, ^{133}Xe, ^{54}Mn, ^{58}Co, ^{59}Fe, ^{60}Co, ^{65}Zn, ^{95}Zr, ^{103}Ru, ^{106}Ru, ^{124}Sb, ^{125}Sb ^{131}I, ^{134}Cs, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{144}Ce, ^{152}Eu, ^{153}Gd, ^{154}Eu, ^{155}Eu

5.3.2 Dry/wet deposition

Radioactivity concentration in atmospheric deposition (rain and dust) is monitored by collecting wet and dry deposition (fallout dust and precipitation together) and by measuring the sample radioactivity in the laboratory. The sampling devices are typically installed in the yards of the ERSS laboratories (Figure 1). Sampling is done on 24 hour intervals. If it has not rained during the sampling the collector is washed with 1 litre of distillate water. The sample is dried and measured for gross beta on the same day. For gamma spectrometric analyses the entire deposition sample collected in one month is evaporated and the residue is measured. Gamma nuclides[7] are assessed by gamma spectrometry on monthly cumulated samples.

5.4 MONITORING OF RADIOACTIVITY IN WATER

5.4.1 Surface waters

Surface waters are sampled in the same locality with the ERSS, on the main rivers (Figure 1). Sampling procedures (methodology, quantities and sampling periodicity) are the following:

Gross beta analyses

- Methodology according to the internal procedure based on ISO 9697/2015 (Water quality – gross beta activity in non-saline water)
- Quantity: 1 litre
- Sampling periodicity: once every 24 h

Gamma spectrometric analyses

- Methodology according to the internal procedure, based on SR EN ISO 10703:2016 (Water quality - Determination of volumetric activity of radionuclides)
- Quantity: 30-31 litres
- Sampling periodicity: once every 24 h, all days of the month

Beta spectrometry (^{3}H analysis)

- Methodology according to the internal procedure, based on ISO 9698/2015 (Water quality – Determination of tritium activity concentration – Liquid scintillation counting method)
- Quantity: 0.3 – 0.31 litres
- Sampling periodicity: once every 24 h, all days of the month

The following radionuclides are assessed: gross beta, ^{3}H, ^{7}Be, ^{40}K, ^{210}Pb, ^{212}Bi, ^{212}Pb, ^{228}Ac, ^{214}Bi, ^{214}Pb, ^{226}Ra, ^{231}Th, ^{234m}Pa, ^{234}Th, ^{235}U ^{54}Mn, ^{58}Co, ^{59}Fe, ^{60}Co, ^{65}Zn, ^{95}Zr, ^{95}Nb, ^{103}Ru, ^{106}Ru, ^{124}Sb, ^{125}Sb, ^{131}I, ^{134}Cs, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{144}Ce, ^{152}Eu, ^{153}Gd, ^{154}Eu, ^{155}Eu and ^{241}Am.

5.4.2 Ground water

Ground water radioactivity monitoring, according to the Recommendation 473/2000/Euratom, is carried out by sampling from boreholes used as drinking water sources. Ground water is sampled from each Water Supply Zone (WSZ) (Figure 3). Two liters of water are taken for gross alpha/beta determination at least twice a year and 25-30 liters are taken for radionuclide separation once a

7 ^{7}Be, ^{40}K, ^{210}Pb, ^{212}Bi, ^{212}Pb, ^{228}Ac, ^{214}Bi, ^{214}Pb, ^{234}Th, ^{235}U, ^{133}Xe, ^{54}Mn, ^{58}Co, ^{59}Fe, ^{60}Co, ^{65}Zn, ^{95}Zr, ^{103}Ru, ^{106}Ru, ^{124}Sb, ^{125}Sb, ^{131}I, ^{134}Cs, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{144}Ce, ^{152}Eu, ^{153}Gd, ^{154}Eu, ^{155}Eu

year. In addition four samples per year are taken for ^{3}H determination in the area of influence of the Cernavodă NPP. The following radiological data is assessed:

- Gross alpha and beta (all laboratories)
- Artificial radionuclides (^{137}Cs, ^{90}Sr), natural radionuclides (U_{nat}, ^{226}Ra, ^{210}Pb, ^{210}Po) (not performed by all of the laboratories, depending on the technical and staff situation of the laboratories)
- ^{3}H in the area of influence of the Cernavodă NPP (Bucharest and Constanta laboratories)

From 2017 artificial radionuclides in groundwater are analysed in the area of influence of nuclear installations only (Cernavodă NPP, Kozloduy NPP, Pitesti Nuclear Research Institute).

Figure 3. Water Supply Zones in Romania and the number of samples for radioactivity control

Drinking water quality from the tap is monitored based on the Directive 2013/51/Euratom, implemented by the Law 301/2015 on drinking water radioactivity.

5.5 MONITORING OF RADIOACTIVITY IN SOIL

5.5.1 Soil and sediments

Monitoring of soil and sediments is carried out by taking a sample of surface soil or bottom sediment and measuring its radioactivity content after drying. Soil sampling locations are situated in the ERSS laboratory yards. The following procedures are applied:

- Gross beta analyses
    - Methodology according with the internal procedure, based on STAS 12248 – 84 Sediment - Global beta activity determination and other reference documents
    - Quantity: 1 g
    - Sampling periodicity: once every week
- Gamma spectrometric analyses
    - Methodology according with the internal procedure, based on ISO 18589-3:2015, Measurement of gamma emitting radionuclides – Soil
    - Sampling periodicity: once every year in July
    - Quantity: 500 cm^3

The following radionuclides are assessed: gross beta and gamma nuclides (^{40}K, ^{210}Pb, ^{212}Bi, ^{212}Pb, ^{228}Ac, ^{214}Bi, ^{214}Pb, ^{226}Ra, ^{234}Th, ^{235}U, ^{54}Mn, ^{58}Co, ^{59}Fe, ^{60}Co, ^{95}Nb, ^{65}Zn, ^{95}Zr, ^{103}Ru, ^{106}Ru, ^{124}Sb, ^{125}Sb, ^{131}I, ^{134}Cs, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{144}Ce, ^{152}Eu, ^{153}Gd, ^{154}Eu, ^{155}Eu and ^{241}Am).

5.5.2 Terrestrial biota

Monitoring of terrestrial biota is carried out by sampling grass and measuring its radioactivity content after drying. Sampling locations are situated in the ERSS laboratory yards. The following procedures are applied:

- Gross beta analyses
    - Methodology according to an internal procedure
    - Quantity: 2g
    - Sampling periodicity: once every week
- Gamma spectrometric analyses
    - Methodology according to an internal procedure
    - Sampling periodicity: once every year, in July
    - Quantity: the whole grass quantity from 1 m^2

The following radionuclides are assessed: gross beta and gamma nuclides (^{40}K, ^{210}Pb, ^{212}Bi, ^{212}Pb, ^{228}Ac, ^{214}Bi, ^{214}Pb, ^{234}Th, ^{235}U, ^{54}Mn, ^{58}Co, ^{59}Fe, ^{60}Co, ^{95}Nb, ^{65}Zn, ^{95}Zr, ^{103}Ru, ^{106}Ru, ^{124}Sb, ^{125}Sb, ^{131}I, ^{134}Cs, ^{137}Cs, ^{139}Ce, ^{141}Ce, ^{144}Ce, ^{152}Eu, ^{153}Gd, ^{154}Eu, ^{155}Eu and ^{241}Am).

5.6 MONITORING OF RADIOACTIVITY IN FOOD AND FEED

5.6.1 Milk

Monitoring radioactivity concentration in milk is carried out by collecting five litre samples from the public market twice a year. Gross alpha and beta, ^{134}Cs and ^{137}Cs are measured on a regular basis; ^{131}I if required. Some laboratories measure also natural radionuclides (U_{nat}, ^{226}Ra, ^{210}Pb, ^{210}Po) on one sample per year.

5.6.2 Mixed diet

Mixed diet radioactivity content is measured by collecting two samples per year from public canteens (if possible from schools). The sample represents two complete menus for a given day. The samples are dried, ashed and measured for radioactivity in a laboratory.

5.6.3 Foodstuffs

Radioactivity in foodstuffs is monitored by sampling vegetables, fruits, processed products, milk and dairy products, meat, fish, honey, forest fruit, cultivated or wild mushrooms, water used in the technological process of food processing or in animal farms, dehydrated products (additives, ingredients for food), etc. The radioactivity content (^{134}Cs and ^{137}Cs; ^{131}I if required) is determined in the laboratories of the National Sanitary, Veterinary and Food Safety Authority (NSVFSA).

5.6.4 Feeding stuffs

The National Sanitary, Veterinary and Food Safety Authority (NSVFSA) carries out monitoring of radioactivity in feeding stuffs by sampling mixed fodder, concentrated fodder and other feeding stuffs as ready for consumption by pigs, poultry, sheep, calves, etc. Radioactivity concentrations of ^{134}Cs and ^{137}Cs are determined on a regular basis, ^{131}I if required (in an emergency situation).

5.7 MOBILE RADIOACTIVITY MONITORING SYSTEMS

5.7.1 Ministry of Environment

The Ministry of Environment has mobile laboratory systems in ERSS Bechet (near Kozloduy NPP), ERSS Cernavodă (near Cernavodă NPP) and NRRL (NEPA, Bucharest). The systems are based a Land Rover Defender 4x4 terrain vehicles. The vehicles are equipped with the following equipment:

Gamma Spectrometry System

- MDS Mobile Detection System
- In-situ gamma spectrometry system with a coaxial germanium detector

Fixed system for plume tracking

- MDS Mobile Detection System for gamma radiation
- Notebook with graphical interfacing, GPS navigation receiver and GPS antenna
- Maptrack software (complete package including operation, conversion, map generation, acquisition, evaluation and calibration software)
- Portable high volume aerosol sampler type VOPV-12, model K0215-04 3 -12 m3/h

Other equipment

- Autonomous installation for external decontamination: Diesel-powered Multipurpose Decontamination System MPDS, Hand water pump, Collapsible water tank 2500 l, Decontamination tent field shower
- Portable meteorological station (only in Bucharest)
- GPS Instrument
- 12 and 24 volts DC power panel with 4 inputs
- 220V/50 Hz AC power panel with 4 inputs; DC to AC converter
- external generator 2.2 kW in rear compartment

5.7.2 General Inspectorate for Emergency Situations

In Bucharest the GIES has two mobile CBRN intervention trucks, which are equipped for radiation dose rate monitoring and radionuclide identification. They have the following mobile radiation monitoring systems:

- EXATEL RAB-M mobile alpha/beta/gamma detector with a contamination probe
- EXATEL ARGU-SAT independent radiation monitor with GPS and mobile communication
- ARGUS 3 + ARGUS 3 PC
- EXATEL AMP-07 system for radionuclide identification
- Berthold LB 125 system for radionuclide identification
- Individual dosimeters, sampling equipment

6 VERIFICATIONS

6.1 NATIONAL ENVIRONMENTAL PROTECTION AGENCY

6.1.1 Bucharest radioactivity laboratory

Verification team visited the laboratory of the NEPA in Bucharest *(294, Splaiul Independentei Street, Sector 6, Bucharest*). The laboratory staff consists of the Director, laboratory manger and 8 staff members. The facility is equipped to carry out a wide variety of environmental radioactivity analyses. Samples are received not only from Bucharest, but also from other NERSN local laboratories (ERSS).

The laboratory is accredited to ISO/CEI 17025:2005 and it is considered a national reference laboratory for radioactivity measurements, i.e. it performs scientific, technical and methodological coordination of the NERSN. The function of environmental radioactivity surveillance is carried out (1) through the network of radioactivity surveillance stations and (2) by the national early warning monitoring network.

Altogether some 900 samples are received for gamma analysis and about 1300 for tritium measurement each year. On receipt the samples are registered in an Excel sheet and in a paper log book and receive a unique sample code.

The laboratory is equipped with suitable equipment for sample preparation and storage (balances, grinders, furnaces, evaporators, freezers, etc.). In addition it's equipped for chemical preparation (distillation, chemical separation) of certain samples. The laboratory counting equipment is the following:

- Liquid scintillation counter (Quantulus 1220)
- Liquid scintillation counter (Tri-Carb 2770 TR/SC)
- Alpha spectrometer (Canberra Alpha Analyst 8 chambers)
- 2 HPGe-gamma spectrometers (Canberra with Genie 2000 software)
- 1 portable HPGe-gamma spectrometer (Canberra with Genie 2000 software)

All counting systems are calibrated using commercial standards. Mathematical calibration (Monte Carlo) can be used for certain geometries. Daily testing is carried out to monitor instrument stability.

NEPA laboratory has also two Thermo Scientific mobile radiation dose rate GPS mapping systems; one can be used in a car (NEPA off-road vehicle is available) and one in an aircraft. In addition the laboratory has several hand-held monitoring devices (dose rate, contamination, alpha/beta monitor, radon monitor).

Laboratory building is adequate and all laboratory devices have UPS power back-up.

Verification team noted that the NEPA laboratory does not have capability to monitor gaseous radioactive iodine concentration in air (activated charcoal filters). In Romania this capability is available at the mobile laboratories located in the areas close to the Cernavodă and Kozloduy nuclear power plants. NEPA has the capability to monitor particulate radioactive iodine in its laboratory (fiberglass filters).

> *In order to ensure early detection of gaseous radioactive iodine in Bucharest in the event of a nuclear emergency the verification team suggests that NEPA evaluates the need for having additional high-sensitivity gaseous iodine detection capability in Bucharest.*

6.1.2 Early warning system data centre

Verification team visited the data centre of the National Environmental Radioactivity Surveillance Network (NERSN), which comprises 86 radiation monitoring stations throughout the country. There are two operational continuous monitoring networks: the 'old' network around the nuclear sites Cernavodă and Kozloduy (near the Bulgarian border, on the Romanian territory) and the 'new'

network, which covers the whole Romanian territory. The new network has sensors also for meteorological parameters (wind and precipitation). Two monitoring stations are located in Bucharest. Data from the networks is collected at servers located at the NEPA laboratory building and made available to the public at the NEPA website and at the EURDEP system website.

NEPA has a customised laboratory information management system, which stores and displays radiation and radioactivity data from the laboratories and from the automatic networks. The system is used also for early warning purpose - it is able to send an SMS message and make automated telephone calls to predefined numbers in the event of abnormal values. Verification team noted that in NEPA these alarms are received by four staff members, but there is no 24h stand-by duty service organised for abnormal radiation situations (GIES, which maintains an official 24h stand-by duty for radiological emergencies, has access to the system).

No remarks.

6.1.3 Other facilities

Verification team verified the fixed radiation dose rate monitoring station located in front of the laboratory building. This 'old' network station has two GM-tubes (one for low and one for high dose rate ranges). There are also sensors for wind speed and direction, temperature, rain (yes/no) and humidity. The station has a battery for back-up power.

The siting of the station is not ideal since the detectors and weather sensors are shielded by trees and the laboratory building is close-by.

No remarks.

6.2 MINISTRY OF HEALTH

6.2.1 Ionizing Hygiene Laboratory

Verification team visited the radioactivity laboratory of the Ministry of Health (Public Health Directorate) located in Bucharest *(6 Intarea Reconstructiei Street, Sector 3, Bucharest)*. This laboratory is one of the 18 regional laboratories measuring mainly drinking water, but also milk and mixed diet samples. It measures samples from the city of Bucharest and 5 other counties, altogether covering some 3.5 million people. The water supply at this area is 85% surface water. There are about 300 water samples measured annually, about 180 of them from Bucharest.

On receipt the water samples are registered in an Excel sheet and in a paper log. The laboratory has no dedicated laboratory information management system. Two litre samples are measured for gross alpha/beta emitters; 0.5 litre samples for Tritium and 40 litre samples for gamma nuclides (gamma spectroscopy on an evaporated sample). Results are reported to water suppliers and in annual reports, which are made available at a public website. Measurement procedures are well documented and a quality assurance system is in place. Samples are discarded after measurement.

The equipment of the laboratory consists of one piece of each equipment type – other network laboratories can provide back-up in the event of a malfunction. During the verification visit the old gamma spectrometer of the laboratory was not functional – the verification team was informed that a new gamma spectrometer system has been included in the institute investment plan.

The counting equipment of the laboratory is the following:

- Gas proportional counter (Oxford Tennelec Series 5 (Gross alpha/beta)) operational from 1998)
- Radon monitor (Radon in water) acquired in December 2017
- Liquid Scintillation Counter (Packard Tri-Carb 2750 (^{3}H, ^{14}C and ^{90}Sr), operational from 1998)
- Gamma spectrometer (old, not operational from 2009)

Verification team noted that when reporting drinking water measurement results to customers, the laboratory reports also an estimated annual radiation dose of a person drinking the measured water. The reporting form does not include the basic assumptions made in the dose estimation.

Verification team was informed, that the current quality assurance system does not require participation in laboratory inter-comparison exercises, and therefore no comparison activity was undertaken in 2017.

Verification team noted that although the laboratory has sufficient staff for routine measurements, there would not be enough resources for sample collection and management in the event of a radiological emergency in the Bucharest area.

Verification team recommends that when reporting an estimated annual dose from drinking water consumption also the assumptions and restrictions of the dose calculation would be communicated to the customer.

As a matter of good laboratory practise, the verification team recommends participation in laboratory inter-comparison exercises, in particular on drinking water measurements, at least on national, but preferably on international level.

Verification team recommends acquisition of a new gamma spectroscopy system for the Bucharest laboratory as soon as possible. Also it's suggested to replace the laboratory devices which are close to the end of their operational lifetime (Liquid scintillation counter, Alpha spectrometer and the Gas proportional counter for gross alpha/beta measurements).

Verification team recommends that the Ministry of Health considers different options for allocating sufficient additional personnel for the laboratory in the event of a radiological emergency.

6.3 INSTITUTE FOR HYGIENE AND VETERINARY PUBLIC HEALTH

The Institute for Hygiene and Veterinary Public Health (IHVPH) in Bucharest carries out several tasks in the field of public health, including monitoring radioactivity in food, feed and drinking water. It coordinates the work of all NSVFSA laboratories involved in radioactivity monitoring, carries out personnel training and organises inter-comparison exercises between the network laboratories. In addition to the State programme, samples are analysed also on commercial basis (import or export of food).

In Romania there are 14 laboratories under the National Sanitary, Veterinary and Food Safety Authority carrying our radioactivity measurements (Figure 4).

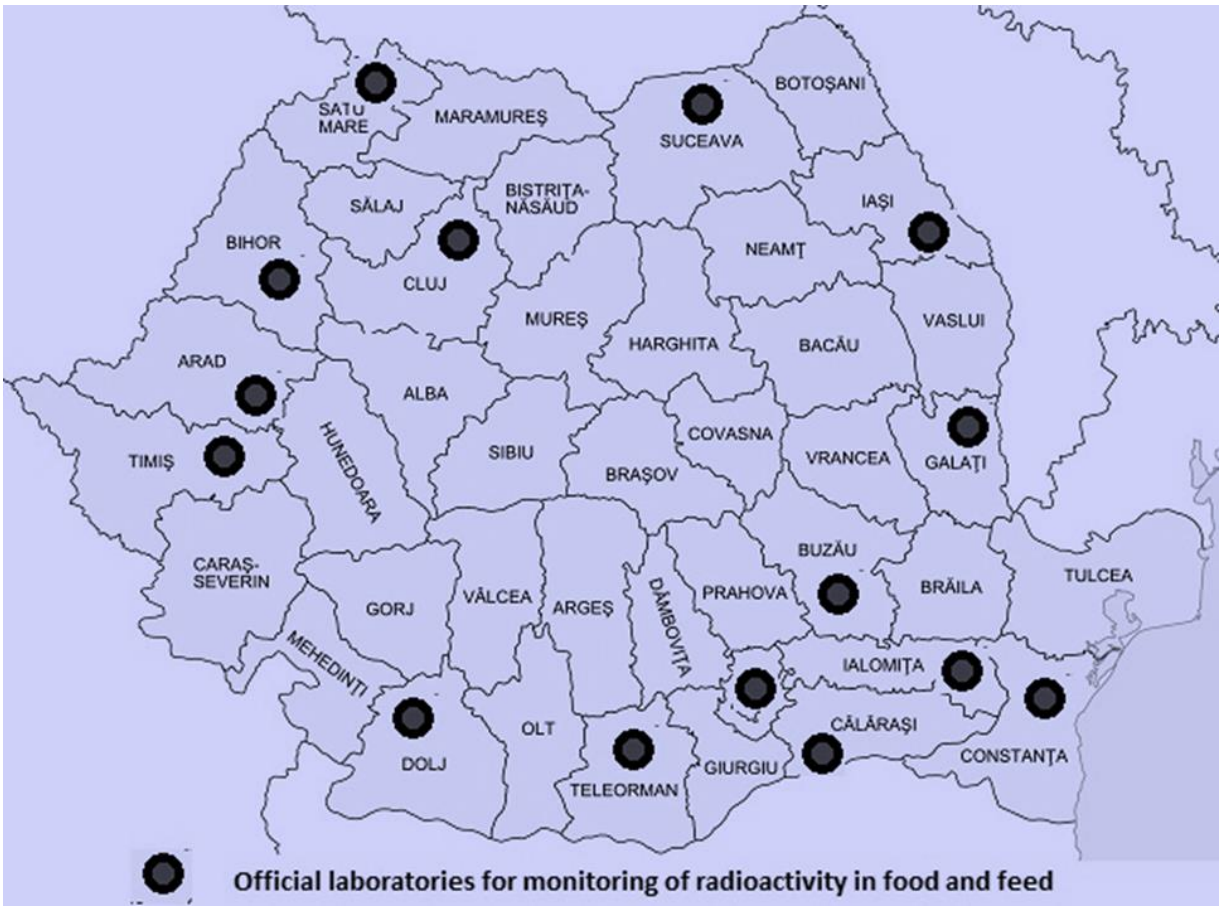

Figure 4. NSVFSA laboratories for monitoring of radioactivity in food and feed

6.3.1 Bucharest radioactivity laboratory

Verification team visited the Radioactivity Laboratory of the Institute for Hygiene and Veterinary Public Health *(5 Campul Mosilor Street, Sector 2, Bucharest)*. In total the laboratory has 89 staff, 12 of them working in section 'Chemistry and radioactivity'. Annually over 2500 different samples are analysed in this laboratory for the determination of level of radioactive contamination (^{134}Cs and ^{137}Cs on a regular basis, ^{131}I and other gamma-emitting radionuclides if required). Samples include vegetables, fruits, processed food products, milk and dairy products, meat, fish, honey, feeding stuffs, forest fruit, cultivated or wild mushrooms, water used in the technological process of food processing or in animal farms, dehydrated products (additives, ingredients for food), etc. The methods of analysis are accredited by the Romanian accreditation body RENAR according to ISO 17025:2005.

Samples are typically collected by food safety inspectors and delivered at the laboratory reception, where they are registered in LIMS and bar-coded. After homogenisation and weighting the samples

are measured. The laboratory has two high resolution HPGe gamma spectroscopy systems (Canberra/Genie 2000 and Princeton Gamma-Tech/Quantum Gold) and one NaI(TI) low resolution system. A LIMS system is available for data management. The systems are placed in a fairly small temperature controlled counting room. The NaI system is fairly old and rarely used, but due to quick analysis it is kept available for situations where the number of incoming samples becomes too large for the two HPGe systems (emergency monitoring).

Verification team was informed, that more working space will be available when the laboratory will move to a new building in 2018. The current laboratory facility is cramped and does not facilitate a specific room for storing large numbers of incoming samples in the event of an emergency.

Verification team was informed that the laboratory carries out regular control of counting system efficiency, energy stability and resolution – results are recorded, but no long term trend visualisation is done.

Verification team recommends that the laboratory considers a room plan where a specific room outside the counting room is allocated for management of possible contaminated samples in the event of an emergency.

As a matter of good laboratory practice the verification team recommends long term trend visualization of gamma spectroscopy system efficiency, energy stability and resolution (FWHM of the ^{60}Co peak at 1332 keV).

6.4 General Inspectorate for Emergency Situations

Verification team visited the Bucharest facility of the General Inspectorate for Emergency Situations *(46 Banul Dumitrache Street, Sector 2, Bucharest)* in order to verify the radioactivity monitoring capabilities of the GIES mobile CBRN truck (Figure 5). In Bucharest there are two such units; altogether there are 31 of such units in Romania. These units can monitor chemical and radiological substances in the event of an emergency and carry out decontamination of personnel and the general public. They can measure radiation dose rates, survey contamination, take samples and identify radioactive nuclides with low-resolution hand-held equipment; they are not equipped to carry out quantitative radioactivity analysis or high-resolution gamma spectroscopy.

The CBRN response unit has also a decontamination tent, which can facilitate decontamination of maximum 80 persons per hour. The unit is equipped with electrical power supply systems for independent operation.

The following radiation monitoring equipment is available:

- Hand-held dose rate monitors (4)
- Fixed dose rate monitor (in the vehicle)
- EXATEL ARGU-SAT independent radiation monitor with GPS and mobile communication (Figure 6)
- EXATEL RAB-M mobile alpha/beta/gamma detector with an alpha/beta contamination probe
- Dosimeters for the vehicle personnel
- EXATEL AMP-07
- Gamma-analyser Berthold LB125 for nuclide identification
- SVG2 - alpha/beta/gamma detector with an alpha/beta contamination probe
- Sampling equipment

No remarks.

Figure 5. GIES mobile CBRN response unit

Figure 6. Independent mobile radiation dose rate monitor EXATEL ARGU-SAT

7 CONCLUSIONS

All planned verification activities were completed successfully. The information supplied in advance of the visit, as well as the additional documentation received during and after the verification activities, proved very useful.

The information provided and the verification findings gave rise to the following observations:

(1) Overall, the national environmental radioactivity monitoring programme in Romania complies with the requirements of Article 35 of the Euratom Treaty.

(2) The verification activities found that the facilities needed to carry out continuous monitoring of levels of radioactivity in air, water and soil in Bucharest are adequate. The Commission ascertained that these facilities are in operation and running efficiently.

(3) The verification activities found that the facilities needed to carry out monitoring of levels of radioactivity in the air, water and soil in the event of a radiological emergency in Bucharest are adequate. The Commission ascertained that these facilities are continuously available.

(4) A few recommendations and suggestions have been formulated. They concern in particular renewal of laboratory equipment, laboratory emergency plans and national emergency stand-by arrangements. Notwithstanding these recommendations the verified parts of the national monitoring system for environmental radioactivity in Bucharest are in conformity with the provisions laid down under Article 35 of the Euratom Treaty.

(5) The team's recommendations are set out in detail in the 'Main Conclusions' document addressed to the Romanian competent authority through the Romanian Permanent Representative to the European Union.

(6) The Commission services kindly request the Romanian authorities to submit, before 30 June 2019, a progress report on how the team's recommendations have been implemented and on any significant changes in the set-up of the monitoring systems. Based on this report the Commission will consider the need for a follow-up verification in Romania.

(7) The verification team acknowledges the excellent cooperation it received from all people involved in the activities it undertook during its visit.

ANNEX 1

VERIFICATION PROGRAMME

EURATOM ARTICLE 35 VERIFICATION ROMANIA (BUCHAREST)

6 – 8 December 2017

Wednesday 6 December

09.30 National Environmental Protection Agency
(*294, Splaiul Independentei Street, Sector 6, Bucharest)*

- European Commission Art. 35 verification programme introduction
- Overview of environmental radioactivity monitoring arrangements in Bucharest
- Verification planning

13.30 National Environmental Protection Agency

- Early Warning System
- Gamma dose rate monitoring system in Bucharest
- High volume air sampler in Bucharest
- Mobile laboratory systems

Thursday 7 December

09.00 Laboratory for drinking water radioactivity analysis in Bucharest
(*6 Intarea Reconstructiei Street, Sector 3, Bucharest*)

12.30 Radioactivity laboratory of the Institute for Hygiene and Veterinary Public Health
(*5 Campul Mosilor Street, Sector 2, Bucharest (Zona Piata Obor)*)

Friday 8 December

09.00 General Inspectorate for Emergency Situations – GIES
(*46 Banul Dumitrache Street, Sector 2, Bucharest*)

- CBRN vehicle in Bucharest
- Possible other mobile monitoring capabilities

ANNEX 3

NATIONAL ENVIRONMENTAL RADIOACTIVITY SURVEILLANCE NETWORK LABORATORIES

Laboratory name	Address	Operating under	Responsibility
ERSS Satu Mare	Str. Mircea cel Batran nr.8/b, Cod 440012, loc. Satu Mare, jud. Satu Mare	LEPA Satu Mare	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Oradea	B-dul Dacia nr.25/A,Cod. 410464, loc. Oradea, jud. Bihor	LEPA Bihor	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Targu Mures	Str. Podeni nr. 10, Cod 540253, loc. Targu Mures, jud . Mures	LEPA Mures	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Cluj Napoca	Str. Vanatorilor nr.17,Cod 400213, loc. Cluj – Napoca, jud. Cluj	LEPA Cluj	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Deva	Str. Aurel Vlaicu, nr. 25, cod 330007, loc. Deva, jud. Hunedoara	LEPA Hunedoara	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Timisoara	Str. Gheorghe Adam nr. 15, Cod 300310, loc. Timisoara, jud Timis	LEPA Timis	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Babele	Busteni – Cabana Babele, jud Prahova	LEPA Prahova	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Ploiesti	Str. Laboratorului nr.6, Cod 100070, loc. Ploiesti, jud.Prahova	LEPA Prahova	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Brasov	Str. Politehnicii Nr.3, Cod 500.019, loc. Brasov, jud. Brasov	LEPA Brasov	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Drobeta Turnu Severin	Str. Baile Romane nr.3, Cod 220234, loc. Dr. Tr. Severin, jud. Mehedinti	LEPA Mehedinti	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Pitesti	Str. Egalitatii,nr 50 A, Cod 110049, loc. Pitesti, jud. Arges	LEPA Arges	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSSTulcea	Str. 14 Noiembrie Nr. 5,Cod. 820009, loc. Tulcea, jud Tulcea	LEPA Tulcea	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Sfantu Gheoghe	Localitate Sfantu Gheorghe, Cod 827195, Judetul Tulcea	LEPA Tulcea	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Buzau	Str. Democratiei, nr. 11, cod 120018, loc. Buzau, jud. Buzau	LEPA Buzau	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Galati	Str. Regiment 11 Siret, nr.2 , Cod 800322, loc. Galati, jud Galati	LEPA Galati	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Suceava	Str. Bistritei, nr.1A, cod 720264, loc. Suceava, jud. Suceava	LEPA Suceava	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Piatra Neamt	Piata 22 Decembrie, nr.5, cod postal 610007, loc.	LEPA Neamt	External gamma dose rate monitoring Air, water, soil, vegetation sampling

Laboratory name	Address	Operating under	Responsibility
	Piatra Neamt, jud.Neamt		Air, water, soil, vegetation total beta
ERSS Toaca	Cabana Toaca, Masiv Ceahlau, jud. Neamt	LEPA Neamt	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Resita	Str. Petru Maior nr.73, cod 320111, loc. Resita, jud. Cars Severin	LEPA Cars Severin	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Iasi	Str. Th. Vascauteanu, Nr. 10 bis, Cod 700462, loc. Iasi, jud. Iasi	LEPA Iasi	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta Air, water, soil, vegetation gamma spectrometry
ERSS Bacau	Strada Oituz nr. 23, Cod 600266, loc. Bacau, jud Bacau	LEPA Bacau	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Baia Mare	Str. Iza 1A, Cod 430073, loc. Baia Mare, jud. Maramures	LEPA Maramures	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta Air, water, soil, vegetation gamma spectrometry
ERSS Zimnicea	Str. Giurgiului, nr. 1, sediul Primariei, loc. Zimnicea, Cod 145400, jud.Teleorman	LEPA Teleorman	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Arad	Splaiul Muresuluiu, fara numar, Cod 310132, loc. Arad, jud Arad	LEPA Arad	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta Air, water, soil, vegetation gamma spectrometry
ERSS Focsani	Str. Dinicu Golescu nr.2, Cod 620106, loc. Focsani, Jud. Vrancea	LEPA Vrancea	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Alba Iulia	Str. Lalelelor nr. 7B, cod 510215, loc. Alba Iulia, jud Alba	LEPA Alba	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Botosani	B-dul M. Eminescu, nr.44, cod. 710186, loc. Botosani, jud. Botosani	LEPA Botosani	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Sibiu	Str. Hipodromului nr 2A, Cod Postal 550360, loc. Sibiu, jud. Sibiu	LEPA Sibiu	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Miercurea Ciuc	Str. Marton Aron, nr 43, Cod 530211, loc. Miercurea Ciuc, jud. Harghita	LEPA Harghita	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Vaslui	Str. Calugareni, nr. 63, Cod 730150, loc. Vaslui, jud. Vaslui	LEPA Vaslui	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Constanta	B-dul Mamaia, nr.300, Sediul C.M.R.D., camera 19, cod 900581, loc. Constanta, jud. Constanta	LEPA Constanta	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta Air, water, soil, vegetation gamma spectrometry
ERSS Cernavodă	Str. Energiei Nr.23, Cod 905200, loc. Cernavodă,	LEPA Constanta	External gamma dose rate monitoring Air, water, soil, vegetation sampling

Laboratory name	Address	Operating under	Responsibility
	jud. Constanta		Air, water, soil, vegetation total beta In situu gamma spectrometry Tritium in air and water
ERSS Craiova	Calea Bucuresti nr.150, Cod 200620, loc. Craiova, jud. Dolj	LEPA Dolj	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta Air, water, soil, vegetation gamma spectrometry
ERSS Bechet	Str. A. I. Cuza, Nr.7, Cod 207060, loc. Bechet, jud. Dolj	LEPA Dolj	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta In situu gamma spectrometry
ERSS Slobozia	Str. Mihai Viteazu nr. 1, cod 8400, loc. Slobozia, jud Ialomita	LEPA Ialomita	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Calarasi	Sos. Chiciului nr. 2, Cod 910005, loc. Calarasi, jud Calarasi	LEPA Calarasi	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
ERSS Bucuresti	Sos. Bucuresti - Urziceni, nr. 6, loc. Afumati, Jud. Ilfov	LEPA Bucuresti	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation total beta
NRRL	Splaiul Independentei nr. 294, sector 6, cod 060031, loc. Bucuresti	NEPA	External gamma dose rate monitoring Air, water, soil, vegetation sampling Air, water, soil, vegetation gamma spectrometry Air, water, soil, vegetation total beta Tritium in air and water