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Radiation protection and nuclear safety

**Technical report of the verifications under the terms of
Article 35 of the Euratom Treaty**

Cyprus
National monitoring network for environmental radioactivity

9 to 11 March 2015

Reference: CY 15-01

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35 OF THE EURATOM TREATY

FACILITIES: National monitoring network for environmental radioactivity

LOCATIONS: Nicosia, Limassol

DATES: 9-11 March 2015

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Appendix 1: References and documentation

Appendix 2: The verification programme

1 INTRODUCTION

Article 35 of the Euratom Treaty requires that each Member State shall establish the 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 Standards¹. 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. The radiation protection and nuclear safety unit (ENER D.3) of the EC's Directorate-General for Energy (DG ENER) 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 Communication² was published in the Official Journal on 4 July 2006 describing practical arrangements for the conduct of Article 35 verification visits in Member States.

2 PREPARATION AND CONDUCT OF THE VERIFICATION

2.1 PREAMBLE

The EC's decision to conduct an Article 35 verification was notified to the Government of Cyprus by a letter addressed to the Cyprus Permanent Representation to the European Union. The Government of Cyprus subsequently designated the Department of Labour Inspection (DLI) to lead the preparations for this visit.

2.2 DOCUMENTS

In order to facilitate the work of the verification team, a package of information was supplied in advance by the national authorities. Additional documentation was provided during and after the visit. All documentation received is listed in Appendix 1 to this report. The information thus provided has been extensively used for drawing up the descriptive sections of the report.

2.3 PROGRAMME OF THE VISIT

The EC and the DLI discussed and agreed upon a programme of verification activities which is given in Appendix 2, with due respect to the Commission Communication of 4 July 2006 setting out practical arrangements for the conduct of Article 35 verification visits.

The following representatives of the national authorities and other parties involved were met:

¹ Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation (OJ L-159 of 29/06/1996) which will be superseded by 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 of 17.1.2014, p. 1).

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, p. 2–5).

Department of Labour Inspection

Anastasios Yiannaki	Acting Director of DLI
Panicos Demetriades	Senior Labour Inspection Officer
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State General Laboratory

Popi Nicolaidou Kanari	Director
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Civil Defence Emergency Centre

Andreas Frantzis	Cyprus Civil Defence Commissioner
Kyriacos Hadjigeorgiou	Senior Civil Defence Officer
Valentinos Pagalos	Assistant Civil Defence Officer

3 RESPONSIBLE ORGANISATIONS

3.1 DEPARTMENT OF LABOUR INSPECTION

Under the framework law for the protection against ionizing radiation of 2002, the Radiation Inspection and Control Service (RICS), within the Department of Labour Inspection (DLI), was established as the regulatory authority for Radiation Protection, Nuclear Safety and Radioactive Waste Management in Cyprus. RICS reports to the Department of Labour Inspection of the Ministry of Labour, Welfare and Social Insurance (MWLSI). The regulatory authority has the following responsibilities:

- Enforce legislation;
- Perform environmental radioactivity monitoring;
- Report regularly to the European Commission (EC) on the basis of Article 36 of the Euratom Treaty;
- Ensure emergency preparedness and response in case of radiological accidents;
- Deal with all matters concerning the relations of Cyprus with the EU, the IAEA and other international organisations in this field.

RICS is presently staffed with one Senior Labour Inspection Officer as Head and four Labour Inspection Officers with engineering and science (medical physics) backgrounds, trained in radiation protection and nuclear safety. RICS has established a network for continuous monitoring of ambient gamma radiation and a sampling programme for particles in the atmosphere for radioactivity concentration monitoring. RICS has also procured various portable radiation monitoring instruments (alpha, beta, gamma and neutron survey, contamination meters and portable spectrometers) for inspection and monitoring purposes.

The statutory responsibilities of RICS to be mentioned in the context of this report are:

1. Protection of radiation workers, the general public and the environment from the use of ionising radiation through implementation of:
 - Monitoring the environmental radioactivity by measuring air, water and soil samples;
 - Management of the personal dosimetry data of radiation workers in Cyprus;
 - Recurrent inspection of all installations handling radioactive materials in the medical, industrial, research, and educational sectors;
 - Licensing of all applications of ionising radiation in the medical, industrial, research and educational sectors;
 - Licensing of import, export, transport, storage, use and disposal of fissile and non-fissile radioactive materials;
 - Licensing of the import and use of radiation producing equipment;
 - Scrap metals export and illicit trafficking control;
2. Implementation, in compliance with EC Directives, of radiation protection regulations, safety standards and codes of practice for ionising radiation installations;
3. Ensure education and training of radiation workers on radiation protection issues;
4. Environmental radioactivity monitoring;
5. Implementation of emergency preparedness and response plans;
6. Security of sources and combating radiological or nuclear (RN) terrorism activities.

RICS, within its regular radioactivity monitoring programme, has conducted a number of investigations and measurements concerning foodstuffs, animal feeding stuffs, building materials, drinking water, sea water and milk. RICS can perform monitoring throughout the territory of Cyprus and its economic zone, including the off shore oil platforms.

3.2 CIVIL DEFENCE EMERGENCY CENTRE

Cyprus is divided into 5 civil protection districts, each having 5-8 volunteer civil protection officers. The Civil Defence Emergency Centre coordinates civil protection actions in Cyprus and maintains a 24h duty service for emergency situations, including radiological emergencies. This service does not have radiation monitoring and interpretation capability of its own, so it relies on the RICS to provide a monitoring team if needed. The stand-by duty service has a real-time online access to the national radiation ambient dose rate monitoring data and the emergency contact details of RICS personnel is available in case of a radiological emergency (specific national EPR plan “ELECTRA”).

3.3 DEPARTMENT OF FISHERIES AND MARINE RESEARCH

The Department of Fisheries and Marine Research (DFMR) collaborates with the RICS on marine radioactivity sampling.

4 LEGAL FRAMEWORK FOR ENVIRONMENTAL RADIOACTIVITY MONITORING

4.1 LEGISLATIVE ACTS REGULATING ENVIRONMENTAL RADIOACTIVITY MONITORING

Cyprus does not operate nuclear reactors or uranium or thorium mines. The main use of ionizing radiation in the country is for medical purposes with some applications in industry, construction and research. Cyprus has introduced a legal framework, which is in line with the EU radiation protection legislation and the IAEA standards for ionizing radiation control. Cyprus has also created the necessary basic administrative structure for monitoring of environmental radioactivity throughout the country.

The regulatory framework for ionizing radiation control, including monitoring activities, is the following:

- The Protection from Ionizing Radiation and Nuclear Safety Laws of 2002 to 2011, N.115(I)/20002, N.8(I)/2009 and N.127(I)/2011
- The Protection from Ionizing Radiation (Basic Principles) Regulations of 2002, ΚΔΠ 494/2002
- The Protection from Ionizing Radiation (Medical Exposure) Regulations of 2002, ΚΔΠ 497/2002
- The Protection from Ionizing Radiation (Information to the Public on Applicable Measures in case of Emergency) Regulations of 2002, ΚΔΠ 495/2002
- The Protection from Ionizing Radiation (Supervision and Control of Shipments of Radioactive Waste and Spent Fuel) Regulations of 2009, ΚΔΠ 86/2009
- The Protection from Ionizing Radiation (Control of High Activity Sealed Radioactive Sources and Orphan Sources) Regulations of 2006, ΚΔΠ 30/2006
- The Protection from Ionizing Radiation and Nuclear Safety (Responsible and Safe Management of Spent Fuel and Radioactive Waste) Regulations of 2014, ΚΔΠ 178/2014
- The Conventions on Early Warning and Assistance in case of Nuclear Accident Ratification Law, N.164/1988
- The Convention on Nuclear Safety Ratification Law of 1998, N. 20(III)/98
- The Convention on Physical Protection of Nuclear Material Ratification Law, N.3(III)/1998, and its amendment, N.38(III)/2012
- The Comprehensive Nuclear Test Ban Treaty Ratification Law, N.32(III)/2003
- The Treaty on the Non-Proliferation of Nuclear Weapons Ratification Law, N.8/1970
- The Safeguards Agreement between Cyprus and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons Ratification Law, N.3/1973.

4.2 INTERNATIONAL LEGISLATION AND GUIDANCE DOCUMENTS

EU (EURATOM)

- 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
- Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation
- 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
- 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
- Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption

- Commission Recommendation of 20 December 2001 on the protection of the public against exposure to radon in drinking water supplies
- Council Directive 2013/51/Euratom of 22 October 2013 laying down requirements for the protection of health of the general public with regard to radioactive substances in water intended for human consumption
- Directive 2008/56/EC of 17 June 2008 establishing a framework for community action in the field of marine policy (Marine Strategy Framework Directive).

International Atomic Energy Agency and other International Instruments

- Protocol Additional to the Agreement between Cyprus and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons Ratification Law, N.27(III)/2002
- Agreement between the European Atomic Energy Community, and the Member States without nuclear weapons and the International Atomic Energy Agency, in application of Annexes 1 and 4 of Article III of the Treaty on the Non-Proliferation of Nuclear Weapons and its Additional Protocol (Ratification) Law of 2007, N.37(III)/2007
- International Convention for the Suppression of Acts of Nuclear Terrorism (Ratification) Law of 2007, N.44(III)/2007
- The Convention on Nuclear Safety Ratification Law of 1998, N. 20(III)/98
- The Convention on Physical Protection of Nuclear Material Ratification Law, N.3(III)/1998, and its amendment, N.38(III)/2012
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (ratification) Law of 2009, N.13(III)/2009.

5 NATIONAL ENVIRONMENTAL RADIOACTIVITY MONITORING PROGRAMME

5.1 INTRODUCTION

Environmental radioactivity monitoring has been developed and is under advanced implementation in Cyprus. Studies carried out in the country for the assessment of the situation concerning radioactivity showed very low natural background radioactivity and insignificant radon levels. The MLWSI, as the regulatory authority (RA), acting through RICS/DLI, is responsible for operating the radiation monitoring network, including sampling, data management and reporting. The State General Laboratory (SGL) Environmental and Food Radioactivity Laboratory supports the RA by providing radioactivity analysis and measurement services for all samples collected by RICS. Based on past sampling and measurement programmes and considering knowledge stemming from previous studies, SGL is currently conducting all routine laboratory radionuclide analysis, taking into account the available equipment and personnel resources. The sampling and analysis programme has been designed by the Department of Labour Inspection, in close collaboration with the laboratories involved.

For specific measurements and for any situation with extensive contamination, RICS has established a co-operation with the University of Cyprus and the laboratory of the Geological Survey Department. RICS co-operates also with the regulatory authority in Greece (GAEC), the Greek Research Institute “Demokritos” and the Greek Oceanographic Research Institute.

The radioactivity data from laboratory measurements in Cyprus are sent to the REM data base at the JRC Ispra via a specific data submission tool developed by the JRC. Furthermore, RICS participates in the European radiation data exchange platform EURDEP. Every hour the Telemetric Radiation Monitoring Network automatically sends the one hour average gamma dose rate measurement values from all stations in Cyprus to the data server at the JRC Ispra. Also air radioactivity concentration data (^{137}Cs , ^{131}I , artificial alpha and beta radiation and $^{222}\text{Rn}/^{220}\text{Rn}$) and meteorological parameters are reported to EURDEP.

5.2 MONITORING OF EXTERNAL GAMMA DOSE RATE

The current RICS ambient gamma dose monitoring network was supplied by BITT Technology. The earlier ENVINET detectors and data loggers were removed in 2012 due to contractual problems.

The network has seven local monitoring stations (Lefkosia (Nicosia), Larnaca, Limassol, Paphos, Paralimni, Polis and Evrychou) and three control centres (DLI, Civil Defence Operations Centre and one mobile centre on a notebook). This network, shown in Figure 1 below, also serves as the country's Early Warning System (EWS) in case of a radiological emergency.

The network is fully automatic with communication through DSL connections and GSM (data). It covers all main urban areas of the non-occupied area of Cyprus and has capabilities for future extensions. It measures the ambient dose rate and precipitation and triggers alarms if the alarm levels are exceeded. The system can be fully configured and administered from the stationary control centres and every local station has a battery backup. The data can be retrieved automatically through dedicated DSL connections and stored on the servers of the control centres in Nicosia. The network also sends data automatically to the JRC Ispra (EURDEP platform) every hour. Long-term averages of environmental radioactivity measurements data are also sent to the EC's Radioactivity Environmental Monitoring (REM) databank (Article 36 of the Euratom Treaty) on an annual basis. RICS staff visits each network station on a regular basis.



● Air ● Marine

Figure 1. On-line ambient radiation dose rate monitoring network and the marine sampling locations

The telemetric network was expanded in 2009 with the acquisition of a standalone portable spectroscopic sodium-iodine (NaI) detector, which can be installed anywhere in Cyprus. It communicates with the control centres through existing wireless networks. This station has the ability to monitor the concentration levels of certain radioisotopes e.g. ^{40}K , ^{137}Cs , ^{131}I , ^{132}Te , ^{140}Ba , etc. It is also equipped with a Geiger-Müller detector to record the ambient gamma dose rate. In December 2012, an upgrade of the telemetric network took place with new hardware and software.

5.3 MONITORING OF RADIOACTIVITY CONCENTRATION IN AIR

RICS has two state-of-the-art low volume sequential pumps (LECKEL and TECORA SKYPOST) and a high volume pump (ASS-500, PTI-LOR) which are used for sampling of air particulates. Low volume pumps are loaded with nitrate cellulose filters, while the high-volume pump is loaded with chlorinated vinyl polychloride filters. The high volume pump is located at the Strovolos Industrial Area, south of Nicosia; one low volume pump is positioned on the roof of the RICS building in central Lefkosia (Nicosia) and the other on the roof of a government administrative building (District Office of DLI) in Limassol. The filters from these systems are measured at the State General Laboratory.

In addition, in 2009, RICS installed a very advanced automatic spectroscopic system (BITT AMS-02) for total alpha, total beta and gamma radionuclides (including ^{137}Cs , ^{131}I , ^{220}Rn , ^{222}Rn , etc.) in aerosol. The system is connected online to the telemetric network described in paragraph 5.2. This system has also capabilities for measuring a series of meteorological parameters. It is located in an air-conditioned container on the roof of the RICS building in Lefkosia (Nicosia). The system has altogether 500 filters (400 glass fibre and 100 active charcoal), which are placed in the sampling

station by a robotic arm according to a programmed sequence. The system measures the radioactivity on the filters using a NaI detector; if radioactive iodine is present, active charcoal filters are used. The system has an upgrade capability to measure the gamma spectrum using an electrically cooled HPGe detector. The system is equipped with ^{137}Cs test filters for operation control, UPS for power backup and meteorological instruments for monitoring temperature, humidity, atmospheric pressure and wind speed and direction. BITT AMS-02 is a fully stand-alone monitoring system – it measures the filters automatically on-site and does not therefore require analytical laboratory capacity.

5.4 MONITORING OF RADIOACTIVITY CONCENTRATION IN SURFACE AND DRINKING WATER

RICS conducts sampling in surface waters (dams), drinking water and sea water, the latter in collaboration with the DFMR. Rain water sampling is possible at each local station of the ambient gamma dose rate network.

Sampling of surface water is conducted once a year in four dams (Kourris, Yermasogeia, Asprokremmos and Kannaviou); the samples are analysed for gross alpha and gross beta radiation, as well as for ^{137}Cs , ^{134}Cs and ^{40}K concentrations.

Locally produced or imported drinking water and bottled water is monitored regularly on the basis of the new EURATOM directive 2013/51/EURATOM on radioactivity in drinking water. Samples of drinking water are taken from water treatment plants, desalination plants, water distribution networks, street water dispensers, etc. Sampling is conducted once a year; the samples are analysed for gross alpha and gross beta radiation, as well as for ^{137}Cs and ^{40}K concentrations.

5.5 MONITORING OF THE MARINE ENVIRONMENT

Sampling in the sea is carried out once a year by DFMR at three sampling stations, as shown on the Figure 1 above (Polis Chrysochous, Vasilikos and Paralimni). The following measurements are conducted on the samples collected:

Matrix	Anthropogenic radionuclides	Natural radionuclides	Sampling frequency
Seawater	^{137}Cs	^{238}U , Ra isotopes*	1/yr
Beach sand	Gamma emitters, incl. ^{137}Cs	"	"
Sediment	"	"	"
Seaweed	"	"	"
Molluscs	"	"	"
Fish	"	"	"
Atmospheric deposition (coastal)	"	"	"

* In areas of interest for NORM

Analysis of these samples is performed at the SGL, if needed in co-operation with the Greek Atomic Energy Commission and the Demokritos Research Institute, Greece.

5.6 MONITORING OF FOODSTUFFS

5.6.1 Milk

Monitoring of milk was initiated in 2009 after the latest Art. 35 verification in Cyprus. Routine sampling of milk is conducted at the milk processing plants in Lefkosia and Limassol. Analysis is performed by the SGL.

5.6.2 Foodstuffs and mixed diet/Feeding stuffs

A routine programme for monitoring foodstuffs and mixed diet has been set up. It covers prepared meals, wild berries, game, mushrooms, cereals, vegetables, baby milk and creams, freshwater and sea water fish etc. RICS regularly collects samples of infant food, cereals, locally-produced and imported cheese and flour. The SGL conducts the laboratory analysis for these samples.

Food imports are declared by the customs to RICS, which decides on whether such imports should be sampled and measured by the SGL. Samples of imported milk, infant food, water and cheese are currently analysed. In the future sampling of imported meat, cereals, animal feed etc. is planned. Certificates for imported foodstuffs from third countries are requested.

The Cyprus radioactivity monitoring programme includes monitoring of feeding stuffs, as well.

5.7 OTHER ELEMENTS OF THE PROGRAMME

RICS carries out sampling of soil, grass and seaweed. These samples are analysed at the SGL. Typically the samples are dried and homogenised before subsequent analyses.

6 LABORATORIES PARTICIPATING IN THE ENVIRONMENTAL RADIOACTIVITY MONITORING PROGRAMME

6.1 STATE GENERAL LABORATORY

6.1.1 Introduction

The State General Laboratory (SGL) is the official laboratory in Cyprus for chemical, biological, microbiological, toxicological and radiological controls. For radiological analysis SGL is the only laboratory in Cyprus and RICS is its only client. SGL exclusively performs analyses for the Cyprus authorities; it does not carry out commercial analyses. It is accredited to ISO/IEC 17025:2005 in many areas of its competence. It is an independent department of the Ministry of Health. Altogether the SGL has 19 laboratories and a staff of 175. Radiological measurements are carried out in its laboratory for Food & Environment Radionuclides, which is the only suitable laboratory for this purpose in Cyprus.

6.1.2 Sample registration and preparation

RICS has a contract with SGL for measurement of radioactivity in environmental samples, which include fallout, food, mixed diet, water, soil, grass, seaweed and milk. Feeding stuffs are not included in the programme.

RICS staff carry out the environmental sampling and deliver the samples to the SGL. When received at the lab, each sample is registered in the Laboratory Information Management System (LIMS) and in a paper logbook. Thereafter, the samples are prepared for measurement by drying or ashing. Refrigerators and freezers are available for sample storage. Weighting of samples is carried out with precision scales, which are calibrated every 2 years.

6.1.3 Measurement devices

The radiological analyses carried out in the laboratory include gamma spectroscopy, gross alpha/beta activity and ^{90}Sr activity. The laboratory has an adequate range of radioactivity measurement equipment installed in a temperature and humidity controlled counting room. In line with the quality manual, each instrument has its own logbook for recording measurements, calibrations and quality controls.

Gamma spectroscopy

The laboratory counting room is equipped with two Ortec gamma spectroscopy systems consisting of HPGe detectors (40% and 50% relative efficiencies), digital electronics units (Ortec D-spec) and GammaVision software. Systems are quality controlled each week using a standard source (^{57}Co , ^{60}Co and ^{137}Cs). The control includes efficiency, energy shift and resolution (FWHM). Results are recorded on the control programme and charted for long-term trend detection.

Efficiency calibration of the gamma spectroscopy systems is carried out using NIS-traceable standard sources for each of the measurement geometries used. Density correction is applied using a special correction programme. All calibration standards are certified and kept in a safe.

Alpha spectroscopy

Alpha spectrometry measurements are carried out with a 6-chamber Canberra Alpha Analyst device.

Other equipment

The laboratory has a proportional counter (Protean Instrument Corporation) for measuring gross alpha/beta on the low volume air filters. Unlike many other radiological laboratories in Europe, the SGL does not have a liquid scintillation counter.

6.1.4 Data handling and reporting

SGL keeps the data records for 5 years. The samples themselves are not archived. Air filter papers are kept.

6.1.5 Quality management

SGL has an ISO/IEC 17025:2005 accreditation for the gamma spectroscopy measurements and it is regularly audited by the Cyprus Accreditation Body. The laboratory participates in inter-comparison exercises organised by the EU and the IAEA.

Only approved members of staff can perform each analysis. Written method descriptions and work instructions are available to the staff.

6.2 DEPARTMENT OF LABOUR INSPECTION LABORATORY

The Department of Labour Inspection has some radiation laboratory measurement capability of its own, but these are not used as a part of the routine environment monitoring programme. The equipment includes a laboratory gamma spectroscopy system (Ortec HPGe, 40% relative efficiency), a portable gamma spectroscopy system (Canberra GMX, 40% relative efficiency), and several hand-held radiation dose rate and contamination monitors. The laboratory is used to carry out basic radiation measurements in order to demonstrate compliance with regulatory limits; it is not accredited and does not have a quality management system. The equipment is used to measure for example occasional samples of imported/exported goods, to identify radiation sources or to perform quick radiation dose rate measurements in the event of an emergency or other unexpected radiation situation. The number of samples is quite low (less than 10 per week). The equipment is operated, when needed, by the RICS inspectors, who have been trained abroad for this purpose.

7 VERIFICATIONS

7.1 INTRODUCTION

The verifications were carried out at the RICS, Civil Protection Emergency Centre, SGL and monitoring locations in Nicosia and Limassol according to the programme in Annex 2. They were focused on selected parts of the monitoring programme in order to have an overview of the national monitoring system, paying special attention to the associated laboratories and emergency monitoring systems.

7.2 ROUTINE MONITORING PROGRAMME

It was noted that currently the general public has no on-line access to the monitoring data produced by the monitoring network. In principle, the general public can see hourly data (not delayed) via the public EURDEP website operated by the European Commission, but it is still advisable to have a national website for keeping the Cyprus population informed about the radiation status of their environment. A demonstration of the website intended to be made available when a domain name has been acquired was given.

In order to maintain public knowledge and to create confidence in the monitoring arrangements, the verification team recommends RICS provide on-line access to the monitoring data for the members of the public in Cyprus.

The verification team was informed that the current programme for sampling drinking water requires one annual sample from each type of supply (distribution network, treatment plants, etc.). The new Euratom Drinking Water Directive 2013/51/Euratom includes very specific provisions on the sampling frequency on each supply zone, which should be taken into account when transposing the new Directive in Cyprus (transposition deadline is 28 November 2015). In these provisions the sampling frequency is not fixed, but depends on the amount of water produced/distributed.

The verification team recommends reviewing the drinking water sampling frequencies in order to make sure they comply with the requirements of the Directive 2013/51/Euratom. This should be done without delay in order to make sure the arrangements are in compliance with the Directive on 28 November 2015 at the latest.

7.3 ANALYTICAL LABORATORIES

7.3.1 State General Laboratory

The arrangements for measuring radioactivity in environmental samples at the State General laboratory were verified. The laboratory is well organised and operates in a very professional manner. In general, the existing analysis capabilities are sufficient for a routine programme, but the lack of a liquid scintillation counter is a limiting factor in the laboratory performance. In addition, the laboratory measurement capacity would not be sufficient in an emergency situation, when the number of samples to be measured would significantly increase. Also the number of trained staff is insufficient for this type of situation.

SGL has no back-up equipment for gross alpha/beta measurements and the radionuclide laboratory operates in a very limited space. Due to the financial constraints, the plans for building a new laboratory building have been cancelled and the funds for new equipment are very limited.

The verification team recommends that the radiological analysis capability of the SGL be complemented by acquiring a liquid scintillation counter. In addition, the team suggests making arrangements for emergency situations by training back-up staff from other SGL departments for radiological analysis and by allocating more space for the laboratory. Furthermore, it is suggested to consider establishing back-up arrangements for the most important radiological analysis equipment.

7.3.2 Department of Labour Inspection laboratory

The RICS laboratory is located in the basement of the RICS building. It contains a fairly large collection of measurement devices for inspection, enforcement and other radiation monitoring situations (e.g. emergency situations etc.), but it is not intended as an analytical laboratory for the national monitoring programme, even less to substitute analyses performed at the SGL. It is good that RICS has measurement capacity of its own, but the laboratory would benefit from a more systematic approach to its management, for example by establishing written measurement instructions and a maintenance system for the equipment.

The verification team recommends that RICS institutes a system of written instructions for use and maintenance of the various types of equipment in its laboratory.

7.4 ON-LINE AND OFF-LINE PERMANENT MEASUREMENT STATIONS

7.4.1 External ambient gamma dose rate network

Lefkosia (Nicosia)

The verification team were shown the ENVINET SARA IGS71x portable gamma monitoring station installed on the roof of the RICS building in Nicosia. This is a standard station of the monitoring network, equipped with a solar panel providing power autonomy to the station. It is able to provide the NaI gamma spectrum and gamma dose rate (Ambient Dose Equivalent rate $H^*(10)$). A special heat shield is installed to protect the detector from excessive heat during the summer.

At the same location there is also a BITT RS04/X Gammameter and its data logging unit WEBDL2, which are also used in the automatic monitoring network. This detector is based on a proportional counter, allowing an extremely large measurement range of gamma dose rate (10 nSv/h – 10 Sv/h).

Verification does not give rise to remarks.

Limassol

A BITT RS04/X Gammameter and its data logging unit WEBDL2, as a part of the telemetric network, is installed on the roof of an administrative building (District Office of DLI) in Limassol. This is a standard station of the monitoring network, equipped with a local dose rate display and a rain detector. A special heat shield is installed to protect the detector from the extremely high temperatures encountered during the summer. The system has no electrical back-up.

The verification does not give rise to recommendations. Resources permitting, the team suggests providing electrical back-up for this station.

Network data centre Lefkosia (Nicosia)

The verification team visited the data centre of the ambient dose rate monitoring network at the RICS building. The system comprises four PCs operating the SCADA software (Supervisory Control And Data Acquisition). The system allows a web-based presentation of the data from 7 fixed and one mobile station. The graphical interface facilitates an easy overview of the radiation situation and several displays of statistical analysis of the data. The centre has a UPS system allowing 2 hours of autonomous operation. In the event of telecommunication breakdown, a VHF-system is available for communication with the civil defence authorities.

The verification does not give rise to recommendations. Resources permitting, it is suggested to extend the autonomous operating time of the centre.

7.4.2 Monitoring of radioactivity concentration in air

Lefkosia (Nicosia)

A TECORA Skypost PM HV low-volume air sampler is situated on the roof of the RICS building in Nicosia. This device has an automatic system for changing filters; currently filters are changed every 48 hours. The filter cartridge, which has a 16-filter capacity, is changed every 32 days by the RICS staff. Analysis is carried out at the SGL. The system is equipped with an internal memory card recording the flow data for each filter along with temperature and atmospheric pressure data. Flow meter calibration has been carried out by an external contractor.

Verification does not give rise to remarks.

Additionally the BITT AMS02 automatic aerosol monitoring system located in a container placed on the roof of the RICS building in Nicosia was seen. This is a very advanced system, as described in section 5.3. The system alarm threshold is set at 300 nSv/h.

Verification does not give rise to remarks.

The POLON-IZOT high volume air sampler located in an industrial area at the local civil protection depot in Nicosia was visited. This device has a large 45x45 cm filter; typically the airflow is between 450 and 850 m³/h depending on the amount of dust on the filter. The system is equipped with a flow meter and records the total air flow volume. The filter is changed every 10 days, more frequently during an emergency.

The system has no electrical back-up. Calibration of the flow meter is recommended by the manufacturer after ten years of operation (2018).

Verification does not give rise to recommendations. Resources permitting, the team suggests supplying electrical back-up for this station and carrying out the flow meter calibration in 2018 at the latest.

Limassol

A SEQ47/50 low-volume sequential air sampler is sited on the roof of an administrative building in Limassol. This device has an automatic system for changing filters; currently filters are changed every 48 hours. The filter cartridge is changed every 30 days by the RICS staff. The system is equipped with a memory card recording the flow data for each filter along with temperature and atmospheric pressure data. Flow meter calibration has been carried out by an external contractor. The system has no electrical back-up.

Verification does not give rise to recommendations. Resources permitting, the team suggests equipping this station with an electrical back-up.

7.5 MOBILE AND EMERGENCY MONITORING SYSTEMS

The verification team was informed at the Civil Defence Emergency Centre in Nicosia that so far radiological threats have not been identified as a priority in the civil defence arrangements. This is reasonable, since there are no operating nuclear reactors in the vicinity of Cyprus. However, when the Turkish Akkuyu NPP starts operation at a distance of some 120 km from Cyprus, the situation will change. Cyprus will be in a position where there can be moderate level of radioactive contamination reaching the Cyprus territory in the event of an accident in Turkey. In such a situation, it is unlikely that the contamination level would require actual emergency countermeasures, but it is important to be able to monitor the situation and to quickly establish a comprehensive picture of the radiological situation in the whole country. This is essential to maintain public trust and to avoid panic and unnecessary protective actions initiated on a precautionary basis due to lack of information.

The current automatic monitoring network has 7 stations and some moderate mobile monitoring capability can be provided by the RICS. It would be beneficial to complement the information

provided by these arrangements with information from mobile measurement devices allocated to the local DLI inspectors or civil protection services – for this purpose simple low-cost devices operated by trained inspectors or civil protection volunteers would be quite sufficient.

The verification team recommends RICS and the Civil Protection Service to consider alternatives for achieving a more comprehensive picture of the radiological situation in Cyprus in a shorter time than what is possible with the currently available staff and devices. More extensive use of district inspectors or Civil Protection staff in radiation measurement tasks is encouraged.

8 CONCLUSIONS

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

The information provided and the verification findings lead to the following observations:

- (1) In general, the national environmental radioactivity monitoring programme in the Republic of Cyprus is in compliance with the requirements of Article 35 of the Euratom Treaty.
- (2) 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 are adequate. The Commission could verify the operation and efficiency of a representative part of these facilities.
- (3) A few recommendations are formulated, in particular as regards laboratory equipment, public availability of data and monitoring during an emergency situation. The recommendations do not discredit the fact that environmental monitoring is in conformity with the provisions laid down in Article 35 of the Euratom Treaty.
- (4) The recommendations are summarised in the 'Main Conclusions' document that is addressed to the Cyprus competent authority through the Cyprus Permanent Representative to the European Union.
- (5) The Commission services request a report on the implementation of the recommendations by the Cyprus authorities and about any significant changes in the set-up of the monitoring systems before the end of 2016. Based on this report the Commission will consider the need for a follow-up verification in Cyprus.
- (6) The verification team acknowledges the excellent co-operation it received from all persons involved in the activities it performed.

APPENDIX 1

<p>REFERENCES & DOCUMENTATION</p>
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1. State general Laboratory Annual Report 2013, Ministry of Health, Cyprus, October 2014
2. Description of the AMS 02 Air Monitoring System, BITT Technology-A GmbH, 2007
3. Technical specifications of the BITT Technology AMS 02 Air Monitoring System
4. Technical specifications of the BITT Technology RS04/X Gammameter
5. Technical specifications of the BITT Technology WEBDL2 gamma dose rate monitoring station
6. Technical specifications of the Sequential sampler SEQ47/50
7. Technical specifications of the Skypost PM HV Sequential Station for Particulate Matter
8. Technical specifications of the ENVINET SARA Spectroscopic Gamma Detector IGS71x
9. Technical specifications of the BITT SCADA software 2008

THE VERIFICATION PROGRAMME

CYPRUS**National monitoring network for environmental radioactivity****9-11 March 2015**

Day / date	Time	Activities
Monday 9 March	9.00 – 10.00	Opening meeting at the Department of Labour Inspection
	10.30 – 12.30	Verification of the national environmental radioactivity monitoring network data centre
	13.30 – 17.00	Verification of ambient gamma dose rate measuring facilities of the TRMN network
Tuesday 10 March	9.00 – 13.00	Verification of the State General Laboratory (analysis of environment samples, foodstuffs and drinking water)
	13.30 – 16.00	Civil Defence emergency centre Verification of air radioactivity concentration and precipitation monitoring facilities in Lefkosia (Nicosia)
Wednesday 11 March	9.00 – 10.30	Verification of mobile emergency radioactivity monitoring arrangements in Lefkosia (Nicosia) Closing meeting
	13.30 – 14.00	Verification of air radioactivity concentration and gamma dose rate monitoring in Limassol