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Radiation protection

TECHNICAL REPORT

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35 OF THE EURATOM TREATY

LATVIAN NATIONAL MONITORING NETWORK FOR ENVIRONMENTAL RADIOACTIVITY

REPUBLIC OF LATVIA

21 to 24 March 2006

Reference: LV-06/01

VERIFICATIONS UNDER THE TERMS OF ARTICLE 35 OF THE EURATOM TREATY

FACILITIES	Facilities for monitoring environmental radioactivity in Latvia
DATE	21 to 24 March 2006
REFERENCE	LV-06/01
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DATE OF REPORT	9 February 2007

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TECHNICAL REPORT

ABBREVIATIONS

AAM	Automatic Area Monitoring
BAPA	(Previous abbreviation for the) State Hazardous Waste Management Agency
BEGe Detector	Broad Energy Germanium Detector
BSS	Basic Safety Standards
DG TREN	Directorate General for Energy and Transport
EC	European Commission
EIA	Environmental Impact Assessment
EURDEP	European Radiological Data Exchange Platform
FVS	Food and Veterinary Service
FWHM	Full Width at Half Maximum
GM	Geiger-Müller
HELCOM	Helsinki Commission
HPGe	High Purity Germanium
IAEA	International Atomic Energy Agency
ISO	International Standardization Organization
LEGMA	Latvian Environmental Geological and Meteorological Agency
MCA	Multichannel Analyser
NDC	National Diagnostic Centre
PMS	Permanent Monitoring Station
QA	Quality Assurance
RDC	Radiation Safety Centre
SHWMA	(Current abbreviation for the) State Hazardous Waste Management Agency
SRR	Salaspils Research Reactor
SSIRO	Control programme for State Significant Ionising Radiation Objects
TLD	Thermoluminescence Dosimetry
UPS	Uninterruptible Power Supply

1. INTRODUCTION

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

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

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

For the purpose of such a review, a verification team from DG TREN visited sites located in Latvia, which are part of the national monitoring system for environmental radioactivity. The visit included meetings with representatives of the Ministry of Environment, the Ministry of Agriculture and the Ministry of Health, and with staff from the relevant authorities and expert organisations.

The present report contains the results of the verification team's review of relevant aspects of the environmental radiation surveillance in Latvia. The purpose of the review was to provide independent verification of the adequacy of monitoring facilities for air, soil, water and foodstuffs.

With due consideration to the scope of the verification mission and taking into account the relatively short time available for the execution of the programme, it was agreed that emphasis would be put on:

- Structure of the national environmental monitoring and sampling programme;
- Analytical laboratories of the Radiation Safety Centre and the National Diagnostic Centre;
- On-line automatic monitoring systems;
- Environmental monitoring programmes at the Salaspils Research Reactor and at the radioactive waste repository Radons at Baldone.

The present report is also based on information collected from documents referred to in Appendix 1 and from discussions with various persons met during the visit, listed in section 2.

The verification team acknowledges the co-operation it received from all participating individuals.

[1] Council Directive 96/29/Euratom of 13 May 1996 laying down basic safety standards for the health protection of the general public and workers against the dangers of ionizing radiation

2. PREPARATION AND CONDUCT OF THE VERIFICATION

2.1. Preamble

The Commission services decision to request the conduct of an Article 35 verification was notified to the Latvian Government on 6 January 2006 (letter referenced TREN.H4/CG/bf D(2005)125978 addressed to the Permanent Representation of Latvia to the European Union). The Latvian Government subsequently designated the Latvian Radiation Safety Centre (RDC) to lead the technical preparations for the verification.

2.2. Preparatory documents

In order to facilitate the work of the verification team, information was supplied in advance by the RDC in form of detailed answers to a questionnaire from the Commission services. Additional documentation was provided during and after the visit. All documentation received and other sources consulted are listed in Appendix 1. The information thus provided has been extensively used for the descriptive sections of this report.

2.3. Programme of the visit

EC and RDC discussed and agreed upon a programme of verification activities, based on a draft Communication by the EC, setting out the framework and modalities within which Article 35 verifications may be conducted.

A summary overview of the programme of verification activities is provided in Appendix 2. The verifications were carried out in accordance with the programme. The EC team was divided into two teams. The first team carried out the verification of the Salaspils Research Reactor (SRR) site, the mixed foodstuffs sampling at the Riga Clinical Hospital and the monitoring systems at Jurmala, Talsi and Ventpils; the second team verified the environmental radioactivity surveillance at the Radons site (Baldone) and at several sites within the country including the Daugavpils region. Both teams participated in the verification activities at the RDC facilities.

2.4. Representatives of the competent authorities and the associated laboratories

During the visit the EC verification team met the following representatives of the national authorities and other parties involved:

Latvian representatives from the Ministry of Environment and its subordinated institutions

Mr. Andrejs Salmins	Director of the Radiation Safety Centre (RDC)
Mr. Visvaldis Graveris	Head of the Early Warning Sector of RDC
Ms. Anita Skujina	Head of the Laboratory Division of RDC
Mr. Edmunds Pakers	Head of the Licensing Division of RDC
Mr. Andris Popelis	Head of the Salaspils Research Reactor
Prof. Janis Berzins	Head of Laboratory at the State Hazardous Waste Management Agency (SHWMA)

Mr. Janis Alksnis	Head of Radiation Safety Service at SHWMA
Mr. Jazeps Malnacs	Head of the Radons radioactive waste repository
Ms. Aija Grivite	Deputy Head of the Radons radioactive waste repository
Ms. Dace Satrovska	Head of the Environmental Quality Unit, Environmental Protection Department, the Ministry of Environment
Ms. Arnita Kirilova	Senior Official of the Environmental Quality Unit, Environmental Protection Department, the Ministry of Environment

Latvian representatives from the Ministry of Agriculture and its subordinated institutions

Mr. Dace Mierina	Head of Risk Management Division, Food Surveillance Department, Food and Veterinary Service
Ms. Andra Vilcina	Deputy Head of Risk Management Division, Food Surveillance Department, Food and Veterinary Service
Mr. Vadims Bartkevics	Head of the Food Control Laboratory of NDC
Mr. Janis Rudzitis	Head of the Radiological Department of NDC

Latvian representatives from the Ministry of Health and its subordinated institutions

Ms. Inga Smate	Deputy head, Public Health Department
Ms. Santa Livina	Head, Food Division of Public Health Department
Ms. Solvita Muciniece	Head, Environmental Health Department of the Public Health Agency

3. BACKGROUND INFORMATION

3.1. General

Latvia has no nuclear programme, but the legacy of the Soviet Union has left the country with several environmental issues related to radioactivity, most important being the research reactor site at Salaspils and the radioactive waste repository Radons in Baldone. There is one operational nuclear reactor in the vicinity of Latvia (Ignalina nuclear power plant in Lithuania), therefore monitoring of radioactivity in the environment is well justified.

The monitoring programme of radioactivity in the environment and foodstuffs does not include radiation from natural radionuclides. Exposure to natural radiation is controlled by research activities as long as there is no reason to suspect that natural radionuclides may cause unusually high exposure to the public (e.g. indoor radon and natural radionuclides in drinking water).

Due to the relatively small area of the country and the fact that large parts of the Latvian environment may be affected by a large scale radiological or nuclear accident in a neighbouring country, the whole territory is dealt with as one representative geographical region. In defining monitoring networks the principle of sparse monitoring network[2] has been followed. This is justified by the size of the country.

3.2. Monitoring programmes and responsible organisations

The Latvian Radiation Safety Centre (RDC) is the competent authority for the implementation of the Euratom Treaty radiation protection requirements in Latvia. It is the main responsible organization for the monitoring programme of radioactivity in the environment in Latvia. The responsibility of the overall monitoring is under the Ministry of the Environment, to which the RDC reports. RDC is in charge of the radiological monitoring and receives an annual budget for this purpose. It is also responsible for the associated radiological laboratory measurements.

Within the same ministry, the Latvian Environmental, Geological and Meteorological Agency (LEGMA) is in charge of the monitoring of airborne radioactivity, radioactivity in soil and radioactivity in the aquatic and marine environment.

For monitoring of foodstuffs the overall responsibility lies with the Ministry of Agriculture, which has delegated the work to the Food and Veterinary Service (FVS). Sampling and analyses are made by the National Diagnostic Centre (NDC), which operates under the FVS.

The ministries and organisations involved in the current Latvian monitoring programme are described in the Table I.

In early 2006 a new programme including inland water, seawater, air radioactivity and ambient dose rate monitoring was initiated by the Ministry of the Environment. Until this programme is fully implemented, the current provisions apply.

[2] According to Commission recommendation 2000/473/EURATOM of 8 June 2000 a sparse monitoring network means a monitoring network comprising for every region and for every sampling medium at least one location representative of that region. At such locations high sensitivity measurements should be performed thus giving a transparent representation of actual levels and trends of radioactivity levels.

Table I. Environmental radiation monitoring programmes in Latvia

Programme	Ministries and organisations in charge of the programme	Laboratories/services
Control programme for State Significant Ionising Radiation Objects (SSIRO) (monitoring of SSR, Radons, other sites)	***Ministry of Environment*** Radiation Safety Centre (RDC)	Laboratory division
	Latvian Environmental, Geological and Meteorological Agency (LEGMA)	Environmental laboratory
	Ministry of Agriculture Food and veterinary service (FVS)	National diagnostic centre (NDC)
	Various ministries Operators of SSIRO	Corresponding services
National monitoring programme for the determination of environmental radioactivity	RDC	RDC Laboratory division
National control programme for determination of radioactive contamination of food products	FVS	National diagnostic centre (NDC)

4. LEGAL PROVISIONS FOR ENVIRONMENTAL RADIOACTIVITY MONITORING

4.1. Legally binding documents

Latvia has comprehensive legislation in the area of radiation and nuclear safety. The main legal acts regulating the environmental radiation monitoring are:

- Law on the Radiation Safety and Nuclear safety (26.10.2000[3]);
- Regulation on protection against ionising radiation (9.4.2002[3]);
- Regulation on practices involving radioactive waste and related materials (19.3.2002[3]);
- Regulation on Radiation Safety Centre Statute (15.2.2005[3]);
- Regulation on the Procedure of Issuing of a Special Permit (Licence) or Permit for Activities Involving Ionizing Radiation Sources and Procedure for Public Dispute on the Establishment of Ionizing Radiation Facilities of State Significance or on Essential Modifications thereto (3.7.2001[3]).

Apart from legal documents specific to radiation and nuclear safety there is a set of other legal acts dealing with environmental protection, which also have an impact on the monitoring of radioactivity in the environment:

- Law on Environmental Protection (6.8.1991[3]);

[3] Reference dates are given for the first approval although the document may have been amended at a later stage.

- Convention on the Protection of the Marine Environment of the Baltic Sea Area (HELCOM), (1992);
- Law on Environmental Impact Assessment (21.6.2001[3]);
- Regulation “Procedures for Environmental Impact Assessment” (17.2.2004[3]);

The main legal acts regulating foodstuff monitoring related to radioactivity are:

- The Cabinet Regulation on Protection against Ionising Radiation (9.4.2002[3]);
- The Cabinet Regulation on Mandatory Harmlessness and Quality Requirements for Drinking Water, and the Procedures for Monitoring and Control thereof (29.4.2003);

In addition the EU post-Chernobyl foodstuffs regulations are applicable.

4.2. Non-binding documents

In addition to binding legal requirements, there are important guidance documents, which are relevant to environmental radiation monitoring. The most important ones are:

- Measurement of Radionuclides in Food and the Environment: a Guidebook, IAEA Technical Reports Series No. 295;
- Environmental and Source Monitoring for Purposes of Radiation Protection, IAEA Safety Guide, No. RS-G-1.8;
- EU Commission Recommendation 2000/473/EURATOM 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. (EU Official Journal L-191, 27/07/2000);
- HELCOM Recommendation 19/3, Manual for the Marine Monitoring in the COMBINE programme of HELCOM;
- HELCOM Recommendation 26/3, Monitoring of radioactive substances.

5. ENVIRONMENTAL MONITORING AT THE SALASPILS RESEARCH REACTOR SITE

5.1. General information

Salaspils Research Reactor (SRR) is located at the Institute of Nuclear Physics at Salaspils, some 25 km from Riga. It was designed and constructed by the Soviet Union as a derivative of the IRT-1000 reactor (pool-type light water reactor) originally built at the Moscow Kurchatov institute in the late 1950's. SRR was put into operation in 1961. Between 1973 and 1975 the reactor was closed for upgrading. In 1979 the secondary cooling system was reconstructed and the thermal power increased to 5 MW. After modifications the reactor fuel had an enrichment of 90% ^{235}U, which motivated strict security measures.

The reactor was permanently shut down in 1998 due to aging and financial reasons. The last remaining fresh reactor fuel was sent to Russia in May 2005. There is currently no fuel inside the reactor, but spent fuel elements remain in the reactor hall. The current plan is to remove the remaining spent fuel in 2007 and to clear the whole site of all radioactive material in 5 years.

SRR was operated under license from the Ministry of Environmental Protection and Regional Development and regulated by the State Environmental Inspectorate. After establishment of a single regulatory authority (Radiation Safety Centre) all practices at the SRR have been licensed and controlled by the RDC. Presently the State Hazardous Waste Management Agency manages the decommissioning project of the reactor.

In addition to the management of the wastes produced by the maintenance of the reactor in early stages of decommissioning the current operations at the site also include treatment, conditioning and packing of wastes received from other Latvian operators. From Salaspils the radioactive waste is transferred to the Radons waste repository for final storage.

According to the decommissioning plan approved by the Cabinet of Ministers in 1999 (updated and re-approved in 2005) the final decommissioning of the reactor is envisaged by the end of 2010.

5.2. Provisions for environmental and radioactive discharge monitoring

Limits for liquid and airborne discharges of radioactivity from the SSR into the environment have been established in accordance with the discharge authorisation. The cumulative annual airborne discharge limits at the SRR site are:

Type of release	Release limit Bq/year
Airborne discharges	$6*10^5$ for ^{90}Sr $3*10^6$ for ^{137}Cs $3*10^6$ for ^{60}Co $2*10^6$ for ^{152}Eu and other radionuclides
Liquid discharges	$4*10^7$ for ^{90}Sr $7*10^6$ for ^{137}Cs $3*10^6$ for ^{60}Co $7*10^7$ for ^{152}Eu and other radionuclides

The site-related monitoring programme for the Salaspils site is defined by the Control Programme for State Significant Ionising Radiation Objects (SSIRO). It covers groundwater, sewage, ground deposition, precipitation, soil and radiation in the ambient air. The environmental monitoring programme and the programme for discharge monitoring are implemented by two units of the SHWMA: Radiation Safety Service and the Laboratory for Testing of Radioactive Materials. Extracts from the programme relevant to the Salaspils site are provided the table II. The main equipment used by the laboratories in the environmental monitoring is listed in Appendix 5.

Table II. Environmental monitoring programme of the Salaspils research reactor (3 km radius around the site)

Measurement	**Samplings per year**	**Method**	**Parameters**	**Number of samples or measurements per year**
γ–background:				
• In the territory (grid of 10*10 m)	4	RM	μSv/h	800
• In the technical area	12	RM	μSv/h	120
• Around the territory	1	RM	μSv/h	10
Ground water :				
• In the territory (8 wells)	4	RM, γ–SP	KA, γ–emitters, Bq/l	64
• In the territory (well 5V)	2	Ch	^{3}H, Bq/l	2
• Around the territory (wells -2A, 2B, 2V)	2	Ch	^{3}H, Bq/l	6
• Around the territory (6 wells)	4	RM, γ–SP	KA, γ–emitters, Bq/l	48
Water in the ditch	4	RM, γ–SP	KA, γ–emitters, Bq/l	4
Precipitation	2	RM, γ–SP	KA, γ–emitters, Bq/l, Bq/m^{2}	4
Soil in the territory (5 places)	1	RM, γ–SP	KA, γ–emitters, Bq/kg, Bq/m^{2}	10
Aerosols in the ventilation system	12	RM, γ–SP	KA, γ–emitters, Bq/m^{3}	24

RM: Radiation dose rate monitoring
Ch: Radiochemical analysis
KA: Total beta activity (^{40}K excluded)
γ–SP: Gamma spectroscopy

6. ENVIRONMENTAL MONITORING AT THE RADONS SITE IN BALDONE

6.1. General information

The national radioactive waste near-surface repository Radons was built in accordance with the former Soviet Union standard requirements. The repository is designed for disposal of low and intermediate level waste. The site, with a total area of 7 ha, is situated in the Riga district, about 5 km from the centre of Baldone and 27 km from the centre of Riga. It is managed by the State Hazardous Waste Management Agency. The operations at Radons started in 1962.

The disposal site is divided into two zones: a control zone (zone B) and a supervision zone (zone A). The administrative buildings, the pass office, and the garage for transport vehicles are located in the supervision zone. The main facilities in the control zone are:

- the decontamination building,
- five closed radioactive waste disposal vaults (filled and sealed),
- the vault presently in operation (operation started in 1995),
- the equipment for aerosol sampling and precipitation collection,
- 27 boreholes around the vaults for ground water monitoring.

6.2. Provisions for environmental monitoring

The current monitoring programme is defined by SSIRO. The main parameters to be monitored are radiation in ambient air, radioactive surface contamination of working premises, specific activity of ground/surface water and radioactive contamination of precipitation, soil and plants. RDC carries out the programme at the Baldone site. The details are provided in the table III.

Table III. Environmental monitoring programme managed by the RDC at Baldone

Operation	Samplings per year	Analytical requirement
γ–dose rate survey road Salaspils-Baldone	4	Mobile laboratory
Smear tests in control zone (4 points)	2	Smear test
Groundwater (boreholes B-4, B-3, 6, 7, 8)	2	^{3}H, ^{90}Sr, ^{137}Cs
Surface water (two points)	2	^{3}H, ^{90}Sr, ^{137}Cs
Precipitation (integrated sample)	1	^{90}Sr
Soil • Control zone (2 points) • Supervised zone (4 points)	 2 2	 ^{137}Cs, ^{90}Sr ^{137}Cs, ^{90}Sr
Plants in the supervised zone (4 points – pine needles)	1	^{90}Sr
Air (integrated filter sample)	1	^{90}Sr

Samples at the Radons site are taken by local staff or by the RDC. Sample pre-treatment is performed on site by local staff or at the measuring laboratories. Analytical measurements are performed by the Laboratory for the Testing of Radioactive Materials of SHWMA (Salaspils) or by the RDC laboratory (Riga).

7. NATIONAL ENVIRONMENTAL RADIOACTIVITY MONITORING SYSTEM

7.1. Automatic monitoring network of external ambient gamma dose rate

Gamma dose rate is measured continuously by an automatic network consisting of two independent sub-networks. The locations of both types of measurement stations and exact coordinates are presented in Appendix 4. Network data centre is located at the RDC in Riga. RDC is responsible for compiling the data, reporting, and managing necessary stand-by arrangements for response to network alarms.

The two sub-networks are technically different. The older sub-network is the area radiation monitoring system AAM-95 which consists of nine automatic stations, each equipped with a RD-02L type GM-tube. The stations of this system are able to measure only ambient gamma dose rate. They are connected to the central data server situated at RDC. After detecting a value above the pre-set alarm level (200 nSv/h in all stations), an AAM station sends an alarm message to the central server. The detectors are typically located on roofs of public buildings.

The detector of the AAM station at Daugavpils is placed close to the air filter of the filtering station JL900 Snow White; therefore it is able to alert also upon high activity of aerosols collected by the filter.

The new part of the countrywide network consists of seven PMS stations. These are fully automatic new generation stations, which measure gamma dose rate using a RD-02L type GM-tube and collect low resolution gamma spectra using a NaI detector. The latter feature makes it possible to discriminate between increases in dose rate caused by natural activity and by contamination with artificial radionuclides. The stations analyse dose rates from five different components of the total gamma spectrum. Independent alarm levels are preset for each component, providing early warning even in the case of very low levels of atmospheric contamination. The alarm trigger values are:

- Total gamma dose rate 200 nSv/h
- Dose rate from radon (equilibrium) 200 nSv/h
- Dose rate from radon (disequilibrium) 200 nSv/h
- Dose rate from normal background 200 nSv/h
- Dose rate from artificial sources 50 nSv/h

In addition to radiological values, the PMS stations measure also rain intensity and temperature. Measurement integration time and interval lengths for data sampling are separately adjustable for each station. Stations are connected to the central server at the RDC. Data is transferred to the central server three times a day via public telephone networks.

The information from both sub-networks is processed by central software in the central server. All radiological information is stored in a common database. Alarm messages are stored on the main server and distributed through an Internet service to GSM phones and local area computer networks. Duty specialists can be alerted on a 24h basis.

From the RDC central database data is made available on a public website and provided to the Nordic countries data exchange system and to the European data exchange system (EURDEP) operated by the EC. Provision is made for increased data polling frequency in the event of an emergency.

There is an ongoing PHARE 2003 project to enlarge and renew the automatic measurement network in Latvia during year 2006.

7.2 Monitoring of airborne radioactivity

There is one continuously operating high volume air sampling station in Latvia (JL-900 "Snow White") with an average flow rate of 550 m^3/h. This station is located in Daugavpils, approximately 30 km from the Ignalina NPP[3]. The sampler uses glass fibre filters for aerosol sampling and activated charcoal filters for iodine sampling. In routine sampling glass fibre filters are used; charcoal filters are applied during exercises and actual emergencies.

Filters from the station are delivered by car or sent by mail to the RDC laboratory. After pre-treatment, they are measured by an HPGe gamma spectroscopy detector (20 hours counting time). Filter change interval is 7 days in the wintertime and 15 days in the summertime.

7.2. Monitoring of drinking water

The current monitoring programmes in Latvia do not include systematic monitoring of drinking water. However, the Public Health Agency, according to the paragraph 3 of Cabinet Regulation No. 235 from 29.04.2003 "Mandatory Harmlessness and Quality Requirements for Drinking Water, and the Procedures for Monitoring and Control thereof", is implementing monitoring of drinking water supplied to inhabitants including radioactivity measurements. Currently this implementation is incomplete due to the fact that there is no accredited laboratory for drinking water radioactivity measurements. The Latvian authorities are looking at several options to provide this capability.

7.3. Monitoring of soil

The Latvian Environmental, Geological and Meteorological Agency (LEGMA) is responsible for the monitoring of radioactivity in soil. Sampling and analysis are carried out by the National Environmental Monitoring Laboratory of LEGMA. Samples from two different depths (0-5 cm and 5-10 cm) are taken from six locations in Latvia once a year in August and analysed for ^{137}Cs, ^{90}Sr, ^{40}K, natural uranium and thorium. The LEGMA soil monitoring programme is outlined in Table IV.

Table IV. LEGMA monitoring programme for the determination of radioactive substances in soil

Sampling point	Frequency	Number of samples/ mode of sampling	Parameter
Ventspils (Libciems)	1/year	1- in depth 0-5 cm, 1- in depth 5-10 cm	^{137}Cs, ^{90}Sr, ^{40}K, ^{nat}U, ^{nat}Th, [Bq/kg] and [Bq/m^2]
Liepaja (Cimdenieki)	1/year	1- in depth 0-5 cm, 1- in depth 5-10 cm	^{137}Cs, ^{90}Sr, ^{40}K, ^{nat}U, ^{nat}Th, [Bq/kg] and [Bq/m^2]
Baldone (Drukas)	1/year	1- in depth 0-5 cm, 1- in depth 5-10 cm	^{137}Cs, ^{90}Sr, ^{40}K, ^{nat}U, ^{nat}Th, [Bq/kg] and [Bq/m^2]
Daugavpils (Demene)	1/year	1- in depth 0-5 cm, 1- in depth 5-10 cm	^{137}Cs, ^{90}Sr, ^{40}K, ^{nat}U, ^{nat}Th, [Bq/kg] and [Bq/m^2]
Balvi	1/year	1- in depth 0-5 cm, 1- in depth 5-10 cm	^{137}Cs, ^{90}Sr, ^{40}K, ^{nat}U, ^{nat}Th, [Bq/kg] and [Bq/m^2]
Salacgriva	1/year	1- in depth 0-5 cm, 1- in depth 5-10 cm	^{137}Cs, ^{90}Sr, ^{40}K, ^{nat}U, ^{nat}Th, [Bq/kg] and [Bq/m^2]

[3] The station was relocated to Baldone a few months after the verification visit.

7.4. Monitoring of food

The Food and Veterinary Service (FVS) is responsible for the monitoring programme for radioactive substances in food products. The programme is developed in cooperation with the RDC and implemented by the FSV. All samples are analysed for ^{137}Cs, ^{40}K and ^{90}Sr. The programme includes:

- Sampling of non-processed milk from 14 dairies in Latvia. Sampling frequency is two times a year (winter and summer) except for the unit in Riga where samples are taken four times a year.

- Sampling of potatoes, carrots, beef, pork, fish and cereals 1-2 times a year from Riga, Liepaja and Daugavpils areas. Fish and potato sampling is also carried out in Ventspils. Samples of cereals and wild mushrooms are taken once a year from ten other locations in the country.

- Sampling of mixed-food diet from the Riga Clinical Hospital canteen 4 times a year. Radioactivity in mixed diet is dealt with as an additional indicator of public dose. The sampling site is chosen to represent large population groups and the average daily food for adult persons.

- Sampling of miscellaneous imported products (10 samples per year).

7.5. Monitoring of inland water and seawater

Inland water and seawater sampling and analysis are carried out on annual basis (sampling in May-June) by the Environmental laboratory of LEGMA.

Inland water sampling programme is outlined in Table V.

Table V. Inland water monitoring programme

Water sampling point	Frequency	Parameter
Basin of Salaca		
River Salaca (Salacgriva, mouth)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Basin of Gauja		
River Gauja (Mouth)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Basin of Daugava		
River Daugava (Riga, mouth)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Basin of Lielupe		
River Lielupe (Jurmala, mouth)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Basin of Venta		
River Venta (Ventspils, mouth)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Lake of Liepaja, (middle part)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]

Lake of Burtnieks (middle part)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Lake of Razna (Water post Kaunati)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Lake of Lubans, (middle part)	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Lake of Usma	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Lake of Engure	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]
Lake of Babite	1 /year	^{137}Cs, ^{90}Sr, [Bq/m^3]

Seawater sampling is carried out according to the HELCOM MORS marine programme. Results are reported to the HELCOM database. Programme outline is provided in Table VI.

Table VI. Marine monitoring programme in Latvia

Sample type	Sampling location	Number of samples	Frequency[3]	Parameters
Surface water	Gulf of Riga	3	1/year	^{137}Cs, ^{90}Sr [Bq/m^3]
Near bottom water	Gulf of Riga	3	1/year	^{137}Cs, ^{90}Sr [Bq/m^3]
Sediments	Gulf of Riga	42[1]	1/year	γ-emitters, ^{137}Cs, ^{90}Sr [Bq/kg, Bq/m^2]
Fish[2]	Gulf of Riga (Daugavgriva, Central part) Open sea (Lielirbe)	3	1/year	^{137}Cs, ^{90}Sr [Bq/kg]
Aquatic plants	Gulf of Riga (Mersrags, Ainazi, Saulkrasti) Open Sea (Pape, Pavilosta)	5	1/year	γ-emitters, ^{137}Cs, ^{90}Sr [Bq/kg]

[1] At each station the sample core is divided into 14 slices of 2 cm thickness.
[2] Plaice, perch, pilchard
[3] Sampling in August

7.6. Other environmental monitoring activity

There are a few atmospheric fallout and rain samplers in Latvia operated by the State Hazardous Waste Management Agency. The agency also carries out snow sampling.

There is no programme for routine iodine measurements in Latvia, but the NaI spectra received from the PMS stations can be used to detect iodine activity in the event of an emergency.

8. VERIFICATION ACTIVITIES

8.1. Introduction

The verification team visited the following locations:

- Salaspils Research Reactor (SRR) site, some 25 km southeast from Riga;
- The Laboratory for Testing of Radioactive Materials of State Hazardous Waste Management Agency at the SRR site;
- Radiation Safety Centre in Riga, including Laboratory Section and Early Warning Section;
- National Diagnostic Centre in Riga;
- Radons radioactive waste storage site in Baldone;
- Riga Clinical Hospital;
- Selected sampling and monitoring locations at Talsi, Ventpils, Jurmala, Salaspils, Jekabpils, Baldone, Daugavpils and Demene.

8.2. Salaspils Research Reactor site

8.2.1. General

The verification team acknowledged that SRR is in a relatively early stage of decommissioning. Activities at the site relate to decommissioning, radioactive waste management and monitoring of radioactivity at the site or in the near vicinity.

The reactor is licensed to store nuclear fuel, provide management of the radioactive waste and transport radioactive waste to the Baldone site. As the decommissioning process advances, the remaining radioactive material is foreseen to be disposed of in Baldone repository during the next 5 years. Low and intermediate level waste is transported in small (1 m^3) concrete containers.

Discussions with the Russian Federation are aiming at organising the next spent fuel transport to Russia in 2007.

The verification team visited:

- SRR reactor building;
- Radiation Safety Service laboratory;
- Laboratory for Testing of Radioactive Materials.

8.2.2. SSR reactor building

The team verified the existence and functionality of the monitoring and sampling provisions for discharges as defined in the regulatory obligations.

Functionality of the on-line monitoring and control systems was demonstrated. The verification team confirmed the existence of the sampling system for aerosols in the SRR air exhaust stack. The reactor building has a modern stack monitoring system for continuous alpha, beta and tritium measurements in the reactor hall. The IAEA-sponsored system was installed in 2005. It is manufactured by Impex Systems, England. The alpha/beta detectors are type CMS-H35L. The air control filter (type CMS 2000R) is changed on every second day. The sampling lines for gaseous discharges are not designed to ensure isokinetic sampling. There is also a gamma dose rate monitoring system in the reactor hall.

The reactor building is not staffed outside office hours, but an alarm from the monitoring system is forwarded to the security staff at the entrance building. Electrical power back-up is ensured by a diesel generator with about two minutes start-up time.

Liquid discharges are monitored by sampling from the fuel storage tank and the sewage pipe. A weekly one litre sample is taken from the fuel tank and analysed for electrical conductivity and pH. On monthly basis an analysis of water composition and radionuclide activity is also carried out. Sewage is monitored once a year by taking a one litre water sample from the sewage water tank for determination of waste water composition and radioactivity.

There are no detectors in place for continuous on-line measurements of liquid discharges. The water level in the fuel storage tank is monitored; in case the level decreases, an alarm signal is transmitted to the control room.

Verification team recommends the RDC to consider more frequent monitoring of the sewage tank. Should the facility operation be continued beyond the current plans, the verification team recommends the RDC to consider automatic sewage pipe sampling or installing a continuous liquid discharge monitoring system at the SRR.

8.2.3. SRR site area monitoring system

The team verified the presence of GM detectors on the surrounding fence of the SRR. The site area monitoring system consists of five gamma dose rate detectors; four of them situated on the surrounding site fence and one on the reactor building roof. An additional detector is situated inside the reactor hall. The data collection system is installed in the control room. Readings are performed automatically every two minutes. Alarms are forwarded to the security staff. No data back-up of the measurement PC is assured.

Currently no meteorological station exists in the SRR site; therefore it is not possible to have an indication of the wind speed and direction should a release of radionuclides occur. However, the verification team was informed that a new wind measurement system is being implemented.

Verification team recommends that a data back-up procedure is implemented for the measurement data.

Verification team supports the plans to install a measurement system for wind speed and direction.

8.2.4. Radiation Safety Service and Laboratory for the Testing of Radioactive Materials

General

The laboratory for measurements related to the Salaspils research reactor site is the Laboratory for the Testing of Radioactive Materials of State Hazardous Waste Management Agency (SHWMA, previously called BAPA). The laboratory is involved in the implementation of the site control programme under SSIRO and provides the analytical services for SRR dismantling. The laboratory measures not only samples from the Salaspils site but also filters and samples from the Radons site monitoring programme. About half of the measurements performed at the laboratory are connected to SRR or Radons environmental programmes; the other half is carried out on a commercial basis for other organisations such as hospitals needing radioactivity measurements.

The verification team visited the laboratories in charge of the SRR site environmental monitoring and sampling. The monitoring programme was designed by the regulatory authority a few years ago and will be revised in 2006. At the time of the verification the sampling and measurement programme for the SRR site included the following:

- Ground water sampling (66 samples per year for the SRR site, 30 samples per year outside the SRR perimeter);
- Surface water sampling, one sampling point outside the SRR (quarterly);
- Precipitation sampling (two sampling points, twice a year);
- Air filters from the ventilation system (every second day);
- Soil sampling once a year at five locations in and around the site premises, two samples at each location.

Laboratory is also able to analyse biological samples. Currently the only biological samples analysed in the laboratory are pine needles taken from the Baldone site.

A report of the results from the environmental monitoring programme is sent to RDC once a year.

The verification team finds the intensity of surface water and precipitation sampling quite low and suggests the RDC to consider more frequent sampling.

Reception and registration of samples

The team verified the procedures for sample receipt and sample preparation for air filters and water samples. The procedures for sampling, sample analysis and data handling are defined (labelling of samples, responsibilities of individuals, record keeping) both for the Salaspils and Baldone sites. Each sample receives an individual identification number and is registered both in a paper log and on PC. The laboratory has a central database for sample and data management.

The team verified the procedure for soil collection. Soil samples (0-5 cm and 5-10 cm) are collected from five different locations at the SRR site once a year and from one location in Baldone twice a year. All five samples are combined into an average sample and wrapped in a plastic bag. A code is written on the combined sample. Date, time, sampling site coordinates, code of the sample, the person who performed the sampling and the collection location are recorder in the sampling log. The samples are then dried for the gamma spectrometry and later on ashed for the beta analysis.

As a matter of good laboratory practise, the verification team suggests the laboratory to consider implementing a systematic data back-up system for all sampling and measurement data.

Analytical measurements room

There are two gamma spectrometry laboratories: one where the old operational devices are still in place and a new one where the most recent acquisitions are still in the process of installation.

In the new laboratory the verification team acknowledged the presence of the following measurement devices (not all operational):

- Alpha/beta counting system Tennelec manufactured by Oxford;
- Ortec gamma spectrometer (50% detector relative efficiency);
- Canberra gamma spectrometer (20% detector relative efficiency).
- NaI gamma spectrometer for waste drum activity measurements;
- Liquid scintillation counter TRI-CARB-2100 TR for determination of tritium in water samples.

The verification team was informed that the second liquid scintillation counter (Wallac 1414) for water samples was not yet in use and one of the gamma spectrometers was foreseen to be put into operation on the following week.

In the old laboratory the team verified the operation of a gamma spectrometer from Baltic Scientific Instruments using an old detector coupled to an outdated analogue multichannel analyser.

Activity calculations are done manually on Excel spreadsheets; the results are kept in a logbook. The team was informed that it was foreseen to receive a computerized system for radionuclide activity calculations in April 2006.

Samples are discarded after measurement; the procedure of sample storage and disposal is described in the laboratory quality control manual.

Temperature and the humidity in the laboratory are measured and recorded. A back-up power supply system provides autonomy of 10 minutes in the event of a power cut. The equipment used in the environmental monitoring at SRR is listed in Appendix 5.

> *In order to maintain laboratory measurement capability the verification team recommends the laboratory to make the new equipment and analysis software operational as soon as possible and discard the obsolete equipment from the laboratory.*

Quality assurance

All of the laboratory procedures were accredited by the Latvian National Accreditation Bureau according to ISO/IEC 17025. The latest accreditation certificate (registration number LATAK-T-190-07-2000) was issued on 8 February 2005 and expires on 19 June 2008. The accredited methodologies for radioactivity measurements are:

- Determination of radionuclide concentration with gamma spectrometry (2004);
- Determination of alpha and beta activity in deionised water with Oxford Tennelec Solo alpha and beta counting system (2001);
- Determination of tritium activity concentration with liquid scintillation counter (2003);
- Determination of beta radioactivity in groundwater and sewage (2001);
- Determination of gamma dose rates (2003);
- Soil sampling and pre-treatment of soil samples for gamma spectrometric measurements (2003);

- Preparation of precipitation samples for the determination of beta radioactivity (2002);
- Preparation of disperse samples for the determination of beta radioactivity (2002).

The laboratory is audited regularly. A quality assurance and control programme is in place and implemented through a compilation of written working instructions. The laboratory is currently working on a new QA manual.

The laboratory has a contract with the Latvian Academy of Sciences to receive certified calibration standards for each sample type. Calibration of the equipment and the control of laboratory standards are done annually by the Latvian National Metrological centre. Routine control of efficiency, peak energy and peak width in gamma spectroscopy systems is done monthly. The verification team noted that there are no records of calibration results for the gamma spectrometers.

Data from gamma spectrometry are stored both in electronic format and on paper; the archives are kept for 10 years. The laboratory has participated in international inter-comparison exercises arranged by the Risø National Laboratory (Denmark) and the IAEA. The most recent ones were held in 2002, 2003 and 2005.

The verification team recommends the laboratory to maintain records of detector calibrations in order to have long term data on detector stability.

The verification team supports regular participation in intercomparison exercises and the work towards further accreditation of laboratory procedures.

8.3. Radons site

The verification team visited the Radons site in Baldone in order to verify the adequacy of the monitoring programme and its implementation. The site, located in a large forest area, is fenced off and has 24 h surveillance.

The Radons site is a surface burial facility for storing low and intermediate level radioactive waste. This waste mainly originates from the decommissioning activities on the SRR site.

The programme for environmental monitoring performed by the operator at Baldone is outlined in chapter 6. The site personnel have the main responsibility for environmental sampling and sample preparation. Measurements of the different samples are performed by the RDC in its laboratory in Riga or by the Laboratory for the Testing of Radioactive Materials in Salaspils.

For continuous gamma dose rate monitoring there is a PMS station situated on the roof of the entrance building. The electronics of the station are located in the top floor of the building. Data transfer is performed by a mobile phone link. The team was informed that the data transfer was not very reliable; sometimes there are large data gaps from this station at the RDC data centre.

On site there is also an air sampler device (Russian design, large 30x100 cm filter cloth). It was reported that this sampler does not run permanently, but it was operational during the visit.

There is no instrument for measuring the wind speed or direction at the site. An unheated precipitation sampler is available. Water is collected in a plastic container and after evaporation one litre is transferred into a Marinelli beaker for measurement. The sampler is not heated, so ice and snow disturb the measurement.

Every year a report concerning the Radons site is produced and forwarded to the Ministry of Environment.

There are plans to enlarge the site by a new storage vault and to upgrade the monitoring facilities[4]. The verification team was informed about the planned expansion of the site operations as the amount of waste will increase due to the upcoming stages of the SRR decommissioning.

The verification team recommends installing a measurement system for wind speed and direction.

The team recommends improvement of the data transmission reliability of the PMS station at the Radons site.

The team endorses the planned modernisation of the environmental monitoring equipment of the site, especially in view of the planned enlargement of the facility.

8.4. RDC Laboratory Division

8.4.1. General

The RDC Laboratory Division has two sectors, both located at the RDC headquarters in Riga: TLD sector and Radiation safety sector. The verification team visited briefly the TLD sector but the actual verification was done at the Radiation safety sector.

The laboratory is responsible for most of the analytical measurements of the national and site related environmental monitoring programmes in Latvia. It measures radionuclides in groundwater, surface water, precipitation, soil, air sampling filters and biological samples (pine needles). From April 2006 onwards the RDC will also measure marine environmental samples according to HELCOM guidelines.

The laboratory has a quality management system. ISO 17025 accreditation is planned to be achieved in 2007. The quality manager post was vacant at the time of the verification and due to the lack of staff the accreditation process had not been prioritized. Whether it will be completed depends to a large extent on the number of personnel at the laboratory.

Laboratory TLD sector is equipped with two RADOS TLD readers and one RADOS TLD irradiator. These are used for personnel dosimetry; there is no TLD application in environmental measurements.

The verification team supports the ongoing work towards accreditation.

8.4.2. Reception and registration of samples

RDC staff collects most of the samples themselves. The verification team confirmed the existence of a sample registration room and sample registers for soil, water, vegetation and air filters. The procedures for sampling, analysis and data handling are well defined (labelling of samples, responsibilities of individuals, record keeping, etc.). Incoming samples are registered in the laboratory registration book and entered into a computer system. Every sample receives an individual identification number. Sampling procedures are clearly described in the quality manual of the laboratory and in the work instructions registered in the computer.

The team verified the written procedures for soil collection (5 samples on a 4x4 m area, 100 mm sample depth). The collection device was demonstrated to the team.

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4 This operation would include relocation of the Snow-White high volume air sampler from Daugavpils to Baldone.

Laboratory has two furnaces for drying or ashing samples and a drying cabinet. All facilities and equipment were in good condition.

The laboratory uses electrical scales, which are annually calibrated by an external calibration service. Calibration files and monthly control files are available for each scale.

Verification does not give rise to particular remarks.

8.4.3. Analytical measurements

RDC laboratory is able to carry out tritium and strontium determination through radiochemical separation. Analyses of tritium and total alpha/beta from ground water and drainage water are performed with a 1220 Quantulus liquid scintillation counter. The verification team acknowledged the existence of the written procedures for each operation.

There are two Canberra gamma spectrometers, one with a closed-end coaxial HPGe detector (40% relative efficiency) and one with a 'Broad Energy' BEGe detector (38% relative efficiency low energy detector). Technical details of these systems are provided in Appendix 6. Spectrum analysis and activity calculations are done with the analysis programme Canberra Genie 2000. Correction coefficients for density and coincidence summing are added manually on Excel spreadsheets. The team verified the associated written procedures.

Calibration of the measuring devices is done annually by the Latvian National Metrological Centre. Calibration of efficiency, energy and peak width (FWHM) is controlled after each liquid nitrogen filling using a ^{137}Cs standard. The team verified the calibration logs. Calibration procedures for germanium detectors are described in the Quality manual guideline RDC KV 5.1. Calibration sources are kept in a safe at sufficient distance from germanium detectors.

The laboratory has also a low-level multicounter system Risø GM-25-5, used for ^{90}Sr determinations. Technical details of these systems are provided in Appendix 6. In addition a Canberra alpha counting system was in place, but not yet made operational.

In most cases the samples are discarded after the measurements or after the analysis report is finished. There is no formal time limit for storing the samples for the possible need for new measurements.

As a matter of good laboratory practise, the verification team recommends the RDC to consider storage of environmental samples in a systematic and formalised manner.

8.4.4. Mobile measurement vehicle

The RDC operates an independent 4x4 mobile radiation survey vehicle, which is equipped with a 4-litre Exploranium® GPX-256 NaI(Tl) detector and a measurement system GR-660 consisting of an on-board computer and an Exploranium GR-320 detector. The vehicle has a GPS positioning system, which enables it to produce a radiation map of the surveyed area. The system has ^{137}Cs sources to control system stability (energy and peak width). During the years 2002-2005, radiation background mapping was performed in some Latvian regions. The total length of mapping route was about 4000 km.

The vehicle is on permanent stand-by for emergency situations, but apparently RDC staff limitations would restrict its full-time use during an emergency situation. Written procedures for vehicle operation are available.

The verification team suggests making sure there is enough trained staff to operate the vehicle on a continuous basis during emergency situations.

8.4.5. Reporting

An annual report of the environmental measurements is prepared by the RDC and made available to the public.

Verification does not give rise to particular remarks.

8.4.6. Quality assurance

A quality assurance and control programme is in place and implemented through the Quality manual (guideline RDC KV 5.1.). Handling of samples is described in the quality manual as well as in other written procedures related to sampling, sample pre-treatment, sample storage and disposal.

Analysis results are checked and signed by the analyst. The reports are signed by the analyst and approved by the head of the laboratory division. All documents and data are stored and archived according to the Quality manual. Data back-up of the two data servers in the laboratory is performed daily.

For gamma spectrometry various quality control procedures have been established and compiled into Quality manual guideline RDC KV 5.1. It is stated to use a ^{137}Cs control source and a multi-nuclide standard for quality control measurements.

The laboratory participates regularly in international inter-comparison exercises. The verification team verified the records of RDC participation in the inter-comparison exercise organized by the Risø National Laboratory (Denmark) in 2004.

Verification does not give rise to particular remarks. Verification team supports further participation in inter-comparison exercises.

8.4.7. Other verification items

The verification team noted that temperature and humidity in the laboratory rooms are monitored and recorded.

Laboratory staff has received training on all analysis procedures, but at the time of verification the total number of trained staff in the laboratory was low due to problems in attracting qualified personnel.

The verification team points out that adequate number of qualified staff is crucial to laboratory operation and wishes to encourage the RDC to make every effort to increase the number of trained personnel at the laboratory.

8.5. National Diagnostic Centre

8.5.1. General

The National Diagnostic Centre (NDC) is part of the Food and Veterinary Service (FVS) which belongs to the Ministry of Agriculture. Some 400 staff are organised in one central and four regional laboratories. Radioactivity measurements are only performed in the Radiology Division (3 persons) which is part of the Food and Environment Investigation Laboratory (some 100 staff).

Tasks for the staff are clearly defined including replacement functions. However, due to the small number of personnel and different levels of expertise effective replacement appears to be hard to achieve. Contingency plans do not exist and no additional qualified personnel could be made available from other departments of the laboratory in the event of a radiological emergency situation. The 3 persons involved in radioactivity measurements in routine conditions would also have to handle any event with possible large numbers of samples, giving probably rise to stress and errors.

In 2005 some 75-100 samples, i.e. 15-20% of the overall for radioactivity measurements, were collected under the regulatory surveillance, the rest were taken on private basis. It is assumed that in 2006 this will be similar.

The verification team recommends the NDC to ensure adequate staffing and trained replacement staff for the main functions of the radiological analysis unit.

8.5.2. Sample collection, receipt and preparation

Samples are collected by the regional divisions of the Food and Veterinary Service according to a detailed sampling plan. The verification team confirmed that sampling procedures and forms are available. The samples receive individual numbers from the sampler. They are then shipped in cooled vans to the central laboratory. After arrival the samples are stored in refrigerators near the reception office (with the exception of radiological samples, which go directly to the radiological division) where they are registered in a PC based system and given a unique NDC identifier. At the time of the visit this system was being expanded to include all Latvian samples and to allow access to the data also by the regional laboratories.

Samples are treated for measurement in preparation rooms. Before treatment they are stored in separate refrigerators (meat/fish/milk) at controlled temperature. Sample preparation e.g. for meat samples consists in homogenisation by manual cutting of the whole sample – no separation of muscle tissue and fat etc. is foreseen. The lab operates two automatic furnaces for ashing and one electric plate for evaporation.

The temperature control of the refrigerators is calibrated. Laboratory scales had their last calibration in September 2005.

Verification does not give rise to particular remarks. The verification team encourages the ongoing development of a common data system that would allow wider access by the regional laboratories and sampling staff.

8.5.3. Analytical measurements

Gamma spectroscopy

The gamma spectroscopy system consists of one HPGe-detector (Baltic Scientific Instruments; 57% relative efficiency), low background spectrometer electronics and a customised Pb/Cu shield. Spectrum storage and analysis is done on PC by two software modules: one in English for data acquisition, the other partly in Russian for peak analysis.

Calibration of the system is performed once a year by the National Metrological Centre. Background measurements are done once every 3 months for some 70 000 seconds. Every day there are energy checks for quality assurance using a ^{137}Cs standard; the results are manually transferred into an X-graphics chart. If the energy deviates by more than 2 sigma a recalibration with an $^{241}Am/^{152}Eu$ standard source is performed (software recalibration, no re-adjustment of the electronic settings). If the efficiency deviates by more than 2 sigma the National Metrological Centre is called. There is no regular control for peak width (FWHM).

Changing the analysis system to the Canberra Genie software has been considered, but dismissed as too expensive. Using new spectroscopy software by the Baltic Scientific Instruments is also under consideration.

Maintenance of electronic devices is performed when needed. There is no long-term service contract in place.

Liquid nitrogen for cooling the detectors is supplied externally twice per week.

Gamma spectroscopy analysis results are manually transferred into a logbook. Linking the results to a laboratory information system is not performed due to cost reasons.

In order to detect possible detector degradation as early as possible the verification team recommends the NDC to control and document also the peak width (FWHM) on regular basis.

The verification team suggests using modern spectroscopy analysis software and a centralised data system, which would avoid multiple manual inputting of data from measurement systems.

Liquid Scintillation Counting

Laboratory has a liquid scintillation counting system Wallac Guardian 1414, which is used for determination of ^{90}Sr by Cherenkov counting. The programme Wallac WinSpectral with Wallac easy GLP protocol provides also the quality management tasks (automatic checks with ^{3}H and ^{14}C). Performance checks are done daily using an X-graphics chart for a $^{90}Sr/Y$ standard. A quality manual was available at the laboratory.

A new Quantulus liquid scintillation counting system had just been received at the laboratory. At the time of the visit it was not yet operable; a specialist from Finland was expected for the set-up. The device will be used for determination of ^{3}H in drinking water, although at the time of the visit no official programme for drinking water existed.

The laboratory has established service contracts for the liquid scintillation counting equipment.

Verification does not give rise to particular remarks.

8.5.4. Reporting

Results from gamma spectrometry are transferred to UNDA (laboratory information system) on a separate PC. Reports are printed in the sample registration office, based on the data in the laboratory information system. A standard activity reporting format is used. The results are checked by measurement division staff, signed by the head of laboratory and by the head of the measurement division.

The reports are sent to the regional unit of the FVS, which took the sample. The regional unit then informs the risk assessment division of the FVS. In case a regulatory activity concentration limit is exceeded the NDC laboratory informs the risk assessment division directly.

Verification does not give rise to particular remarks.

8.5.5. Quality assurance

The NDC has national accreditations by Latvia, by Germany (re-accreditation foreseen for April 2006) and by Russia. The Latvian and German accreditations cover gamma spectrometry (as a general accreditation, not single nuclide specific) and Strontium analysis (Cherenkov counting method) for food, feeding stuffs and raw materials. The Russian accreditation is needed because Russia does not accept EU accreditations.

Verification does not give rise to particular remarks.

8.5.6. Other verification items

For sample tracking a fish oil sample from December 2003 was chosen. The paper version of the archive was immediately available. The archive PC contained the analysis results but no spectrum analysis option (since the spectrum was available only on an old computer system using Windows 95 a re-analysis would have been too time-consuming and was not requested). The verification team observed that the checked activity values were the same in all versions.

Verification does not give rise to particular remarks.

8.6. National environmental radiation monitoring system

8.6.1. General

The verification team verified the general provisions for national environmental radiation monitoring in Latvia.

The team noted that at present there is no measurement programme for radioactivity in drinking water in Latvia. The team was informed that a new monitoring programme including drinking water is under development.

The team supports the work towards development of a comprehensive drinking water monitoring programme and related laboratory analysis capabilities.

8.6.2. National automatic dose rate monitoring network data centre

The RDC hosts the data collection centre of the Latvian automatic radiation measurement network, which currently consists of 7 PMS stations and 9 older AAM stations. Locations of the stations are described in Appendix 4.

The RDC central server polls the data via public telephone lines on 8 hour intervals. The alert threshold is set at 200 nSv/h, the normal background level being below 100 nSv/h. Alerts are forwarded to the RDC duty officer mobile phone. Most PMS stations have electrical back-up; the AAM stations do not normally have any electrical back-up.

Data from the automatic network is published on-line immediately. In addition there is a restricted website with ARGOS-simulations[5] for use by the authorities. The data is also provided to the Nordic radiation data exchange and to the EURDEP system data centre in Ispra, Italy, where it is available to the authorities and the general public throughout Europe.

The verification team noted that the RDC maintains continuous availability of the data collection centre of the network with fairly small staff - there are times when there is only one expert available to take charge of the data collection and retransmission operations.

The verification team recommends the RDC to consider the possible need to increase the number of trained staff for the handling and maintenance of the on-line monitoring system central database during emergency situations.

[5] ARGOS is a decision support system of Danish origin for radiological emergency situations.

8.6.3. Jekabpils PMS station

The verification team verified the functionality of the standard PMS station located at the Jekabpils meteorological station. At the time of the visit the dripping bucket rain gauge was snow covered, thus not producing representative precipitation information (standard PMS system does not have a heated rain gauge). There is no electrical back-up for the equipment at the station.

Verification team recommends making sure all PMS stations have adequate back-up systems for electrical power.

8.6.4. Jurmala PMS station

Verification team verified the functionality of the standard PMS-station in Jurmala. The station is located at the State Environmental Laboratory. The location offers the advantage of placing the station computer in the laboratory premises. The station has battery back-up for electrical power; the batteries are placed inside the laboratory building. Station maintenance is outsourced to an external company Dozimetrs.

Verification does not give rise to particular remarks.

8.6.5. Talsi AAM station

Verification team verified the functionality of the AAM station at Talsi. The detector is installed at the roof of the City hall building and the measurement unit inside the building. The station has a local display (ALNOR RDS-120) for dose rate values. Maintenance of the station has been outsourced to company Dozimetrs.

During the course of the verification it appeared that the RDC personnel was not very well informed about the technical specifications of the measurements stations.

Verification team points out that although network maintenance has been outsourced it is important to maintain an adequate level technical knowledge of the measurement network also within the RDC permanent staff.

8.6.6. Ventspils AAM station

Verification team verified the functionality of the AAM station at the Ventspils harbour. This is a standard AAM station located at the roof of a regional environmental office building. The station was functional, but without a local display. According to the information provided the display was removed in 2001.

Verification team points out that a local dose rate display on each station is important in the event of a failure of the communication lines between the station and the RDC.

8.6.7. Salaspils AAM station

The verification team verified the functionality of the AAM station at the Salaspils Botanical garden. This is a standard AAM station located at the roof of an office building. The station was functional, but without a local display.

Verification does not give rise to particular remarks.

8.6.8. Daugavpils AAM and PMS stations

The verification team visited the AAM station, which is installed close to the 'Snow White' air sampler in Udensvada and the PMS station in central Daugavpils. The AAM station was not operational at the time of the visit.

Verification team recommends the RDC to return the Daugavpils AAM station in normal operation as soon as possible.

8.6.9. Demene region AAM station

The verification team verified the functionality of the AAM station at Demene region close to the Lithuanian border.

Verification does not give rise to particular remarks.

8.6.10. High volume air filtering station at Daugavpils

A high volume air filtering station (type SnowWhite JL-900) is installed at the premises of company Daugavpils Udens (Daugavpils Waters) in Udensvada. This is the only modern air filtering station in Latvia. The device is owned by the RDC. It was installed for detecting, as early as possible, any air contamination in the event of a nuclear accident at the Ignalina nuclear power plant, some 30 km from the Latvian border. During routine conditions the system uses glass fibre filter material for sampling aerosols. During exercises and when an accident is suspected the system is equipped with charcoal cartridges for sampling gaseous iodine.

The verification ream verified the existence of the station. At the time of the visit the station was not operational. The team was informed that due to organisational changes regular maintenance and filter changes could no longer be provided at the current location. Removal of the station to another location (e.g. Baldone) was under discussion[6].

With regard to the aerosol measurement programme, the verification team recommends the RDC to define a long-term solution that guarantees continuous surveillance. This is in particular valid for regions close to nuclear power plants.

8.6.11. Soil sampling sites

The verification team visited soil sampling sites at Demene and Daugavpils regions close to the Ignalina NPP where several sampling sites are situated. Due to ice and snow the sampling points were not always easy to identify.

Verification does not give rise to particular remarks.

8.6.12. Drinking water sampling

The verification team did not verify provisions for drinking water sampling due to the fact that there currently is no drinking water sampling programme in Latvia.

The verification team supports the current efforts to implement the relevant provisions of the monitoring programme in order to provide sampling and analysis of drinking water.

[6] Relocation of the SnowWhite station to Baldone was carried out a few months after the verification visit.

8.6.13. Mixed diet food sampling

Verification team witnessed sampling of a mixed diet at the Riga Clinical Hospital. The procedure used for sampling of mixed food diet for analyses of radioactivity is identical to all samplings related to food safety. Sampling was carried out according to check-lists where the exact amount of each food item and beverage was documented. Each item was put in a sealed plastic bag, weighted and then placed in a cool-box for transportation. Paper logs are kept of each sampling. Logs and check-lists are signed by the hospital and by the food safety inspector taking custody of the samples.

Verification does not give rise to particular remarks.

9. CONCLUSIONS

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

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

(1) The verification activities that were performed demonstrated that the facilities necessary to carry out continuous monitoring of levels of radioactivity in the air, water and soil with regard to the surveillance of the Latvian territory are adequate. The Commission could verify the operation and efficiency of these facilities.

(2) However, a few recommendations are formulated, mainly in relation to general quality assurance and control. These recommendations aim at improving some aspects of the environmental surveillance. These recommendations do not detract from the general conclusion that the Latvian national monitoring system is in conformity with the provisions laid down under Article 35 of the Euratom Treaty.

(3) The recommendations presented in this report are summarised in the 'Main Findings' document that is addressed to the Latvian competent authority through the Permanent Representative of Latvia to the European Union.

APPENDIX 1

REFERENCES AND DOCUMENTATION

1. Main related websites

Monitoring Network

http://www.jvp.vdc.lv/eng/info/mon_proj_2001.htm (*Latvian Ministry of Environment, Latvian Environmental Agency website*)
http://rem.jrc.cec.eu.int/175.html (*EC EURDEP platform website*)
http://enrin.grida.no/htmls/latvia/faktori/radiacija/agras.htm
http://www.rdc.gov.lv/data/Nordic/LAT.RAD;

Salaspils Research Reactor information

http://www.nti.org/e_research/profiles/Latvia/index.htm
http://www.ens-newswire.com/ens/oct2005/2005-10-06-02.asp
http://www.lza.lv/EN/INST/in02.htm (*Latvian Academy of Sciences web site*)
http://www.vidm.gov.lv/ivnvb/ivn/projekti/projekti/Esalaspils.htm (*Latvian Ministry of Environment website*)
http://www.doe.gov/news/1622.htm

Legal framework

http://greenhorizon.rec.org/bulletin/Bull53/CEELI.html
http://europa.eu.int/comm/enlargement/fiche_projet/document/2004-006.245.04.01%20Radioactive%20waste%20management%20and%20reactor%20decommissioning.pdf (*EC website*)
http://www.sapierr.net/files1/results_latvia.htm (*EC website*)
http://www.rdc.gov.lv/eng/Documents/NSC/First%20NSC_Report%20LV.pdf (*Latvian Radiation Safety Centre*)

Baldone radioactive waste repository

http://www.rdc.gov.lv/eng/Documents/RW/LATVIA_RW_2002.pdf (*Latvian Radiation Safety Centre*)

2. Other documents:

- Questionnaire on the implementation of Art. 35 of the EURATOM Treaty in the Republic of Latvia, 2005
- Verification activities under the terms of Art. 35 of the Euratom Treaty, preliminary information questionnaire addressed to the national competent authority in view of preparing the Art. 35 verification in Latvia 21-24 March 2006
- Ministry of Agriculture, Food and Veterinary Services presentation at the opening meeting
- Ministry of Environment, Radiation Safety Centre presentation at the opening meeting
- Latvian Environment, Geology and Meteorology Agency presentation at the opening meeting
- Ministry of Health, Public Health Agency presentation at the opening meeting

APPENDIX 2

VERIFICATION PROGRAMME

Monday 20/03

EC verification team travels from Luxemburg to Riga.

Tuesday 21/03

1. Opening meeting at the Latvian Radiation Safety Centre
2. Team 1 starts verification activities at the analytical laboratory for environmental samples at the Radiation Safety Centre (RDC)
3. Team 2 starts verification activities at foodstuff and feeding stuff control laboratories at RDC and at the National Diagnostic Centre (NDC).

Wednesday 22/03

4. Team 1 verifies the provisions for monitoring and sampling of the radioactive discharges of the Salaspils Research Reactor and visits the reactor's operations control room. The team verifies the site-related provisions for environmental monitoring and sampling and visits the associated laboratories.
5. Team 2 verifies the provisions for monitoring and sampling of radioactive discharges from the radioactive waste repository "Radons" at Baldone (airborne and liquid). The team verifies the site-related provisions for environmental monitoring and sampling and the automatic dose rate monitoring stations at the Baldone site.

Thursday 23/03

6. Team 1 verifies the mixed-food diet sampling at the Riga Clinical Hospital and visits the monitoring stations at Jurmala, Talsi and Ventspils.
7. Team 2 verifies the monitoring and sampling provisions for the national environmental monitoring programme in Jekabpils, Daugavpils and Demene area. Team visits also the telemetric national environmental monitoring system in the assigned areas.

Friday 24/03

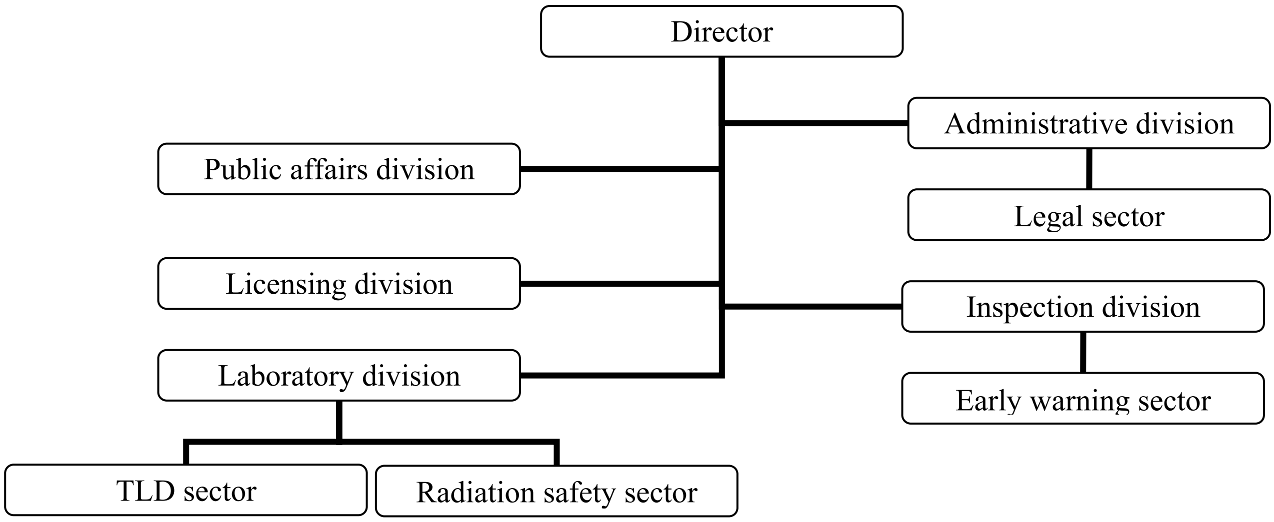
8. Closing meeting

Team 1: V. Tanner
A. Godeanu Metz
Å. Wiklund

Team 2: C. Gitzinger
E. Henrich

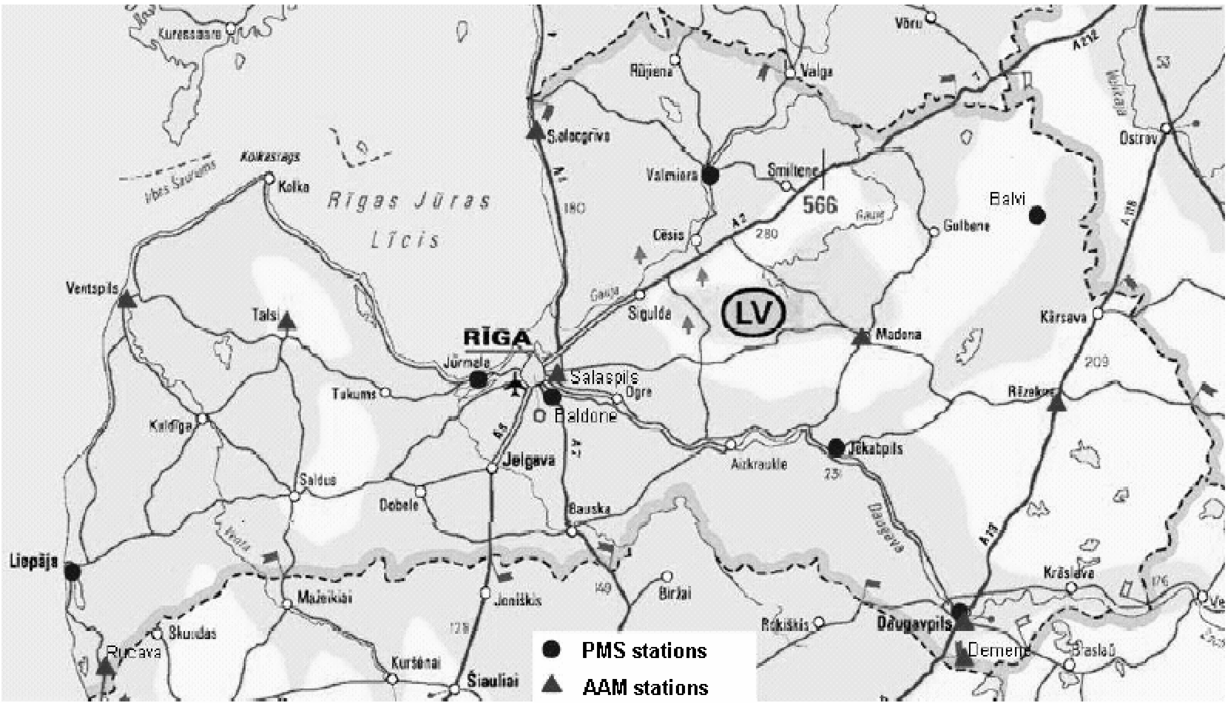
APPENDIX 3

RADIATION SAFETY CENTRE ORGANISATION STRUCTURE



APPENDIX 4

AUTOMATED GAMMA MONITORING STATIONS IN LATVIA



No.	Network name	Station identification code (EURDEP ID)	Locality name	Latitude (decimal degrees)	Longitude (decimal degrees)	Type of monitoring	Presence of meteorological devices
1.	AAM	LV0011	Demene	N 55.73	E 26.54	γ-dose rate	N
2.	AAM	LV0012	Rucava	N 56.16	E 21.17	γ-dose rate	Y
3.	AAM	LV0015	Madona	N 58.58	E 26.23	γ-dose rate	N
4.	AAM	LV0008	Rēzekne	N 56.50	E 27.34	γ-dose rate	N
5.	AAM	LV0014	Salacgrīva	N 57.75	E 24.36	γ-dose rate	N
6.	AAM	LV0013	Salaspils	N 56.86	E 24.35	γ-dose rate	N
7.	AAM	LV0016	Ventspils	N 57.39	E 21.59	γ-dose rate	N
8.	AAM	LV0009	Talsi	N 57.25	E 22.59	γ-dose rate	N
9.	PMS	LV0006	Jēkabpils	N 56.52	E 25.93	γ-dose rate	Y*
10.	PMS	LV0007	Valmiera	N 57.53	E 25.42	γ-dose rate	Y*
11.	PMS	LV0004	Liepāja	N 56.45	E 21.00	γ-dose rate	Y*
12.	PMS	LV0001	Balvi	N 57.13	E 27.27	γ-dose rate	Y*
13.	PMS	LV0002	Daugavpils	N 55.87	E 26.53	γ-dose rate	Y*
14.	PMS	LV0005	Baldone	N 56.76	E 24.32	γ-dose rate	Y*
15.	PMS	LV0003	Jūrmala	N 56.97	E 23.83	γ-dose rate	Y*
16.	AAM, SW[7]	LV0010	Daugavpils	N 55.88	E 26.54	γ-dose-rate, aerosol off-line	N

* Rain and temperature measurements available.

[7] The station SnowWhite (SW) was relocated to the Radons site in Baldone after the verification visit.

APPENDIX 5

EQUIPMENT USED FOR ENVIRONMENTAL MONITORING AT THE SRR SITE

Scope of application	Equipment	Technical parameters and/or MDA
Continuously control of γ dose rate in reactor hall	γ monitor WS04GRAETZ and data accumulation system	100 nSv/h–10 Sv/h, 60 nSv/h–200 μSv/h; 40 keV–1.3 MeV
Control system for the determination of ^3H in air of reactor hall	Tritium monitoring station CMS-H35L	3×10^4–1×10^{11} Bq/m^3
System for the control of alpha, beta and tritium radioactivity in aerosol emission	Alpha, beta aerosol monitor CMS-2000	α: 2 MeV–10 MeV, 0.1 Bq h/m^3; β: 60 keV–2 MeV, 3 Bq h/m^3;
	Tritium monitor CMS-H35L	37 kBq/m^3–0.1 TBq/m^3
Equipment for the control of γ-dose rate in the temporary storage of radioactive waste containers	γ monitor CMS-1LG	<0.1 μSv/h
Equipment for the control of γ-dose rate around the perimeter of territory	γ monitor CMS	<0.1μSv/h
Equipment for the determination of total α, total β radioactivity	Tennelec SOLO	α: 0.03 Bq, β:0.15 Bq
Equipment for the determination of gamma emitters	HPGe gamma spectrometer (Canberra)	MDA ^{137}Cs = 0.3 Bq/kg; MDA ^{40}K = 4 Bq/kg
Equipment for the determination of ^3H in water	TRI-CARB-2100 TR	MDA = 2 Bq/l

APPENDIX 6

TECHNICAL SPECIFICATIONS OF THE MAIN EQUIPMENT USED FOR ENVIRONMENTAL MONITORING AT THE RDC LABORATORY DIVISION

Gamma spectroscopy

Detector type / Specifications	Germanium Closed-end coaxial Detector	The Broad Energy Germanium (BEGe) Detector
Manufacturer	CANBERRA Industries, Inc., made in USA	CANBERRA Industries, Inc., made in USA
Detector model	GC4019	BE3820S
Cryostat model	7500SL	7500SL
Preamplifier model	2002CSL	2002CSL
Relative Efficiency	40%	not specified
Resolution	1.9 keV (FWHM) at 1.33 MeV	2.1 keV (FWHM) at 1.33 MeV
Diameter of detector	62 mm	70 mm
Length of detector	57 mm	not specified
Active area	Not specified	3800 mm^2
Distance from window	5 mm	5 mm
Bias voltage	(+) 2500 V dc	(+) 3000 V dc
Digital Spectrum Analyzer	DSA-1000	DSA-1000
Software	Genie 2000	Genie 2000
Working energy range	59 keV to 2 MeV	59 keV to 2 MeV
Minimum Detectable Activity of ^{137}Cs for water samples in1l Marinelli geometry	0.09 Bq/l if counting time 99h, volume 1 l	not available

Low level beta counting system

Item	Specification
Manufacturer	Risø National Laboratory DK 4000, Roskilde, Denmark
Detector model	Risø GM-25-5
Sample size	25 mm diameter
Counter gas	99% Argon, 1% Isobutane
Sample counter elements	25 mm diameter with aluminized mylar window (<1mg/cm^2)
Guard counter	100 mm x 250mm x12 mm
Background in 100 mm lead shielding	<0.2 CPM (typically <0.15CPM)
Efficiency: ^{90}Y and ^{99}Tc	47% an42%
Distance from window	5 mm
Voltage	about 1100 – 1400 V
Software	The GM-25-5 software for Windows
Minimum Detectable Activity of ^{90}Y for water samples	2.0 mBq/l if counting time 12h, volume 2.5 l
Minimum Detectable Activity of ^{90}Y for soil samples	0.06 Bq/kg if counting time 12h, mass 0.100 kg
Minimum Detectable Activity of ^{90}Y for smear test	0.1 mBq/cm^2 if counting time 12h, area 100 cm^2