RADIOACTIVE WASTE PROGRAMME IN LATVIA

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Latvia

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THE HISTORY AND MAGNITUDE OF THE USE OF RADIATION SOURCES IN LATVIA

The decision to build a radioactive waste repository in Baldone was taken by the Latvian Government in 1959. The operation of the repository started in 1962, according to the technology and standards which were valid at that time all over the Soviet Union.

Since then, the Baldone repository has been regularly adapted and modernised, the last major development being the construction of a new treatment/storage facility (vault N°7) which is in operation since 1995.

In Latvia radioactive waste are produced by four main groups of activities: research, medical practice, various industrial activities and, until 1994 - the former Soviet armed forces. The last source of waste fortunately exhausted after withdrawal occupation military forces from Latvia.

The Soviet Union/Russia makes comprehensive use of lighthouses powered with radionuclide thermoelectric generators (RTGs). Such generators contain thermocouples that convert the decay heat from a radioactive substance to electricity. Nine such lighthouses containing on the order of a few hundred PBq of 90Sr were located in Latvian waters. These lighthouses are no longer a problem as the RTGs have all been returned to Russia.

THE DEFENCE RELATED USES OF RADIATION SOURCES IN PAST

As a military centre in the Baltic region during the previous Soviet system, Latvia received relatively large quantities of radioactive waste for disposal at Baldone compared to the amounts of waste delivered to the corresponding facilities in Estonia and Lithuania.

In many cases it is difficult to clearly separate defence-related applications of radioactive materials from civilian applications especially for some organisations, such as the former State Company "RNIIRP", provided their services to industrial organisations as well as to the military facilities. The more detailed information could be find in report from NATO project regarding defence related radioactive waste in Latvia - The NATO/CCMS Pilot Study on Cross-Border Environmental Problems Emanating from Defence-Related Installations and Activities, which addresses safety aspects of various defence-related activities.

Year	Defence (Bq)	Total (Bq)	Year	Defence (Bq)	Total (Bq)
1962	1.60E+10	1.13E+11	1979	4.04E+11	3.66E+13
1963	5.55E+08	4.29E+11	1980	7.21E+11	6.72E+12
1964	1.48E+11	8.15E+11	1981	1.09E+12	7.41E+13
1965	4.43E+11	4.09E+12	1982	2.66E+13	7.68E+13
1966	2.09E+12	2.56E+12	1983	7.04E+12	1.92E+13
1967	7.18E+10	2.91E+12	1984	1.84E+12	2.43E+13
1968	5.75E+11	4.44E+12	1985	6.02E+12	1.41E+13
1969	8.85E+10	3.87E+12	1986	4.43E+12	7.55E+12
1970	1.92E+11	3.33E+12	1987	3.19E+12	4.23E+12
1971	7.44E+11	2.36E+13	1988	6.45E+12	6.98E+12
1972	1.31E+12	1.01E+14	1989	7.40E+06	8.27E+12
1973	2.07E+11	1.72E+13	1990	1.00E+13	1.56E+13
1974	1.24E+11	3.57E+13	1991	1.16E+12	1.76E+12
1975	1.25E+11	9.41E+12	1992	1.20E+12	3.17E+12
1976	1.30E+12	9.27E+12	1993	7.40E+06	3.34E+12
1977	9.48E+11	4.76E+13	1994	1.19E+12	3.70E+12
1978	3.74E+12	2.35E+13			

GROUPS OF PRACTICES RELEVANT TO RADIOACTIVE WASTE GENERATION

PRACTICE GROUP	NUMBER OF USER ORGANIZATIONS	TOTAL NUMBER OF UNITS-ALL ORGANIZATIONS
Nuclear gauges	85	1 irradiator, 25 neutron sources, one gamma radiography unit, ~3500 sources with activity around 50 TBq
Medical radiation therapy	4	4 teletherapy, 3 brachytherapy units
Neutron capture and activation analysis techniques	3	19
Thermalization of neutrons using sealed sources	4	6
Industrial and research irradiation facilities	1	1
Uses of unsealed radioactive materials	17	28

The main source of radioactive waste in Latvia is the nuclear research reactor in Salaspils, which was permanently shut down in summer of 1998. The Decommissioning Concept was approved by the government and it is envisaged that the decommissioning and dismantling works be completed by 2009.

BRIEF OVERVIEW OF THE DEVELOPMENT OF NATIONAL LEGAL DOCUMENTS

The initial system was established by environmental protection legislation, which empowered the Government to issue regulations and authorised institutions to control the radiation safety. There was transitional period when some former regulations were partly in force to prevent loss of control over radiation sources and to avoid the legal vacuum. The next step was the transposition of legal requirements set force in international agreements for the national use.

The main facilities related to nuclear risks in Latvia are research reactor and radioactive waste disposal. They have to give an indication of eventuality of an incident or accident, which might result in radioactive contamination and exposure of members of the public. It is also important to note that potential threat is also represented by industrial facilities where radiation sources are used and by medical applications of radiation sources in diagnostics and treatment. In case of an accident at those facilities, the threat of radioactive contamination and exposure of the members of the public remains. More over such facilities are also in neighbouring states, as reference can be use recent study in Baltic region.

Consequently the environmental protection legislation regulated also those activities, which have possible or direct impact to the safety for environment and the general public, e.g. transport, waste management and environmental impact.

The International Agreements

The main, relevant to the radioactive waste management internationally binding documents, which were accepted by Latvia, are as:

1) 1986 Vienna Convention on Early Notification of a Nuclear Accident,
2) 1986 Vienna Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency,
3) 1971 Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction on the Sea Bed and the Ocean Floor and in the Subsoil thereof,
4) 1960 Convention concerning the Protection of Workers against Ionising Radiation,
5) 1963 Vienna Convention on Civil Liability for Nuclear Damage, .
6) 1988 Joint Protocol relating to the Application on the Vienna Convention and the Paris Convention,
7) 1994 Convention on Nuclear Safety,
8) 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management.

Addition to those existing agreements, there are several proposals haw to improve situation internationally. Many issues can be handled by the existing international system, but some need to be modernised. IAEA introduced "Code of Conduct on the Safety and Security of Radiation Sources and Radioactive Materials", which should improve situation. Its main aim is full implementation of IAEA Basic Safety Standard, consequently the threat to lost control over sources will be minimised and response capabilities maximised. There are also activities to strengthen civil liability regime - the Protocol amending Vienna convention and plans to increase the scope for Physical protection convention.

THE LAW ON RADIATION SAFETY AND NUCLEAR SAFETY

Since 1994 the Law on Radiation Safety and Nuclear Safety is the main act, several regulations had been issued under this law. Just some days ago the new law became in force. One of the major tasks of new Law is to establish the Radiation Safety Center (hereinafter RDC). The Radiation Safety Center being a state regulatory body under authority of the Ministry of Environmental Protection and Regional Development will assume tasks and functions prescribed in the law "On Radiation Safety and Nuclear Safety".

The RDC will carry out state supervision in the field of radiation safety and nuclear safety with an overall aim to protect the members of the public, workers and the environment against harmful effects of ionising radiation, as well as to enhance international co-operation in this area.

Regarding any practice, the Law on Radiation Safety and Nuclear Safety enforces the main rule – only authorised practices are legal. Under the law several regulations were issued, which deal with different steps of radioactive waste management, but there are also some specific articles in the law itself. In the new version of law Radiation safety centre is empowered to solve the problem with orphaned sources and several provisions regarding transboundary movement of the waste.

There are some provisions directly related to the radioactive waste management in new Law - Article 27 prescribes:

(1) Import of radioactive waste into the Republic of Latvia from other countries is not permissible, except for in cases:

1) when those radioactive wastes, which originated as a result of treatment of radioactive waste exported from the Republic of Latvia are transported back into the country;

2) when it is impossible to segregate the radioactive waste, which during the treatment process abroad and has originated from the radioactive waste which was imported from the Republic of Latvia, in this case an equivalent amount of other radioactive waste that was imported into the country.

(2) Prior to issuance of a special permit (licence) or permit for those practices, which may result in generation of radioactive waste, the Centre requests information about projected quantity of radioactive waste and measures to be taken with given radioactive waste from the operator.

(3) The Cabinet of Ministers prescribes requirements for practices with radioactive waste and related materials thereof.

(4) The Cabinet of Ministers approves criteria and principles for set up of equivalence of different radioactive waste.

(5) In case of import into the Republic of Latvia of radioactive substances that, after use thereof, generate radioactive waste, which needs to be disposed of in Latvia, a natural resource tax is payable for import of such substances.

REGULATIONS OF CABINET OF MINISTERS

Based on main safety goal introduced by Law - protection of inhabitants and environment against radiation, the following legal documents, relevant to the radioactive waste management, were adopted by the Cabinet of Ministers:

- On Protection against Ionising Radiation;
- On State Accounting and Control System of Nuclear Materials;
- On Dosimetric control on the border;
- On Issuance of Licenses and Permits for Activities with Radioactive Substances and Other Sources of Ionising Radiation;
- On Safe Transportation of Radioactive Materials;
- On Radioactive Waste Management etc.

We can analyse also the system aimed to prevent unauthorised practices with radiation sources, which could have threats for the environment and public. The major fields that shall be regulated, preferable since the very beginnings, are:

- Accountancy and control of radiation sources,
- Penalties for non-authorized practices with such sources,
- Control system on the border to prevent illegal import or export.

In Law on administrative penalties and Criminal Law also are provisions regarding unlicensed practices and violations of regulations.

According to the new law, all existing regulations within twelve months will be modernised and prepared according the changed basic requirements set in force by the law. Some of "old" regulations will be separated in some parts, such as the regulations concerning the authorisation system. The short list of envisaged new (re-drafted old) regulations, which will replace existing regulations in the nearest year, is the following:

1. Accounting and control of exposures with ionising radiation,

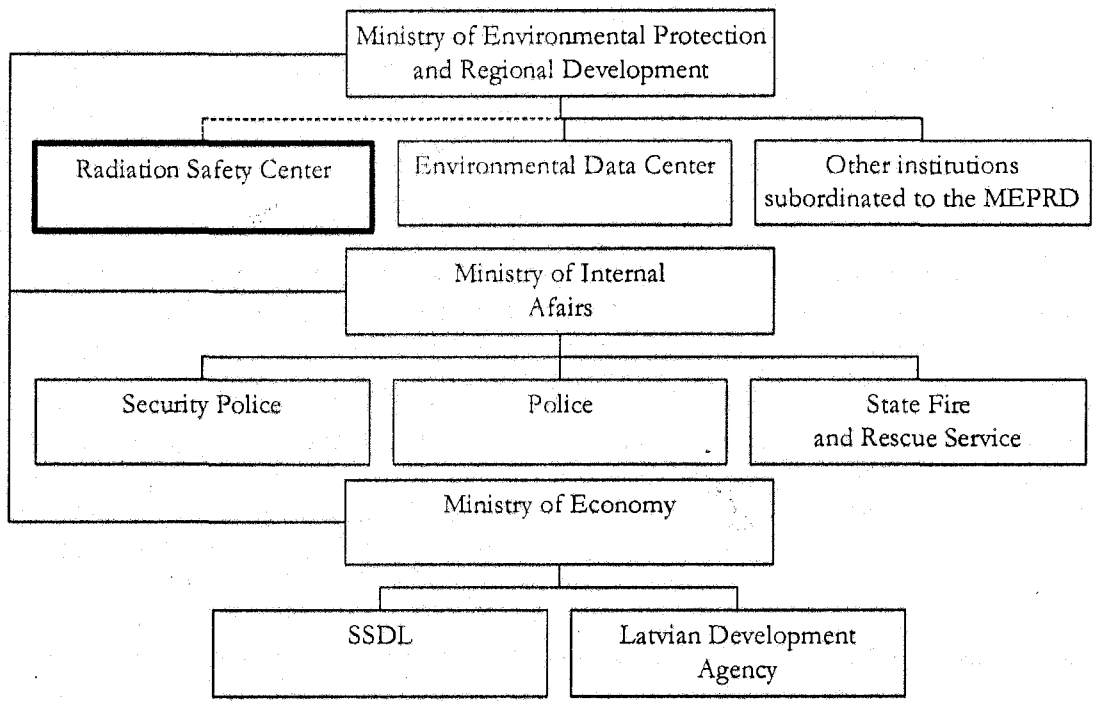
2. Practices with sources of ionising radiation, which can be performed without permit,
3. The criteria for licensing of ionising radiation sources,
4. On issuance of licenses and permits for activities with sources of ionising radiation,
5. On protection against ionising radiation,
6. On radiometric control of cargo and goods on the state border,
7. The procedures for public hearing in licensing of ionising radiation sources of state significance,
8. On management of radioactive waste.

RADIATION SAFETY REGULATORY INFRASTRUCTURE

The main problem for Latvia still is implementation of a full radiation protection concept - legislation, education, training, awareness-building etc. We have to take into account the transition situation, when certain specific needs do not always prevail over the basic daily needs of the general public.

At present the two ministries share the responsibilities to supervise the implementation of the Law and the relevant regulations. The new law is approved and thus the system shall be changed in nearest future - the Radiation Safety Centre shall be established in 2001. To ensure effective supervision the Parliament already approved necessary amendments to the Administrative Penalties Law and some changes in Criminal Law.

Proposed Radiation Safety Supervision system relevant to the Radioactive Waste Management



RADIOACTIVE WASTE MANAGEMENT

Since the beginning of the 1960's, the radioactive waste produced in Latvia is collected and transported to the centralised storage/treatment/disposal facility of Baldone, which is operated by the "Radons" State Enterprise.

Radioactive Waste Management facilities in Latvia

Site	Type of facility	Type of waste
Baldone	Disposal	Research reactor operational RW; institutional LILW; military RW
Salaspils RR	Temporary storage	Decommissioning waste

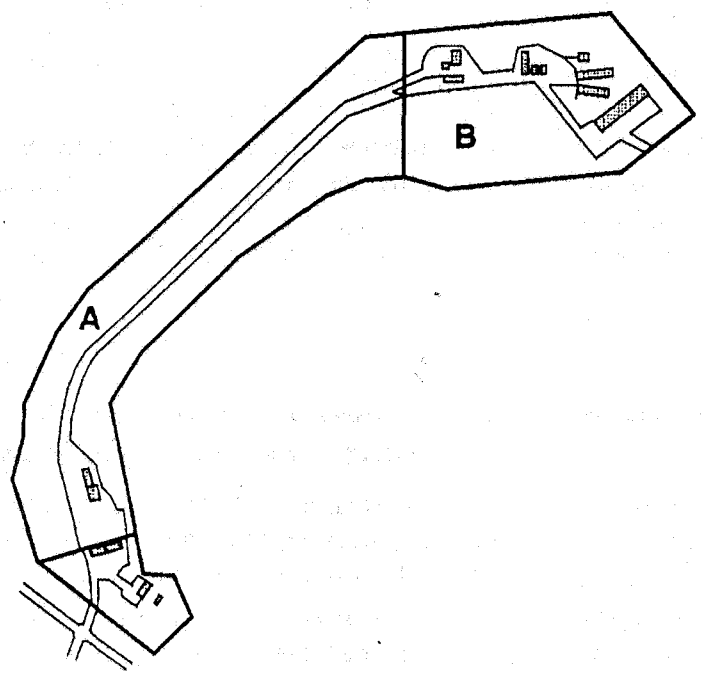
Institutional Framework for Radioactive Waste Management

According to the recent decision of the Minister for environmental protection and regional development the new state body shall be established in next year - the Radioactive Waste Management Agency (short acronym from Latvian - RAPA). The RAPA will be established from nowadays State enterprise "Radons" and "Reaktors" Ltd. The main tasks for RAPA will be radioactive waste management and decommissioning of Salaspils Research Reactor. Initially RAPA will be as the state enterprise with limited liability. In next year, when the new law on state agencies will be in force, some minor changes are envisaged - modifications of the statutes for RAPA and to empower it according the duties set by the regulations on radioactive waste management.

Basic Design of Repository

The storage/disposal vaults of the Baldone repository are constructed close to the top of a small hill with soft slopes, at about 60m above the Baltic Sea level.

The waste-handling part of the facility is also shown in detail in below and includes seven vaults. Three of them (vault numbers 1, 3 and 6 in the figure) are concrete underground 200-m3 vaults, two (numbers 4 and 5) are concrete underground 40-m3 vaults. One vault (number 2) is a 200-m3 stainless steel underground tank used for liquid waste, but the waste in this tank has now been removed and the tank cleaned up. As the vaults for solid waste were filled up, a new 1200-m3 vault (number 7) was built. This was put into use at the end of 1995.



The sketch shows the entire fenced-in area. Waste is received from the main road at the lower left corner. Near this entrance is the administration building. There is a long access road to area B where the waste is stored. The vaults numbered 1–6 constitute the old repository while vault number 7 is the new storage facility.

Solid waste was generally placed in the concrete vaults without conditioning. When a waste layer thickness of about 1.5 m was reached, the voids were filled with mortar using ordinary construction cement. A similar process was used for biological waste. In these cases, however, the waste was first sterilised using CaOCl or formalin and embedded in gypsum before final disposal. Spent sealed sources were disposed of in their industrial shielding containers. It was not until the mid 1980s that such sources were conditioned, that is, removed from their original containers, placed together with several other sources in lead containers and any voids filled with molten lead. In this way the volume of the waste was reduced, and long-term storage safety was improved.

The facility originally included a liquid waste treatment system using ion-exchange resins and active carbon, but this system was never used and was consequently scrapped. Before 1985, all liquid waste was stored in the stainless steal tank only; then, according to new regulations all of the stored liquid waste was treated and the secondary solid waste disposed of. The treatment of the liquid waste took place in 1988, and the processing equipment was later removed. Since then, liquid waste has been stored only during the winter; in all other seasons such waste is solidified by cement and used as mortar for the conditioning of solid waste.

Since 1995, when vault 7 was putted in operations, all radioactive waste was conditioned and stored in transportable containers - either steal drums or concrete containers. Now the new concept based on IAEA recommendations for near surface waste disposals was adopted and used.

RADIOACTIVE WASTE INVENTORY

It is clear that a number of questions exist about the completeness and correctness of the data, especially for the older shipments of waste for which only very partial information is available. The quality of the data is also much better for the sealed sources- representing by far the biggest part of the radioactivity- than for other waste.

In 1991, a computer-base database was developed, and all the data accumulated up to them in hand-written records were progressively introduced in the electronic database which is still being completed and developed. The system is giving at any time the inventory of each disposal/storage unit.

Vault 1; 100 m3 (50% of total capacity), the radioactivity for main long-lived isotopes (which are more than 1010 Bq in vault) are given in table below

Radionuclide	Total Activity, Bq
H-3	5.70E+10
C-14	4.04E+11
Co-60	3.38E+11
Sr-90	1.50E+12
Ba-133	1.43E+10
Cs-137	2.24E+12
Pb-210	8.64E+10
Ra-226	8.02E+11
U-232	5.85E+10
Pu-239	2.41E+10
TOTAL	5.54E+12

Vault 3; 160 m3 (80% of total capacity)

Radionuclide	Total Activity Bq (1)
H-3	1.67E+13
C-14	1.00E+12
Al-26	1.05E+12
Cl-36	6.10E+11
K-40	8.81E+10
Co-60	1.88E+12
Ni-63	9.49E+12
Kr-85	2.27E+10
Sr-90	2.31E+12
Ba-133	4.76E+11
Cs-137	4.78E+13
Pb-210	9.64E+11
Ra-226	6.65E+10
Pu-239	1.06E+12
Am-241	1.05E+11
TOTAL	8.36E+13

Vault 4; 36 m3 (90% of total capacity)

Radionuclide	Total Activity Bq (1)
H-3	4.97E+10
C-14	3.30E+11
Co-60	3.18E+10
Ni-63	2.87E+10
Sr-90	1.67E+11
Cs-137	1.36E+12
Ra-226	1.18E+10
Pu-238	1.01E+10
Pu-239	3.84E+10
Am-241	1.49E+10
TOTAL	2.06E+12

Vault 5; 34 m3 (85% of total capacity)

Radionuclide	Total Activity Bq (1)
H-3	2.66E+10
C-14	3.31E+10
Ni-63	1.91E+10
TOTAL	9.99E+10

Vault 6; 140 m3 (70% of total capacity)

Radionuclide	Total Activity Bq (1)
H-3	6.33E+12
C-14	1.35E+11
Co-60	4.97E+11
Ni-63	5.73E+10
Kr-85	1.76E+10
Sr-90	7.07E+11
Cs-137	1.46E+13
Eu-152	2.98E+10
Ra-226	2.73E+11
Pu-238	7.91E+10
Pu-239	3.25E+11
Am-241	2.92E+11
TOTAL	2.33E+13

EU DG ENVIRONMENT PROJECT - CASSIOPEE ACTIVITIES IN LATVIA

The main objective is to provide advice to the Latvian authorities on the safety enhancements and waste acceptance criteria for near surface radioactive waste disposal facilities of Baldone repository.

The project will include the following activities:

- To examine the current status of the management of radioactive waste in Latvia in general and, at the Baldone repository in particular
- To perform the long-term safety analysis of the Baldone repository, including:
  - Radiological safety in the operational phase, including the planned increase of capacity for disposal and long term storage
  - Radiological analysis for the post-closure period
  - Environment Impact Assessment (non radiological components)
- To put forward recommendations for future updating of radioactive waste acceptance criteria
- To put forward recommendations for safety upgrades, if necessary, for the facility.