Luxembourg

National Report on the measures taken by Luxembourg to fulfill the obligations laid down in the:

"JOINT CONVENTION ON THE SAFETY OF SPENT FUEL MANAGEMENT AND ON THE SAFETY OF RADIOACTIVE WASTE MANAGEMENT"

Fourth review meeting of the contracting parties in 2012

This report was produced by the Department of Radiation Protection (DRP) on behalf of the Government of Luxembourg

List of Acronyms and Abbreviations

ADR	European Agreement Concerning the International Carriage of Dangerous Goods by Roads
ANDRA	French National Agency for Radioactive Waste (ANDRA)
ALARA	As low as reasonably achievable
ASS	Rescue Services Agency
CBRN	Chemical, Biological, Radiological and Nuclear
DRP	Department of Radiation Protection
DS	Directorate of Health
EU	European Union
GPR	Radiological Protection Unit of the ASS
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICSD	Ionizing chamber smoke detector
ISO	International Organization for Standardization
ITM	Labor inspectorate
MS	Ministry of Health
NISF	National Interim Storage Facility for radioactive waste
NORM	Naturally Occurring Radioactive Materials
ONDRAF	Belgian Waste Management Agency (ONDRAF/NIRAS)
RID	Regulation Concerning the International Carriage of Dangerous Goods by Rail

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Section A : Introduction

General introductory remarks

Luxembourg has signed the Joint Convention on 1st October 1997 and is a Party thereof since 19 November 2001. The Convention entered into force on 21 June 2001.

Luxembourg has no nuclear power plant, no other fuel-cycle facility, no research reactor and no other facility generating radioactive substances. Thus many requirements of the Joint Convention do not apply to Luxembourg. It further has no spent nuclear fuel and no high level radioactive waste on its territory.

There are other reasons which explain, why the actual total amount of radioactive waste, mainly in form of disused sealed sources of low activity, is marginal:

- small size of the country with only few users of radioactive substances;
- import and utilization license for a radioactive sealed source is only granted by the competent authority under the condition that the foreign supplier certifies taking back the disused radioactive source;
- import and installation of radioactive smoke detectors and of radioactive lightning conductors has been forbidden for many years;
- most of the old “historical” radioactive sealed sources have been returned to the country of origin or to a foreign waste management facility.

In Luxembourg radioactive wastes are mainly arising from the use of radioactive sources in industry, medicine and to a small extent from the use in education and research. Its activity and its volume being very low, the Luxembourg Government takes the position that the option of a national management facility and of a final disposal facility would be unrealistic, because not at all commensurate. Therefore all disused sealed sources have to be returned to the country of origin and if this turns out to be impossible, to a foreign waste management facility.

Since 1967, Luxembourg has a legislation and a regulation on radiation protection, which cover all relevant nuclear and radiological safety issues. This regulation is revised periodically in order to be in conformity with the provisions of the Directives of the European Union of which Luxembourg is a Member State. The last amendment of the regulation was put into force on 24 July 2011 with the transposition of the Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations.

The legal framework relates to the protection of the general population, to the protection of workers and to the protection of the environment from damage that may be caused by radioactive sources or radioactive waste.

The department of radiation protection (DRP) is responsible for the content of the present report. The aim of this report is to demonstrate that Luxembourg meets its obligations of the Joint Convention. This demonstration is mainly based on the Luxembourg legislation and policy framework concerning the management, the control and the inspection of radioactive sources and radioactive waste held in the country.

The report is structured in conformity with the "Guidelines regarding the form and structure of national reports" issued by the IAEA on 19 July 2006 (INFCIRC/604/Rev.1). The section concerning the safety of spent fuel management covering articles 4-10 of the Joint Convention are not applicable to Luxembourg.

The situation with regard to the obligations of the Convention has practically not changed since the previous Review Meeting. For this reason and with the objective to produce a stand-alone document many paragraphs have remained unchanged.

New developments that have occurred since the last review meeting are notably the introduction of a quality assurance program within the laboratory of the DRP via an accreditation according to ISO 17025 (achieved in July 2010). Early 2010, the DRP has started with performance evaluation interviews. By September 2011, all "known" lightening conductors have been removed. The adoption of the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste is another important step that will lead to a further strengthening of the regulatory framework in Luxembourg.

Luxembourg has also developed a technical statement with regard to the planed French geological repository. This issue does not fit under any of the articles of the convention. But since it might be interesting for other contracting parties, it is reported as a general issue within an additional sub-paragraph within the present section.

These new elements and other planed actions are clearly assigned throughout the document by underlining the first words of a sentence. By the following the report includes a section addressing observations and comments to Luxembourg during the last review session in 2009.

Observations and comments from the 3rd review meeting

At the 2009 peer review, two challenges were identified for Luxembourg. The final management of liquid wastes containing tritiated thymidine of a particular licensee needed to be solved. A second issue was the potential impact of security considerations on the 'classical' regulatory approaches focused on safety with potential consequences on regulatory relationships, manpower requirements, issues of dual regulation, etc.

The overall conclusions were that Luxembourg has addressed all articles in the national report and answered all questions in a full and transparent manner. The national report demonstrated compliance with the JC requirements. It was finally concluded that, while the JC has limited application to Luxembourg, the national report and presentation were exemplary and could provide a good model for other countries of similar circumstances.

Luxembourg's evaluation of the French plans to build a deep geological repository for high-level radioactive waste.

Located some 100 km from the Luxembourg border, the French National Agency for Radioactive Waste (ANDRA) operates in Bure-en-Barrois an underground laboratory to assess the possibilities of implementing a deep geological repository for high-level radioactive waste. Since 2000, research galleries were dug about 500 feet deep. Although the underground laboratory will not be used for the storage of nuclear waste, construction and tunneling for the storage may begin in 2017 in an area near the laboratory, with the objective of starting operation around 2025.

The Luxembourg Government, for which this issue is of paramount importance, established in 2006 an interdepartmental group to observe and independently assess the scientific work in Bure-en-Barrois. At the 7th meeting of the joint Franco-Luxembourg commission on nuclear safety in 2006, the Luxembourg delegation requested an exchange of information to the widest extend possible, which the French safety authority (ASN) and ANDRA and were willing to provide. Following the set of documents received, the interdepartmental group was able to start its assessment. On July 3, 2009, representatives of France and Luxembourg, in the presence of the ambassadors of both countries, had the opportunity to collect additional information during a visit of the underground research laboratory in Bure.

Early 2010, the interdepartmental group submitted its final report to the Luxembourg Government. This report is also published on the website of the DRP (http://www.ms.public.lu/fr/activites/radioprotection/protect-popul-nucleaire/coop-nat-internationale/rp_rapport_groupe_bure_final.pdf). Besides a brief description of the project, it contains a set of observations, conclusions and recommendations.

Section B: Policies and practices (Article 32.1)

Radioactive waste management policy

The Luxembourg policy of the radioactive waste management is dictated by the practical needs of the country. The low activity and volume of radioactive waste produced in the country are not justifying the implementation of a national final waste repository on the territory.

The Luxembourg policy is based on the aim to avoid the production of radioactive waste, through the following provisions:

- return of disused sealed sources to the foreign supplier;
- replacement of radioactive sources by non-radioactive alternatives if available;
- minimization of the production of waste by the user;
- storage of transition radioactive waste on the user's premises until decay;

Concerning the small quantities of radioactive waste arising in Luxembourg, the Belgian government has exceptionally, and due to the small quantities, accepted to treat the waste coming from the Grand Duchy of Luxembourg, in Belgium.

The interim storage of radioactive wastes has to be guaranteed by the licensee. The small national interim storage facility (NSIF) only holds waste for which no license holder exists, such as consumer goods or orphan sources.

The following table gives an overview over the national radioactive waste management policy according to the matrix used at the last review meeting.

Type of Liability	Long-term management policy	Funding of Liabilities	Current practice / facilities	Planned facilities
Non-power wastes	• Export to Belgium	• Licensee • State budget	• Decay (Interim storage and retention of short lived wastes) • Interim storage (Either at the licensee or in the NISF)	• None
Disused Sealed Sources	• Return to supplier • Export to Belgium	• Licensee • State budget	• Interim storage (Either at the licensee or in the NISF) • Return to supplier • Export to Belgium	• None

Table 1: national waste management policy

Radioactive waste management practices

The radioactive waste management policy is implemented via the legal framework and an active encouragement by the DRP to avoid the production of radioactive waste.

Facilities using radioactive substances exceeding the exemption levels (Euratom Council Directive 96/29 – Table A) need to be licensed by the competent authority, according to the licensing system as reported under Article 19. Theses facilities are fully responsible for the safety and the security of the radioactive sources they use and for the management of the radioactive waste resulting from this use.

Radioactive waste is classified by the half-life of the corresponding nuclides and whether the disused sources are sealed or unsealed. A classification system as recommended by the European Commission (Commission Recommendation 1999/669/EC, Euratom) is not used, as it presents no practical advantage for Luxembourg.

The Grand-ducal regulation of 14 December 2000 concerning the protection of the population against the dangers arising from ionizing radiation further defines clearance levels for unconditional release. Any licensee may release waste to the environment without additional license if the specific activity of the waste is below the clearance levels and does not exceed one ton per year. Clearance of very low activity wastes above these levels has to be licensed by the Minister of Health. The defined clearance levels are taken from the document issued by the German "Strahlenschutzkommission" (Commission on Radiological Protection) "Clearance of Materials, Buildings and Sites with Negligible Radioactivity from Practices subject to Reporting or Authorisation" published 1998.

Management practices of the different types of wastes, are separately reported on in the following paragraphs. The management of disused sealed sources is reported in section J.

Management of wastes from unsealed sources

Unsealed sources are only used in nuclear medicine, radiotherapy or in biomedical laboratories, e.g. Ga-67, Sr-89, Y-90, Tc-99m, I-125, I-131, Gd-153, etc. Several research laboratories, mainly in the field of biomedical research also use small quantities of H-3, C-14, P-32, S-35 and I-125. The license, authorizing these practices, specifies the procedures for adequately handling, controlling and minimizing the releases of these radioactive substances.

Wastes resulting from these practices and containing short-lived radionuclides are stored on the user's premises until decay or until the activity of the waste decreased below the clearance levels. Wastes containing small specific activities below clearance level and not exceeding a total weight of 1000 kg may be treated the same way as conventional hospital waste.

With the objective of minimizing releases, the DRP instructed all hospitals engaged in iodine-131 therapy to install a special retention system for all wastewaters from these departments.

Concerning liquid radioactive substances with longer half-lives, such as C-14 and H-3, most licensees work with almost marginal activities. Thus the resulting liquid wastes and contaminated solid wastes remain below the clearance levels.

One hospital had however collected all liquid wastes from tritiated thymidine over several years. The specific activity was above the clearance levels for unconditioned release and 180 liters with a total activity below 2 GBq had been accumulated. Because of the organic properties a licensed release with other wastewaters was excluded as a potential option.

This unsolved problem was consequently identified as a challenge during the last review meeting. In the following several consultations between the licensee, the national agency for waste management "SuperDrecksKescht ®" and the DRP took place. The waste management

agency holds contacts with several plants engaged in the incineration of problematic wastes of which a few were entitled to accept tritiated liquids below exemption level. Since the waste had been accumulated over several years, the DRP authorized the licensee to organize two transfers to an incineration plant, one in 2009 and one in 2010. At present, no laboratory further produces this type of waste.

Management of activated materials

The national radiotherapy center operates the only irradiator, able to activate material. According to the radioactive waste policies of the producer's country, the material that has been activated during its use in Luxembourg may not be returned to the country of origin. As far as these activated parts cannot be cleared, they will have to be stored at the user premises and prepared for a shipment to Belgium.

Management of orphan sources

All metal recycling plants and national waste recycling plant have installed fixed portal monitoring systems to detect radioactive materials at the entrance to their sites. In all cases these portal monitors consist of two large plastic scintillation detectors. On the only harbor in Luxembourg a commercially available crane monitoring system is used for the unloading of scrap from ships.

All operators of detection gates have worked out clear procedures together with the DRP for adequately reacting when radioactive substances are detected. Agreements exist with Belgium and with France for the return of the truck or the train under certain conditions and following defined procedures. In all other cases the load has to be separated in Luxembourg. The radioactive sources are then either returned immediately or stored in Luxembourg until a safe return to the country of origin can be organized.

Either the operator of the monitoring systems or the responsible supplier of the material has to cover the costs for the safe management of these orphan sources. If this turns out to be impossible or in case bankruptcy and abandon of the site holding radioactive sources, a specially labeled credit of the state budget covers all associated costs.

Since the last review meeting, only few alerts have been reported to the DRP. It is worth mentioning two cases of Co-60 contamination of stainless steel products. One case concerned 17 elevator buttons up to 270 Bq/g, the second one involved a train with 55 tons of contaminated metal scrap, mainly turnings, up to 25 Bq/g. In both cases the material was returned to the supplier, in France and Germany respectively.

More recently, in August 2011, a steel plant reported a radiation alert on a slag sample from the electric arc furnace. The measurement of that sample in the laboratory of the DRP showed the presence of Am-241. The concerned interim damp for the slag is at present isolated. The measurements indicate a total contamination of around 300 MBq, heterogeneously distributed in approximately 1000 tons of slag. The concentration in the dust of the filters remained below 50 Bq/kg. Further investigations are presently conducted.

Management of disused consumer goods containing small amounts of radioactive substances

To minimize radioactive waste produced in Luxembourg, the use and installation of the below listed goods containing radioactive substances has consequently been prohibited over the years:

- The installation of new ionizing chamber smoke detectors (ICSD) has been prohibited in 1994.
- In 1995, the DRP has started a program to withdraw all radioactive lightning conductors in use. These radioactive lightning conductors were installed in the 60s and 70s without the required licenses. The DRP again contacted early 2008 all responsible actors to encourage the removal of the remaining 5 lightning conductors. Finally, on 23 September 2011, the last of these known lightening conductors has been dismantled and transferred to the NISF.
- The production and import of thorium incandescent gas mantles are forbidden, since gas mantles without any radioactive substances are available with similar properties.
- Consumer goods as watches, compasses, fishing floats, etc, containing radio-luminescent paintings or other consumer goods containing radioactive substances, as technical porcelain, optical glasses are collected by the DRP.

The waste arising from these products is either returned to the supplier or collected at the national interim waste storage for being shipped to a foreign waste management facility.

Section C: Scope of application (Article 3)

The present report applies to the safety of the management of radioactive waste resulting from civilian applications and containing artificial radionuclide exceeding the regulatory clearance levels for the unconditional release.

The present report also applies to waste that contains naturally occurring substances exceeding the regulatory clearance levels for the unconditional release. It does not apply to waste that contains naturally occurring substances that, at the time of production, were not considered by law as radioactive waste.

As Luxembourg has no nuclear fuel cycle, the present report does not apply to the safety of spent fuel management.

Section D: Inventories and lists (Article 32.2)

The inventories of the radioactive wastes stored on 1 September 2011 at the NISF and on the user's premises are listed in Annex I.

The relevant regulation further attributes the responsibility to the DRP for maintaining a national database of all radioactive sources above exemption level. This includes radioactive wastes. Licensees have to notify the DRP of any modification of their inventory. The database contains information about the type, activity and registration number of the source its localization and a reference to the corresponding license.

During the recent years, the amount of waste and disused sources stored in Luxembourg has been reduced. At the licensee's side this is due to the fact that some facilities have stopped using radioactive sources and returned all disused sources to the suppliers. The reduction at the NISF has been achieved by systematically organizing transfers to Belgium. It should also be noted that most historical consumer goods, such as ICSD's, have already been exchanged by non-radioactive alternatives.

Section E: Legislative and regulatory system

Article 18: Implementing measures

In 1963, a framework law was enacted on the Protection of the Public Against the Hazards of Ionizing Radiation, which established general principles and attributes competence to the Minister of Health.

The law of 21 November 1980 concerning the organization of the Directorate of Health (DS) defines a department of radiation protection (DRP), charged with questions concerning the protection against hazards of ionizing and non-ionizing radiation, as well as nuclear safety.

These principles formed the basis for executive regulations, which were regularly amended in conformity with the EU directives on radiation protection and to govern the various aspects of nuclear safety. The current regulation implements Council Directive 96/29/Euratom of 13 May 1996 laying down basic standards for the health protection of the general public and workers against the dangers of ionizing radiation. The last amendment of the regulation was put into force on 24 July 2011 with the transposition of the Council Directive 2009/71/Euratom of 25 June 2009 establishing a Community framework for the nuclear safety of nuclear installations. Following a preliminary analyze a few amendments of the legislative and regulatory framework will necessary to be implemented in order to transpose the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste.

The current regulations apply to the production, manufacture, possession, sale, transit, transport, import, export, use for commercial, industrial, medical, scientific or other purposes, recycling and re-use of equipment or substances capable of emitting ionizing radiation. They also apply to the treatment, handling, storage, elimination and disposal of radioactive substances or waste and to any other activity involving a risk arising from ionizing radiation.

The various laws and regulations, building a solid legal framework, are listed in Annex II.

Article 19: Legislative and regulatory framework

Radiation Protection

The provisions relating to dose limits for the public and workers take into consideration the ALARA principle (As Low As Reasonably Achievable). Thus, the exposure of the public and workers to ionizing radiation and the number of persons and workers exposed to radiation must be kept as low as reasonably possible.

The limit of the annual effective dose for exposed workers (including women of child-bearing age, apprentices and adult students) is fixed to 10 mSv. The working conditions for pregnant women have to guarantee, that the equivalent dose to the unborn child will not exceed 1 mSv. Nursing women are not allowed to work in conditions bearing high risks of contamination. For apprentices and students aged between 16 and 18 years who are obliged to use radioactive sources, the annual effective dose is fixed to 3 mSv. For members of the public and for apprentices and students below the age of 16 years, the maximum annual effective dose is fixed to 1 mSv.

The current regulation describes the operational rules to protect workers, outside workers, apprentices and students exposed to radiation. In particular, working areas are divided into "controlled areas" and "supervised areas" and workers are categorized. The regulations further impose a certain number of obligations, including the implementation of radiological monitoring of workers and workplace, as well as medical supervision, procedures regulating access to different areas, appropriate information of workers and training in the field of radiation protection.

The system of licensing and prohibition

Facilities are ranged in four different categories:

- Category I defines nuclear installations as defined by Council Directive 2009/71/Euratom, facilities in which fissile material in quantities exceeding 500 effective grams is customarily used or stored and facilities for the final disposal of radioactive waste. Currently no undertaking of category I exists in Luxembourg.
- Category II is dedicated to facilities using or holding radioactive substances exceeding by a factor of thousand the exemption limits as fixed by the Council Directive 96/29/EURATOM of 13 May 1996 or conditioning, respectively having an interim storage of radioactive waste.
- In Category III are ranged all facilities using or holding radioactive substances above the exemption limits fixed by the Council Directive 96/29/EURATOM of 13 May 1996, but not exceeding these levels by a thousand fold.
- In Category IV are classified all facilities using or holding radioactive substances staying below the exemption limits fixed by the Council Directive 96/29/EURATOM of 13 May 1996 but exceeding 1/100 of these limits.

The regulation lays down separate licensing conditions for each category of installation, notably in relation to the technical information to be supplied, public information and participation in the licensing procedure. A license, issued by the Government in Council (category I), the Minister of Health (category II) and the Directorate of Health (categories III) is required for categories I-III. Declaration to the DRP is sufficient for category IV. The Minister of Health may suspend or withdraw a license when the licensee contravenes the regulation in force or the conditions of the license. The established practice is to limit licenses for holding, storing and using radioactive materials to 10 years.

Control, enforcement and responsibilities

Licensed facilities are inspected at regular intervals by inspectors of the DRP. Theses periodic inspections focus on the radiological protection of the workers and the physical protection of the radioactive substances. The licensee has to demonstrate that internal procedures concerning the management of radioactive substances exist, are adequate and correctly applied.

The inspectors of the DRP are enabled to impose appropriate measures to in order to avoid potential incidents or accidents with implications on workers, public and environment. Agents of the DRP are further attributed with the legal power of police officers. Inspections are conducted at least once per year in all nuclear medicine and radiotherapy centers, and in around 50% of the other facilities licensed to use radioactive sources.

An inter-comparison exercise in the years 2007 and 2008 of the regulatory activities with focus on the implementation of Council Directive 96/29/Euratom between the Radiological

Protection Institute of Ireland and the DRP was considered to be a very valuable process. As a direct consequence, the following aspects have been implemented within 2009 and 2010 in Luxembourg:

- Modification of the inspection form used, based partially on the questionnaires set by IAEA-TECDOC-1526 “Inspection of Radiation Sources and Regulatory Enforcement” and the inspection form used in Ireland during inspections.
- Development of a guide to implement general procedures on radiation safety.
- Development of a guide to perform risk assessments.
- Development of a guide on internal intervention planning.

In May 2011, one facility reported the loss of a sealed Cs-137 source of 500 MBq. The DRP has informed neighboring countries about the loss and reported it to the Illicit Trafficking Database.

Security – Safety interface

At the previous review meeting, Luxembourg addressed the potential conflict arising from increasing security considerations on the 'classical', open and transparent, regulatory approaches focused on safety. Luxembourg was consequently asked to highlight this issue in more depth in the next national report. The aim the following few paragraphs is to provide an appropriate response to that “challenge”, starting with the rational why Luxembourg had included this issue in its previous oral presentation.

Luxembourg has over many years tried to establish a mechanism with its neighboring countries that allows exchanging information on nuclear safety issues in an open and transparent manner. While these bilateral exchanges have not been very easygoing right from the beginning, they have substantially developed over the years. The bilateral relations stand now on an excellent basis that allows to debate on very difficult issues in a highly constructive atmosphere. Many information exchange protocols have been adopted and are applied on a routine basis. The independent evaluation on the planned French geological disposal facility (read more in section A) is one good example of what benefit may arise from transparency.

Transparency cannot be unidirectional. Luxembourg’s regulation on radiation protection consequently foresees for public information and participation during licensing procedures. End of 2006, the European Commission started to organize activities on Radiological Risk Reduction, and the DRP represented Luxembourg in several seminars. These initial activities in radiological security gave rise to many discussions on obligations for security clearance and classification of information. Fortunately the process developed over several years and resulted in a more moderate approach, consisting of an action-plan, adopted in November 2009, that does not jeopardize safety regulations. Additionally, the directive on nuclear safety and the more recent directive on the safety of waste management strengthen transparency.

Luxembourg did thus not encounter the earlier anticipated difficulties. After adoption of the above mentioned action plan, the DRP analyzed the recommendations on radiological issues that are directly applicable for Luxembourg. It turned out that only the few points, briefly discussed below, still need additional efforts. Others have already been implemented or do not concern radiological safety in Luxembourg. These recommendations focus indeed primarily on category 1 and 2 sources, which are presently not used in Luxembourg. Also the recommendations of the code of conduct on the safety and security of radioactive sources, as

well as its guidance on import and export have previously been implemented into the relevant regulation. The following main points remained:

1. Each Member State should ensure that first responders receive training on forensic awareness in a CBRN crime-scene.

   Cooperation between the ASS, DRP and the relevant police department has been established. The primary goal is to enable the use of synergies between these players. Joined exercises have been hold in May and September 2010.

2. Each Member should conduct a regular assessment of the available means for effective decontamination and their capacity to deal with mass casualties.

   The ASS, supported by the DRP, has set up an intensive cooperation with specialized first responders in France and in Belgium. Concerning the decontamination capacities for a high number of causalities, the ASS has purchased the same equipment that is used by the French brigades with the aim to facilitate mutual assistance. Luxembourg also participated in several international exercises and organized in October 2010 a two days workshop with over 200 participants from Belgium, France and Luxembourg. The main goal was to develop the tools for an effective decontamination of a realistic radioactive contaminant.

3. Each Member State should integrate CBRN emergencies into its response plans.

   With the initiated review of the national emergency response plan, the inclusion of CBRN emergencies has been considered.

4. Member States should promote monitoring of radiation for security purposes.

   A systematic radiation monitoring at the international airport or at the significant nodal transit points is not yet realized, but concrete plans exist for the near future.

Article 20: Regulatory body

The legislative and executive competence in the field of radiological safety and radiation protection is attributed to the Minister of Health. The law of 21 November 1980 concerning the organization of the Directorate of Health defines a department of radiation protection (DRP) and allocates particular missions to all departments within the Directorate of Health. Similarly to a number of other small countries, the DRP centralizes as a single department all competence of radiation and nuclear safety. The organizational structure and missions of the DRP are summarized in figure 1.

The DRP is composed of 8 agents of higher education, specialized in radiation protection (1), medical physics (2), nuclear engineering (1), physics (1), geology (1), biology (1) and chemistry (1). For regulatory purposes, they rely on the lawyers of the Ministry of Health. One technical engineer, 2 technicians, 1 laboratory assistant and one secretary complete the department. Compared to the 1st January 2008, these numbers are stable. However, due to the permanent leave of one laboratory assistant, the DRP could upgrade this position and engage an additional a physicist in 2009.

Early 2010, the DRP has started with performance evaluation interviews. Part this individual exchange between the head of the department and each of his staff members is the establishment of a personal training schedule. This measure is expected to maintain and to further develop competence.

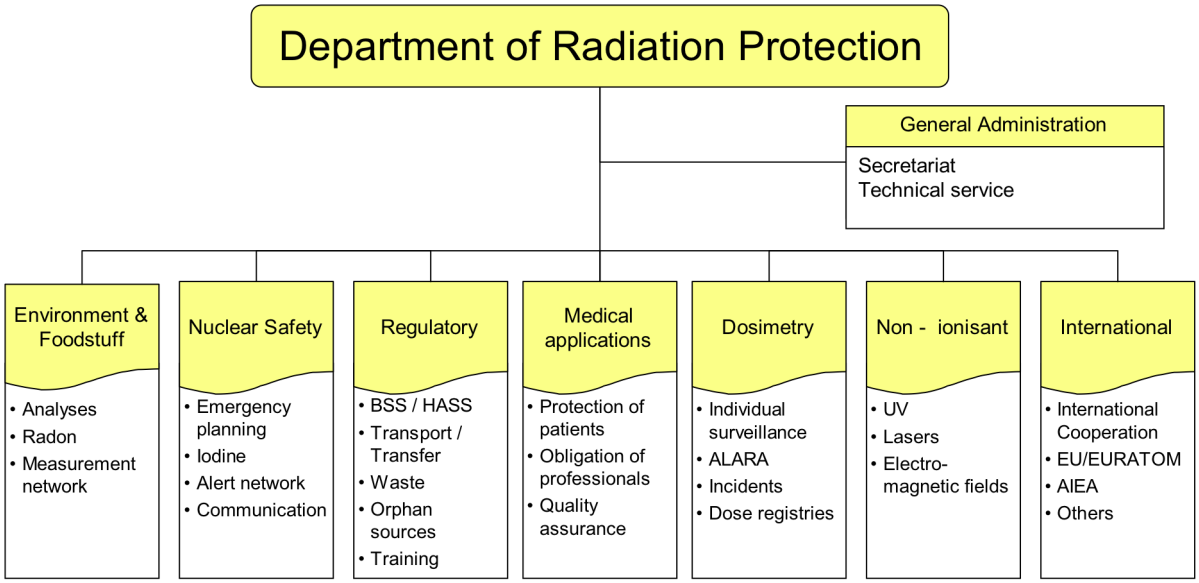

Figure 1: Organizational structure and missions of the DRP

All activities and projects of the DRP are financed via state budget, allocating predefined credits on a yearly basis. Some of these credits are non-limited to allow covering important non-predicable costs. This applies for example to expenses resulting from accidents and incidents, management of orphan sources or transfer of radioactive waste to Belgium. The budget of the DRP has usually been increased in the past about a 4% yearly rate in conjunction with the economic growth. Due to the economic crisis, the budget has however been frozen in the years 2010 and 2011 on the level of 2009. Concerning the year 2012, the decision is to be taken in the coming months

The financial and human resources of the DRP are not extensive, but they are felt to be adequate. It has always allowed the DRP to fulfill its obligations in an appropriate way. The DRP is also well prepared to overcome a short period of budgetary restrictions, without having to jeopardize any of its projects.

Following the nuclear accident in Fukushima, the Government has asked the DRP to increase efforts on nuclear safety and nuclear emergency preparedness. In order not to be forced to neglect its other missions, the DRP has officially requested for additional staff.

A first project of a quality management system was launched in 2007 within the laboratory of the DRP. The target, to be granted an accreditation according to ISO 17025, has been reached in July 2010.

On April 2009, the Ministry of Health lunched a new Internet Portal. Under www.radioprotection.lu exists a direct link to the DRP. On this new site one may find relevant information on all aspects related to the missions of the DRP, such as relevant legislation, explanations and guides for RPO's, specific reports and information for the public. The homepage is regularly up-dated and expanded.

Section F: Other general safety provisions

Article 21: Responsibilities of the license holder

According to grand-ducal regulation of 14 December 2000 concerning the protection of the population against the dangers arising from ionizing radiation, the license holder is fully responsible for the respect of all regulatory provisions.

Article 22: Human and financial resources

By legislation, facilities using or holding radioactive sources or radioactive waste are bound to provide adequate human and financial resources to guarantee the safety and security of their sources and waste.

All licensees have to designate a qualified radiation protection officer who is responsible to implement the obligations of the licensee. They must further contract a special insurance covering the reparation of radiological damage to third parties in case of an accident.

Since the transposition of the Council Directive 2003/122/Euratom in 2006, holders of high activity sources have to conclude a contract with the supplier, where the latter agrees to take back the source after use, even when the licensee is unable to cover the associated costs.

Article 23: Quality assurance

The designated radiation protection officer is responsible to establish and implement a quality assurance program with regard to the implementation of internal procedures, such as regular verifications and calibrations of the used radiation measurement equipment.

Article 24: Operational radiation protection

The licensee is fully responsible to implement internal radiation protection following the principles described under article 19 and the control of actual or potential discharges according to the national policies described under section B.

Article 25: Emergency preparedness

As facilities are fully responsible for the safety of their radioactive sources and waste, they have to take the necessary steps to cope with radiological emergencies. Depending of the quantities of radioactive substances, they have to draw up internal emergency response plans taking into account the most probable accidents. Periodic review of the plans and training of the staff by organizing regular exercises are part of the conditions set in the license.

In case of an emergency, the license holder is obliged to notify immediately the DRP, the Rescue Services Agency (ASS) and the labor inspectorate (ITM), to evaluate the possible radiological consequences for the populations at risk, to take the necessary steps to avoid or to stop the release of radioactivity in the environment and limiting by that the exposure of individuals and to respect the legal provisions in case of emergency exposures.

The Government has set up a national emergency response plan to alert and to protect the population in case of a radiological emergency. The Minister of Health and the Minister of Interior are responsible for the off-site emergency planning. The plan is activated and

regularly tested by the DRP and by the ASS, in national, bilateral and international exercises. Emergency teams have been formed to assist in the event of a nuclear disaster, and refresher courses are held periodically. Following the nuclear accident in Fukushima, the Government has decided to review the national emergency response plan.

Bilateral agreements on mutual assistance have been concluded with Germany, France and Belgium. These general agreements also cover radiological and nuclear emergencies. A bilateral agreement on mutual early information has been concluded with France and Belgium.

Most licensed users of radioactive materials have a general internal emergency plan, covering all potential accidents. The DRP insists and verifies that the radiological risk is properly reflected within that emergency plan.

Article 26: Decommissioning

Prior to licensing all users of high activity sources have to introduce a safety report. This report includes precautions for avoiding accidents and provisions for the management of incidents and accidents, such as potential contaminations necessitating cleanup and decommissioning. These reports are regularly up-dated by the licensee and submitted to all involved actors, including the DRP.

Section H: Safety of Radioactive Waste Management

Article 11: General safety requirements

As highlighted in section B only marginal amounts of radioactive wastes exist in Luxembourg and effective measures are in place to keep their amounts and the duration of interim storage very low. Thus many provisions of article 11 do not apply. Facilities that store such radioactive wastes have to comply with the safety provisions of category II facilities.

Article 12: Existing facilities and past practices

The radioactive wastes resulting from practices highlighted in section B and for which exist no license holder are collected by the DRP for a short interim storage at the national radioactive waste interim storage facility (NISF), operated and controlled by that department and situated at the CHL, 4, rue Barblé, Luxembourg. The NISF is located within the building of a hospital at the minus 2 level. It consists of two small rooms, used for storage and manipulating the sources, respectively. Access to the location is from a public accessible parking lot though a single door and limited to agents of the DRP. The NISF is further integrated into the more global internal emergency response plan of the hospital. A detailed inventory of all the radioactive waste presently stored at this location is given in annex I.

The storage time of the waste is not defined, neither limited, but oriented according to practical considerations. A transfer is normally organized when sufficient waste of one type is available to reach the yearly quota. This concerns mainly smoke detectors and lightening rods of which the storage time is mostly below 5 years. Other types of wastes in very small quantities are stored longer.

At regular intervals, the Belgian Waste Management Agency (ONDRAF/NIRAS) picks up this radioactive waste in Luxembourg and transfers it to the Belgian storage facility. Before organizing a transfer, ONDRAF establishes an offer on the bases of quantities and involved nuclides. The last transfers took place on October 2010, December 2008 and October 2005.

From the DIRECTIVE 2011/70/EURATOM it will become necessary that the operation and the control of the NISF will have to be attributed to two bodies that are functionally separated. It seems clear that the DRP will remain the regulatory body and responsible for the institutional supervision. Two different options for finding another operator are presently prepared and will be discussed with the potential candidates within the coming months.

Articles 13, 14 and 15: Siting, design, construction and assessment

Any hypothetic project to build a radioactive waste management facility or a facility for the final disposal of radioactive waste is subject to prior authorization by the Government in council according to the procedures defined for category I facilities. Each applicant would have to demonstrate full compliance with articles 13, 14 and 15.

Article 16: Operation of facilities

As stated under article 12, Luxembourg only operates a single waste interim storage facility. In order to guarantee a safe storage, the DRP regularly asks the Belgian authorized inspection organization AV Controlatom for segregation and packing of the collected wastes, according to the acceptance criteria established by the Belgian Waste Management Agency (ONDRAF/NIRAS).

The inspectors of the DRP further verify radiation level within the storage room and absence of radioactive contamination on a yearly bases.

Article 17: Institutional measures after closure

The NISF is not very likely to be contaminated. Thus no specific measures, except of a final contamination verification will be needed after closure. However, accidental contamination during the manipulation of the wastes or as a result of a more server accidents like fire or flood may occur. It is foreseen that the storage facility would then be set back into a contamination free state.

Depending on the degree of contamination, decontamination may be performed by own means and by the Radiological Protection Unit (GPR) of the ASS. Luxembourg is also increasingly cooperating with specialized rescue teams from neighbor countries that could assist in case of major accidents.

The DRP has further the possibility to contract a specialized private company. To this effect, a specially labeled credit of the state budget has been introduced in order to cover such non-predictable costs and a German company is licensed by the Minister of Health to perform decontamination activities in Luxembourg.

Section I: Transboundary Movement (Article 27)

In Luxembourg, transport of radioactive material is under control of the competent authorities. The provisions of the ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Roads) and of RID (Regulation Concerning the International Carriage of Dangerous Goods by Rail) apply. Also the technical instructions of the ICAO and the Dangerous Goods Regulations of the International Air Transport Association (IATA) are applicable.

Only licensed carriers are allowed to transport radioactive materials in quantities above exemption level. The authorization may be limited to a single transport operation or valid for a limited period of five years at maximum.

For the transfer of radioactive sources, the EU Council Regulation of 8 June 1993 on shipments of radioactive substances between Member States is applicable. The transfer of radioactive waste is regulated by the grand-ducal regulation of 3 march 2009 on the supervision and control of shipments of radioactive waste and spent fuel.

Section J: Disused sealed sources

Management of disused sealed sources

All radioactive sealed sources have to be imported from other countries, mainly from other European member States. In line with the regulation in force, each import and installation of a sealed source is submitted to a licensing procedure. As part of this licensing procedure, the applicant must have a written commitment from the foreign supplier, where the latter agrees to take back the source if disused. If it turns out that the supplier is unable to respect his commitment, e.g. in case of bankruptcy, the user or holder is obliged to take all necessary administrative steps to send his disused source to any other supplier of radioactive sources or foreign waste management facility. This also applies to older sources not yet covered by these new regulatory provisions. Before the shipment is scheduled is sources are stored on the users premises. A list of all these sources is given in annex I.

Section K: Planned activities to improve safety

Given the size of the country, Luxembourg does not know significant modifications from review meeting to review meeting. However Luxembourg is determined to constantly consolidate, up-date and improve its dispositions with regard to safety of radioactive substances. This is a constant process. Planned activities are as follows:

- Transposition of the COUNCIL DIRECTIVE 2011/70/EURATOM of 19 July 2011 establishing a Community framework for the responsible and safe management of spent fuel and radioactive waste. Transposition needs to be completed on July 2013.
- Establishment and implementation of a national program for the management of all types of radioactive waste under our jurisdiction from generation to disposal. It is foreseen to establish the national program in parallel with the transposition of the above directive.

- Review and update of the national emergency response plan. The work on the review has started, but no date has been scheduled for the adoption of the updated plan.
- Organize in the course of the ongoing school-year 2011/12 a national campaign to collect the not-used radioactive sources and substances from schools.
- The European Commission has submitted on 29 September 2011 a proposal for a Council Directive laying down basic safety standards for protection against the dangers arising from exposure to ionizing radiation. This proposal needs to be analyzed by the DRP and will most probably lead to further amending the legal and regulatory framework in Luxembourg after its adoption by the European Council.

Annex I - Inventory

Interim storage of radioactive waste stored on 1st September 2011 on the users premises. Very short-lived radioisotopes are not taken into account:

Radionuclide	Physical state	Volume	Total activity
Activated material from irradiator	solid	200 kg	To be determined

Inventory of disused radioactive sealed sources stored on 1st September 2011 on users premises (5 licensees).

Radionuclide	Number of sources	Total activity (GBq)
Am-241	17	599.7
Kr-85	14	25.53
Sr-90	1	0.37
Co-60	1	0.05
Cs-137	4	2.24
Total:	**25**	**306.48**

Inventory of disused radioactive sealed sources stored on 1st September 2011 on the authority's premises. Divers items containing NORM are not included (chemicals and minerals containing NORM and some items containing Ra-226, together below 30 liters).

Source type	Radionuclide	Number of sources	Total activity (GBq)
Lightening conductors	Am-241	2	0.072
Lightening conductors	Ra-226	6	0.207
ICSD's	Am-241	432	0.016
ICSD's	Ra-226	218	< 0.001
Industrial sources	Ni-63	1	0.37
Demonstration source	Ra-226/Be	1	0.111

Annex II - Legislative

Law of 25 March 1963 concerning the protection of the population against the dangers arising from ionizing radiation.

Law of 21 November 1980 concerning the organization of the Directorate of Health.

Law of 28 March 1984 concerning the approbation of the agreement between the government of the Grand Duchy of Luxembourg and the government of the French Republic concerning the information exchange in case of an incident or accident which might have radiological consequences, signed in Luxembourg on 11 April 1983.

Law of 11 april 1995 concerning the approbation of the Convention on the Physical Protection of Nuclear Material, opened for signature in Vienna and New York on 3 march 1980.

Law of 19 March 1997 concerning the approbation of the Convention on Nuclear Safety, adopted in Vienna on 20 September 1994.

Law of 28 July 2000 concerning the approbation of the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency, adopted in Vienna on 26 September 1986.

Law of 28 July 2000 concerning the approbation of the Convention on Early Notification of a Nuclear Accident, adopted in Vienna on 26 September 1986.

Law of 20 june 2001 concerning the approbation of the Joint Convention on the Safety of Spent Fuel Management and the Safety of Radioactive Waste Management, adopted in Vienna on 5 September 1997.

Law of 27 April 2006 concerning the approbation of the agreement between the government of the Grand Duchy of Luxembourg and the government of the Kingdom of Belgium concerning the information exchange in case of an incident or accident which might have radiological consequences, signed in Eischen on 28 April 2004.

Law of July 28, 2011, 1) approving the Amendment to the Convention on the Physical Protection of Nuclear Material, adopted at Vienna, July 8, 2005; 2) amending the amended law of 11 April 1985 approving the Convention on Physical Protection of Nuclear Material, opened for signature at Vienna and New York dated March 3, 1980.

Grand-ducal regulation of 27 November 1987 concerning the admissible levels of radioactivity in foodstuffs.

93/1493/EURATOM - Regulation of 8 June 1993 on shipments of radioactive substances between Member States.

Grand-ducal regulation of 16 April 1994 concerning transboundary shipments of radioactive wastes.

Grand-ducal regulation of 11 August 1996 concerning the provision of information to the population on the applicable measures for the protection of public health and on the conduct to be adopted in the event of a radiological emergency.

Grand-ducal regulation of 14 December 2000 concerning the protection of the population against the dangers arising from ionizing radiation, as modified on 21 July 2006 an on 24 July 2011.

National emergency response plan in case of an incident or accident in the nuclear power plant of Cattenom or in case of any other radiological or nuclear event. (December 1994).

Grand-ducal regulation of 3 march 2009 on the supervision and control of shipments of radioactive waste and spent fuel (transposition Council Directive 2006/117/EURATOM of 20 November 2006).