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DU GRAND-DUCHÉ DE LUXEMBOURG
Ministère de la Santé

Direction de la santé



National Report to the Joint Convention - Sixth review meeting

National Report on the Measures Taken by
Luxembourg to Fulfil the Obligations Laid Down in
the:

**Joint Convention on the Safety of Spent Fuel
Management and on the Safety of Radioactive
Waste Management**

*Sixth review meeting of the contracting parties in
2018*

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
D-RadW	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.
DRP	Department of Radiation Protection
DS	Directorate of Health
EU	European Union
EU-BSS	Council Directive 2013/59/EURATOM of 5 December 2013 laying down basic safety standards for protection against the dangers arising from exposure to ionising radiation, and repealing Directives 89/618/Euratom, 90/641/Euratom, 96/29/Euratom, 97/43/Euratom and 2003/122/Euratom.
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	Labour inspectorate
LCDR	Collection point for radioactive waste (Local de collecte de déchets radioactifs)
LNS	National laboratory of Health
MS	Ministry of Health
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

Luxembourg has signed the Joint Convention on 1 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 a 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. The Luxembourg Government takes the position that the option of a national management facility and of a final disposal facility would be unrealistic, because it would not at all be commensurate with the radioactive waste activity and volume, which are very low. 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 1963, Luxembourg has legislation and regulation on radiation protection, which cover all relevant nuclear and radiological safety issues. The regulatory decrees are 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 relevant decrees was put into force on 30 July 2013 with the 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, hereafter referred to as "D-RadW". A new law and decrees in order to transpose the EU-BSS are underway.

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 latest draft version of the “Guidelines regarding the form and structure of national reports” (INFCIRC/604/Rev.3). The section concerning the safety of spent fuel management covering articles 4-10 of the Joint Convention is 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. All new or changed elements, the addressing of challenges from the last review meeting and other planned actions are clearly assigned throughout the document by underlining the first words of a paragraph.

The present report clearly presents the follow-up of the challenges identified (see overview in section K). It further aims at focusing on the topics identified within the conclusions of the summary report of the 5th review meeting.

Section B: Policies and practices (Article 32.1)

Radioactive waste management policy

The Luxembourg radioactive waste management policy 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 final waste repository on national 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;

However, as it is never possible to obtain a zero waste status, some radioactive waste will still remain and needs to be taken care of. As these are very small quantities an agreement between Belgium and Luxembourg had existed since 1990, in which the Belgian Government accepted to treat the waste coming from the Grand Duchy of Luxembourg, in Belgium.

In order to fully comply with the D-RadW, the Governments of both countries retained a bilateral agreement, which was signed on July 4 2016. This new agreement foresees not only the treatment of the Luxembourgish waste in Belgium, but also the final storage of the waste.

As the new agreement takes in charge treatment, conditioning as well as storage of the radioactive waste, Luxembourg decided to declassify its National Interim Storage Facility (NISF). There is still a collection point (LCDR - Local de collecte de déchets radioactifs) in Luxembourg for radioactive waste, arising mostly through appearance of orphan sources, where the radioactive materials are collected and packed for transportation to a dedicated facility in Belgium. As this waste is however not conditioned and only stored for a short period before being transferred, the need for an interim storage facility seemed disproportionate.

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

Type of Liability	Long-term management policy	Funding of Liabilities	Current practice / facilities	Planned facilities
Non-power wastes	<ul style="list-style-type: none">• Export to Belgium	<ul style="list-style-type: none">• Licensee• State budget	<ul style="list-style-type: none">• Decay (interim storage and retention of	<ul style="list-style-type: none">• New location for the

			short-lived wastes)	LCDR
			<ul style="list-style-type: none"> • Packed for transport and awaiting transfer to Belgium (either at the licensee or in the LCDR) 	
Disused Sealed Sources	<ul style="list-style-type: none"> • Return to supplier • Export to Belgium 	<ul style="list-style-type: none"> • Licensee • State budget 	<ul style="list-style-type: none"> • Packed for transport and awaiting transfer to Belgium (either at the licensee or in the LCDR) • Return to supplier 	<ul style="list-style-type: none"> • New location for the LCDR

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. The implementation of the policy is formalized in the national programme for the management of spent fuel and radioactive waste, following the D-RadW.

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. These 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 categorized 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 constitutes no practical advantage for Luxembourg. The classification of the radioactive waste rests within the Belgian authorities, according to the Belgian classification systems, when treating and conditioning the waste.

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 competent authority. The defined clearance levels are taken from the document "Clearance of Materials,

Buildings and Sites with Negligible Radioactivity from Practices subject to Reporting or Authorisation”, published by the German “Strahlenschutzkommission” (Commission on Radiological Protection) in 1998.

Management practices of the different types of waste, are separately reported on in the following paragraphs. The management of disused sealed sources is reported on 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 quantities. Thus the resulting liquid wastes and contaminated solid wastes remain below the clearance levels.

Management of activated materials

The national radiotherapy centre operates an 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. Those parts are now stored for decay. Most of the parts decay within a ten years storage time below clearance levels. Some smaller items may need to be treated as radioactive waste. The waste is currently monitored and further decisions or partial clearance will be considered in 2018.

Management of orphan sources

All metal recycling plants and national waste recycling plants have installed fixed portal monitoring systems to detect radioactive materials at the entrance of their sites. In all cases these portal monitors consist of two large plastic scintillation detectors. At the only harbour 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 in order to react adequately when radioactive substances are detected. If the detection signal is very small, agreements exist with France concerning the return of

the truck or the carriage 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 of bankruptcy and abandonment of the site holding radioactive sources, a specially labelled credit of the state budget covers all associated costs.

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.
- The installation of lightning conductors is also prohibited since 1994. An extensive programme was conducted in order to locate and dismount all the installed lightning conductors containing radioactive substances in Luxembourg. However, it cannot be excluded that in the future isolated lightning conductor may appear. If so, they will be collected by the DRP for disposal. On that subject, a remaining lightning conductor was found in June 2017. Dismounting of the conductor is foreseen by end of the year.
- 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 such as watches, compasses, fishing floats, etc. containing radio-luminescent paintings or other consumer goods containing radioactive substances, such as technical porcelain, optical glasses etc. are collected by the DRP.

The waste arising from these products is either returned to the supplier or collected at the LCDR awaiting its treatment abroad via a bilateral agreement.

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)

In Luxembourg there exists no facility whose primary purpose is the handling, pre-treatment, treatment, conditioning, long-term storage, or disposal of radioactive waste. As described in Section B, Luxembourg hosts only a small collection point (LCDR) for radioactive waste and disused sources for which no license holder exists.

The inventories of the radioactive wastes and disused sources stored on 1st October 2017 at the LCDR and on the user's premises are listed in Annex I.

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 regarding radiation protection, management of radioactive substances and nuclear safety, defined competences for ad-hoc decisions in a radiological or nuclear emergency situation, set the frame for enforcement and attributed the competence to the Minister of Health. This framework law was last amended in 1995.

The law of 21st 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. This law was amended on 24th November 2015 in order to clearly designate the DRP as competent authority concerning the safe management of radioactive waste.

These laws formed the basis for executive regulations (decrees), which were regularly amended in conformity with the EU directives on radiation protection and 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 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.

In some areas, such as, for example, maximum permitted levels of radioactive contamination of foodstuffs, specific EU-Council regulations are directly applicable in all EU member states. Those acts are not listed in the present report.

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

At present, new radiation protection laws and decrees have been drafted and are in the legislative process. This work was necessary for the transposition and implementation of the EU-BSS (2013/59/EURATOM) and the amended nuclear safety directive (2014/87/EURATOM), while modernizing the legislative framework. These new laws shall replace all former laws and decrees and thus include the regulatory framework described above.

Article 19: Legislative and regulatory framework

Radiation Protection and general provisions

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 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 workplaces, 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 divided into four different categories:

- Category I defines nuclear installations, as defined by the Council Directive 2009/71/Euratom, as facilities in which fissile material in quantities exceeding 500 effective grams is customarily used or stored and as 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 (category 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.

Special provisions concerning radioactive waste

The regulatory framework fully respects the provisions of the D-RadW. The legislative system relies on the following pillars:

- Explicit obligation on license holders to keep the generation of radioactive waste to a minimum which is reasonably practicable, both in terms of activity and volume, by means of appropriate design measures and of operating and decommissioning practices, including the recycling and reuse of materials.
- Additional obligations concerning the licensing application for a radioactive waste management facility. The application needs to include:
 - o A safety demonstration covering the development, operation and decommissioning of a facility as well as the post-closure phase of a disposal facility. The extent of the safety demonstration shall be commensurate with the complexity of the facility.
 - o Information concerning integrated management systems, including quality assurance, which give due priority for overall management of radioactive waste to safety.
 - o Demonstration of adequate financial and human resources
- Obligation on the license holder to regularly assess and to continuously improve the safety of the management of radioactive waste.
- The Minister of Health is made responsible for the elaboration and implementation of a national programme for the management of radioactive waste.
- The export of radioactive waste outside the European Union is prohibited.

Further practical provisions on the implementation of the management of radioactive waste are laid down in the national programme for the management of radioactive waste, as required by the D-RadW. The national programme has been adopted in August 2015 and is available to the public.

Control, enforcement and responsibilities

Inspectors of the DRP follow an inspection programme for all facilities holding radioactive material or X-ray emitting devices. The questionnaires used during the inspections are derived from the IAEA-TECDOC-1526, "Inspection of Radiation Sources and Regulatory Enforcement". The inspection programme follows a graded approach. The frequency of inspections depends on the category of the facility and hence of the risk of their activities.

These 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 in order to avoid potential incidents or accidents with impacts on workers, the public and the environment. Some agents of the DRP are further attributed with the legal power of police officers.

Article 20: Regulatory body

Overview – Status, Missions, responsibilities and organizational structure

The executive competence in the field of radiological safety and radiation protection is attributed to the Minister of Health. The law of 21st 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.

The above mentioned law was modified on 24th November 2015, now attributing to the DRP all competences relating to ionizing and non-ionizing radiation, nuclear safety as well as the safety of management of radioactive waste. Similarly to a number of other small countries, the DRP centralizes as a single department all competence of radiation and nuclear safety. It also includes the national laboratory for radiation physics.

The organizational structure and missions of the DRP are summarized in figure 1.

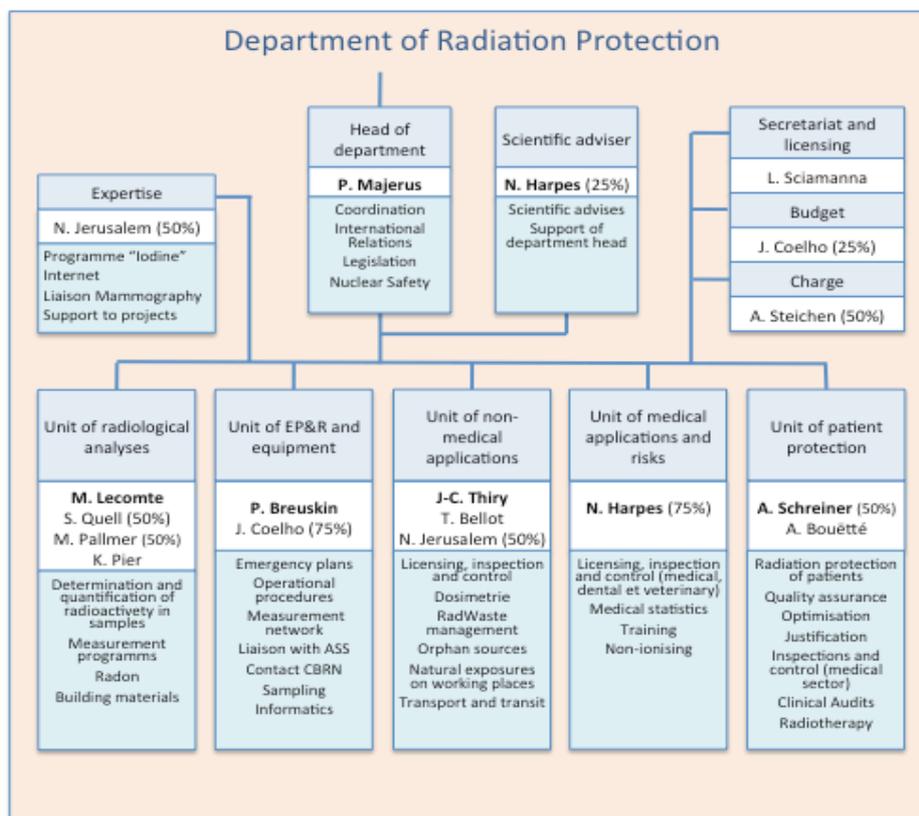


Figure 1: Organizational structure and missions of the DRP

Former plans of splitting the national laboratory for radiation physics from the authority (DRP), on which have been reported in the previous national report have been abandoned. The government takes the opinion that in such a small country, the available competence in matters of radiation protection and safety should not be scattered.

The DRP is at the technical level in charge of supervising the use of ionizing radiation and the safety of management of radioactive waste. License requests are examined by the DRP, which defines the conditions of these licenses. Furthermore, the DRP is also in charge of control and inspections in all domains of ionizing radiation and management of radioactive waste. Besides, the DRP participates in drafting laws, regulations and decrees. It has further issued several guides.

Human and financial resources

The DRP is composed of 9 agents with a Master degree or PhD, specialized in radiation protection (1), medical physics (2), nuclear physics and engineering (2), physics (1), geology (1), biology (1) and chemistry (1). The permanent staff of the DRP is further composed of one Bachelor engineer, 3 technicians, 1 laboratory assistant and a secretary.

Compared to the previous national report, this is an increase of one technician, engaged as of 1st May 2017. This reinforcement allows the DRP to better fulfil its obligation with respect to new European requirements, namely the action plans on Radon.

All activities and projects of the DRP are financed via the state budget, allocating predefined credits on a yearly basis. Some of these credits are non-limited to allow covering important unpredictable costs. This applies for example to expenses resulting from accidents and incidents, the management of orphan sources or the transfer of radioactive waste to Belgium. Another specific unlimited budgetary article allows the DRP in well-justified cases to engage external technical support. This was used in the past in the frame of specific licensing procedures and more recently to acquire an independent technical view on nuclear projects in the vicinity of Luxembourg's national borders. In the past the budget of the DRP has usually been increased at a yearly rate in conjunction with the economic growth.

The financial and human resources of the DRP are not extensive, but they are felt to be adequate. They have always allowed the DRP to fulfil its obligations in an appropriate way.

Transparency and information of the public

Decisions taken by the DRP in its role as competent authority are transparent. This is mainly illustrated through the public consultation during license inquiry. According to the national legislation, licenses of category I and II need to undergo public consultation in the localities in the vicinity of a facility. The issued licenses for these facilities as well as the underlying conditions are also publicly disclosed.

Relevant information on all aspects related to the missions of the DRP, such as legislation, explanations and guides for RPO's, specific reports, results of the environmental survey and information for the public on emergency preparedness is publicly available through our website www.radioprotection.lu. The homepage is updated and expanded at regular intervals. So far only a French version exists, although some of the documents and brochures that can be downloaded are available in other languages as well.

Early 2015, the Ministry of Health has established own press offices, in order to centralize communication with the media. In case of technical questions related to radiation protection or nuclear safety, the media now contact the press offices, which then arrange interviews with the DRP. This office also assists in finalizing press releases including their validation by the minister. Along with this goes an updated guidance on how to interact with the media and defines more precisely what type of information can be shared with the press (i.e. technical and factual information; information on programmes, projects, opinions that are adopted or published). With the help of the press office, it was possible to get a better coverage in the media on some of the DRP projects.

Section F: Other general safety provisions

Article 21: Responsibilities of the license holder

According to the 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 regulation, 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 for implementing 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 for the implementation of 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 on 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 out 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 labour 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 in order to limit the exposure of individuals, and to respect the legal provisions in case of emergency exposures.

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

The Government has set up a national emergency response plan, which has been completely overhauled after the Fukushima accident, to alert and to protect the population in case of a radiological emergency. The Prime Minister, the Minister of the Interior and the Minister of Health are responsible for the off-site emergency planning. The plan is activated and regularly tested by the High Commissioner for national protection, the DRP and 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.

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 clean up 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 their interim storage very low. Thus many provisions of article 11 do not apply. Facilities that keep such radioactive wastes have to comply with the safety provisions of category II facilities.

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.

The DRP also issued some guides such as:

- Guide to implement general procedures on radiation safety.
- Guide to perform risk assessments.
- Guide on internal intervention planning.

Article 12: Existing facilities and past practices

Since there are no radioactive waste repositories in Luxembourg and as these will be stored in Belgium under the bilateral agreement, only a collection centre (LCDR) exists in Luxembourg.

The LCDR is a single facility, which is located on the territory of the City of Luxembourg, and is managed by the DRP. The collected waste is mainly composed of disused sealed sources, for which no other recycling option is possible. Furthermore, since waste volumes are very low and storage is for short time only, pending transfer to a foreign storage centre, a separation between the operator of the centre and the DRP appears disproportionate. Moreover, the waste collected is mainly coming from individuals and mostly consists of small historical sources.

At the LCDR the radioactive waste is grouped according to its nature, isotopic composition and physical state. Disused sealed sources, which are mainly composed of smoke detectors, are collected until a sufficient quantity is reached. They are then packed for transport. Other waste, especially open sources and contaminated objects need to be immediately packed for transport. Packing is done by an external provider approved for that purpose and in accordance with the acceptance criteria of the recipient storage centre. Steps are taken to organize cross-border transfer and

transport. A detailed inventory of all the radioactive waste presently stored at the LCDR is given in annex I.

The 5th review meeting challenged the DRP to *formalize safety assessment for the storage facility*. Shortly after the meeting it was however decided that the premises should be reassigned for other purposes and will no longer be available to be used as a collection centre in medium term.

For this reason, the Minister of Health decided to plan for a new facility. The new accommodation is build as an annex to the National laboratory of Health and situated on the territory of the City of Dudelange. The facility has been explicitly designed to host radioactive waste by a specialized engineering office. Even though the collection centre only hosts properly packed transport barrels and disused radioactive sources, the legislative obligations for a category II facility, to which belong waste treatment and interim storage licensees have been applied. In addition, in order to fully satisfy the challenge addressed by the 5th review meeting, a further independent safety assessment for these new premises by foreign radiation protection experts is underway.

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

Siting, design, construction of a waste facility, and its assessment, is ruled by the law on Protection of the Public against the Hazards of Ionizing Radiation and its decrees, laid down in section E.

According to the legislative context, waste facilities may be classified as:

- Category I: for final repositories
- Category II: for treatment and interim storage for radioactive waste.

There is no category I facility in Luxembourg. The LCDR has been designed and built according to the category II requirements, although it only is a collection centre where no treatment takes place.

Any hypothetic further projects to build radioactive waste management facilities or facilities for the final disposal of radioactive waste are subject to prior authorization according to the procedures defined in Luxembourgish laws and decrees. According to these each applicant would have to demonstrate full compliance with articles 13, 14 and 15, which include studies on safety aspects, public consultation, suitable measures to limit possible radiological impacts, decommissioning plans and independent safety assessments.

Article 16: Operation of facilities

As stated under article 12, Luxembourg only operates a single waste collection facility. In order to guarantee a safe storage, the DRP regularly asks the foreign authorized inspection organizations for segregation and the 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 the absence of radioactive contamination on a yearly basis.

Article 17: Institutional measures after closure

The LCDR 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 severe accidents like fire or flooding 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 neighbour 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 labelled credit of the state budget has been introduced in order to cover such unpredictable 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 controlled by the competent authorities. The provisions of the ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Roads) and of the 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 may be valid for only a 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. This regulation addresses all the requirements laid down in Article 27 on the Joint Convention and is the transposition of the Council Directive 2006/117/EURATOM of 20 November 2006 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. Part of the licensing procedure aims at reducing the production of radioactive waste, which relies on the following principles:

1. Reduction of the amount of sealed sources in use

As part of the licensing procedure, the DRP verifies the justification of the use of a sealed source. The applicant must in particular demonstrate that no non-radioactive alternative is available. This also applies when a source needs to be exchanged at the end of the recommended lifetime. In several cases this policy has led to the replacement of sealed sources by X-Ray devices, such as for the control of the thickness of thin metal foils.

2. Reduction of the number of disused sources stored in Luxembourg through the systematic return of the sealed source to the supplier

The applicant must have a written commitment from the foreign supplier, in which the latter agrees to take back the source if disused. Several licensees still hold older disused sources where the supplier does no longer exist or never made any commitment and other solutions are needed. For recently installed sealed sources (approx. the last 15 years) the return to the supplier works in nearly all cases without delay, so that no interim storage is needed. Only in a very few instances a supplier tried to avoid the reacceptance.

3. Maintaining necessary documents

In the recent past it turned out in a few cases that the shipment back to the supplier was not possible because necessary certificates of the source (e.g. special form certificate) were expired. As a consequence the DRP now verifies the availability of all necessary documentation during its inspections. If necessary, the licensee is also asked to renew the reacceptance certificates.

4. Individual tracking of sealed sources by the DRP

The DRP holds a register with all sealed sources licensed in Luxembourg. The register contains the nuclide, the activity, the source number, the manufacturing date, the use of the source and data concerning the licensee.

If it turns out that the supplier is unable to respect his commitment of reaccepting the sealed source, 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 sources are sent back to the foreign supplier or to a foreign waste management facility, the user or holder must guarantee the safe interim storage of

the disused sources on his premises. Such interim storage needs to be licensed and follow provisions to be respected for the safe storage. The expenses related to the interim storage, to the conditioning, to the transport and to the final disposal of the radioactive waste are covered by the user or holder.

Use of sealed sources in education

In early 2014, the DRP has started a national campaign to collect the unused and/or unneeded radioactive sources and substances from schools. This action plan was taken in order to evacuate ancient collections of radioactive substances, often exempt from licensing, which however present a risk without serving for educational purposes.

After an enquiry phase in form of a questionnaire sent to the different schools in March, the first on-site visits and collections of orphan sources started in 2014. During these visits, a complete inventory is established for the school and all the disused radioactive substances and sources are evacuated. The remaining sources are then subject to issuing of a new licence (if required) in order to ensure compliance with the legislative requirements.

The action plan is still on-going and will be followed within the next months and the collected sources will eventually be disposed of.

Orphan sources

The DRP assumes the management of disused sealed sources for which a safe management may not be guaranteed, e.g. in case of bankruptcy of the owner of the source. This is also the case when members of the public still hold old historic disused sources. Those sources are then brought to the LCDR. At regular intervals, these sources are prepared for shipment and transferred in accordance with the bilateral agreement with Belgium to ONDRAF.

A list of all these sources is given in annex I.

Safety and security of sealed sources

The provisions of the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance on the Import and Export of Radioactive Sources were transposed into national regulations in 2006. Luxembourg also notified its efforts on that topic to the IAEA and expressed to the Director-General its support and endorsement of the Agency's efforts to enhance the safety and security of radioactive sources.

Section K: Planned activities to improve safety

Given the size of the country, Luxembourg does not experience any significant modifications from review meeting to review meeting. However Luxembourg considers the Joint Convention pair review as a highly valuable exercise. It allows a small country with a limited programme to gain insight into relevant issues in other countries. Besides the aspect of being reviewed, having frank and open discussions with qualified experts is extremely useful.

Luxembourg is determined to constantly consolidate, update and improve its dispositions with regard to the safety of radioactive substances. The process of self-assessment, when writing the national report every 3 years, supports such continuous improvement. Luxembourg commits itself to follow up the suggestions and challenges identified at the previous review meeting.

Furthermore, in order to fully assess the safety of radioactive waste management, Luxembourg requested an ARTEMIS peer review from the IAEA. As Luxembourg already hosts an IRRS mission in 2018, for which the legislative framework and the competent authority shall be assessed, the ARTEMIS mission is planned to be held subsequently to the IRRS mission in 2018.

At the 2015 peer review meeting, 4 challenges have been identified for Luxembourg. The present report addresses those challenges in the relevant sections. The table below summarizes the challenges and the way in which they are addressed.

#	Challenge	Solution
1	Updating of the bilateral agreement with Belgium on the management of radioactive waste from Luxembourg in Belgium (the existing agreement is not in line with the requirements of Directive 2011/70/EURATOM) – definition of responsibility are to be defined as part of the agreement negotiations - aim to be completed in June 2015;	The new bilateral agreement has been signed by the governments of both countries and is waiting for ratification (<i>see also section B</i>)
2	Transposition of the EU-BSS directive 2013/59/EURATOM – limited resource to complete;	A new legislative framework is underway (<i>see also section E - Article 18</i>)
3	Preparation for the first IRRS mission, including of waste management (scheduled for 2018);	An IRRS and ARTEMIS mission are foreseen in 2018 (<i>see also section K</i>)
4	Formalize safety assessment for the storage facility.	The initial conditions changed. A new building was designed and external assessment is foreseen for the new premises (<i>see also section H - Article 12</i>)

Table 2: Challenges from the 5th review meeting

Luxembourg has also started working on the issues that were presented in the previous national report as planned activities. These issues are summarized in the table below and their progress is indicated.

#	Activity	Progress
1	National campaign to collect the unused and/or unneeded radioactive sources and substances from schools	The campaign is still on-going as the workload is higher than expected. The end of the campaign is foreseen for 2018 (<i>see also section J</i>)
2	National programme addressing EU directive for the management of radioactive waste (deadline August 2015)	The national programme has been adopted in August 2015 (<i>see also section E - Article 19</i>)
3	Important contribution to the new European Approach for cross-border Emergency Preparedness (HERCA-WENRA work, adopted 21 October 2014.)	Luxembourg has been strongly involved in the development of the HERCA-WENRA approach and is still actively promoting its implementation.
4	First IRRS mission scheduled for 2018 - the report will be made public as per regulation.	Preparations are in progress.

Table 3: Progress of planned activities from the 5th review meeting

The DRP made its national reports and other relevant documents available to the public. In particular, the national reports, the questions and comments including the written answers, and the national reports of the two previous RM's are available on the Internet (direct link: <http://www.sante.public.lu/fr/espace-professionnel/radioprotection-cooperation/instruments-cooperation/joint-convention/index.html>).

After each RM, the DRP also publishes a small statement on the review process, summarising in particular the suggestions and challenges that have been identified.

Annex I - Inventory

Interim storage of radioactive waste stored on 1st October 2017 on 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

Table 4: Interim storage of radioactive waste stored on users' premises

Inventory of disused radioactive sealed sources stored on 1st October 2017 on users' premises (3 licensees).

Radionuclide	Number of sources	Total activity (GBq)
Am-241	18	635
Kr-85	13	26.64
Co-60	1	0.05
Cs-137	4	2.24
Total:	36	663,93

Table 5: Inventory of disused sources stored on users' premises

Inventory of disused radioactive sealed sources stored on 1st October 2017 at the LCDR. Items containing NORM are not included (chemicals and minerals containing NORM and some items containing Ra-226, together below 30 litres).

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	963	0.315
ICSD's	Ra-226	651	0.0037
Industrial source	Ni-63	1	0.37
Demonstration sources	H-3	3	0.481

Demonstration sources	Am-241	17	0.0024
Demonstration source	C-14	1	0.0092
Demonstration sources	Co-60	9	0.0050
Demonstration sources	Cs-137	8	0.0206
Demonstration source	Na-22	1	0.0002
Demonstration source	Sn-113	1	0.0004
Demonstration sources	Sr-90	8	0.001
Demonstration sources	Tl-204	3	0.0027
Demonstration sources	Th-232	87	0.0015
Demonstration sources	Ra-226	167	0.34
Demonstration source	Ra-226/Be	1	0.111

Table 6: Inventory of disused sources stored at LCDR

Annex II - Legislative framework

- 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.
- 93/1493/EURATOM - Regulation of 8 June 1993 on shipments of radioactive substances between Member States.
- 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 and 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 (2014).
- Grand-Ducal regulation of 3 March 2009 on the supervision and control of shipments of radioactive waste and spent fuel (transposition of Council Directive 2006/117/EURATOM of 20 November 2006).