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ICELAND

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

**National Report from Iceland
to the 7th Review Meeting
24 May to 4 June 2021**

This report was compiled by the Icelandic Radiation Safety Authority (IRSA)
on behalf of the Government of Iceland

List of Acronyms and Abbreviations

ADR	European Agreement concerning the International Carriage of Dangerous Goods by Road
ALARA	As Low As Reasonably Achievable
ALI	Annual Limit on Intake
CTBTO	Comprehensive Nuclear-Test-Ban Treaty Organisation
EURDEP	European Radiological Data Exchange Platform
IAEA	International Atomic Energy Agency
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
IEC	IAEA Incident and Emergency Centre
IRSA	Icelandic Radiation Safety Authority
IXP-NARAC	International Exchange Program - National Atmospheric Release Advisory Center
JC, Joint Convention	Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
NCA(A)	National Competent Authority (Abroad)
NCA(D)	National Competent Authority (Domestic)
NKS	Nordic Nuclear Safety Research
NNSA	US National Nuclear Security Administration
NORM	Naturally Occurring Radioactive Materials
RANET	IAEA Response and Assistance Network
RASSC	IAEA Radiation Safety Standards Committee
Regulatory Authority	Icelandic Radiation Safety Authority
TENORM	Technically Enhanced Naturally Occurring Radioactive Materials

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Section A Introduction

Iceland deposited an instrument of accession to the Joint Convention on 27 January 2006. There were no declarations or reservations attached to the instrument of accession. The Convention entered into force for Iceland on 27 April 2006.

The description in the reports submitted to previous review meetings is in all major respects still valid. For the sake of coherency and for presenting a readable overview, much of the text from the previous national reports is repeated here. Most of the text on changes and progress made since the 4th National Report can be found in Sections F, J and K. The main additional information since the last (5th) National Report concern

- traces of NORM found in pipe scalings at geothermal power plants (p. 6),
- the work in progress on the removal of old disused radioactive sources of relevance at The University Hospital where old radium needles no longer in active use are kept in a special secure underground storage. On request of Iceland, in January 2019 the IAEA concluded successfully a preparatory mission to Iceland for the management of the Radium-226 sealed source inventory of The National University Hospital of Iceland. A follow-up mission to condition the sources has been planned and will be carried out as soon as the pandemic situation allows (p. 22).
- two sealed sources have been given new categorisations. According to the registry of sources there is one source in category 1 and one source in category 2 in the country. Both are in use at the University Hospital (p. 15 and ANNEX I).

Also, reference to the EU COUNCIL DIRECTIVE 2013/59/EURATOM of 5 December 2013 replaces the previous EU Council Directive 96/29 Euratom of 13 May 1996.

These supplementary information are indicated by **bold** text in this report.

Section G covering Articles 4 - 10 of the Convention is not applicable to Iceland and is included in the structure of the report for the mere sake of completeness.

Iceland is a country that has no nuclear industry and no research reactor. Therefore many of the requirements of the Joint Convention do not apply to Iceland. There is no nuclear fuel or high level waste on Icelandic territory. **Out of the 83 Member States of the Joint Convention Iceland is by far the smallest nation. Only three other Member States have populations of fewer than 1M.**

The total amount of radioactive waste in Iceland is very low, due to the small size of the country, with a population of only 366.700 (30 June 2020), few users of radioactive material and requirements to have disused sealed sources sent back to the foreign supplier or to a foreign waste management facility.

Radioactive waste in Iceland originates mainly from the use of radioactive sources in medicine but also from uses in research, education and industry. The very low activity and volume of radioactive waste produced in Iceland does not justify a national final waste depository.

The first legislation in Iceland on radiation protection was passed in 1962 and has been revised periodically. The legislation covers all relevant radiological safety issues. The latest major revision took place in 2002, Act 44/2002, with the aim of harmonizing the Icelandic legislation in the field of radiation protection and its implementation with the Directives of the European Union in the field of radiation protection and their implementation. Iceland is not a member of the European Union and

the Directives of the European Union in the field of radiation protection have no legal bearing in Iceland. A minor revision to the radiation protection Act was made in April 2008 and became effective 1st January 2009. The latest revision of the Act was made in December 2013 and became effective 1st January 2014.

The present report is the 6th Icelandic national report and is presented to the 7th Review Meeting to the Convention that starts on 24 May 2021 at the IAEA in Vienna. The report was prepared by the regulatory authority, the Icelandic Radiation Safety Authority, at the request of the Ministry for Foreign Affairs in Iceland.

The aim of this national report is to demonstrate that Iceland meets its obligations of the Joint Convention. The report is laid out in conformity with the requirements set in the IAEA Information Circular INFCIRC/604/Rev.3 as applicable.

Section B Policies and Practices

Article 32.1: Reporting

No changes have been made to the framework described in the previous report and the conditions described remain the same, the text in this section is thus unchanged.

Iceland has no nuclear reactors, no nuclear fuel processing facilities and no such operations are foreseen. Thus, there is nothing to report in relation to spent fuel management (Article 32.1 (i) and (ii)).

Radioactive Waste Management Policy

Radioactive waste is regulated within the framework of the Act on Radiation Protection and regulations on radiation protection based on the Act.

Radioactive waste management policy in Iceland is based on the practical needs of the country. The very low activity and volume of radioactive waste does not justify a national final waste depository. There is a requirement that disused sealed sources can be returned to the country of origin, or, disposed of in another legal way accepted by the Regulatory Authority unless they can be stored under secure conditions until decayed before a licence to import and use is granted.

Radioactive Waste Management Practices

The procedure for a disused source is for it to be returned to the country of origin. Some sources that have been taken out of usage are however kept by their licensed owners in an interim storage. If no further use is foreseen and/or the storage conditions do not meet the requirements set by the radiation protection Act and regulations (e.g. with regard to safety and the security of the source(s)), then the Regulatory Authority can send the source for disposal at the owner's expense. In case the owner can not cover the expense i.e. due to bankruptcy the authority will bear the cost. The Icelandic Radiation Safety Authority stores a few low-activity sources for licensed owners. Most of these sources are disused sources from schools, where experiments involving radioactivity have been removed from the curriculum. In addition, the Regulatory Authority stores a few low-activity sources that previously were stored at the University of Iceland.

Buyers of sealed sources are required to ensure that the imported source can be returned before a licence is granted to import and use a radioactive sealed source.

The use of open sources is mainly in the medical sector. A few laboratories outside the medical sector use very limited amounts of radionuclides for research. The procedures for the handling of open sources, including releases, are outlined in the users' licences. Wastes are generally stored on the licencees' premises until they decay below clearance level.

There have been very few cases of identified orphan sources in Iceland, in all cases these have been low activity sealed sources.

Before the last JC Review Meeting traces of NORM had been found in scalings in specific parts of piping installations at two geothermal power plants in south-west Iceland. The scalings from one of the power plants (Hellisheiðarvirkjun) are a minor issue as the only isotope found is Po-210 (with a half-life of 138 days) in small quantities and it only takes a couple of years for the activity to reach below the limit (1 Bq/g). The other power plant (Reykjanesvirkjun) is working on a permanent waste management solution. The scalings can amount up to some tons per year (about

one cubic meter per year) when the borehole pipes are cleaned. The isotopes found are at the bottom of the U-238 chain, Pb-210 and its daughters with an atypical ratio of Po-210/Pb-210, the activity of Po-210 being 2-4 times higher than that of Pb-210. Due to the half-life of Pb-210 and the concentrations in question the waste will need to be stored for more than 100 years for the activity to reach below the limit (1 Bq/g). The owner of the power plant has been given a temporary licence to store the scalings on site until a suitable waste solution is found. After this discovery IRSA has measured scaling from all the major geothermal power plants in Iceland and only the two power plants mentioned above have been found to produce these radioactive scalings.

Criteria used to define and categorize radioactive waste

The definition and classification of radioactive waste in Iceland is in line with IAEA definitions and classifications.

Requirements and limits regarding the handling and disposal of radioactive sources are further specified in national regulations no. [809/2003](#) and [920/2003](#) (open sources) and regulation no. [1298/2015](#) (sealed sources). Exemptions from the requirements of the Icelandic Act on Radiation Protection with respect to specific and total activity of material handled are covered under Article 7 of the Act and corresponding guidelines issued by IRSA, GR-19:04. **These are based on the 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 IAEA publication Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA SAFETY STANDARDS SERIES No. GSR Part 3 (2014).** The directive has no legal standing in Iceland, but it was used as a reference to ensure consistency in requirements with EU countries. Practices may also be exempt if doses will under all circumstances not exceed prescribed values.

The table below gives an overview of the national radioactive waste management policy.

Type of Liability	Long-Term Management Policy	Funding of Liabilities	Current Practice / Facilities	Planned Facilities
Spent Fuel	N/A	N/A	N/A	N/A
Nuclear Fuel Cycle Wastes	N/A	N/A	N/A	N/A
Application Wastes	Decay	Licencee State budget	Decay	N/A
Decommissioning	N/A	N/A	N/A	No facilities planned
Disused Sealed Sources	Return to supplier	Licencee State budget	Return to supplier Interim storage	No facilities planned

Table 1. National Waste Management Policy

Section C Scope of Application

Article 3: Scope of application

There are no changes from the previous report in this section. The report does not apply to the safety of spent fuel management since Iceland has no nuclear facilities.

Iceland has not declared waste that contains only naturally occurring radioactive material as radioactive waste for the purpose of this Convention.

Iceland has no military or defence programmes that produce radioactive waste.

As Iceland has no nuclear installations this report does not apply to the safety of spent fuel management.

Section D Inventories and Lists

Article 32.2: Reporting

Spent Fuel Management Facilities and Inventory of Spent Fuel

Iceland is a non-nuclear country and has no spent fuel facilities subject to the Convention.

Radioactive Waste Management Facilities

Disused sources are stored, under the control of the Regulatory Authority, on the users' premises until decayed or shipped to a foreign radioactive waste management facility. The Regulatory Authority stores a few low-activity disused sealed sources for which safe management may not be guaranteed otherwise, as described on page 5 of this report.

Inventory of Radioactive Waste

The competent authority operates a database of all radioactive sealed sources in Iceland. The content of the database used is similar to the content of the database proposed to be used in the EU for high activity sources.

No nuclear facilities have been installed in Iceland and thus no such facilities need to be decommissioned.

Research laboratories in Iceland (outside the medical field) are few and use very limited amounts of radionuclides. In total, eight licencees use open radioactive sources. These are:

- One independent research service using Lu-177
- The Marine Institute using C-14
- The University of Iceland using C-14, S-35 and P-32
- One independent radiology service using Mo-99/Tc-99m
- Different research and medical faculties of the University Hospital using I-125, F-18, Ra-223, Cs-137, Cr-51, I-123, I-131, Ga-67, In-111, H-3 and Mo-99/Tc-99m
- IRSA has a licence for the use of weak calibration sources.

Lists of sealed sources in storage and in use are provided in Annex I.

Section E Legislative and Regulatory System

Article 18: Implementing Measures

The Act on Radiation Protection of 18 April 2002 constitutes the legal basis for regulating the use of ionizing and non-ionizing radiation, radiation protection requirements, medical use of radiation, emergency planning, waste management and discharges to the environment.

The objective of the Act is to ensure adoption of the necessary safety measures to protect against radiation from radioactive materials and radiological equipment and to limit the detrimental effects of such radiation. An effort shall be made to ensure that all exposure to radiation resulting from any practice covered by this Act shall be as low as reasonably achievable, taking into account economic and social factors.

The objectives of the Act shall be attained through specific measures, for example the inspection of radioactive materials and radiological equipment, studies and research, monitoring of radioactive substances in the environment, measures against radiological emergencies, and through education and guidelines on radiation protection. The Act applies to:

- safety measures against ionising radiation in respect of any practices that could cause a risk of radiation exposure to persons, for example, the production, import, export, delivery, possession, installation, use, handling and disposal of radioactive substances and radiological equipment;
- safety measures against ionising radiation in practices that result in increased levels of natural radiation in the environment;
- safety measures against ionising radiation from radioactive substances and radiological equipment insofar as this is not governed by other legislation pursuant to international conventions;
- monitoring and research in respect of radioactive substances in the environment and foodstuffs;
- radiological aspects of measures concerning radiological and nuclear emergencies.

The Icelandic Radiation Safety Authority is an authority under the auspices of the Minister of Health. The Authority's role is to implement safety measures against radiation from radioactive substances and radiological equipment.

Minor amendments to the Act were approved by the parliament in April 2008 and became effective as of 1 January 2009. These amendments mainly involved clarifying wording in a few clauses. The main change relevant for this report is that previously it could be deduced that export of radioactive substances would require a licence, now it is clearly stated. The wording concerning emergency preparedness was also made clearer, a reference to analysis of threats was added as well as coordination of emergency preparedness planning with internationally accepted practices.

Further amendments to the Act were approved by the parliament in late 2010 and became effective as of 1 January 2011. This amendment is not relevant for this report since it addressed a general ban for young people under 18 using commercial sunlamps.

Following Iceland's application for membership of the European Union the legislation was reviewed and compared with the EU Acquis (the application has since been withdrawn). Based on the review, a bill to change the Act on radiation protection with the aim of harmonizing further towards the EU

Acquis was submitted to the parliament in the autumn of 2013, adopted in December 2013 and became effective as of 1 January 2014.

In addition, the following acts apply:

Act #[20/1972](#) on the prohibition of release of dangerous materials to the ocean

Act #[32/1986](#) on the prevention of marine pollution

Act #[33/2004](#) on the prevention of pollution of the coast and the ocean

Article 19: Legislative and Regulatory Framework

Regulations

The regulations on radiation protection and use of radiation issued in 2003, based on the act on Radiation Protection of 18 April 2002, have been revised in 2015 following the most recent amendment to the Act. Revised regulations were issued by the Ministry of Health in December 2015 and entered into force in January 2016. The most important change is in relation to inspections carried out by the Authority. Previously the frequency of inspections was determined in the regulations of 2003 but in the new regulations the decisions on frequency and scope of inspections is determined by the Authority. By this change the Authority is effectively independent in its regulatory decisions.

The main regulations currently in force are the following:

- Regulation #[1299/2015](#) deals with radiation protection in the use of X-rays
- Regulation #[1298/2015](#) covers the use of sealed sources
- Regulation #[1290/2015](#) covers limits of exposure
- Regulation #[809/2003](#) with amendment #[920/2003](#) covers the use of open sources
- **Regulation #[738/2003](#) on waste landfill, which prohibits the disposal of radioactive waste in landfill**

Details regarding regulation of radioactive waste are found in the relevant regulations and further developed by the regulatory authority through guidelines and requirements in licences.

The regulatory body has issued several guides, in particular related to radiation protection in medical applications.

Licensing and enforcement

The production, import, ownership, use, storage, delivery or disposal of radioactive substances, whether pure, mixed with other substances or installed in equipment, are subject to licensing by the Icelandic Radiation Safety Authority. The granting of licences is subject to conditions set out by the Institute, including provisions governing the handling of radioactive substances at the end of their use.

The Act on Radiation Protection itself requires that a Licence must be obtained for radioactive substances, unless the quantity or concentration is below the exemption limits or the substance is in a product that has been approved (e.g. ionising smoke detectors) or defined as not being of concern (e.g. old radio luminescent watches).

A Licence is not required in respect of radioactive substances if their total content or concentration per mass unit is under the exemption limits as determined by the Icelandic Radiation Safety Authority. **Exemptions from the requirements with respect to specific and total activity of material handled are covered under Article 7 of the Act. Corresponding guidelines, GR-19:04 were issued in**

October 2019. These are based on 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 IAEA publication Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA SAFETY STANDARDS SERIES No. GSR Part 3 (2014)

A Licence can be suspended, modified or revoked. If the offence is serious, then the Act states that a breach of the provisions of this act is subject to fine or imprisonment for up to 2 years, unless other law stipulates more severe penal action. No such serious offence has been discovered.

Article 20: Regulatory Body

The Icelandic Radiation Safety Authority

Legal foundation

As defined in the Act on Radiation Protection, the regulatory authority (the competent authority) is the Icelandic Radiation Safety Authority (IRSA) which is a governmental authority under the auspices of the Minister of Health.

Independence of the regulatory authority

Actions to strengthen the effective independence of the Authority have been taken following an IAEA advisory mission to Iceland in 2014 to review the regulatory infrastructure. In particular the Authority now decides on frequency of inspections but before this was decided in a regulation issued by the Ministry of Health. The Authority is now effectively independent in its safety related decision making.

Mandate, mission and tasks

The Authority's role is to implement safety measures against radiation from radioactive substances and radiological equipment.

The Authority regulates matters concerning radiation protection, nuclear safety and security, nuclear and radiological emergency preparedness and radioactive waste.

Authorities and responsibilities

The Icelandic Radiation Safety Authority is responsible for (as defined in the revised Act effective 1 January 2009):

- monitoring and supervising the implementation of this Act and its implementing rules and regulations;
- any inspections and research deemed necessary pursuant to this Act and its implementing rules and regulations;
- monitoring workers' exposure to ionising radiation, and maintaining a dose register of the results of the dose estimates for every worker;
- regular assessment of the total ionising radiation exposure of the general public from practices under this Act;
- regular assessment of patients' exposure to ionising radiation from practices under this Act;
- monitoring and researching radioactive substances in foodstuffs and the environment;
- courses in radiation protection for workers who work with radiation, as well as dissemination of information to the general public and the mass media;
- research in the field of radiation protection;

- the radiological part of measures concerning all types of radiation emergencies, including analysis of threats, coordination of emergency preparedness with internationally accepted practices, the operation of emergency response and radiation measuring systems, and other measures relating thereto;
- dosimetric activities appropriate for meeting the need arising from the use of ionising radiation in Iceland;
- collaborating with foreign institutions in relation to radiation protection and nuclear issues.
- other factors pertaining to the implementation of this Act, and other projects in the field of radiation protection in accordance with further decisions thereon by the Minister.
- The Minister may request the Institute to address certain matters or projects relating to its duties under this Act.

Organizational structure of the regulatory body

The organisational structure of IRSA is flat, with work being carried out through projects and tasks, each under the leadership of a staff member. Each group of related activities, such as inspections, emergency preparedness etc., is lead by a member of staff having an over-all coordinating responsibility. The director is in charge of the management of the Authority. He shall see to it being operated in accordance with existing laws and regulations at all times and is responsible for its daily operation. The minister appoints the director of the Icelandic Radiation Safety Authority for a term of five years at a time.

Human and Financial Resources

IRSA has a staff of 10 of which 8 are technical experts with an academic background. The staffing situation has not improved over the past six years despite a significant increase in scope of activities.

Extensive participation in Nordic and international cooperation in the field of scientific projects, emergency preparedness and radiation protection is an important factor in maintaining competence of staff. All staff members are effectively encouraged to seek continuous education.

The funding from the government and other income i.e. fee for inspections and authorizations, is barely sufficient to ensure that the Authority can fully carry out its regulatory activities in accordance with the legislation.

Quality Management System

The Icelandic Radiation Safety Authority holds for all its operations an ISO 9001:2015 certification by the British Standards Institution (FS 540268). The quality system provides a framework for the various tasks the Authority needs to perform, e.g. dealing with incidents and accidents.

Section F Other General Safety Provisions

Article 21: Responsibility of the License holder

There is no spent fuel or radioactive waste in Iceland in terms of the JC. The following applies to licencing for the handling of radioactive substances in general:

The prime responsibility for the safe management of radioactive sources including radioactive waste management rests with the licensee according to the Act on Radiation Protection. This includes the responsibility to ensure that disused sealed sources are handled in a safe manner and returned to the manufacturer/supplier or disposed of in another legal way accepted by the Regulatory Authority. According to paragraph 12 of the Act, *the storage and disposal of radioactive substances shall always take place in accordance with the rules set by the Icelandic Radiation Safety Authority. The same applies to other waste, equipment or packaging which contains or is contaminated by radioactive substances.* The paragraph also states that *the Icelandic Radiation Safety Authority shall be notified when an instrument or equipment capable of producing ionising radiation is finally taken out of use. For as long as equipment contains radioactive substances or is capable of producing ionising radiation, it shall be kept in safe storage, and shall be safeguarded in accordance with the rules established by the Minister pursuant to Section 10, paragraph 4. The Radiation Safety Authority is authorised to demand the disposal or removal of radioactive substances and radiological equipment no longer in use. If the Authority's demands on disposal or removal are not met within a specified deadline, the Institute may carry out such actions at the owner's expense.* If the licence holder is in financial difficulties or out of business then the authority may take responsibility for safe disposal of the source.

Licensing and enforcement

The production, import, ownership, use, storage, delivery or disposal of radioactive substances, whether pure, mixed with other substances or installed in equipment, are subject to licensing by IRSA. The granting of licences is subject to conditions set out by the Institute, including provisions governing the handling of radioactive substances at the end of their use.

The Act on Radiation Protection itself requires that a licence must be obtained for radioactive substances, unless the quantity or concentration is below the exemption limits or the substance is in a product that has been approved (e.g. ionising smoke detectors) or defined as not being of concern (e.g. old radio luminescent watches).

A Licence is not required in respect of radioactive substances if their total content or concentration per mass unit is under the exemption limits as determined by the Icelandic Radiation Safety Authority. **The exemption limits determined are consistent with the 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 IAEA publication Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA SAFETY STANDARDS SERIES No. GSR Part 3 (2014).**

A Licence can be suspended, modified or revoked. If the offence is serious, then the Act states that a breach of the provisions of this act is subject to fine or imprisonment for up to 2 years, unless other law stipulates more severe penal action. No such serious offence has been discovered.

Any application for a new activity that involves radiation needs to be supported by a plan ensuring safety and security, and no licence is granted without IRSA's review and approval of these plans. A graded approach is used. Most licencees are in medical diagnostic radiology and most radioactive sources are category 4 or 5. For stronger sources IRSA can set specific requirements for detailed site-specific emergency preparedness plans addressing both safety and security aspects.

Article 22: Human and financial resources

Article 22 (i) and (ii) do not apply to Iceland.

Human and Financial Resources

All licence holders are required to ensure the proper training and retraining of personnel and no licences for the use of sealed or open sources are granted without confirmation of the users' appropriate training and education in radiation protection. IRSA can set specific requirements in this regard. All licencees are subject to the approval of IRSA (Regulation no. 1298/2015 on the use of sealed sources, Regulation no. 809/2003 with amendment 920/2003 on the use of open sources).

Article 23: Quality Assurance

Quality Assurance

A review of the licencee's local plans for on-site emergency preparedness and response is part of the licencing and inspection process. Any application for a new activity that involves radiation needs to be supported by a plan ensuring safety and security, and no licence is granted without IRSA's review and approval of these plans.

A graded approach is used. Most licencees are in medical diagnostic radiology and most radioactive sources are category 4 or 5. For stronger sources IRSA can set specific requirements for detailed site-specific emergency preparedness plans.

In the inspection of licencees, IRSA focuses on the assessment of the quality management system of the licencee and the review of the quality management system and the safety measures including on-site emergency preparedness and response plans is part of the inspection process. IRSA provides advice and recommendations to applicants as required.

Article 24: Operational radiation protection

All who have radioactive sources in interim storage hold a licence to own and use such sources and are subject to the terms of the Icelandic radiation protection Act, relevant regulations, and regular inspections. This includes keeping the sources in a safe and secure storage, assuring that the doses to workers and the public are below the limits given in regulation (which is consistent with the recommendations of the ICRP and EU directives). Furthermore, the principle of ALARA must be applied (paragraph 13).

Releases from laboratories must be as low as reasonably achievable and within the limits set in regulation 809/2003 on radiation protection in the use of open sources (this is based on publication *Application in the Nordic countries of International Radioactive Waste Recommendations* and requires the total amount in a single release through a given route of disposal by a licensed user to be no more than 2.5 ALI and the total monthly release to be less than 25 ALI. Since the laboratories apply the ALARA principle and store waste for decay whenever possible, the actual releases have in practice been far below these limits by all laboratories. The only exception is the medical use of radionuclides, for which the limits above do not apply.

Each laboratory using radionuclides is required to report amounts of radionuclides purchased each year, this is checked against corresponding information from importers. Additional information is

obtained from the users concerning the use in medical establishments administrating radiopharmaceuticals.

Article 25: Emergency Preparedness

General

Radiological emergency preparedness and response in Iceland is based on the safety standards of the IAEA and the IAEA framework for emergency preparedness and response. The nearest nuclear power plant is more than 1000 km away from Iceland. Therefore a nuclear accident in a power plant is very unlikely to have a significant health effect in Iceland. An accident in a nuclear powered vessel close to Iceland or the re-entry of a nuclear powered satellite could have significant effects in a restricted area. Malevolent acts may affect Iceland, even if they would not be directed against the country, since the country is a hub for many types of transports (passengers and goods) over the North Atlantic.

Experts from IRSA have observed and participated actively in various exercises abroad. Iceland participated in the CONTEX 2016 and CONTEX 2018 exercises in Denmark. An overall emergency management plan for CBRNE events has been finalised and is in the implementation phase. The emergency management plan is the joint effort of the Department of Civil Protection and Emergency Management of the National Commissioner of the Icelandic Police, the National University Hospital, the Directorate of Health, the Icelandic Met Office, The Icelandic Food and Veterinary Authority, the Environment Agency, the Iceland Construction Authority and the Icelandic Radiation Safety Authority, with active involvement of other relevant stakeholders.

IRSA maintains a comprehensive registry of radioactive sources in Iceland based on the IAEA categorization of sources. **According to the registry there is one source in category 1 and one source in category 2 in the country. Both are in use at the University Hospital.** Since there is no nuclear industry in Iceland and due to the limited use of radioactive sources it is difficult to envision a domestic radiological emergency requiring more than an on-site response. There is a classification of situations in the generic emergency plans in use, and they are being revised and harmonised as possible with the classifications used for emergency situations in general in Iceland. This work is carried out by the Department of Civil Protection and Emergency Management of the National Commissioner of the Icelandic Police with IRSA in an advisory capacity.

The radiation protection Act states that the licensee is responsible for organizing local plans to deal with on-site emergency preparedness and response. The licensee is also responsible for informing IRSA immediately in case of a radiological emergency, for making initial estimates of potential consequences and for doing what is possible to minimize these.

The objective of the IRSA is to be able to deal with any radiological situation (incl. rumours, incidents and accidents), in cooperation with other authorities as appropriate, and to minimise possible harmful effects as possible. With no specific nuclear threat to Iceland, the emergency response is generic in structure based on the IAEA framework, taking into account but not limited to a set of predefined scenarios. The aim has also been to lower the threshold, to be able to respond to any radiation related situation that might be of public concern, whether it poses a significant health risk or not. This can e.g. include responding to false rumours that might cause public concern and could subsequently have societal and economical effects.

The National Competent Authority

IRSA is the National competent authority for nuclear emergencies Abroad (NCA(A)) as well as Domestic (NCA(D)) in terms of the Convention on Early Notification of a Nuclear Accident.

In the radiation protection law it is stated that IRSA is responsible for, amongst other things, the radiological part of measures concerning all types of radiation emergencies, including analysis of threats, coordination of emergency preparedness with internationally accepted practices, the operation of emergency response and radiation measuring systems, and other measures relating thereto.

The national nuclear and radiological emergency preparedness in Iceland is being integrated with other fields of emergency preparedness. This is reflected in the Act no. 82/2008 on civil protection, according to which the director of IRSA is a member of the National Committee for Civil Protection and Safety. The integration is carried out by the Department of Civil Protection and Emergency Management of the National Commissioner of the Icelandic Police. IRSA has also a member in the committee on infectious diseases, set up in accordance with law no. 19/1997. This committee has the role of coordinating response against threats to public health.

Interaction between IRSA and other authorities are defined in terms of harmonised response plans, using the framework developed at the Department of Civil Protection and Emergency Management of the National Commissioner of the Icelandic Police.

Early warning

Iceland has ratified the Convention on Early Notification of a Nuclear Accident.

Effective and fast low-threshold exchange of information has been made possible through close cooperation with the other Nordic countries. A high-level working group on emergency preparedness has been instrumental in this, e.g. by preparing a manual on response activities and information exchange.

Gamma monitoring stations

IRSA operates a network of 4 gamma monitoring stations in cooperation with the Icelandic Meteorological office. The data from the stations are combined with meteorological data to aid assessment. Given the size of Iceland and the distance to other countries having spent fuel and radioactive waste management facilities, these 4 stations should be sufficient to detect a plume coming from another country. The locations of the stations are shown in Fig. 1.

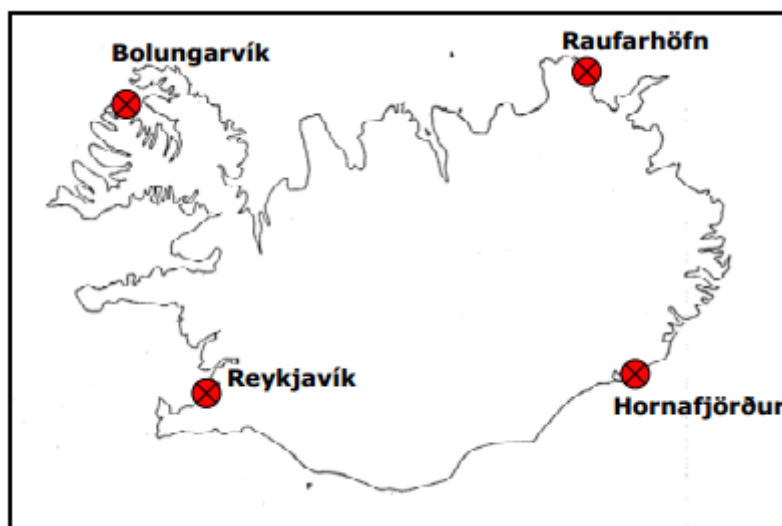


Fig. 1 Locations of gamma monitoring stations in Iceland

These data are accessible by the European Radiological Data Exchange Platform (EURDEP) system. In case of a nuclear incident in Europe, Iceland would access real-time EURDEP data.

High volume aerosol samplers

The regulatory authority also operates an automatic high-volume air sampling station (>500 m³/h) in the network of the Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO). Even though these are not real-time results, they are very useful for assessing possible effects of suspected releases, which could result in low air concentration in Iceland, but which might nevertheless be of concern. IRSA has also a mobile high volume (>100 m³/h) aerosol sampler that can be utilised to assess specific situations where needed.

Capability to detect and analyse radioactivity

Three sets of sensitive gamma spectrometric mobile systems are currently in use in Iceland, as a part of cooperation with the US National Nuclear Security Administration (NNSA). The systems can be operated from planes, cars, or in a stationary mode. IRSA has also co-operated with the NNSA by testing its analytical services (TRIAGE system) by a non-US user. The IXP-NARAC system is used to assess potential atmospheric distribution of radionuclides. IRSA staff have received extensive training by NNSA in the use of these equipment by NNSA on a yearly basis.

Exercises and regional cooperation

Maintaining competence in emergency preparedness and response is a challenge for a small non-nuclear country such as Iceland. The solution adopted is to be actively involved in international cooperation and exercises.

Information exchange exercises between the Nordic countries are performed on a routine basis, a few times per year. Iceland also participates in international exercises i.e. ConvEx exercises organized by the IAEA. Experts from IRSA have observed and participated in exercises abroad, i.e. in Finland, Sweden, Denmark and in the US. Exercises of specific parts of the response functions (functional exercises) involving other authorities in Iceland have been performed.

Nordic cooperation

The radiation safety authorities in the Nordic countries (Denmark, Finland, Iceland, Norway and Sweden) have cooperated closely for decades, including radioactive waste management. A part of this cooperation is the *Nordic Nuclear Safety Research* (NKS, www.nks.org), which has supported joint Nordic research and seminars. The director of IRSA is the current chairman of the Board of NKS. Examples of recent Nordic activity with Icelandic involvement include:

- RADSHIELD (2017) - Activity estimation of shielded or hidden radionuclides in emergency conditions
- RINFOR (2018) - Development of a Resource for the Improvement of National Nuclear Forensics Gamma Spectrometric Core Capabilities
- AUTOMORC (2018) - Improvement of automatic methods for identification of radioactive material out of regulatory control (MORC) by mobile gamma spectrometric search
- RADSHIELD 2 (2018) - Activity estimation of shielded or hidden radionuclides in emergency conditions: Impact of environmental conditions
- SHIELDMORC (2019) - Detection distances and methods to locate orphan gamma radiation sources in shielded building geometries by mobile gamma spectrometry.

HERCA

HERCA (www.herca.org) is a voluntary association of the *Heads of European Radiological Competent Authorities*. Lessons learned after Fukushima are an important part of the work and HERCA has a working group on emergencies chaired by Luxembourg, which has been given the task to identify the most urgent needs for further harmonisation of European response to faraway events and propose practical solutions. Iceland is actively taking part in the work of HERCA, with the director of IRSA being the past chairman of HERCA.

CTBTO

The Comprehensive Nuclear-Test-Ban Treaty Organisation (CTBTO) has a very powerful worldwide network of air samplers, one of which is located in Reykjavik, Iceland and is operated by IRSA. The station would play a key role in detecting airborne traces of contamination from radioactive waste or spent fuel.

IAEA

The IAEA safety standards are at the core of the current radiation emergency response plans in Iceland, as well as the new plans now being developed using the general framework for response. The close cooperation of the Nordic countries, e.g. concerning low threshold notification of incidents, is based on the framework provided by the IAEA. For Iceland, the IAEA provides the framework for international cooperation for dealing with radiation emergencies. Iceland is registered with the RANET network and takes part in exercises in the request for and provision of assistance in case of radiological emergencies. Iceland is actively taking part in the work of IAEA, with the director of IRSA being a past chair of RASSC.

Article 26: Decommissioning

This article does not apply to Iceland. No nuclear facilities have been installed in Iceland and thus no such facilities need to be decommissioned.

Section G Safety of Spent Fuel Management

Articles 4 – 10

Iceland has no nuclear fuel cycle. Articles 4 – 10 of the JC do not apply to Iceland.

Section H Safety of Radioactive Waste Management

Article 11: General Safety Requirements

Article 12: Existing facilities and past practices

All those who have a licence from the Regulatory Authority to own and use radioactive substances are required to justify their use and keep their stock to the minimum necessary. The licensed user is responsible for that all those who handle waste do it according to accepted procedures, which have to be based on accepted practices within radiation protection and in accordance with the Icelandic Act and regulations on radiation protection. Every user is required to have an appropriate quality system. Regular inspections by the Authority include checking the records of radionuclide use and waste generation. Where appropriate (e.g. in medical use of radionuclides), the licensed user is responsible for that radiation safety issues are integrated with other safety issues that need to be taken into account (e.g. biological and chemical).

The Regulatory Authority has taken over a few low activity sources for long term storage as described on page 6 of this report. These sources are kept in locked safes in a storage room at IRSA and are subject to the same requirements as radioactive sources in storage elsewhere. The storage of these sources is subject to internal and external audit as a part of IRSA's ISO 9001:2015 certified quality system.

OSPAR

Iceland is party to the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention).

ANNEX 1, Art. 1 of the OSPAR Convention stipulates:

4. When adopting programmes and measures in relation to radioactive substances, including waste, the Contracting Parties shall also take account of:

- (a) the recommendations of the other appropriate international organisations and agencies;
- (b) the monitoring procedures recommended by these international organisations and agencies.

ANNEX II, Art. 3 of the OSPAR Convention stipulates:

(a) The dumping of low and intermediate level radioactive substances, including wastes, is prohibited.

Articles 13 to 17

At present, Iceland has no plans for constructing a waste management facility. If any plans were considered necessary, Iceland would, beginning in the planning phase and continuing all through the

project, take due account of its obligations according to the Joint Convention as well as applicable Icelandic legislation and regulations.

Section I Transboundary Movement

Article 27: Transboundary Movement

The shipment of radioactive sources to and from Iceland is subject to the international requirements concerning transport of dangerous goods. The main method of transport is by air cargo.

Iceland does not import any radioactive waste and it is not the State of origin of any radioactive sources. The only transboundary movements involving Iceland are thus shipments of disused radioactive sources, normally sent to their State of origin.

According to the radiation protection Act and regulation 1298/2015, an owner of a source needs to have the approval of the Regulatory Authority before disposing of a source. Furthermore, the amendment made to the radiation protection Act, that became effective 1 January 2009 makes the export of radioactive substances is subject to a licence from the Icelandic Radiation Safety Authority. Such a licence will only be granted provided the requirements of Article 27-1 are met. Carriers operating between Iceland and other countries are subject to international regulations on the shipment of dangerous goods. There has never been a shipment of radioactive waste from Iceland to a destination south of latitude 60 degrees south and no such shipment would be allowed.

The Regulatory Authority has increased cooperation with the Icelandic Directorate of Customs; this includes the ability to detect and find radioactive substances.

The *Code of Conduct on the Safety and Security of Radioactive Sources, and supplementary Guidance on the Import and Export of Radioactive Sources* (IAEA/CODEOC/2004) is adhered to in the legal framework. The provisions of ADR, ICAO and IATA regarding the transport of dangerous goods are applicable on Icelandic territory.

Section J Disused Sealed Sources

Article 28: Disused sealed sources

The Ministry of Health and Social Security has issued Regulation No. [1298/2015](#) on radiation protection in use of sealed sources. The Radiation Protection Act of 2002 and this regulation implement the obligations under Article 28 of the Joint Convention ensuring that possession, storage and disposal of disused sealed sources take place in a safe manner. It is the responsibility of the license holder to ensure that disused sealed sources are handled in a safe manner and returned to the manufacturer/supplier or disposed of in another legal way as stated in section F.

All facilities where sealed sources are used or stored are inspected by the Regulatory Authority every 2 – 4 years in order to ensure that the use and storage of these sources is in accordance with the legislative framework and requirements in the licenses.

No manufacturing or remanufacturing of sealed sources takes place in Iceland.

The Regulatory Authority has encouraged licensees to dispose of their unused sealed sources by sending them back to the manufacturer and it has provided some assistance where needed. The close contact and co-operation with users has resulted in that all disposal has been reported and done in consultation with the Regulatory Authority, not only the disposal of high activity sources.

In case of orphan sources, the procedure is for the Regulatory Authority to take control of the source, to ensure its safe storage and find the owner if possible.

A legal action may be taken towards the owner if circumstances warrant such an action. Orphan sources are very rarely identified in Iceland. There have only been very few cases over the last years, and in all cases involving low activity sealed sources.

The Regulatory Authority has in use a sensitive mobile gamma spectrometric system that can be mounted in vehicles of most kinds and is capable of detecting weak gamma emitting sources. This greatly enhances the capability of the authority to find orphan sources. The Directorate of Customs and the Coast Guard also have identical systems that are used for routine surveys and can be deployed for special use, e.g. should the need arise for a search for an orphan source. These systems are complemented by backpack systems with gamma and neutron detection capabilities, for search in less accessible and indoor locations.

Section K General Efforts to Improve Safety

For reasons outlined in this report Iceland has not identified safety issues of special concern related to radioactive waste management justifying plans for new costly or extensive activities beyond the current practices.

A strong feature in safety management in Iceland is the close cooperation between emergency response parties. This has evolved from the country's history of dealing with natural disasters. A National Rescue Center is activated and specialists in each kind of situation are called in when needed. The Department of Civil Protection and Emergency Management of the National Commissioner of the Icelandic Police is responsible for the general coordination of the activities, which will typically involve the Coast Guard, the Directorate of Customs, the Police, the Fire and Rescue Service, the Association for Service and Rescue, Emergency-Alert 112, the respective departments of the University Hospital, the Directorate of Health, the Meteorological Office, the media, and IRSA, to name a few.

IRSA continues to strengthen its collaboration with the national emergency response parties, in particular through training and exchange of information. The Coast Guard operates the National Rescue Center in Reykjavik: a 24-hour desk, and serves as the National Warning Point (NWP) with direct communication channels to IRSA. Communication tests are performed on a regular basis. The Coast Guard operates the Maritime Traffic Service and consults with IRSA in case of marine traffic involving the transport of radioactive waste in Icelandic waters. The Department of Civil Protection and Emergency Management of the National Commissioner of the Icelandic Police has participated actively in several national, regional and international exercise and training activities related to the safety of e.g. radioactive waste under the supervision of IRSA.

The EU Directive 2013/59/Euratom of 5 December 2013 on the control of high-activity sealed radioactive sources and orphan sources has no legal bearing in Iceland, but its requirements were taken into consideration when the regulations on the use of sealed radioactive sources were written.

The requirements of the new EU BSS are taken into consideration in the revised regulations concerning use of sealed sources that entered into force in December 2015.

Long term storage and disposal of old disused radioactive sources can be a challenge, especially for non-nuclear countries with very limited amounts of radioactive waste. Such sources can often not be returned to the manufacturer, and if a cost effective way of disposal is not found there is a risk that the sources are to be kept indefinitely at the place of last usage and without a defined procedure for final disposal. In Iceland disused sources have the same legal status as sources in active use. They are subject to the same requirements concerning a safe and secure storage and they are also subject to regular inspections as sources in active use. Additionally, once sources are taken out of active use the licensee is required to notify the Regulatory Authority. The Regulatory Authority is authorized to demand the disposal of a radioactive source no longer in use or no longer in safe and secure storage as estimated by the Authority. If the demands are not met within a specified deadline the Regulatory Authority may carry this out at the licensee's expense. In case the owner can not cover the expense i.e. due to bankruptcy the authority will bear the cost. The only old disused radioactive sources of relevance are at The University Hospital where old radium needles no longer in active use are kept in a special secure underground storage. **On request of Iceland, in January 2019 the IAEA concluded successfully a preparatory mission to Iceland for the management of the Radium-226 sealed source inventory of The National University Hospital of Iceland. A follow-up mission to condition the sources has been planned and will be carried out as soon as the pandemic situation allows.**

International Cooperation

Even for faraway accidents, international exchange of information and assessments is essential. All information by authorities can now be instantly compared with information from other sources, the slightest discrepancy can be spotted at once and lead to lack of confidence. This makes international cooperation all the more important, also when faraway incidents are concerned. IRSA seeks the co-participation of national regulatory bodies in international cooperation in the safety sector. A recent example of this is the joint participation of IRSA, the National Commissioner of the Icelandic Police and the Directorate of Customs in a cross-border cooperation project for enhanced detection and interception of illicit CBRN materials on the Slovakian-Ukrainian border project in 2017. Further examples of international cooperation in this field are covered under Section F Other General Safety Provisions of this report.

Openness and transparency

As a governmental organisation all activities of IRSA fall under the Information Act No. 140/2012, which applies to all operations of such entities.

The objective of this Act is to guarantee transparency in government administration and the handling of public interests, inter alia with the purpose of strengthening the following:

- the right to information and the freedom of expression,
- possibilities for the public to participate in a democratic society,
- the restraints exercised by the media and the public on government authorities,
- possibilities for the media to communicate information on public affairs,
- public confidence in government administration.

It is the policy of IRSA to increase release of information to the public. As an example, National Reports to the Convention on Nuclear Safety and to the Joint Convention are published on IRSA's web as soon as they are submitted.

Annex I - Inventory

Sealed sources kept in storage by licensed owners and subjected to regular inspections by the Icelandic Radiation Safety Authority.

Radionuclide	No. of sources
Am-241	4
Am-241/Be	2
Am-241/Cs-137	4
C-14	1
Cs-137	7
Co-57	0
Co-60	4
Ni-63	4
Ra-226	2

All sources are category 4 and 5 sources.

In addition a few m³ of pipe scalings are in interim storage on site at a geothermal power plant.

Sealed sources in use by a total of 37 licensed owners and subjected to regular inspections by the Icelandic Radiation Safety Authority.

Radionuclide	No. of sources
Am-241	11
Am-241/Be	4
Am-241/Cs-137	4
Ba-133	2
Cs-137	16
Co-57	12
Co-60	2
Gd-153	1
Ge-68	2
I-125	1
Ir-192	1
Kr-85	3
Ni-63	13
Ra-226	2
Sr-90	1

One Cs-137 source qualifies as a category 1 source.

One Ir-192 source qualifies as a category 2 source.

Two Am-241/Be, one Cs-137 and one Co-57 source are category 3 sources.

The remaining sources are category 4 and 5 sources.

Annex II - International and bilateral instruments to which Iceland is a party

	In force
Statute of the International Atomic Energy Agency	06.08.1957
Agreement on the Privileges and Immunities of the IAEA	19.03.2007
Convention on the Physical Protection of Nuclear Material	18.07.2002
Convention on Early Notification of a Nuclear Accident (ENAC)	28.10.1989
Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency	26.02.2006
Convention on Nuclear Safety	02.09.2008
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	27.04.2006
Revised Supplementary Agreement Concerning the Provision of Technical Assistance by the IAEA (RSA)	09.05.1984
Application of safeguards in connection with the Treaty on Non-Proliferation of Nuclear Weapons (with Modified Small Quantity Protocol)	16.10.1974
Protocol Additional to the Agreement between the Government of Iceland and the IAEA for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons	12.09.2003
Modified Small Quantity Protocol	15.03.2010
Partial Test Ban Treaty	29.04.1964
Comprehensive Nuclear-Test-Ban Treaty (CTBT)	26.06.2000
Treaty on the Prohibition of the Emplacement of Nuclear Weapons and other Weapons of Mass Destruction in the Sea-Bed and the Ocean Floor	30.05.1972
International Convention for the Suppression of Acts of Nuclear Terrorism	16.09.2005
Legislation and regulations based on commitment to United Nations Security Council Resolution 1540 (2004)	2009-2011
The Global Initiative To Combat Nuclear Terrorism (GICNT)	2007
Incident and Trafficking Database (ITDB)	
Proliferation Security Initiative – PSI	
Memorandum of Understanding No. 32187 between the European Union and the National EURDEP Data Provider of Iceland on the participation to the EURDEP system during routine and emergency conditions	07.06.2011
Nuclear Suppliers Group – NSG	2009
Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR)	25.03.1998
International Convention for the Prevention of Pollution from Ships (MARPOL), 1973, with amendments according to Protocol 1978 of 17.2.1978	1973/1978
Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London)	1973/2003
Convention for the Prevention of Marine Pollution from Land-Based Sources (Paris)	1974