Rialtas na hÉireann
Government of Ireland

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

NATIONAL REPORT BY IRELAND

October 2020

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Section A: Introduction

Ireland became a member of the International Atomic Energy Agency in 1970. In March 2000, Ireland was the 25th State to ratify the IAEA Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, thus bringing the Convention into force.

This, Ireland's Seventh National Report under the terms of the Convention, details the framework of appropriate legislation, regulatory and administrative measures necessary for the implementation of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management in Ireland. It also sets out measures adopted to implement the relevant obligations of the Convention noting that Ireland does not have any spent nuclear fuel to deal with. This National Report has been prepared taking into account comments and questions on Ireland's previous Report of 2017 and is laid out according to the requirements and headings contained in the IAEA Information Circular INFCIRC/604 Rev_3_18 of December 2014 (Ref 1) and according to the definitions in the IAEA INFCIRC/546 December 1997.

Ireland is also a member of the EU and, therefore, transposes into its national legislation, EU Council Directives concerning the safety of nuclear installations and spent fuel, radioactive waste and radiation protection measures for workers and the public. In addition, Ireland is a signatory to a number of international Conventions and Agreements which contain elements relating to nuclear and radiological matters, including the OSPAR Convention on the Protection of the Marine Environment of the North-East Atlantic. Where relevant, these are referred to later in the report.

Ireland currently meets its electricity requirements from a combination of thermal and renewable energy sources. Ireland has chosen not to develop a nuclear power industry and the Government has no plans for a change of policy in this respect. Factors informing the formation of this policy include concerns about public health and safety, environmental protection and security, as well as concern at the continued absence of an acceptable solution to the problem of the long-term management of the large quantities of radioactive waste produced by nuclear power stations.

Ireland has:

- No nuclear power stations.
- No defence reactors for research or other purposes.
- No spent nuclear reactor fuel in storage or awaiting treatment and no associated spent fuel reprocessing facilities of any sort.

- No trans-boundary movement of spent nuclear fuel from other countries across its territory, nor through its territorial waters.

Moreover, Ireland has no civilian research reactors (including those for production of isotope sources, any requirements for which are met by importing sources in a readymade form).

However, like all modern societies, Ireland uses radioactive materials in the form of sealed and unsealed sources in support of its high technology industries and its medical and other societal infrastructure. These activities give rise to waste materials such as disused sealed sources. There are also small amounts of naturally occurring radioactive materials that are produced and also discharged as a result of Ireland's exploitation of natural resources.

Ireland has a well-developed infrastructure to control and monitor these materials and to provide the necessary protection of public and workers health. This is exercised through the Environmental Protection Agency (EPA) which is the national competent authority and regulatory body for regulating practices involving the use of radioactive sources or equipment such as X-ray, which produces ionising radiation. The day to day responsibility for regulation in this area is delegated to the Office of Environmental Enforcement (OEE). (See Section E Article 20 for functions of the OEE).

In late 2010 the Government adopted a policy outlining principles and key future steps to be taken with regard to Radioactive Waste Management in Ireland and in the intervening years, substantial progress has been made in Ireland on the basis of this policy. This policy has subsequently been reviewed and revised in 2018. Further detail on this policy is given in Section B of this report.

In respect of Article 32 of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, Ireland's National Report focuses on radioactive waste arising from the medical, industrial and research applications of radioisotopes.

The scope of the application of the Convention states that the Convention shall not apply to waste that contains only naturally occurring radioactive materials and that does not originate from the nuclear fuel cycle, unless it constitutes a disused sealed source, or it is declared as radioactive waste for the purposes of this Convention by the Contracting Party. To demonstrate Ireland's commitment to safety and the protection of its population from all sources of ionising radiation, reference is made in this National Report to the control of such sources and materials.

Summary of the Main Developments during the Reporting Period

The main developments since the last national report include:

- The transposition into national legislation of the Council Directive 2013/59/Euratom of 5 December 2013 into Irish legislation through the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019). These new Regulations, are referred to as the Ionising Radiation Regulations of 2019 (IRR19),
- Implementation of graded authorisation with the transposition of the new European Basic Safety Standards Directive with an authorisation system consisting of licensing and registration
- A review and update of the National Emergency Plan for Nuclear Accidents (NEPNA) to a new National Plan for Nuclear and Radiological Exposures by the Department of the Environment, Climate and Communications (DECC) was reviewed by the Government Task Force on Emergency Planning and received ministerial approval.
- A strategic review of the EPA's emergency preparedness and response arrangements was conducted by external consultants which concluded that the EPA's arrangements for a nuclear or radiological emergency were robust.
- The OECD conducted a review of the EPA's institutional and organisational set-up. This review analysed the EPA's governance arrangements, including how the EPA assesses its own performance and is open and transparent about its obligations and results. This review was published in 2020.
- In 2020 EPA undertook a review of the 2010 SKM Enviros report which explored the technical and economic aspects of developing a National Waste Facility. This review considered relevant developments since 2010 and examined whether any outstanding recommendations remained valid.

Section B: Policies and Practices

Article 32. Reporting

Article 32. Spent Fuel Management Policy

Ireland has no civil or defence reactors to deal with.

Article 32. Spent Fuel Management Practices

Ireland has no fuel processing facilities to deal with.

Article 32. Radioactive Waste Management Policy

As reported in the last reporting cycle, in late 2010 the Government adopted a policy outlining principles and key steps to be taken with regard to Radioactive Waste Management in Ireland. Development of the policy was guided by the following principles:

- The need to address the storage and disposal of legacy and orphan sources into the future in a safe, secure and sustainable way that meets Ireland's international commitments and addresses domestic concerns.

- To aim to do this in a way that has the support of stakeholders (including those who hold and use radioactive sources, and relevant Government Departments and Agencies) and of the public.

- The development and implementation of the policy needs a "whole of Government" approach, with a high level of inter-agency co-operation in a context of agreed and clearly defined demarcation of roles and responsibilities.

- There is no "one size fits all" solution to the variety of waste sources, thereby requiring a number of parallel and complementary strands.

- The resource requirements of implementing the policy should be addressed, as far as possible, according to the "polluter pays" principle.

- The policy reflects the specific roles of key stakeholders including the role of the regulatory authority in terms of licensing and compliance monitoring.

The key elements of the 2010 policy were:

- The current inventory of disused radioactive sources is to be reduced through a co-ordinated and phased Inventory Reduction Programme.

- Interim centralisation of sources by sector in a small number of sector-specific existing storage facilities.

- A National Radioactive Waste Storage Facility for disused radioactive sources is to be established. A National Implementation Committee, comprising of the Environmental Protection Agency (EPA) and Department of Communications, Climate Action and Environment (DCCAE) has been constituted to draw up a

detailed specification for the facility and make recommendations on the siting, management and resourcing of the facility.

The Group has been mandated to give further consideration to options for the final disposal of Ireland's disused radioactive sources. Further updates to be provided to Government, as necessary, as this work progresses.

Radioactive Waste Management Guiding Principles

Ireland follows the principles of;

- minimisation of the generation of radioactive waste in any form
- avoidance of the importation of radioactive waste in any form.
- Management of all sealed sources from "cradle to grave". This includes an authorisation system and take-back arrangements with the original overseas supplier of the sources (discussed in detail below).

If available, the practice of replacement of radioactive sources by non-radioactive alternatives is applied. This includes, for example, prohibiting the import and use of lightning conductors that employ radioactive sources or of radium used in luminising materials.
The disposal limits in licence conditions relating to the disposal of radioactive waste in Ireland are generally set at levels such that it can be demonstrated that doses to the public will be very low and typically less than 10 µSv/year.

Criteria Used to Define and Categorise Radioactive Waste

Categorisation of radioactive materials and radioactive waste in Ireland is based on a pragmatic approach consistent with the relatively simple needs of the country.
The definition of radioactive waste is derived from Council Directive 2011/70/Euratom, which states that 'radioactive waste' means radioactive material in gaseous, liquid or solid form for which no further use is foreseen or considered by the Member State or by a legal or natural person whose decision is accepted by the Member State, and which is regulated as radioactive waste by a competent regulatory authority under the legislative and regulatory framework of the Member State;
The waste categorisation scheme under the current categories applicable in Ireland are disused sealed sources in storage/custody and unsealed radioactive material arising from medical applications.

In Ireland, sealed and unsealed sources are used in the State and private sectors of the economy. In the public sector, the main users are medical and educational establishments. The uses of sealed sources in the private sector includes density/level gauges, as check sources and in medical devices. The lists of sources that are now classified as disused and held in custody have been summarised in Appendix 1 (Table 1) of the Report. They are illustrated by sector (medical, industrial, educational and state), and categorised by half-life > 10 yrs).

The regulation by the EPA of practices involving ionising radiation and radioactive materials in Ireland is provided for in Ireland's Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019) replaces S.I. No 125 of 2000 and incorporates the Radiological Protection Act 1991 (Responsible and Safe Management of Radioactive Waste) Order 2013 (S.I. No. 320 of 2013) and the Radiological Protection Act 1991 (Control of High-Activity Sealed Radioactive Sources) Order 2005 (S.I. No. 875 of 2005) which have been revoked. This is discussed in more detail under Section E Article 20.

Exemption

Exemptions from the requirements of Ionising Radiation Regulations of 2019 are covered under Regulation 9 and include exemptions with respect to the specific and total activity of materials that are being handled, used or disposed of as radioactive waste and also exemptions with respect to practices. With respect to the former, these are based on Annex VII of EU Council Directive 2013/59/Euratom of 5 December 2013 laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation (Ref 2) and are, therefore, fully consistent with other EU Countries. The Annex and Regulation 9 of the Ionising Radiation Regulations of 2019 also include practices that may be treated as exempt from the regulatory regime. Practices may be exempt if it can be shown that under all circumstances doses will not exceed certain prescribed values.

Clearance levels

Provisions in relation to the release from regulatory control is set out in Regulation 19 of the Ionising Radiation Regulations of 2019 with clearance levels set out in Table A of Schedule 7.

NORM (Naturally Occurring Radioactive Material)

Risks from ionising radiation due to natural sources of radiation (NORM) are covered under Regulation 68 of the Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019). Practices involving NORM may be found in various industries and a full list of potential industrial sectors is contained in Schedule 6 of S.I. No. 30 of 2019.

As previously reported, the EPA carried out an extensive survey of such industries and the materials they handle and dispose of, including those involving discrete sources (e.g. thoriated products) and diffuse sources (mainly those arising from extractive industries, especially oil and gas but also peat burning and bauxite and cement production). Because of the wide range of processes involved, the EPA has found it necessary to adopt a sector-specific approach to the risk assessment methodologies it has adopted. The results of the associated studies have been published (Ref 3).

In 2019, NORM materials were identified in a gas processing plant in Ireland, with the potential for large volumes to be generated over the lifetime of the installation. The EPA was promptly notified by the company and a thorough risk assessment was conducted, requiring a multidisciplinary approach (across radiation protection, conventional and radioactive waste and transport regulations). The provisions of Schedule 7 of S.I. No. 30 of 2019 were applied first to see if regulatory control was justified, and second to decide on an appropriate/optimised level control. At the time of writing, the EPA is considering applying the general clearance criteria (S.I. No. 30 of 2019 Schedule 7(3)(a)), meaning that the material will be cleared from authorised practice, subject to specific conditions approved by the EPA and managed under a radiological licence for the production of NORM waste above 1 Bq/g (waste below 1 Bq/g is considered out of scope). Some of the specific conditions likely to apply will include stringent monitoring procedures, maximum activity disposed of annually and an approved disposal route.

Future Changes

In 2011, the European Council adopted a new directive (2011/70/EURATOM) establishing a community framework for the responsible and safe management of spent fuel and radioactive waste. The directive applies, *inter alia*, to radioactive waste management, from generation to disposal, when radioactive waste results from civilian activities. It provides for the establishment of national policies and national programmes on radioactive waste management and sets out certain criteria that should be used in developing such policies and procedures. In particular, it strongly encourages Member States to make arrangements for the disposal of wastes in the Member State in which it was produced though it does allow for international arrangements. It sets out the requirements for a national waste management framework including the competent

regulatory authority as well as the responsibilities of licence holders. It has provisions on transparency and reporting and specifically provides for a peer review of national arrangements every ten years.

The directive was transposed into Irish law as Radiological Protection Act 1991 (Responsible and Safe Management of Radioactive Waste) Order 2013 (S.I. No. 320 of 2013) and provides, inter alia, for a report to the Minister on the implementation of the directive. (S.I. No. 320 of 2013) was subsequently revoked and the provisions contained were included in Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019 with the transposition of the Council Directive 2013/59/Euratom of 5 December 2013.

Section C: Scope of Application

Article 3(1). Reprocessing

Ireland does not carry out any storage or reprocessing of spent fuel from any civil nuclear programme, current or historic and, therefore, has not declared any spent fuel for the purposes of the Convention, pursuant to Article 3(1).

Article 3(2). Naturally Occurring Radioactive Materials (NORM)

The issue of NORM is addressed in Section B of this Report.

Article 3(3). Spent Fuel or Radioactive Waste (Within Military or Defence Programmes)

Ireland has no defence, research or other reactors, current, or historic and, therefore, has declared no spent fuel within military or defence programmes for the purposes of the Convention, pursuant to Article 3 (3).

Section D: Inventories and Lists

Article 32. Reporting - Paragraph 2 Inventory and lists

The only materials declared as radioactive waste under the current categories applicable in Ireland are disused sealed sources in storage/custody; unsealed radioactive material arising from medical applications that are disposed of described in Section J.

Ireland introduced a detailed licensing system for users (and their premises) using sealed sources in 1977. This has allowed a detailed pattern of the locations and life histories of sources to be built up, allowing tracking of those that are still in use and those which are now disused (and considered to be radioactive waste) to be maintained. It also allows a regular schedule of inspections and monitoring to be carried out by the EPA. Until 2014 the EPA used a bespoke Structured Query Language (SQL) compliant database to maintain licensing information relating to all sources of ionising radiation held under licence throughout Ireland. This database was reaching the end of its useful life and a project was undertaken to replace it with a more up to date information management to provide greater functionality and more flexible and versatile data management capabilities. In 2014 the EPA commenced the development of a new information management system to support its regulatory activities. The new system was designed on a Microsoft Customer Relationship Management (CRM) based Licensing and Enforcement Management Application (LEMA) and replaced the existing SQL regulatory database. All EPA licensees use LEMA, accessing it through the EPA's Environmental Data Exchange Network (EDEN) on-line web portal, and are able to manage their own licences on-line, including submitting requests for licence amendments and applications to renew their licence.

This CRM system was then upgraded to accommodate for registration in addition to licensing in order to implement a system of graded authorisation. Registration has a lower cost and administrative burden and is appropriate to radiation practices, which have been shown to be of relatively low risk. Licensing continues to apply to high risk practices. Certificates of Registration are issued automatically and unlike licensing require no inspector review. The applicant completes a self-declaration form confirming a number of regulatory obligations e.g. that they have undertaken a risk assessment for the

registered practice they have sought the authorisation for. Certificates of registration certificate are indefinite and licences are valid for ten years when issued.

In order to legally carry out any practice involving the use of radioactive sources or equipment it is necessary to obtain an authorisation in advance from the EPA, unless the practice has been specifically exempted. Before authorising a practice the EPA must assure itself that the practice itself has been justified, that the risks have been adequately assessed and that appropriate control measures are in place.

The form of authorisation, which will apply in given situation, depends on the magnitude and likelihood of any exposures resulting from the practices, the impact that regulatory control may have in improving radiological safety, the complexity of the practice, safety, security and any safeguards required having regard to the circumstances in which the relevant practice is proposed to be carried out. Practices that are subject to registration include, for example, dental radiography using and intra/external oral unit, general veterinary radiography (carried out in a risk assessed veterinary clinic) and carriage of sources other than High Activity Sealed Sources.

All practices related to the use of radioactive sources are currently authorised by licence with the exception of practices that use Ni-63 sources (for example security screening for explosive vapour detection) which fall under registration. For registrants that are authorised for a practice that uses Ni-63 sources they are required to maintain their own inventory.

From the source's first entry into the licensing system, its history is tracked from the authorisation to acquire the source, through information on any transfers between licensees to the return of the source to the supplier through the mandatory take-back agreement. The database includes information detailing the radionuclide type, activity, number of sources and location. Licensees are required to advise the EPA of any changes relating to any of the items for which they are licensed through the EDEN portal. Information held on the EPA's database is routinely audited by EPA inspectors during inspections of these licensees. For registrants that are authorised for a practice that use Ni-63 sources records including inventory details are audited during inspections.

Using the licence records, the EPA is able to give a breakdown of the total number of sources that are disused and in safe storage (under the relevant licence conditions) and their locations. The total number of 'custody only' disused sources from the EPA data is shown in Appendix 1 (Table 1). Further details of the sources are given in Section J.

As most of the material is in sealed sources, the physical size of the inventory, even taking account of shielding and packaging, is also small in comparison to the large volumes encountered in fuel cycle programmes. In 2010 the EPA commissioned SKM Enviros to undertake a report "to explore the technical and economic aspects of developing a National Waste Facility. This report is titled "The Management of Spent Radioactive Sources in the Republic of Ireland". In this report it was estimated that the waste inventory at that time would require a storage capacity of only fifty-three 200 litre drums though this could increase significantly if a source reduction programme was not implemented and take back agreements were not exercised.

Since the previous reporting cycle there has been a very significant reduction in the size of the disused source inventory as a result of Ireland's successful Source Inventory Reduction Programme.

In 2020 the Department of the Environment, Climate and Communications requested the EPA to undertake a review of the SKM Enviros 2010 report. Since 2010 Ireland has undertaken a significant legacy source reduction programme bringing the number of disused sources down from thousands in the early part of decade to 25 today. These outstanding legacy source all fall into the IAEA low risk source categories 4 and 5. Consequently, the estimation of store capacity requirements documented in the SKM Enviros 2010 report are now significantly out of date. While recognising that there remains the potential for orphan source to arise in the future, a long-term waste store of the scale and nature envisaged in the SKM Enviros 2010 report would now be a disproportionate use of resources relative to the actual problem. However, there remains a need to maintain national arrangements for the management of orphan sources which may arise. These arrangements are likely to include a range of measures including national financial provision for orphan sources, strengthened financial provision requirements on licensees holding disused sources, ongoing review of security requirements at sites holding disused sources and temporary emergency storage arrangements.

Section E: Legislative and Regulatory System

Article 18. Implementing Measures

Responsibility for nuclear safety policy is vested in the Minister for the Department of the Environment, Climate and Communications (DECC). Within DECC, there is a dedicated Air Quality, Noise and Environmental Radiation Protection Division., whose responsibilities include:

- Policy development and advice to Government in relation to nuclear matters;

- Transposition into national legislation of relevant EU and other international instruments;

- Representation at meetings of the EU, IAEA and other international organisations.

The Air Quality, Noise and Environmental Radiation Protection Division is assisted in these activities by the Office of Environmental Enforcement of the Environmental Protection Agency described in more detail under Article 20 of this Section.

Ireland's policy on nuclear weapons non-proliferation and disarmament is the responsibility of the Department of Foreign Affairs and Trade. For many years now, Ireland has been very proactive in promoting and supporting nuclear weapons non-proliferation and nuclear disarmament.

Article 19. Legislative and Regulatory Framework

Ireland is a member of the European Union, therefore its regulatory framework in respect of radioactive waste and the protection of workers and the public from the hazards associated with ionising radiation is based on the relevant EU Directives and Regulations.

The framework legislation governing the nuclear and radiation protection sectors in Ireland is the Radiological Protection Act, 1991 as amended. This Act repealed the Nuclear Energy Act, 1971. Under the 1991 Act, the Minister for the Department of Communications, Climate Action and Environment has Ministerial responsibility in relation to nuclear and radiological protection matters. The Radiological Protection (Miscellaneous Provisions) Act No 20 of 2014 provides for the merger of the Environmental Protection Agency (EPA) and the Radiological Protection Institute of Ireland (RPII) essentially establishing the EPA as the national regulatory body with the radiation protection functionality being exercised on a day to day basis by the Office of Environmental Enforcement (OEE).

Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019. which was made under Section 30 of the Radiological Protection Act of 1991, gives legal effect in Ireland to EU Council Directive 2013/59/Euratom of 5 December 2013, which lays down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation. Under S.I. No. 30 of 2019, all activities involving radioactive sources, save those which meet the criteria

for exemption specified in the S.I., require an authorisation from the EPA. In addition, the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019 gives effect to Council Directive 2003/122/EURATOM on the control of high activity sealed radioactive sources and orphan sources.

The Radiological Protection Act, 1991 as amended sets out the functions of the EPA as well as the legislative powers of the Minister for the Department of the Environment, Climate and Communications in the areas of nuclear safety and radiological protection. The Act also provides for the implementation of future European Union legislation in the area of radiation protection by means of Ministerial Order. It also sets out specific responsibilities of other Government Ministers and functions of the Food Safety Authority of Ireland, principally in regards to the protection of individuals from radiological hazards in food.

The BSS was transposed into Irish law through new regulations: Statutory Instrument 30 of 2019: Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019 (IRR 2019) and Statutory Instrument 256 of 2018: European Union (Basic Safety Standards Arising from Medical Exposure to Ionising Radiation) Regulations 2018 (as amended). In addition to various administrative measures. These new regulations introduce a number of changes in the way in which ionising radiation is regulated in Ireland. A number of key changes are outlined below:

- Patient Protection: Responsibility for patient protection has been assigned to a new national regulator: the Health Information and Quality Authority. This role is governed by the European Union (Basic Safety Standards Arising from Medical Exposure to Ionising Radiation) Regulations 2018; (S.I 256 of 2018)

- Regulatory fees: A new fee structure has been introduced in tandem with graded authorisation and was transposed into law by Radiological Protection Act 1991(Authorisation Application And Fees) Regulations 2019 (SI No 34 of 2019). The new fee structure has been designed so that the charges are proportionate to level of risk associated with the type of practices being carried out. The new fees include separate authorisation and enforcement elements. Authorisation fees will apply when an application is made to carry out a new practice or to significantly modify an existing practice. Enforcement fees will apply to licensed practices and will be charged annually. Enforcement fees are intended to cover the costs associated with guidance, inspection and licence amendments.

- Dose limit for the lens of the eye: IRR 2019 introduce a reduced dose limit for occupational exposure to the lens of the eye. The new limit on the equivalent dose

for the lens of the eye is 20 mSv in a single year or 100 mSv in any five consecutive years subject to a maximum dose of 50 mSv in a single year. The EPA will issue guidance in relation to acceptable measurement protocols for the measurement of eye dose.

- Strengthened arrangements for outside workers: IRR 2019 changed the definition of an "outside worker" to mean "any exposed worker who is not employed by the undertaking responsible for the supervised and controlled areas, but performs activities in those areas, including apprentices and students". Currently only category A workers not employed by the undertaking are considered to be outside workers. As a consequence of the Regulations a greater number of exposed workers will fall within the definition of outside worker.

- Changes to the Radiation Protection Officers (RPO) and Radiation Protection Adviser (RPA) roles: The IRR 2019 set out a more defined role for Radiation Protection Officers (RPO). The RPO will be an individual or unit reporting directly to the undertaking with operational responsibility for radiation protection. The new Regulations require the RPA to be consulted on specified situations.

- Disposal of Unsealed Sources: IRR 2019 no longer permit the deliberate dilution of radioactive materials for the purpose of them being released from regulatory control. The mixing of materials that takes place in normal operations where radioactivity is not a consideration is not subject to this prohibition. The EPA may in certain circumstances authorise the mixing of radioactive and non-radioactive materials for the purposes of reuse or recycling.

- Radon: IRR 2019 introduce more stringent protections for workers in workplaces with high indoor radon levels and in activities processing naturally occurring radioactive material (NORM). The national reference level for radon levels in workplaces will decrease from 400 Bq/m3 to 300 Bq/m3. Under the new regulations there is a general duty on employers to carry out radon measurements in underground workplaces and in above ground workplaces identified as being liable to have high radon levels (based on the EPA's radon risk map).

- Emergency Preparedness: IRR 2019 introduce new requirements for undertakings responsible for certain types of practice covering their emergency arrangements.

In addition to the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019, the principal Irish legislation directly or indirectly relating to nuclear matters and radiological protection includes the following:

- European Communities (Nuclear Safety) Regulations 2017 (S.I. No. 332 of 2017)
- Radiological Protection (Miscellaneous Provisions) Act (No 20) of 2014
- Radiological Protection Act, 1991 (Nuclear Safety) Order, 2011 (S.I. No. 390 of 2011)
- European Communities (Supervision and Control of Certain Shipments of Radioactive Waste and Spent Fuel) Order, 2009 (S.I. No. 86 of 2009)
- Radiological Protection Act 1991 (Authorisation Application and Fees) Regulations 2019 (SI No 34 of 2019).
- Health Act, 1953 (No. 26 of 1953).
- Safety, Health & Welfare at Work Act, 2005 (No. 10 of 2005).
- Dumping at Sea Act, 1996 (No. 14 of 1996).
- Harbours Act, 1996 (No. 11 of 1996), as amended by the Harbours (Amendment) Act 2000 (No. 21 of 2000).
- Containment of Nuclear Weapons Act 2003 (No. 35 of 2003).
- Nuclear Test Ban Act 2008 (No. 16 of 2008).
- Electricity Regulation Act 1999 (Single Electricity Market) Regulations 2007 to 2017 (S.I. No. 3 of 2017) Environmental Protection Act (No. 7 of 1992), 1992

A list of the main Irish legislation pertaining to ionising radiation is provided in Appendix 2.

Article 20. Regulatory Body

The Regulatory Body for matters relating to ionising radiation in Ireland is the Environmental Protection Agency (EPA). The EPA is the designated competent authority for public and worker protection. The EPA which has a dedicated section devoted to radiation protection regulation within the Office of Environmental Enforcement (OEE). It was established by the Environmental Protection Act, 1992 taking on radiological functions through the Radiological Protection (Miscellaneous Provisions) Act, 2014.

Mission Statement:
To protect and improve the environment as a valuable asset for the people of Ireland. To protect our people and the environment from harmful effects of radiation and pollution.

The EPA is an independent public body that reports to Government and is partially funded by the exchequer. Radiation Protection Regulation in EPA is under the overall responsibility of the Director with responsibility for the OEE who reports to the Director General and Board of the EPA. The EPA has the following duties and responsibilities in respect of radiation protection, nuclear safety and waste management:

- To provide advice to the Government, the Minister for Department of the Environment, Climate and Communications and other Ministers on matters relating to radiological safety.
- To provide information to the public on any matters relating to radiological safety.
- To maintain and develop a national laboratory for the measurement of levels of radioactivity in the environment and to assess the significance of these levels for the Irish population.
- To regulate through system of licensing and registration practices involving the use of radioactive sources or equipment such as X-ray, which produces ionising radiation.
- To assist in the development of national plans for emergencies arising from nuclear accidents and to act in support of such plans.
- To carry out or promote research in relevant fields.
- To monitor developments abroad relating to nuclear installations and radiological safety generally and to keep the Government informed of their implications for Ireland.
- To co-operate with the relevant authorities in other states and with appropriate international organisations.
- To represent the State on international bodies.
- To be the competent authority under international conventions on nuclear matters.
- Where appropriate, to provide, or oversee the provision of, specialist radiation protection services such as personal dosimetry, radioactivity measurement, instrument calibration, radon measurements and product certification.

The EPA has also been designated the national competent authority for the purposes of the IAEA Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency and the Convention on Early Notification of a Nuclear Accident and is the National Authority responsible for the physical protection of nuclear material.

Under the Radiological Protection Act of 1991, the EPA regulates practices using ionising radiation through a graded authorisation system of licensing and registration, the terms and conditions of which are set out under S.I. No.30 of 2019, which is a Ministerial Order made under Section 30 of the 1991 Act. In addition to providing for providing for authorisation it also transposes Council Directive 2013/59 Euratom of 5 December 2013, referred to earlier, into national legislation. A full list of practices that are subject to licensing and registration is published on the EPA website.

The EPA publishes a report of its regulatory activities including the focus of inspections. (Ref 4).

The Graded Authorisation System

Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019 established a graded approach to authorisation comprising both registration and licensing. This new graded system replaces the older licence-based system established under earlier Regulations. In order to legally carry out any practice involving the use of radioactive sources or ionising radiation producing equipment such as X-ray apparatus, it is necessary to obtain an authorisation in advance from the EPA, unless the practice has been specifically exempted. The form of authorisation (registration and licensing), which applies in a given situation, will depend on the magnitude and likelihood of any exposures resulting from the practices and the impact that regulatory control may have in improving radiological safety. The EPA has published a list of Practices subject to Registration and a list of Practices subject to Licensing on its website (https://www.epa.ie/radiation/regulation/authorisation/)

The authorisation system operated by the EPA according to the requirements of the Radiological Protection Act, 1991 as amended and of S.I. No. 30 of 2019 is central to the control of radioactive materials and radioactive waste in Ireland. There are currently 247 active licences covering a broad range of practices that cover radiotherapy, research, non-destructive testing and process irradiation. There are 1274 active registrations covering practices involving They are summarised in Figure 1. In addition, the High Activity Sealed Radioactive Sources and Orphan Sources (HASS) Directive was transposed into Irish Law in December 2005, Radiological Protection Act 1991 (Control of high-activity sealed radioactive sources) Order 2005 (S.I. No. 875 of 2005). This was subsequently revoked, and its provisions included in the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019. The EPA is designated as the Competent Authority for the purposes of the Legislation and the Directive.

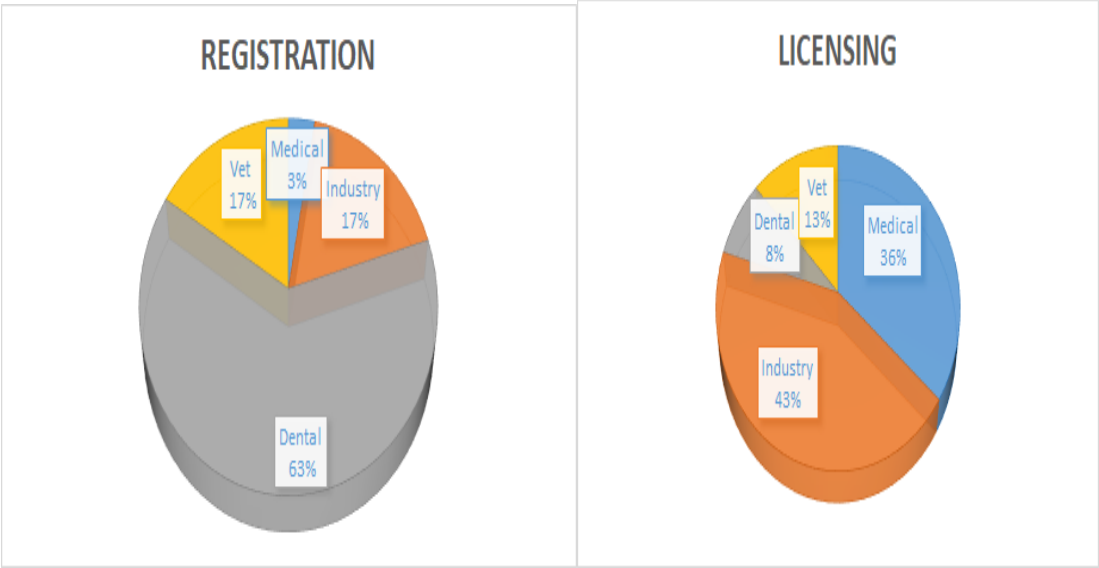

Figure 1: Licensees and Registrants by Sector (June 2020)

Key aspects of the EPAs graded authorisation system central to implementing the overall policy on radioactive waste are as follows (it also covers aspects of the responsibilities of holders of EPA authorisations i.e. licences or certificates of registration): -

- The licensing system in Ireland for sealed and unsealed sources had been in operation since 1977. This system was updated to a graded authorisation system. As part of the system, information has been gathered and maintained on all such sources. This database provides a useful tool in the "cradle to grave" management of sources.

- Authorised users of disused sources are required to verify their holdings at specific periods which are set out in their EPA authorisation and to report any anomalies to the EPA. Sealed sources, whether in use or not, must be leak tested not less than once every two years or as recommended by the manufacturers and reported to the EPA.

- EPA authorisation conditions include requirements for the management of radioactive waste.

- EPA authorised users are required, as a prerequisite to their authorisation being issued, to have an agreement with the source supplier or manufacturer to take back sources ("take back agreement") when they become disused. The EPA looks for written evidence from the supplier or manufacturer that the source will be accepted back when no longer required before issuing a licence.

- Authorised users are required to consult with a Radiation Protection Adviser (RPA). Furthermore, the EPA maintains a Register of all persons approved to act as RPAs to undertakings in the medical, dental, educational and veterinary sectors.

- EPA authorised users wishing to transfer sources between sites must comply with the International Atomic Energy Agency transport regulations, national regulations and any authorisation conditions that the EPA may consider important to impose. A specialised training course for those involved in the transport of relevant radioactive consignments was first approved by the EPA in 2007 and has been re-evaluated on an annual basis since then. Similar arrangements apply to transboundary shipments (see Section I). Transboundary shipments of sources within the EU are governed by specific pieces of European Community legislation.

- General requirements of the authorised user include a duty to keep records, to ensure proper labelling of sources and containers, to provide training and to arrange for the appointment of responsible persons. They are obliged to inform the EPA of any changes in the inventory of radioactive sources for which they are responsible and to have their authorisation amended accordingly.

- Inspectors from the EPA carry out inspections to assess compliance with the authorisation conditions (see below). Information on the number of inspections carried out in 2019 is presented in Appendix 3.

As part of the EPA authorisation process all authorised users are obligated to carry out a risk assessment in relation to all sources in their inventory including waste management at hospitals for example. Such licenses are also obligated to develop safety procedures to manage the risks identified and to keep doses as low as reasonably achievable. Such risk assessments and safety procedures have to be reviewed and updated periodically.

As a result of a combination of a well-established graded authorisation system, take back arrangements and a comprehensive inventory of sources, there have been very few incidents involving orphan sources. The number of such sources that have been discovered is very low and the EPA has dealt with them in consultation with the Department of the Environment, Climate and Communications on a case-by-case basis. Where orphan sources have been identified and seized, they have been taken into the safe custody of existing licensees. There is now an operational protocol mandated by Government, in place to deal with the management of such sources.

The licence conditions specify that adequate provision must be made, by way of a financial security or any other equivalent means appropriate to high activity sealed

sources (HASS), for the safe management of HASS when they become disused sources. A documented financial costing for the safe management of HASS is required with all licence applications/amendments for HASS. This costing shall be signed by the General Manager or equivalent of the company concerned. In addition, a written guarantee from the General Manager or equivalent of the company concerned to cover the cost of management/disposal is required to accompany all licence applications/amendments. This guarantee covers the return or disposal of HASS, including all packaging, transport and return fees even in the event of the applicant/licensee becoming insolvent or going out of business. Any changes in the financial arrangements have to be confirmed in writing to the EPA on an annual basis.

The status of licence and registration conditions is laid down in the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019. (Regulation 14 & 15). These regulations states where the Agency has specified a condition in a licence or registration that the undertaking shall comply with that condition.

Inspection

EPA inspections are designed to assess compliance with national Regulations and any conditions attached to a registration or licence. The inspection programme also aims to assess the standard of radiation protection in place at each licensed facility and to encourage licensees to strive to attain best practice in relation to radiation protection. Inspection planning is risk based with higher risk practices subject to more frequent inspections.

In assessing the level of risk account is taken of:

- The number of practices licensed and the level of complexity of the practice(s);
- The type, size, number and complexity of the radioactive source or irradiating apparatus;
- The security and safety measures required;
- The complexity of radiation protection measures required;
- The potential for doses arising to workers or members of the public;
- Consequences of an accident.

The EPA has the resources to undertake typically 100 - 150 radiological inspections per year and the number of inspections undertaken in a given year is based upon a risk analysis. Table 2 in Appendix 3 details the breakdown of inspections carried out in 2019 within the different categories.

Inspections may be unannounced or announced in advance. Since 2016, the number of unannounced inspections has increased from over 30% to 80% of the programme. The number can vary from year to year depending on the focus of the inspection and the disciplines being covered.

Inspections can also arise outside of the normal annual programme where incidents are investigated.

The EPA is committed to ensuring the highest standards in all activities it undertakes. In fulfilment of this commitment all inspection activities are carried out within the framework of an ISO 17020 quality management system. This ensures that inspections are carried out to best international standards and ensures consistency between both inspections and inspectors. In particular the system provides for inspection planning, training of new and experienced inspectors, the conduct of inspections as well as post inspection follow up and review.

Each year the EPA publishes an annual inspection activities report on its website which provides a detailed overview of its radiological authorisation and inspection activities. The report explains how the annual inspection priorities and programme are developed and includes a review of the previous year's inspection programme findings together with details of the programme and high-level objectives for the forthcoming year.

Enforcement

Failure to comply with either a regulatory requirement (IRR 2019) or a condition attached to an authorisation is an offence which could lead to prosecution. In addition, conducting a practice without an authorisation is an offence that can lead to a prosecution.

The EPA and its inspectors are provided with significant enforcement powers under the Radiological Protection Acts 1991 and the IRR 2019 including powers of entry and seizure. Prosecutions can and have been taken against individuals and companies involved in unauthorised activities and against non-compliant undertakings. Fines have been imposed by the courts on individuals and companies which have been prosecuted. In addition, the EPA has the power to issue directions and enforcement notices. It uses these powers where the appropriate standards of radiation protection are not upheld. Since the last reporting period there have been no prosecutions taken. The EPA has responded to incidents involving orphan sources and has worked with all of the actors concerned to resolve the issues involved.

The regulatory function comprises 10 whole time equivalent inspectors and support staff. In addition, external expert consultants are brought as needed to assist in specialist inspections. Inspections are carried out under the with EPA's ISO 17020 Quality Management System and in all cases the responsibility for determination of conformity of the facility being inspected will remain with the EPA inspector.

Inspectors are engaged in all regulatory activities in addition to inspection, including authorisation, drafting guidance documentation, accreditation activities, provision of advice to Government, radioactive waste management, management of Radiation Protection Advisor (RPA) registers, approval of courses, international representation, regulator/stakeholder liaison, policy and technical advice for legislation development.

Public Information

One of the key strategic goals for the EPA is to provide information on radiation protection, in a readily accessible and understandable format, so that the public has the necessary information to protect themselves from the harmful effects of exposure to radiation. A range of communication activities are undertaken each year to meet this objective and to promote the work of the EPA through the media, events, advertising, the EPA website, free phone call centre for radon advice, presentations and publications.

The media play a significant role in disseminating information and in reporting on radiological protection issues of public concern. Press releases are issued to coincide with the EPA's major events and media interest in EPA activities is strong with staff participating in many television and radio programmes on an annual basis. The print media also have a keen interest in EPA activities. Feature articles have also been placed in publications which assist in highlighting the array of activities that the EPA is responsible for. The EPA ensures that all public communications are focused and use the media to target various groups in the community and continuously develops their existing relationships with the media.

Each year the EPA hosts a number of events including report launches, seminars and presentations with the objective of disseminating information to targeted groups. The EPA's website, www.epa.ie, is a valuable source of key information.

Each year, the EPA produce a number of publications, including reports, guidance notes, codes of practice, information leaflets and posters – all of which are available free of charge on www.epa.ie.

Section F: Other General Safety Provisions

Article 21. Responsibility of the Licensee or Registrant

Duties and responsibilities of licensee and registrants in Ireland are described in the conditions in Section E Article 20 above.

The principle of prime responsibility of the licensee and registrant is met by a sum of regulatory requirements including justification and adherence to specific authorisation conditions set down by the Competent Authority (EPA).

Ireland operates a Common Law legal system in which the law comprises a combination of principles adopted and developed by the courts through successive precedent cases and

primary and secondary legislation passed by the legislature and government. In summary, the vesting of primary safety responsibility in the person carrying out an activity in Ireland derives from both principles of law developed by the courts and from legislation.

In Ireland primary responsibility for the safety of an installation would rest with the undertaking carrying out an authorised practice at the installation. Such an allocation of responsibility would derive primarily from legal principles developed by the courts in the area of tortuous liability (i.e. negligence, occupier's and employer's liability etc). The imposition of such primary responsibility on the party carrying out an activity has been reinforced through primary legislation such as the health and safety legislation and miscellaneous secondary legislation such as S.I. No. 30 of 2019.

Article 22. Human and Financial Resources

In addition to the Office of the Director General (ODG), the EPA is divided into five offices: the Office of Communications and Corporate Services (OCCS); the Office of Environmental Enforcement (OEE); the Office of Environmental Sustainability (OES); the Office of Evidence and Assessment (OEA) and the Office of Radiation Protection and Environmental Monitoring (ORM). The OEE office has functional responsibility to the Board and Director General of the EPA for, inter alia, radiation protection regulation and radioactive waste regulation and ORM is responsible for emergency preparedness.

The current organisational structure for the EPA is shown in Figure 2. The Radiation Protection Regulation (RPR) function falls under the Radiation and Waste Thematic in OEE. The RPR have 11 staff with a significant range of experience and qualifications in science and business. Staff competence within the EPA in radiological protection is maintained under a Performance Management and Development System (PMDS) and annual Work Programme planning where competence and capacity is taken into account. Additionally, there is a process of 'Workforce Planning' where competency and capacity needs for the organization as a whole are identified. The Director of the OEE is a member of the Board of the EPA.

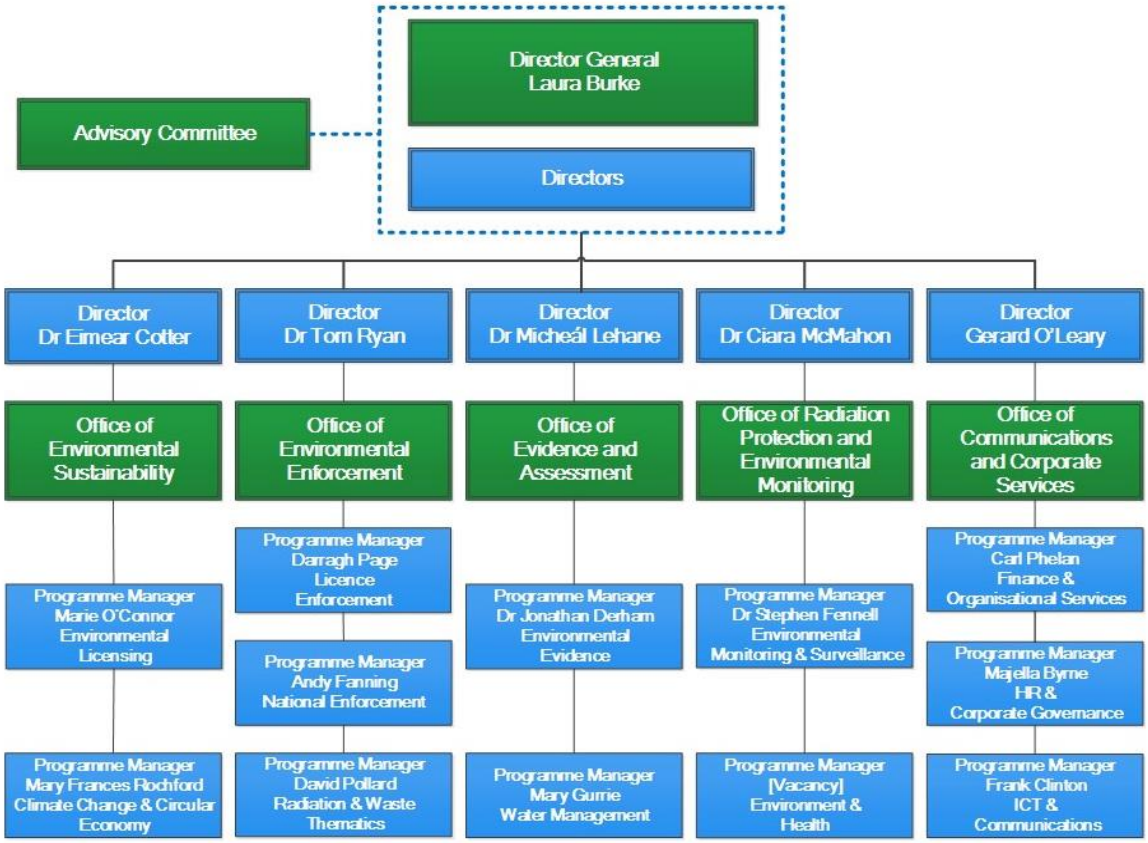

Figure 2: Organisational Structure of EPA

The EPA's income is made up of grants from the Exchequer and Earned and Other Income which includes Environmental Licensing and Enforcement, recovery of Emissions Trading Unit Costs, Regional Laboratory services and income from Radiological activities. In 2017, the EPA's income of €71.182m was made up of a grant of €32.001m from the Exchequer, and included earnings of €1.132m from Radiological Activities that included licence fees and charges for instrument calibration, product certification, radon and radiation measurement and related services.

The on-going financial, human resource, and research and development requirements of the EPA are ensured through the normal annual budgeting and workforce planning processes exercised between Department of the Environment, Climate and Communications and agencies under its aegis.

Development and maintenance of competence

As reported in previous cycles, in 2000, the IAEA carried out a peer review mission of the regulatory authority's licensing system. The IAEA review covered all areas of the work of the regulatory authority, with the exception of the regulation of the transport of radioactive materials. In summary, the review team was of the opinion that the essential legal infrastructure for radiation protection is well established in Ireland and that the regulatory programme is effective. The team, however, felt that the regulatory authority would benefit from a thorough review of work priorities in licensing inspection and policy and guidance, to ensure that the activities of the Radiation Protection Regulation function remain well focussed.

In the intervening period a number of targeted peer reviews were undertaken encompassing the licensing and inspection arrangements for Radiotherapy, Non Destructive Testing, and Industrial Sterilisation and the off-shore oil and gas sectors. Implementation of the recommendations arising from these reviews constitutes continuing work the regulatory authority. Most issues have been addressed such as augmenting existing expertise in the medical sector, implementing a focused training programme for inspectors and taking a more safety focused approach to inspections.

The OEE has 7 WTE inspectors who carry out regular inspections of radiological licensees 'and registrants' premises and facilities to ensure that they comply with their authorisation conditions. The frequency of the inspections is generally adjusted to be consistent with the degree of hazard and risk involved in the practices covered by each licence. Currently reports prepared by inspectors on licensees and registrants operations are not generally made public. Each year the EPA publishes an inspection activities report periodically on its website which provides a detailed overview of its radiological

authorisation and inspection activities. The report explains how the annual inspection priorities and programme are developed and includes a review of the previous year's inspection programme findings together with details of the programme and high level objectives for the forthcoming year. The inspection schedule in 2019 is set out in Appendix 3. Ensuring the availability of sufficient radiation protection professionals is a challenge both for the competent authority and for the regulated community. In particular, Ireland has established a formal competence-based system of recognition for radiation protection advisors and the current register of RPAs is well populated. RPAs have an important role in terms of advising on the management of the small inventory of radioactive material in Ireland.
Other aspects of operational radiation protection are described below (Article 24 of the Convention).

The EPA offers an extensive range of support to all staff to assist them to perform and develop in their current role and prepare for future roles and to improve the depth of skills and knowledge across the organisation to support the delivery of the EPA's mandate and strategic goals. This commitment is reflected in an expenditure for learning and development, which represents approximately 2.5% of payroll spend. During 2018, staff participated in many events, including training courses, workshops, conferences and seminars. These events are also opportunities for informal learning, which the EPA sees as a significant forum for learning. This amounted to a total of over 2289 training days – an average of 5.7 days of training per person. An annual Learning & Development Plan is aligned to support the achievement of EPA goals, whilst also supporting team and individual development needs.

In May 2017, the Director General of the EPA, launched a Human Resource Development (HRD) Strategy to 'become a role model for the stewardship and development of our people and organisational resources'. The Strategic Framework covers the period 2017-2021 and has been endorsed by the Board of the EPA.

The overarching theme for this new HRD Strategy is, "Engaging, Enabling, Empowering". To support this theme, EPA have identified four strategic goals that will provide a clear focus for the work of the EPA in the years ahead. Through these the EPA are committed to fostering a healthy, engaged, and resilient workforce; developing people and organisational resources; empowering managers as experts and leaders; and evolving the HR delivery model. The Strategy and Goals apply to all Offices of the EPA. The strategic priorities identified under Goal 2 (Develop our people and organisational resources) that relate to the initial IRRS Mission finding, specifically include actions to:

- Develop an integrated view of workforce planning and resource management that

incorporates staff and contractors;
- Develop a succession management plan that addresses critical posts due to become vacant between 2017 and 2021.

The EPA receives a State grant for its current and capital expenditure as well as for research.

The Ionising Radiation Regulations 2019 (S.I. No. 30 of 2019) introduce graded authorisation, which allows for better targeting of regulatory effort in accordance with risk. The fee structure to accompany this new regulatory approach is set out in the Radiological Protection Act 1991 (Authorisation Application and Fees) Regulations 2019 (S.I. No. 34 of 2019) and Section 49 the EPA Act 1992.
This structure comprises 3 types of regulatory fee:
Authorisation fees apply whenever an application is made to the Agency for authorisation to commence a radiological practice. Depending on the nature of the radiological practice an authorisation may be in the form of a registration or a licence.
Renewal fees apply 10 years after a licence has been granted and on the first licence renewal after the commencement of the 2019 Regulations. Renewal fees do not apply to registrations as these are issued for an indefinite period.
Enforcement fees are charged annually for all licences to cover the ongoing cost of regulation (inspection, reviews, guidance, enforcement, advice, etc.). Enforcement fees do not apply to registrations. Enforcement fees are based on the full economic cost of regulation.
A full list of regulatory charges is published on the EPA website.

Article 23. Quality Assurance

The EPA continually seeks to improve the quality and consistency of its service to its customers. In 2007 the then RPII developed a quality system for its inspection activities in line with ISO 17020 (General Criteria for the Operation of Various Types of Bodies Performing Inspection), an international standard specifically designed for inspection bodies. The quality system provides a framework for planning and reviewing the annual inspection programme, for the conduct of inspections, the follow up to inspections and the training of inspectors. Furthermore, the system facilitates continuous improvement through a transparent process of document management and periodic audits involving all staff. Accreditation was awarded in December 2008 by the Irish National Accreditation Board (INAB) and has been successfully maintained since.

As part of the conditions to maintain this accreditation INAB conducts an annual surveillance visit to assess the EPA's compliance with the standard and INAB

regulations. In 2013 the RPII revised its quality management system to meet the requirements of the new ISO 17020:2012 standard. The new standard is an amalgamation of ISO 17020:1998 Standard with the IAF/ILAC-A4:2004 Guidance on the Application of ISO/IEC 17020. Under the new standard there is a greater emphasis on inspector competence rather than training, as well as more detailed requirements for complaints and appeal processes. In June 2013 INAB performed a re-assessment visit prior to the expiration of the five-year accreditation certification previously awarded. As part of the re-assessment visit they assessed compliance to the new 2012 standard. The accreditation was successfully maintained for the existing scope and was awarded the transition to the new ISO17020:2012 standard in September 2013. Accreditation continues to be successfully maintained on an annual basis

As part of the EPA's bilateral agreement with the French Radiation and Nuclear Regulator (ASN), the ASN Quality Management Team has undertaken an audit of the EPA's Quality Management System at the end of 2017, with respect to its compliance with ISO 17020. In 2019 and 2020 a reciprocal audit was undertaken by the EPA of ASNs Quality Management System.

During the IAEA IRRS Mission to Ireland in 2015, the team reported a good practice for the accreditation of the EPA's radiation inspection activities to ISO:17020.

As part of its programme of continuous improvement, the EPA regularly upgrades its laboratory practices and facilities so as to ensure the delivery of a state-of-the-art measurement service. The laboratories of the EPA are accredited to ISO 17025 Standard and also participate in national and international inter laboratory comparison studies.

A team from the European Commission visited Ireland in September 2014. The scope of the visit was to verify, under Article 35 of the Euratom Treaty, the operation and efficiency of the facilities for continuous monitoring of the level of radioactivity in the air, water and soil, as well as the monitoring of aerial and liquid radioactive discharges into the environment from nuclear medicine in hospitals in Ireland. The team visited a number of environmental radioactivity monitoring sites. The formal report provided indicated that all verifications that had been planned by the verification team were completed successfully. The information supplied in advance of the visit, as well as the additional documentation received during and after the verification was useful. In particular, the report of the extensive peer review carried out in 2009 of the environmental monitoring programme is considered as a valuable example of best practice in this area. Recommendations made are being addressed.

Article 24. Operational Radiation Protection

Ireland has no historic or current nuclear reactors or spent fuel storage or reprocessing activities. Its operational radiation protection measures are, therefore, centred on:

- Inspections of the premises and procedures of EPA licensees and registrants. An appropriate focus is given to licensees holding custody licences for disused radioactive sources. This has already been covered in Section E under Article 20.

- Emergency monitoring systems. These are described in detail separately (under Article 25 below).

- Routine environmental radiation monitoring of food and water, mainly from the marine environment. This is mainly aimed at ensuring protection from the effects of discharges from the Sellafield re-processing plants in the UK and also commitments to various EU Directives. It also supports Ireland's commitments to OSPAR.

- Licence conditions which include limits on the quantities of radioactive materials that may be disposed of to the environment.

- In the case of unplanned or uncontrolled release of radioactive materials into the environment, the appropriate measures under the emergency preparedness plan referred to in Article 25 would be initiated.

Article 25. Emergency Preparedness

Ireland's emergency preparedness is divided into three main areas, i.e.,

- Site emergency planning. These plans relate to licensees 'or registrants' responsibilities in the keeping of sources or of disused sources or their transport.

- Local/regional emergency planning. These plans relate to the response to major emergencies at the local and regional level by the emergency services (Police, Fire Service, Ambulance and Coast Guard) and their associated agencies.

- National emergency planning - designed to cater for a widely dispersed radiological emergency or crisis such as that arising from a major incident at a nuclear installation abroad resulting in radioactive contamination reaching Ireland. Certain elements of the national emergency response would also come into play in the case of a local emergency depending on the extent of the emergency.

Site Emergency Plans

Undertakings authorised to carry on certain defined categories of practice, such as transportation of radioactive materials, industrial radiography, industrial irradiation, nuclear medicine and radiotherapy are required, under the Ionising Radiation Regulations of 2019 (IRR19), to prepare detailed emergency plans when directed to do so by the EPA. These plans must be based on risk assessment and must address potential risks to workers, intervention personnel (e.g. fire services) and, where appropriate, members of the public. These plans must address issues such as resources, consultation with relevant stakeholders, emergency procedures, training, exercises and review. The Ionising Radiation Regulations of 2019 (IRR19) requires that undertakings submit the plans to the EPA. It also requires that undertakings immediately notify the EPA of an emergency and to inform the local emergency services of the circumstances with respect to the emergency. A multi-agency protocol has been prepared by the DECC to assist inter-agency emergency response by fire, ambulance and police services to local radiological incidents. It should be noted that Ireland does not have any sources equivalent to Threat Categories I or II as defined for the purposes of IAEA Safety Requirements GS-R-7.

Licensees and registrants are obliged to report incidents within 24 hours to the EPA. Where it is concluded that the incident was the result of failure of equipment or shortcomings in procedures, other authorised users who use the same equipment or who are involved in the same or similar procedures and where by implication, the same incident could occur, are advised accordingly. Incidents, which arise from negligence on the part of the licensee or registrant, may result in prosecution. (See Section E Article 20 above).

Major Emergency Plans

In Ireland, Major Emergency Plans are in place in all local authority areas and may be activated by any one of the Principal Response Agencies: the Local Authorities (Fire Service), An Garda Síochána (Police), the Health Service Executive and the Coast Guard. Major emergencies include those resulting from fires, transport accidents, hazardous substances incidents and severe weather. The Major Emergency Plan of each agency sets out that agency's response, as well as its contribution to the combined response of all agencies.

In September 2006, the current Framework for Major Emergency Management was launched by Government and following from this all Major Emergency Plans were updated. This Framework is currently being revised. As part of the Major Emergency

Development Programme, a series of inter-agency protocols to underpin the multi-agency response to different categories of emergency was developed, including a Protocol for Multi-Agency Response to Radiological/Nuclear Emergencies. This protocol which was prepared under the aegis of the National Steering Group on Major Emergencies, with the assistance and co-operation of the DECC and the EPA, is also currently being revised.

The aim of the protocol is to enable the Principal Response Agencies and their Principal Emergency Services to work together and to respond effectively and safely and to assist them in working, if necessary, with the EPA and others to successfully manage emergencies that may have a radiological/nuclear dimension. The protocol was drafted based on information from international sources, including the International Atomic Energy Agency (IAEA) (Ref 5), World Health Organisation (WHO) (Ref 5), and the International Commission on Radiological Protection (ICRP). In particular, it uses the advice given in the IAEA's "Manual for First Responders to a Radiological Emergency". The Framework for Major Emergency Management makes provision for linking the local and regional level co-ordination arrangements of the principal response agencies with the national arrangements under the National Plan for Nuclear and Radiological Emergency Exposures.

National Level Emergencies

In July 2017, the Office of Emergency Planning in Ireland published the Strategic Emergency Management (SEM) National Structures and Framework[1]. The SEM identifies 50 different emergency/incident types that would require a national level response. It provides the basis for national-level strategic emergency management and the supports required should such emergencies occur. It outlines the structures for co-ordinating a "whole of government" approach and the framework for achieving a systems approach to emergency management. This framework is complemented by a series of SEM guidelines dealing with specific aspects of strategic emergency management such as Emergency Communications and Critical Infrastructure Resilience.

The SEM has identified 50 scenarios that would require a national level, whole of government response and includes nuclear emergencies, local radioactive contamination and malign CBRN incidents.

[1] https://www.emergencyplanning.ie/system/files/media/file-uploads/2018-06/Strategic%20Emergency%20Management%20National%20Structures%20and%20Framework_0.pdf

Since 2018, the Lead Government Department responsible for preparedness and response to a nuclear incident abroad which could impact Ireland is the Department of Communications, Climate Action and Environment with approximately 20 other government departments and State Agencies having a principal support role in assisting the Lead Government Department. The arrangements for preparing for and responding to such an emergency are described in the National Plan for Nuclear and Radiological Emergency Exposures.

A national protocol for responding to CBRN incidents (malevolent Chemical-Biological-Radiological-Nuclear events) was completed by the Government Taskforce (GTF) on Emergency Planning in 2011. The protocol covers acute incidents where the location of the potential contamination is known and contained.

Hazard Assessments

One of the principal elements of the systems approach to emergency management is a hazard assessment. Ireland has completed a number of key assessments which considered the risks to Ireland from nuclear accidents at the Sellafield Nuclear Reprocessing Site and at one of the proposed nuclear power plants in the UK and from radiological emergencies arising from sources in use in Ireland.

The EPA completed a detailed assessment[2] of the radiological impacts on Ireland of four severe hypothetical accident scenarios at the Sellafield nuclear fuel reprocessing plant in England. The hypothetical accidents were those identified in a risk assessment of Sellafield commissioned by the Irish Government as having the greatest potential to have an impact on Ireland. The study assessed the potential exposure to radiation for people and contamination of the environment for a year following an accident. For each of the worst-case scenarios considered, the predicted radiation doses were found to be below the levels which would require measures such as sheltering, relocation or evacuation of people. However, without appropriate food controls, significant radiation doses could be incurred in the year following the accident through the consumption of contaminated foods. Ireland's National Plan for Nuclear and Radiological Emergency Exposures provides for the introduction of food controls and on-farm measures, to reduce radiation doses from this pathway and ensure food for sale is safe to eat.

[2] http://www.epa.ie/pubs/reports/radiation/Potential_radiological_impact_Ireland.pdf

In addition, the Irish Government commissioned the Economic and Social Research Institute (ESRI) to carry out a study[3] to assess the Potential Economic Impact on Ireland of a Nuclear Incident in North-western Europe. This study considered four scenarios to develop indicative estimates of the scale of economic losses that might arise. These scenarios were designed to provide a spectrum of outcomes across different seasons and included a scenario where there is no actual radiological impact on Ireland; one where there is some low-level contamination of the environment and food in Ireland; one where the degree of contamination of the environment and food in Ireland warrants food controls and agriculture protective actions for a number of months; and finally one encompassing significant contamination of the environment and food in Ireland such that people are advised to remain indoors as much as possible for up to 48 hours. The report provides lower bound estimates of the potential economic impacts on Ireland in each of the scenarios examined.

National Plan for Nuclear and Radiological Emergency Exposures ("The National Plan")

To implement many of the emergency preparedness and response provisions in the European BSS Directive that were transposed into Irish law through IRR 2019, a new National Plan for Nuclear and Radiological Emergency Exposures ("The National Plan") was developed by the Department of Communications, Climate Action and Environment. The National Plan replaces the National Emergency Plan for Nuclear Accidents (NEPNA) which was published in 2005.

The National Plan sets out details of Ireland's planning, preparedness and response arrangements for a nuclear or radiological emergency likely to cause widespread exposure across Ireland. The National Plan was reviewed by the Government Task Force on Emergency Planning and approved by the Minister for the Environment Climate and Communications (DECC) in 2019.

The National Plan sets out a framework for a coordinated national response to an event where the response is beyond the resources or capabilities of any individual Government Department or public authority and as such requires the political and strategic involvement of Government. The main elements of the National Plan cover:

- Hazard Analysis;
- Mitigation;

[3] http://www.dccae.gov.ie/en-ie/news-and-media/publications/Pages/The-Potential-Economic-Impact-of-a-Nuclear-Accident.aspx

- Planning and Preparedness;
- Response;
- Recovery.

Radiation incidents occurring in Ireland and affecting only a limited area of the country do not fall under the scope of the National Plan, but if required some or all of the arrangements provided in the National Plan may be invoked as part of the emergency response. Such incidents include accidents involving nuclear powered ships or ships transporting radioactive substances in waters close to the Irish coast (response co-ordinated by the Irish Coast Guard) and local dispersal of radioactive substances that may require a further scaling up of response, including further co-ordination with the EPA including activation of the National Plan, if necessary.

The national response to a widespread radiation emergency is likely to involve mobilisation of the resources and expertise from a broad range of public authorities/agencies within the State. The National Plan envisages that in the event of a major radiation emergency, a National Emergency Coordination Group (NECG) would be convened to coordinate the response. The NECG for nuclear accidents is made up of officials from key Government Departments and other public authorities and is chaired by the DECC. This NECG is responsible, inter alia, for providing advice on protective actions and for co-ordinating their implementation. In an emergency, the NECG would meet in the National Emergency Coordination Centre (NECC) which has been equipped to coordinate the national response to emergencies.

EPA's Radiation Emergency Response Plan

The EPA has an internal nuclear and radiological emergency response plan which describes the arrangements in place in EPA to fulfil its responsibilities with regards to emergency preparedness and emergency response under the National Plan, the EPA radiation emergency response structure and the roles of teams and individual staff members in responding to a radiation emergency. In 2017 a strategic review of the EPA's emergency response/emergency arrangements was conducted by external consultants from outside Ireland (Operational Command Training Organisation Ltd.) and this review concluded that the EPA's arrangements for a nuclear or radiological emergency were robust.

The EPA nuclear and radiological emergency response plan is a living document and is based on the principle of continuous improvement. The responsibility for overseeing the preparation of internal EPA plans for the various aspects of response lies with the Emergency Preparedness Unit. One of the strategic actions for the EPA in the period

2016 to 2020 was to extend the EPA nuclear and radiological emergency response plan to include all relevant EPA capabilities. To date the following actions have been achieved:

- Introductory training to staff in the regional water chemistry laboratories on the basics of radioactivity;
- Training staff in the regional chemistry on how to prepare food and environmental samples in an emergency;
- Acquisition of survey meters and the provision of training for staff in the regional water chemistry laboratories to attend the scene of a radiological emergency;
- Increasing EPA's capacity to analyse samples in an emergency by purchasing sodium iodide detectors for screening samples in the regional water chemistry laboratories in an emergency.

Article 26. Decommissioning

Ireland has no historic or current civil or defence nuclear reactors or spent fuel storage or reprocessing facilities. There are currently no centralised waste stores. The issue of the decommissioning of such facilities, therefore, does not apply in Ireland.

Any decommissioning activities relating to disused sealed sources are readily covered and accommodated with the other relevant guidance and legislation applicable in Ireland. For example, the safety of workers will be covered under the Radiological Protection Act 1991 whilst the relevant Transport Regulations covering radioactive materials (covered in detail in Section I Article 27 below) will cover packaging and transport within and outside Ireland.

Furthermore, Ireland has never carried out mining of uranium for manufacture of nuclear fuel and, as such, there are no requirements in respect of decommissioning such facilities.

Section G: Safety of Spent Fuel Management

Articles 4 and 5. General Safety Requirements and Existing Facilities

As already stated in this Report, Ireland has:

- No nuclear power reactors
- No defence reactors for research or other purposes.
- No spent nuclear reactor fuel in storage or awaiting treatment and no associated spent fuel facilities of any sort.
- No transboundary movement of spent fuel from other countries neither across its territory nor through its territorial waters.

Moreover, Ireland has no research reactors (including those for isotope production).

Furthermore:

- Ireland has been a key driver of non-proliferation since the 1960s. The then Minister for External Affairs, Frank Aiken, was the first minister to sign the Nuclear Non-Proliferation Treaty. By 1992, all five then-declared nuclear weapons States had signed the Treaty, and the Treaty was renewed in 1995 (and followed by the Comprehensive Test Ban Treaty in 1996).

- While Ireland maintains a policy not to use nuclear energy for the generation of electricity (Ref 7), Ireland recognises the right of States to determine their own energy mix, including whether or not to develop nuclear power.

- The 1999 Electricity Regulation Act (Section 18 of the Act) prohibits the use of nuclear energy for the generation of electricity in Ireland.

- The 2007 White Paper on Energy (Ref 7) states *"The Government will maintain the statutory prohibition on nuclear generation in Ireland. The Government believes that for reasons of security, safety, economic feasibility and system operation, nuclear generation is not an appropriate choice for this country. The Government will continue to articulate its strong position in relation to nuclear generation and transboundary safety concerns in Europe in the context of the EU Energy Strategy. Developments in relation to nuclear generation in the UK and other Member States will be closely monitored in terms of implications for Ireland."*

Article 6. (Siting of proposed facilities)
Article 7. (Design and construction of facilities)
Article 8. (Assessment of safety of facilities)
Article 9. (Operation of facilities)
Article 10 (Disposal of spent fuel)

Ireland has no historic or current civil or defence nuclear reactors or spent fuel storage or reprocessing activities. There are, therefore, no specific plans relating to the siting, design or operation of spent fuel storage, reprocessing or disposal facilities and no plans relating to the disposal or treatment of spent nuclear fuel to which these Articles of the Convention relate.

Section H: Safety of Radioactive Waste Management

Article 11. General Safety Requirements

- General Safety Requirements for radioactive waste in Ireland are laid down in the relevant legislation, particularly in the Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019). These are enforced by the EPA. The overall principles and policies have been laid out in Section B of this report.

Article 12. Existing Facilities and Past Practices

This section of the National Report is limited to radioactive waste arising from the medical, industrial and research applications of radioisotopes from unsealed sources. These are described and itemised below. (Disused sealed sources are dealt with separately under Section J Article 28)

Management of Unsealed Radioactive Material

Radioactive waste in unsealed form arises from the use of radionuclides mainly in hospitals and in a few educational and research establishments. The sources are either imported from the relevant overseas suppliers or short-lived ones generated on the main hospital sites.

Requirements for the licensing of the use and disposal of unsealed sources, or exemption from such requirements, are established by Regulation 19 of the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019). Quantities or concentrations requiring licensing under S.I. No. 30 of 2019 are based on those specified in Annex VII EU Council Directive 2013/59/Euratom. Normal practice in regard to requirements for licensing is to apply the limits or concentrations used on a daily basis. The Ionising Radiation Regulations of 2019 (IRR19) no longer permit the deliberate dilution of radioactive materials for the purpose of them being released from regulatory control. The mixing of materials that takes place in normal operations where radioactivity is not a consideration is not subject to this prohibition. The EPA may in certain circumstances authorise the mixing of radioactive and non-radioactive materials for the purposes of reuse or recycling

The licence also includes conditions relating to disposal, which have been amended to ensure that the system of reporting takes account of Ireland's obligations under the OSPAR Convention to which Ireland is a signatory (Ref 8).

The main aspects of the safety and management of unsealed sources in Ireland are as follows:

- The generator cores that produce Tc-99 are returned to the supplier. Most are being imported from Holland or the UK. Transport to and from Ireland is in accordance with the appropriate transport Regulations.

- The practice of liquid radioactive waste disposal relates mainly to the medical sector in Ireland. It is a condition of licences granted in the medical sector, where unsealed

sources are used, that there is annual reporting of the quantities discharged. This data is now collated annually by the EPA and is available to the OSPAR Commission as part of Ireland's reporting requirements under the OSPAR Convention. In addition, recent assessments have shown that the maximum dose to the critical public group (sewer workers) from such disposals is less than 10 µSv/year.

- Solid waste materials from hospitals that contain residual activity are segregated and controlled at source. In particular, they are isolated and stored until the levels of radioactivity are such that disposal is permitted under the conditions set out in the hospitals' licence.

- Licensees are obliged to report the quantities of radionuclides which are actually disposed of to sewers.

- Licence conditions on hospitals include requirements to ensure that precautions are taken to prevent radioactive contamination, including contamination in the form of excreta from patients.

- The licence condition places an obligation on hospitals and clinics to keep records of radionuclide administrations to patients which will enable estimates of the quantities excreted to the sewers to be made, using established excretion factors.

- The EPA also requires that any licence application to use unsealed radionuclides for medical purposes be accompanied by an estimation of doses to critical groups. In the case of disposal to sewers, the licensee must demonstrate that doses to sewer workers, who are taken as the critical group, will be below 300 µSv/year. In practice such doses will be below 10 µSv/year.

Use and Potential use of Holding Tanks for Discharges from Hospitals

There are currently four hospitals in Ireland, which are involved in radioiodine thyroid ablation treatments and therefore use significant amounts of radioiodine (~3-5 GBq/patient). In this regard, the doses to critical groups averted by decay tanks must be balanced against the potential radiation doses to workers involved in their maintenance and risks from bacteriological hazards. All hospitals in Ireland that use significant amounts of radionuclides for therapeutic purpose are situated close to the sea. This means that discharges to sewers pass into treatment works and then via a normally short route to the sea where dilution takes place quickly. There are no discharges from such facilities into fresh water that may be used for human consumption.

Following a review of iodine ablation therapy practices in Ireland, particularly in relation to the possible use of holding tanks for the decay of Iodine-131, the following regulatory position was adopted in 2014 and remains valid:

- In the case of existing iodine ablation facilities licensees will not be required to retro-fit iodine holding tanks.

- Licensees with existing ablation facilities will be required to undertake both on- and off-site monitoring to validate the assumptions and calculations in their risk assessments.

- Licence applications for new ablation facilities will continue to be assessed on a case-by case basis to determine whether holding tanks are required.

- New and existing licensees will be required to undertake appropriate on and off site monitoring of discharges to validate the assumptions and calculations in their risk assessments during the operation of their facilities.

Article 13. Siting of Proposed Facilities

Radioactive waste management in Ireland centres on the cradle to grave management of sealed sources. Management of unsealed sources is addressed above. Management of disused sealed sources is addressed in Section J where it is shown that disused sources, which for whatever reason cannot be returned to the original supplier, are held in secure store on the premises where they were previously used and subject to any EPA authorisation conditions which the EPA may see fit to impose and to inspection by the EPA.

As mentioned earlier under Section E (the graded authorisation system), the EPA has updated its inventory of disused sources.

Article 14. Design and Construction of Facilities

It should be noted that if the building of a new radioactive waste storage facility is considered appropriate, Ireland would, in the planning and siting of any future waste storage facility and, as a member of both the IAEA and the European Community, take due account of all relevant aspects of the requirements for public consultation, as required by the Aarhus Convention, to which Ireland is a signatory (Ref 9 & Ref 10); an Environmental Impact Assessment, where required (Ref 11), and would also take due

account of the regulations, both national and international governing the siting, planning, construction and operation of such a facility.

Article 15. Assessment of Safety of Facilities

Under the current regulatory regime, the EPA would assess any application for facilities for the short or long term storage or the disposal of sealed sources in Ireland. The EPA would not license the facility until it was satisfied that it did not present a hazard to persons or the environment. All such applications would have to take due account of the standards for such facilities as promulgated by the IAEA.

Article 17. Institutional Measures after Closure

Ireland has no historic or current civil or defence nuclear reactors or spent fuel storage or reprocessing activities. There are currently no centralised waste stores. There are, therefore, no specific plans or requirements relating to post closure institutional control and associated activities of, for example, monitoring or security. Any institutional regulatory measures for stored waste sources and current disposals in Ireland are fully covered under the current legislative and regulatory regime (notably the Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019) and are described in Section E Legislative and Regulatory System (especially under authorisation conditions).

Section I: Transboundary Movement (Article 27)

In Ireland, any internal or transboundary transport of radioactive sources (whether in use or disused) is controlled and authorised by the EPA. The shipment and transfer of radioactive substances are governed by the national legislation derived from the relevant European Commission Directives and Regulations. This means transboundary movements are governed by:

- The provisions of the ADR (European Agreement Concerning the International Carriage of Dangerous Goods by Roads) and of RID (Regulation Concerning the International Carriage of Dangerous Goods by Rail) which apply directly.

- Technical Instructions of the International Civil Aviation Organisation (ICAO) and the Dangerous Goods Regulations of the International Air Transport Association (IATA) that are directly applicable.

- Council Directive 2006/117 EURATOM of 20 November 2006 on the supervision and control of shipments of radioactive waste and spent fuel.

- Commission Decision 2008/312/EURATOM of 5 March 2008 establishing the standard document for the supervision and control of shipments of radioactive waste and spent fuel referred to in Council Directive 2006/117/EURATOM.

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

The transfer of radioactive sources or waste from Ireland to other countries is limited to the return of disused sources to the suppliers or to the transfer of disused sources to an overseas waste management facility for reuse or recycling purposes.

The approval of the Dublin Port Company is required for transport of Class 7 dangerous goods by sea through Dublin Port and other authorised Ports. Shipments are required to be in accordance with the current IMDG Code (International Maritime Dangerous Goods Code). The EPA and the Dublin Port Company collaborate on shipments of Class 7 by sea.

The EPA also collaborates with the Northern Ireland Environment Agency and the HSE Northern Ireland with respect to cross border movements of Class 7 goods (industrial radiography, nuclear moisture density gauges, radiopharmaceuticals etc). In addition to regular contact, both organisations meet annually to discuss areas of mutual interest with respect to radiation protection, emergency planning, environmental monitoring and transport of radioactive material.

A request for the practice of importation / exportation of the source to be added to the licence if the item is being brought in from a country outside the EU. If a licensee in Ireland is importing / exporting the sources, then importation/ exportation must be included in the inventory schedule of the licence.

For sealed sources being brought into Ireland from the EU or are being shipped out of Ireland to the EU, the standard document pursuant to Council Regulation (EEC) No 1493/93 on the Shipment of Sealed Sources between the Member States of the European Community, needs to be completed by the applicant and stamped by an inspector of the Competent Authority.

Section J: Disused Sealed Sources (Article 28)

In Ireland, sealed and unsealed sources are used in the State and private sectors of the economy. In the State sector, the main users are medical and educational establishments. In the private sector, sealed sources have many uses including in gauges, check sources and medical devices. Authorisation conditions have already been described (Section E Article 20). The lists of sources that are now classified as disused are set out in Appendix 1 which relate to the position in October 2020. The following Sections give further details of the main groups.

Inventory of Sealed Sources

In 2011 a source reduction programme commenced to reduce the inventory of disused radioactive sources held by EPA authorised users across Ireland. This programme resulted in a very significant reduction the national inventory of disused sealed sources, reducing it to a very small fraction of the inventory that existed in the years prior to 2011 (Figure 3).

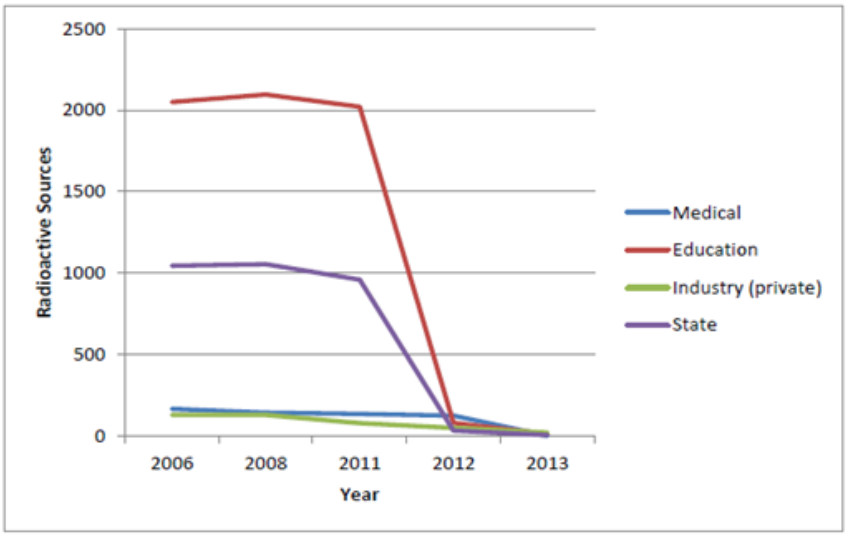

Figure 3: Disused source inventory reduction in all sectors (half-life >10 years)

The remaining sources that comprise the current disused source inventory arise from acquisitions made prior to the introduction of take-back agreements into normal regulatory practice and so the waste issue in Ireland is substantially a legacy issue. The inventory is comprised of items containing such radioisotopes as Cs-137, Co-60, Am-241 and Sr-90. These are detailed in Appendix 1.

Lightning Preventors Incorporating Radium

In the 1970s a number of lightning preventors incorporating radium in semi-sealed sources were imported and used on a number of buildings in Ireland. They are no longer considered to provide any benefit over conventional lightning conductors and the ORP does not allow their importation. A programme has been undertaken to review historic records to identify unlicensed lightning preventors containing radium-226. There was a concerted effort in particular to have these removed from buildings and disposed of and this proved to be very successful. However, at the time of reporting four remain and there is on-going work to ensure they will be disposed of.

In February 2015, the EPA was informed that elevated radiation levels had been detected in a consignment of scrap metal at a metal recycling facility by a portal monitor on the weighbridge. The material where the high readings originated was removed, segregated and made secure. After a thorough radiological assessment and manual search of two scrap metal consignments, a damaged lightning preventor (with five radioactive foils attached) plus two loose radioactive foils were discovered. The sources were removed to a safe location by the EPA inspectors where subsequent testing revealed the sources to be radium-226. Irelands Temporary Operation Protocol for making safe and managing orphaned or seized radioactive sources is a regulatory document published in 2013. This Protocol was implemented by the EPA with the Department of the Environment, Climate and Communications for these sources which were subsequently sent abroad for recycling.

Disused Educational Sources

A disposal programme for disused sources held by secondary schools was undertaken and a tender seeking specialist waste disposal contractor to dispose of all unwanted schools' sources was issued in 2013. Following a successful tender process, a source disposal programme commenced in June 2013 with an initial survey of 55 schools to estimate the scale of the problem. The source removal phase of the commenced in December 2013 and is now complete. An update was provided in the oral presentation at the Convention meeting in 2015. All legacy disused school sources previously reported was recycled abroad as part of the source reduction programme in line with Government policy.

Implementation in Ireland of the HASS Directive

The purpose of the HASS Directive (2003/122/EURATOM) (Ref 12) is to prevent exposure of workers and the public to ionising radiation arising from inadequate control of high activity sealed radioactive sources and orphan sources and to harmonise controls in place in the Member States by defining specific requirements ensuring that each such source is kept under control. The Directive was transposed into Irish Law in December 2005 as the Radiological Protection Act 1991 (Control of high activity sealed radioactive sources) Order 2005 (S.I. No. 875 of 2005). This was subsequently revoked, and its provisions included in the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019. The EPA is designated as the Competent Authority for the purposes of the Legislation and the Directive.

At present there are approximately 1200 licensed sealed sources in Ireland, which have activities that would bring them under the control of the HASS Directive. The majority of these are used in the irradiation cells of two sterilisation plants. The majority of the remaining sources coming within the scope of the HASS Directive are held by industrial radiography companies, universities, and hospitals and by a manufacturer of radioactive gauges. All legacy HASS sources previously reported have now been disposed of abroad as part of the source reduction programme in line with Government policy.

Emerging Issue with Orphan Sources

Since 2010 there has been a significant increase in the use of waste to energy facilities for municipal solid waste (MSW) in Ireland. The Industrial Emissions Directive 2010/75/EU (IED) and the corresponding Irish Regulations (The European Union (Industrial Emissions) Regulations 2013 (SI 138 of 2013) and Environmental Protection Agency (Industrial Emission) (Licensing) Regulations 2013 (SI 137 of 2013)) require such incineration/ thermal recovery facilities to have portal monitoring systems to detect

the presence of radioactive material. Both Irish facilities now have such monitoring systems in place.

Since early 2020 both radiation monitoring portal monitoring systems have been operational at both Irish facilities. Experience to date suggests that the majority of activations result from short live isotopes are of medical origin, which can be decayed stored. This situation is being closely monitored to establish if future detections of sources by these portal monitoring systems, if any, is creating a high volume of orphan sources. This will subsequently feed back into the evolution of the national radioactive waste management policy.

Progress on Inventory Reduction

On-going initiatives taken by the EPA and other actors in line with Government policy during the reporting period have resulted in a significant reduction in the number of disused sources. These initiatives included encouraging holders through the inspection process to pursue disposal options available from specialist waste management companies.

Section K: Planned Activities To Improve Safety

The EPA continually reviews its graded authorisation and inspection system to ensure that it remains focused on ensuring a high level of safety and security and takes account of developments in radiation protection philosophy and radiation safety standards. Recently implemented or planned activities to improve safety include the following:

Suggestions and Challenges raised at the Sixth Review Meeting, May 2018

Establishment of a National Waste Store was highlighted as a challenge at the Sixth Review Meeting 2018.

- The nature of the challenge has significantly changed following successful Source Reduction Programme
- The requirements for such a facility have changed

As highlighted in the previous national report, the National Source Reduction Programme resulted in a significant reduction in the size of the national inventory of disused sources. In 2020 DECC requested that that the EPA undertake a review of the national storage requirements for radioactive waste envisaged in the 2010 Enviros report. This review concluded that while there has been a significant reduction in the number of disused sources, the potential for orphan sources to arise still remains. This will inform the revision of national waste management policy.

In addition, the EPA continues to take the following specific regulatory actions:

- Continue to target holders of disused radioactive sources in the annual inspection programme bringing pressure to bear to explore disposal options as an alternative to enhanced security arrangements. Ultimately, where routes are identified and there are no compelling reasons for not exercising them particularly where there are existing ‘take back’ agreements in place then EPA authorisation can be revoked and prosecutions can be contemplated though this has not been tested to date. The current strategy is to strongly encourage compliance and there is some evidence that this is working.

- Continue to engage with the Radiation Protection Advisors (RPA) in a future workshop to outline the issues and objectives of the inventory reduction programme and to encourage their active participation in source disposal initiatives.
- A graded approach to authorisation has been introduced and the EPA has increased, to the maximum extent possible taking full cognisant of safety and security issues, the transparency of the regulatory process.
- The development of a modern information management system to provide a greater degree of functionality and data management for the graded authorisation system of licensing and registration.

Overview matrix of liabilities and current policies and practices

An overview matrix providing the types of liabilities and the general policies and practices for Ireland is provided in Appendix 5 (Table 4).

Implementation of the National IRRS Action Plan

Ireland hosted an IAEA IRRS review mission in 2015, following a thorough self-assessment, and the final report was presented to Ireland in February 2016. This report set out the review team's assessment of Ireland's compliance with the IAEA's Fundamental Safety Principles and Safety Requirements and included a series of explicit recommendations, suggestions and good practices.

An IAEA press release was issued at the end of the IRRS mission. The report is available on the EPA website, the IAEA website and the Department of the Environment, Climate and Communications website.
http://www.epa.ie/pubs/conferencesandevents/irrsmissionreportfinal.html

An Action Plan was developed to address the IRRS findings as well as other significant issues identified during the self-assessment phase of the IRRS process and significant progress has been made to date in addressing these findings.

At the time of the review, the International standard (IAEA GSR Part 3) had been updated in line with the most recent ICRP Recommendations (ICRP 103). However, because the 2013 EURATOM BSS had not yet been transposed into Irish Law, the Irish regulatory system was still based on the previous Directive (1996 EURATOM BSS) which was underpinned by earlier ICRP recommendations (IRCP 60). As a consequence, the majority of the individual recommendations and suggestions relate to the updating of Irish Law in line with the new standard. Consequently, the transposition of the 2013

EURATOM BSS into Irish Law in early 2019, together with the development of the EPA's general Code of Practice address many of the IRRS findings.

It should be noted that another significant tranche of the recommendations was addressed through the new regulatory framework for patient protection and the establishment of the Health Information and Quality Authority (HIQA).

A summary of the current situation (June 2020) is as follows:

- Ten findings have been closed with the transposition of the Basic Safety Standards Directive.
- Seven findings are considered partially closed and on track to be closed with confidence, on publication of the general Code of Practice, relevant guidance and the associated Regulatory Fundamentals Document (late 2020/2021).
- Three findings are partially closed and are a matter for DCCAE & DOH.
- Three findings are closed on the basis that ionising radiation functions are now fully integrated into EPA structures and processes.
- Five findings are closed on the basis of EPA administrative and operational arrangements.
- The finding on Radioactive Waste Management Strategy has been closed by Government under Ireland's National Programme with respect to Directive 2011/70/EC.
- Five Emergency Planning and Nuclear Safety related findings have been closed by the revised National Plan for Nuclear and Radiological Emergency Exposures, published in 2019 by Government and by the EPA's 2016-2020 Strategic Plan and associated Emergency Planning and Regulatory Work Programmes.
- One finding in Emergency Planning and Nuclear Safety is considered partially closed and on track to be closed with confidence. This is linked to the Code of Practice and the Emergency Planning and Regulatory Work Programme (late 2020/2021).
- One finding is currently open for the EPA. Work on the National Dose Register is expected to take place in late 2020 and 2021. The use of a unique identification for an exposed worker has yet to be decided, however it is provided for in the IRR19.

Ireland has requested an Artemis Mission. This has been scheduled for 2021 by the IAEA and preparations are well advanced. The impact of the COVID-19 pandemic on this schedule is unknown at this point.

Enhancing openness and transparency in the implementation of the obligations under the Joint Convention

One of the key strategic goals for the EPA is to provide information on radiation protection, in a readily accessible and understandable format, so that the public has the necessary information to protect themselves from the harmful effects of exposure to radiation. In particular, the EPA publishes an annual report on its regulatory activities and includes issues dealing with radioactive waste. A range of communication activities are undertaken each year to meet this objective and to promote the work of the EPA through the media, events, advertising, the EPA website, free phone call centre for radon advice, presentations and publications.

The media play a significant role in disseminating information and in reporting on radiological protection issues of public concern. Press releases are issued to coincide with the EPA's major events and media interest in EPA activities is strong with staff participating in many television and radio programmes on an annual basis. The print media also have a keen interest in EPA activities. Feature articles have also been placed in publications which assist in highlighting the array of activities that the EPA is responsible for. The EPA ensures that all public communications are focused and use the media to target various groups in the community and continuously develops their existing relationships with the media.

Each year the EPA hosts several events including report launches, seminars and presentations with the objective of disseminating information to targeted groups. The EPA's website, www.epa.ie, is a valuable source of key information. Each year, the EPA produce a number of publications, including reports, guidance notes, codes of practice, information leaflets and posters – all of which are available free of charge on www.epa.ie.

In May 2019 Ireland attended an Open-Ended Meeting of Technical and Legal Experts for Sharing Information on States' Implementation of the Code of Conduct on the Safety and Security of Radioactive Sources and its Supplementary Guidance. The meeting was attended by 192 participants from 104 Member States of the IAEA.

In line with the relevant applicable norms, nuclear safety and security is the prime responsibility of States. While radioactive sources offer many benefits in medicine, industry, agriculture, research and education, they pose risks to human health and the environment unless they are safely and securely managed. Through implementation of the Code of Conduct on the Safety and Security of Radioactive Sources (the Code), the strengthening of national legislative and regulatory infrastructures globally has led to major improvements in the protection and control of radioactive sources. The supplementary Guidance is intended to consolidate and provide further details on the

management of disused sources consistent with the Code in response to requests from Member States and Non-Member States.

A presentation on 'Security of Radioactive Material in Ireland' was provided within the Country Group Session and Ireland also chaired a Topical Session on the 'Safe and Secure Management of Radioactive Material that is Inadvertently Present in Metal Scrap' in addition to presenting the findings to Plenary.

Conclusion

This National Report describes how Ireland is meeting its obligations as a Contracting Party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. It describes the regulatory infrastructure, the operational radiation protection arrangements, the system of emergency preparedness and recent and planned initiatives to improve safety.

Achievements since the Sixth Review Meeting include:

- The transposition into national legislation of the Council Directive 2013/59/Euratom of 5 December 2013 into Irish legislation through the Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019). These new Regulations, are referred to as the Ionising Radiation Regulations of 2019 (IRR19),

- Implementation of graded authorisation with the transposition of the new European Basic Safety Standards Directive with an authorisation system consisting of licensing and registration

- A review and update of the National Emergency Plan for Nuclear Accidents (NEPNA) to a new National Plan for Nuclear and Radiological Exposures by the Department of the Environment, Climate and Communications (DECC) was reviewed by the Government Task Force on Emergency Planning and received ministerial approval.

- A strategic review of the EPA's emergency preparedness and response arrangements was conducted by external consultants which concluded that the EPA's arrangements for a nuclear or radiological emergency were robust.

- The OECD conducted a review of the EPA's institutional and organisational set-up. This review analysed the EPA's governance arrangements, including how the

EPA assesses its own performance and is open and transparent about its obligations and results. This review was published in 2020.

Ireland believes that the current Report answers all the comments made and questions posed by other Contracting Parties on the previous Report relating to the infrastructure and operational arrangements in place to ensure the safety of radioactive waste management in Ireland.

To conclude, therefore, Ireland believes that it is meeting its obligations under the Joint Convention.

References

Ref 1 IAEA Information Circular INFCIRC/604 Rev_3_18 of December 2014 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Guidelines regarding the form and structure of National Reports.

Ref 2 Council Directive 2013/59/Euratom of 5 December 2013 laying down the basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation.

Ref 3 Status of the Implementation of the European Directive 96/29/Euratom in Ireland and with Relation to NORM. C ORGANO, Radiological Protection Institute of Ireland

Ref 4 Inspection and Licensing Activities and Annual Inspection Programme

Ref 5 GS-R-2. Preparedness and response for a nuclear or radiological emergency: safety requirements - ISSN 1020-525X. - [9], 72p.: 24 cm. - Jointly sponsored by FAO, IAEA, ILO, OECD/NEA, PAHO, OCHA, WHO.

Ref 6 Statement by Minister Phil Hogan, Minister for Environment, Community & Local Government, to the 55th Session of the IAEA General Conference, 19th September 2011.

Ref 7 Department of Communications, Marine and Natural Resources Energy White Paper. Delivering a Sustainable Energy Future for Ireland. March 2007.

Ref 8 OSPAR Convention. Appendix 1-Criteria for the definition of Practices and Techniques mentioned in Paragraph 3(b)(i) of Article 2 of the Convention.

Ref 9 Convention on Access to Information, Public Participation in Decision Making and Access to Justice in Environmental Matters (1998 Aarhus Convention).

Ref 10 Socio-economic and other non-radiological impacts of the near surface disposal of radioactive waste. IAEA-TEC-DOC-1308.

Ref 11 Environmental Impact Assessment. Directive 85/337/EEC, as amended by Directive 97/11/EC. Assesses the effects of certain public and private projects

on the environment, including the dismantling or decommissioning of specified nuclear power stations and nuclear reactors.

Ref 12 Council Directive 2003/122/Euratom on the control of high activity sealed radioactive sources and orphan sources (the HASS Directive).

Appendix 1: Data for Disused Sources in Ireland

Table 1: Summary of "Custody Only" disused Sources (half-life > 10yrs October 2020)

	No. Of Licensees	**No of sources half-life >10 yrs.**
Medical	0	0
Industry	4	10
Education	5	8
State/Other	1	4
Total	**10**	**22**

In addition, we are aware of three lightning preventors, with Ra-226, currently in situ on buildings. The EPA is currently working with DECC to resolve this issue.

Appendix 2: Relevant national laws, regulations, requirements and guides.

Radiological Protection Act 1991 (Ionising Radiation) Regulations 2019 (SI No 30 of 2019)

Radiological Protection Act, 1991 (Ionising Radiation) Regulations 2019 (S.I. No. 30 of 2019). This statutory instrument gives effect to Council Directive 2013/59/Euratom of 5 December 2013 (Basic Safety Standards Directive) European Communities (on the supervision and control of certain shipments of radioactive waste and spent fuel) Order (SI No. 86 of 2009);

Commission Regulation (Euratom) No 302/2005 of 8 February 2005 on the application of Euratom safeguards which equally apply in Ireland;

European Communities (Nuclear Safety) Regulations 2017 (SI No. 332/2017)

European Union (Basic Safety Standards Arising from Medical Exposure to Ionising Radiation) Regulations 2018 (SI No. 256 of 2018);

European Communities (Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment) Regulations 2011 to 2019

European Communities (Supervision and Control of Certain Shipments of Radioactive Waste) Regulations, 1994 (S.I. No. 276 of 1994) (This statutory instrument gives effect to Council Directive 92/3/Euratom on the shipment of radioactive waste.)

Carriage of Dangerous Goods by Road Regulations, 2001 (S.I. No. 492 of 2001) (This statutory instrument gives effect to Council Directives 94/55/EC as amended by Directive 2000/61/EC and Directives 96/86/EC and Directive 1999/47/EC and Directive 95/50/EC as amended by Directive 2001/26/EC on the carriage of dangerous goods by road; including the loading and unloading of the dangerous goods in relation to their carriage.)

European Communities (Safety Advisors for the transport of Dangerous Goods by Road and Rail) Regulations, 2001. (S.I. No 6 of 2001) This statutory instrument gives effect to Directive No. 96/35/EC and Directive 2001/18/EC.

Council Regulation (Euratom) No 1493/93 on shipments of radioactive substances between Member States. This regulation sets out the procedure to be followed when shipping sealed sources to Member States of the European Union.

Containment of Nuclear Weapons Act 2003 (No. 35 of 2003)
This Act provides the legislative basis for the implementation of Ireland's obligations under the 1998 Protocol to the 1973 Agreement between the European Atomic Energy Community (EURATOM); the non-nuclear weapons States of EURATOM and the International Atomic Energy Agency.

The Containment of Nuclear Weapons Act, 2003 Regulations, 2004 (S.I. 123 of 2004). This Regulation provides the regulatory basis to enable Ireland to implement its obligations under the Protocol Additional to the 1973 Agreement referred to above.

Nuclear Test Ban Act 2008 (No. 16 of 2008). This Act provides the legislation needed to enable Ireland to implement its obligations under the Comprehensive Nuclear Test Ban Treaty.
European Communities (Supervision and Control of Certain Shipments of Radioactive Waste and Spent Fuel) Order, 2009 (S.I. No 86 of 2009). This statutory instrument gives effect to Directive No. 2006/17/EURATOM laying down conditions for the supervision and control of shipments of radioactive waste and spent fuel.
Radiological Protection (Miscellaneous Provisions) Act, No 20 of 2014

European Communities (Nuclear Safety) Regulations 2017 (S.I. No. 332 of 2017)

The Environmental Protection Agency Act, No 7 of 1992

Radiological Protection Act 1991(Authorisation Application And Fees) Regulations 2019 (SI No 34 of 2019).

Appendix 3: Summary of inspections carried out by EPA in 2019

Table 2: Summary of Inspections carried out by the EPA in 2019

Regulated Facility Category	**Number of Licensees**	**Site Visits Undertaken 2019**
Hospital & Medical Facilities	139	35
Industrial & Commercial Licensees including Source Distributors & Transport Companies	117	29
Education & Research Licensees	15	4
Other Licensees (low & medium risk vets, dentists, cabinet X-ray, & X-ray distributors)	1478	14
Total	**1749**	**82**

Appendix 4: The National Plan for Nuclear and Radiological Emergency Exposures Accidents (The Plan)

Notification of a Nuclear Incident

Early formal notification of a nuclear accident abroad would be received through either or both of the following:

- The European Community Urgent Radiological Exchange system (ECURIE) arrangements which have been set up with the EU to implement Council Decision 87/600/Euratom, providing for the early exchange of information in the event of a radiological emergency.

- The IAEA EMERCON arrangements, which are based on the 1986 Early Notification Convention.

The Irish National Warning Point for both ECURIE and EMERCON is operated by the national police service, An Garda Síochána. The EPA is the national competent authority for both sets of arrangements and to support this the EPA operates an on-call duty officer system whereby a senior member of the EPA staff is available 24 hours a day, 7 days a week to assess any alert and where necessary activate the emergency response.

On receipt of an alert notification, the police will immediately contact the EPA duty officer who will make an initial assessment of the situation. Where appropriate, the duty officer together with other key staff from the EPA and the Department of the Environment, Climate and Communications (DECC). The decision on whether to convene the National Emergency Coordination Group (NECG) will be made by officials from DECC as the Lead Government Department for such emergencies. In the event that the decision is taken to convene the NECG, arrangements are in place for the Office of Emergency Planning to rapidly notify the appropriate key staff in the relevant Government Departments and public authorities.

In the event of an incident occurring at nuclear installations in the UK, arrangements have operated since 1992 whereby the UK Department of Business, Energy and Industrial Strategy (BEIS) informs Ireland's Department of the Environment, Climate and Communications (DECC) and the EPA when it is notified of an incident on UK territory involving a release of radioactivity into the environment. This is regardless of whether the incident has any radiological significance for Ireland. A bilateral agreement covering information exchange is also in place between the EPA and the UK's Office for Nuclear Regulation. This agreement covers both routine bilateral meetings between the

two regulatory agencies and arrangements for rapid exchange of information in the event of an incident or accident. On 10th December 2004, Ireland and the Government of the United Kingdom and Northern Ireland signed a Bilateral Agreement on Notification in the Case of a Nuclear Accident or Radiological Emergency. This Agreement was designed to formalise the above-mentioned existing arrangements by ensuring that exchanges of information happen on agreed basis through specified channels. In 2019, operational arrangements to support this Bilateral Agreement were agreed by all parties.

In the event of an incident from which a release of radioactive material occurs, or is likely to occur, and which has resulted or may result in a release that could have an effect or the risk of an effect outside a Party's territory and be of radiological safety significance to the territory of the other Party, the following information will be provided to the other Party:

- the time, exact location where appropriate, and the nature of the accident or incident;
- the facility or activity involved;
- the assumed or established cause and the foreseeable development of the accident or incident relevant to the transboundary release of the radioactive materials;
- the general characteristics of the radioactive release, including, as far as practicable and appropriate, the nature, probable physical and chemical form and the quantity, composition and effective height of the radioactive release;
- information on current and forecast meteorological and hydrological conditions, necessary for forecasting the transboundary release of the radioactive materials;
- the results of environmental monitoring relevant to the transboundary release of the radioactive materials;
- the off-site protective measures taken or planned, including measures taken or planned to inform the public; and
- the predicted behaviour over time of the radioactive release.

In May 2018, Ireland joined the International Atomic Energy Agency's Response and Assistance Network (RANET). EPA's expertise in atmospheric dispersion modelling, radiation dose assessment and environmental sampling and the analysis of radioactivity in samples was added to RANET. The EPA tested their RANET capabilities by participating as an assisting State in the IAEA's Conv-Ex 2b exercises in 2018, 2019 and 2020.

Emergency Monitoring Systems

As part of Ireland's emergency preparedness, the EPA operates a National Radiation Monitoring Network (NMRN) for the detection and measurement of radioactivity in the air and deposits on the ground (See Figure 4).

The NRMN consist of twenty-one sites across Ireland that constantly monitor radiation levels in the environment, with the support of the national Meteorological Service (Met Éireann), local authorities and the Defence Forces. The locations of the twenty-one sites are illustrated in Figure 4. Fifteen of the twenty-one sites host a continuous gamma dose rate monitor that automatically communicate hourly dose rate measurements. These hourly dose rate measurements are transmitted live to EURDEP (EC), from there to the IAEA IRMIS system, and published on the EPA website. Ten of the sites contain precipitation samplers, which are changed monthly: in routine monitoring two samples are measured each month in the EPA's National Radiation Monitoring Laboratory in Dublin. Five sites contain 4 m^3/hr 'low volume' aerosol filter-roll units that automatically communicate alpha/beta radioactivity readings to the EPA. Six sites contain 6 m^3/hr 'low volume' aerosol filter samplers that are changed on a weekly basis: all filters are posted back to the EPA's National Radiation Monitoring Laboratory and one sample per month from each site is measured by gamma spectrometry and for gross beta using a proportional counter. One site at University College Dublin contains a 900 m^3/hr 'high volume' aerosol filter sampler that is changed weekly and measured by gamma spectrometry at the EPA's National Radiation Monitoring Laboratory. All filter units can also collect charcoal samples for radioiodine analysis in case of a radiological incident.

The National Radiation Monitoring Network is being renewed through a €2.94M project running until 2022. This focusses on deploying all three sample and measurement types (rainwater, aerosol, dose-rate) together at as many stations as possible, with increased automation and resilience in data collection and handling. Siting is being evolved to promote outreach, including installation of a second national high-volume aerosol sampler for radiation monitoring at Waterford Institute of Technology in the South-east of Ireland.

Figure 4. Map of permanent monitoring stations operated by the EPA

Ireland and the UK share the data from their national gamma dose rate monitoring stations, with data automatically exchanged on an hourly basis. In addition, the gamma dose rate data from the Irish national monitoring network are published on the EPA's website for public access (http://www.epa.ie/radiation/monassess/mapmon/).

Arrangements for Assessing the Potential Impact of a Nuclear Accident/Incident

Since 2000, the EPA has implemented the ARGOS (Accident Report and Guiding Operational System) decision support tool as its primary platform for handling environmental data in an emergency. ARGOS was originally developed by the Danish Emergency Management Agency (DEMA) in association with Prolog Development Centre Inc. Ongoing development and maintenance of the system is now managed by an international consortium and the EPA is Ireland's representative on this Consortium. The ARGOS system allows prognostic, measurement, agricultural and meteorological data to be viewed and overlaid in a geographic information system. The system is updated regularly so that any lessons learnt from exercises or emergency use can quickly be incorporated into operational systems.

The EPA also maintains the HYSPLIT atmospheric dispersion model (HYbrid Single-Particle Lagrangian Integrated Trajectory: HYSPLIT). This model, developed and

maintained by the US National Oceanic Atmospheric Administration, does not include the capability to calculate radiation doses but it does allow long-range dispersion (on a global scale) modelling of radionuclides in air. The model also provides resilience in that more than one atmospheric dispersion model is available in an emergency. For the assessments of events in the vicinity of Ireland, the system uses high resolution meteorological data (2.5 km) produced by Met Éireann's operational numerical weather forecast system HARMONIE. Meteorological data are automatically available for the previous 30 days to provide information on the past evolution of a radioactive plume while the latest forecasts provide information on the future movement up to 48 hours ahead. Tracking the movement of radioactive material in the atmosphere over the global scale is likewise supported through use of the latest European Centre for Medium-Range Weather Forecasts (ECMWF) global analyses/forecasts on a slightly larger grid resolution compared to the HARMONIE model (15 km).

A national HYSPLIT user group, chaired by the EPA, is in place to share experiences and resources related to HYSPLIT.,

The EPA has an information management system to support its emergency preparedness and response. In the event of an accident the Emergency Response Management Information System (ERMIS) provides a means of processing, recording and disseminating incoming information during an emergency response. In addition to response management, the ERMIS platform can display dispersion model outputs and monitoring data. ERMIS includes staff and emergency contacts information that may be used during an emergency response. The platform also includes details of international emergency notification systems and other useful background information and emergency procedures.

Public Information in Support of the National Plan for Nuclear and Radiological Emergency Exposures Accidents

Arrangements are in place to inform the public of the accident, its consequences and of any countermeasures that are to be implemented to reduce doses to the population. This information would be issued through media channels: radio, television including social media, internet, press statements, press conferences and via national weather forecast broadcasts on television and radio. Regular updates of the situation would be given. In Ireland, Regulation 59 of IRR 2019 outlines the steps that need to be taken to in the event of an emergency where members of the public could be exposed.

Public opinion is an important part of emergency preparedness and comments received from the public are taken into consideration as part of the planning process. Emergency

planning developments are published in the Annual Reports of the EPA and other statutory agencies such as local authorities update their emergency planning procedures including for nuclear emergencies on a regular basis. These are also published.

The EPA has a dedicated emergency preparedness section on its website to provide information on emergency planning in Ireland for the public and licensees. In addition, the EPA use the @EPAIreland twitter account as a method of communicating quickly and easily with the general public. This may be used to keep the public informed during an emergency response.

Testing of the Emergency Plan

Communication systems and arrangements for exchange of early notifications are tested regularly. A programme of testing of the ECURIE arrangements is coordinated by the European Commission. This includes tests of the duty officer contact arrangements and the exchange of simulated radiological data between Member States. Equivalent arrangements are in place to test the EMERCON notification system (USIE) coordinated by the IAEA. It is recognised that international cooperation on exercises is essential. Irish authorities regularly participate in international exercises such as those in the INEX series and the Conv-Ex exercises coordinated by the IAEA. The EPA also participates in the ECURIE Level 3 exercises coordinated by the European Commission.

Regular national exercises have taken place such as a national-level exercise in 2017 which used an IAEA Conv-Ex-3 exercise to test the whole of government response to a nuclear emergency with the new Lead Government Department, DECC, chairing the National Emergency Co-ordination Group for the first time. The objectives of the exercise were to test various elements of the National Plan and included:

- Receipt and acknowledgement of the emergency notification from the IAEA by the National Warning Point (police) and notification of the Duty officer in the Competent Authority (Environmental Protection Agency);
- Activation of emergency response by the Environmental Protection Agency (EPA) Duty Officer;
- Exchange of information with international organisations using the international notification systems;
- Review of IAEA's Assessment and Prognosis tools;
- Provision of information to the public;
- Decision making regarding agricultural protective actions;
- Provision of advice to Irish citizens in the accident country, advice to citizens travelling to the accident country and preparedness of Irish embassies for nuclear/radiological emergencies;

- Exchange of information on protective actions with the United Kingdom

In 2018, the IAEA invited Ireland to participate as the 'Accident State' in a ConvEx-2c exercise to test arrangements for a transnational radiological emergency. The scenario developed for the exercise was a terrorist incident involving two explosions of devices containing radioactive material (from stolen radiography sources) in Dublin city centre. The exercise was hosted by the EPA in co-ordination with the Incident and Emergency Centre in the IAEA. For this exercise, representatives of the Department of Justice and Equality and the police were present to facilitate real-time, active collaboration with international counterparts through the IAEA. In addition, 70 IAEA Member States and five international organisations (including EUROPOL and the Comprehensive Nuclear-Test-Ban Treaty Organization, CTBTO) participated in the exercise.

In 2019, EPA again participated as the 'Accident State' in a ConvEx-2g exercise on invitation from the International Atomic Energy Agency to test the IAEA's social media simulator for the first time outside the IAEA.

The national level and main international exercises (routine notification exercises are not included) in which the EPA participated since 2017 are listed in Table 3.

Table 3: Main national and international exercises EPA has participated in since 2017

Year	Exercise (main focus)	National/International Exercise
2018	ConvEx-2a (use of USIE – notification of incident and reporting results) ConvEx-2b (To test the arrangements for a request and the provision of assistance. Ireland played as an assisting state.) Conv-Ex-2c (Ireland acted as the accident country involving a CBRN scenario in Dublin) Technical Assessment Exercise (To test the decision-making process for the EPA's Technical Assessment Team) Radiation Monitoring Laboratory Exercise (To test the emergency response capabilities of the EPA's radiation monitoring and sample co-ordination teams) UK-Ireland Bi-lateral Agreement (test contact points outlined in the UK-Ireland Bi-lateral Agreement)	International (IAEA) International (IAEA) International (IAEA) National (EPA) National (EPA) International (UK Department Business Energy and Industrial Strategy)
2019	ConvEx-2a (use of USIE – notification of incident and reporting results) ConvEx-2b (To test the arrangements for a request and the provision of assistance. Ireland played as an assisting state.) ConvEx-2g (To test the arrangements for dissemination of information to the public) Exercise Andromeda (UK-Ireland arrangements for the notification of a nuclear incident in the UK)	International (IAEA) International (IAEA) International (IAEA) International (UK Department Business Energy and Industrial Strategy)

2020	ConvEx-2a (use of USIE – notification of incident and reporting results) ConvEx-2b (To test the arrangements for a request and the provision of assistance. Ireland played as an assisting state.)	International (IAEA) International (IAEA)

In addition to participation in major national exercises, individual public authorities and agencies which have been assigned responsibilities under the National Plan are required to routinely test their emergency arrangements. The EPA, for example, routinely tests its arrangements including: communications arrangements, duty officer arrangements, emergency laboratory procedures and technical assessment procedures. The Defence Forces and Civil Defence regularly test their arrangements for monitoring and sample collection.

Appendix 5: Overview Matrix

Table 4: Overview Matrix

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	Discharge to sewers (unsealed) or stored under licence	Polluter pays principle applies	Discharge to sewers (unsealed) or stored under licence	n/a
Decommissioning	n/a	n/a	n/a	n/a
Disused Sealed Sources	Return to original supplier or overseas for recycling/reuse	Polluter pays principle applies	Return to original supplier, exported for recycling/reuse or stored under licence	Ireland has revised its policy on disused sources in light of the success of a radioactive waste inventory reduction programme which has reduced the number of disused sources to 25. All new sources must have take back/repatriation agreements as part of Ireland's graded authorisation system to ensure the number of

				sources trends towards zero. In light of the 2020 EPA review, DECC are currently reviewing the national waste management policy.