Radiological Protection Institute of Ireland
An Institiúid Éireannach um Chosaint Raideolaíoch

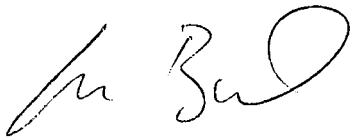
Radiological Protection Institute of Ireland

FINAL REPORT 1992–2014

To the Minister for the Environment, Community and Local Government

The Radiological Protection Institute of Ireland was dissolved on the 1st of August 2014 under Statutory Instrument pursuant to the Radiological Protection (Miscellaneous Provisions) Act, 2014. On that day all of its functions together with its assets, liabilities and staff transferred to the Environmental Protection Agency.

In accordance with the requirements of the Radiological Protection (Miscellaneous Provisions) Act, 2014, I present the Final Report of the activities of the Radiological Protection Institute of Ireland and a Statement of Accounts for the period 1 January 2014 to 1 August 2014.



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Contents

Overview

This report presents an overview of the work of the Radiological Protection Institute of Ireland (RPII) from its establishment in 1992 through to its merger with the Environmental Protection Agency (EPA) in August 2014. Under the terms of the merger, initiated as part of the Government's programme of rationalising State agencies, the functions and staff of the RPII were transferred to the EPA to be undertaken by a newly established office, the Office of Radiological Protection (ORP).

Following its coming into operation in April 1992, the RPII worked to achieve its mission of protecting people in Ireland from the harmful effects of radiation and to establish itself as an independent and authoritative source of information and guidance on all issues relating to the protection of the public from hazards associated with ionising radiation, whether the origin of the radiation is the nuclear industry, radon gas in buildings or its multiple uses in medicine and industry. The new Institute assumed the responsibilities of the Nuclear Energy Board (NEB) but its functions were greatly broadened and brought up to date to reflect the changing priorities and emerging challenges.

Throughout its existence, a major focus for the RPII was the regulation of the safe use of ionising radiation in Ireland, achieved through a system of licensing, inspection, guidance and enforcement. Ionising radiation plays an important role in society through its use for diagnostic and therapeutic purposes in medicine, as well as in research and development, quality control and production in industrial and educational settings. The increase in the number of licences in force from 824 in 1991 to 1734 in 2014 reflected a growth in the use of ionising radiation generally, but also the systematic approach of the RPII to ensuring that all relevant classes of activities were regulated in line with national and international requirements. The main legislation governing these activities is the European Council Directive laying down the basic safety standards for the health protection of the general public and workers against the dangers of ionising radiation.

This Directive was updated at regular intervals at European level, implemented in national regulations and enforced by the RPII. The most recent revision was agreed in 2013 and is due to be transposed into Irish legislation by February 2018. New requirements include the implementation of a risk-based approach to authorisation and the establishment of a comprehensive and transparent national radon action plan.

The RPII invested significant effort in inspection, regular review of licence conditions across all sectors and in the issuing and reviewing of Codes of Practice to ensure that licensees implemented good radiological protection practice. The RPII also made effective use of its enforcement powers, bringing over fifty prosecutions for non-compliance with regulatory requirements.

As a regulator in a small non-nuclear country, from the outset, the RPII identified engagement and collaboration with its international peers as critical to maintaining the expertise of its staff and to fulfilling its mandate to keep Government informed of developments internationally. From a regulatory perspective, it invited a number of peer reviews by international experts to provide assurance of its own effectiveness as a regulator

From the early days of the NEB, a particular concern in terms of radiation safety infrastructure in Ireland was the lack of a dedicated national facility for managing radioactive waste. Such waste comprises radioactive sources that are no longer in use, as well as so called 'orphan sources' that for various reasons are not under control. Over the years a number of initiatives had been taken by the RPII's parent department, Department of Environment, Community and Local Government (DECLG) actively supported by the RPII, but with limited success. However, a number of developments including: the ratification by Ireland of the IAEA's Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (2001), increased security concerns and the finalisation of a European Directive on spent fuel and radioactive waste all contributed to a renewed impetus to address this longstanding issue.

A significant milestone was reached by the submission of a report to DECLG in 2006 entitled 'Towards a Radioactive Waste Management Policy for Ireland'. This led to the establishment by Government of an interdepartmental High-Level Group to advise on the management of Ireland's radioactive waste which resulted in the adoption by Government of a national policy in December 2010. Between 2011 and 2014, the RPII and DECLG, working with a number of Government departments and agencies implemented a phased Inventory Reduction Programme that achieved a reduction of approximately 99% in the number of disused sources with long half-lives that were stored across Ireland. This major reduction in inventory greatly reduced the potential size of a storage facility required to manage the remaining legacy sources. Work continues to fully implement the national policy, including examination of options for final disposal of disused sources.

An ongoing and important role for any national radiation safety authority is the assessment of the level of exposure of the population to radioactivity of both natural and artificial origin, and the communication and dissemination of the results of the assessment together with advice as to the means by which exposure levels can be reduced.

In 1992, the RPII launched a nationwide survey of radon gas to establish the extent of the radon problem in Irish homes. The results of the survey, conducted over a number of years, confirmed that exposure to radon is the largest source of exposure to ionising radiation in Ireland accounting for approximately 13% (~250 per year) of all lung cancers. The survey results also highlighted those areas in the country where the probability of finding high radon levels was greatest. In parallel with the publication of the survey results, the RPII continued to encourage householders to measure their homes for radon and to take remedial action where they found high levels. The RPII also worked with Government agencies and departments and Local Authorities on initiatives to incorporate prevention measures in the Building Regulations; to support householders wishing to remediate their homes; and to survey radon levels in schools, workplaces and social housing. The initiative of the Department of Education and Science to implement a nationwide programme to measure radon in every classroom in all primary- and second-level schools and most importantly, to remediate those found to have high levels, was particularly noteworthy.

Overview (continued)

While many individual initiatives were successful, the RPII was nonetheless convinced that a coordinated multi-agency response, informed by an overall national policy, was essential to reduce the health risk from radon and it continued to advocate for the adoption of such a policy. Following a submission in September 2011 the Government decided to establish an inter-agency group to develop a National Radon Control Strategy for Ireland. The strategy was launched in February 2014 with the ultimate aim of reducing the number of radon-related lung cancer cases in Ireland. It contains 48 actions over four thematic areas: prevention, reduction, regulation and awareness. Experience from other countries shows that the achievement of sustainable solutions to the radon problem requires consistent and focused effort over many years. Tackling the radon issue will remain a key priority for the ORP and the EPA.

In addition to exposure to radon, the RPII also evaluated exposure to other natural and artificial radionuclides present in the environment through its marine and terrestrial monitoring programmes. The main focus of the marine monitoring programme was to assess the impact on people and the environment of the on-going discharges into the Irish Sea from the reprocessing of spent nuclear fuel at Sellafield and to communicate the results of the assessment to Government and the public.

The terrestrial programme also focused on the measurement of radionuclides in the environment and the assessment of impact. While in general the results of both programmes continue to show that the radiation doses incurred by the Irish public as a result of artificial radioactivity are small when compared to doses due to radon, it is essential that Ireland maintains its capacity and capability in this area in order to be able to respond effectively to a nuclear or radiological incident.

Following the accident at the Chernobyl Nuclear Power Plant in 1986, Ireland along with many other countries, recognised that it was not adequately prepared to respond to such an event. In 1992, in order to address this issue, the Government published Ireland's National Emergency Plan for Nuclear Accidents. The plan set out the central roles to be fulfilled by the main players in the event of such an accident. For the RPII this would include emergency notification and activation of response; technical assessment of the potential or actual consequences of a nuclear accident; participation with many state agencies and Government departments in a collective response; and providing advice and information to Government and the public. In the years that followed, the RPII developed its network of environmental radiation monitoring stations and has continued to develop its in-house capability to respond to similar events.

It also established the necessary working arrangements with Government departments and agencies – both nationally and internationally – to allow an effective and coordinated response. These arrangements were tested regularly through a programme of emergency exercises organised at national and international level. The response arrangements and the wider capability within the Irish public service were tested in real time following the severe accident at the Fukushima Dai-ichi Nuclear Power Plant in Japan in March 2011 and the subsequent releases of radioactivity to the environment. Although the levels in Ireland were extremely low, they were detectable. Through its sampling and assessment and international networks, RPII was well positioned to provide information and advice to Government, the public and businesses importing from or exporting to Japan. The further enhancement of response capability and capacity has already been identified as an important task following the merger with the EPA.

A key function of the RPII was to monitor international scientific, technological, economic and other developments relating to ionising radiation and radiological safety in order to keep the Government informed and with particular reference to the implications for Ireland. As might be expected, much of the focus of this activity was directed at developments in the United Kingdom and particularly at the nuclear fuel reprocessing plant at Sellafield. Throughout its existence, the RPII worked closely with DECLG to provide information and advice to Government on developments in the UK which could potentially impact Ireland and its citizens. A number of studies on key installations were completed including Sellafield (2005) and Wylfa (2007). More recently a study has been completed on the planned programme to build new nuclear power stations in the UK (2013).

Internationally, in response to events such as the Chernobyl accident (1986), the September 11th terrorist attacks in the US (2001) and the Fukushima accident in Japan (2011), the Global Nuclear Safety Regime i.e. the framework by which high levels of nuclear safety are achieved, has been continually strengthened and improved. Although Ireland has no nuclear facilities itself, we must ensure the safety and security of sources of ionising radiation in Ireland and contribute to international efforts to enhance safety worldwide. RPII has played its part in this process including through the preparation and presentation of national reports on the implementation of obligations under the international conventions; through the participation in relevant peer review processes and through the exchange of experts and provision of training.

Following an invitation to the IAEA by Government in 2010, Ireland's framework for radiation safety was peer reviewed by a team of international experts from the IAEA in September 2015. Preparations for the comprehensive and wide-ranging review commenced with a detailed self-assessment initiated by RPII and continued by EPA of all aspects of radiation protection in Ireland. The review itself was conducted by a team of 14 international experts over a 10 day period. From an RPII/EPA perspective, the overall finding of the experts was that EPA-ORP is an effective and independent regulatory body that benefits from experienced, technically competent and well-motivated staff. As we continue to embed and strengthen radiological protection as a function within the EPA, the finding of the expert team acknowledges the excellent work completed by the Board and staff of the RPII during its existence and provides a sound basis for the continuous improvement of radiological protection in Ireland.

Introduction

The Radiological Protection Institute of Ireland (RPII) was established on 1st April 1992 following the enabling of the Radiological Protection Act 1991 by Ministerial Order in March 1992.

The new Institute assumed the responsibilities previously carried out by the Nuclear Energy Board (set up in 1973) but its role was greatly expanded.

The work of the Nuclear Energy Board, particularly in the years following the Chernobyl accident in 1986, was hugely valuable in preparing the way for the new RPII, especially in developing the national infrastructure for radiological protection, in establishing a system of regulation for irradiating apparatus and radioactive sources and in setting up a national laboratory for monitoring of radioactivity in the environment.

As the new Institute's name implied the RPII's focus was to be on protection and radiological safety, both for those using sources of ionising radiation in the course of their work and for all people living in Ireland.

During the 23 years of its life, the RPII tackled a broad range of vitally important issues. Some, such as the cancer-causing radon gas, remain as concerns even though great progress has been made by the RPII in identifying areas of the country most at risk and in advising homeowners and employers on the necessity to take remedial or precautionary measures. The launch in 2014 by Government of the National Radon Control Strategy was a key development to advance this issue. Others, such as preparing for nuclear emergencies are also still very much on the agenda, and have changed over time as the impact of events such as 9/11 and Fukushima changed public and Government perception of the risks and the responses required.

And then there have been emerging and increasingly complex technologies such as the widespread use of ionising radiation in medicine, industry and research, and these have impacted widely on the work of the Institute.

Now, in 2015, as one of the integral Offices of the Environmental Protection Agency, the Office of Radiological Protection carries out all of the original functions of the RPII and continues to focus on protecting people from the harmful effects of ionising radiation and seeks to anticipate and to mitigate emerging issues that need to be addressed in the field of radiation protection.

Mission and Functions of the RPII

Mission

To ensure that people in Ireland are protected from the harmful effects of radiation

The functions of the RPII were established in the Radiological Protection Act 1991 and can be summarised as:

- To provide advice to the Government, the Minister for Environment, Community and Local Government 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 control by licence the custody, use, manufacture, importation, transportation, distribution, exportation and disposal of radioactive substances, irradiating apparatus and other sources of 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 and 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.

Regulation and Licensing

The application of ionising radiation in medicine, industry and research plays an important role in society, but also carries a real risk of accident or of use for malevolent purposes. Therefore, the RPII took its responsibility as a regulator very seriously. It exercised this function through a system of licencing supported by inspections and enforcement to ensure the regulations and conditions attached to licences were complied with.

Prior to any individual or organisation acquiring either a radioactive source or an irradiating apparatus, they had to first obtain a licence from the RPII. Since the introduction of a licensing system by the Nuclear Energy Board (NEB) in 1977, the number of licences held increased each year until 2008 (Figure 1) but levelled off in recent years.

At the end of 2014, 1734 licences were held across a range of sectors, including dental, medical, industrial, educational and veterinary. The breakdown of licensee by sector is shown in Figure 2.

Figure 2 Distribution of licensees by sector in 2014

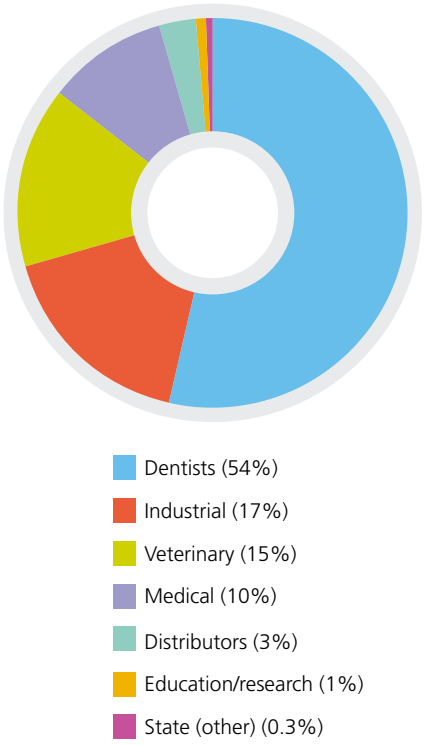


Figure 1: The number of licences issued by the NEB/RPII, 1985 to 2014.

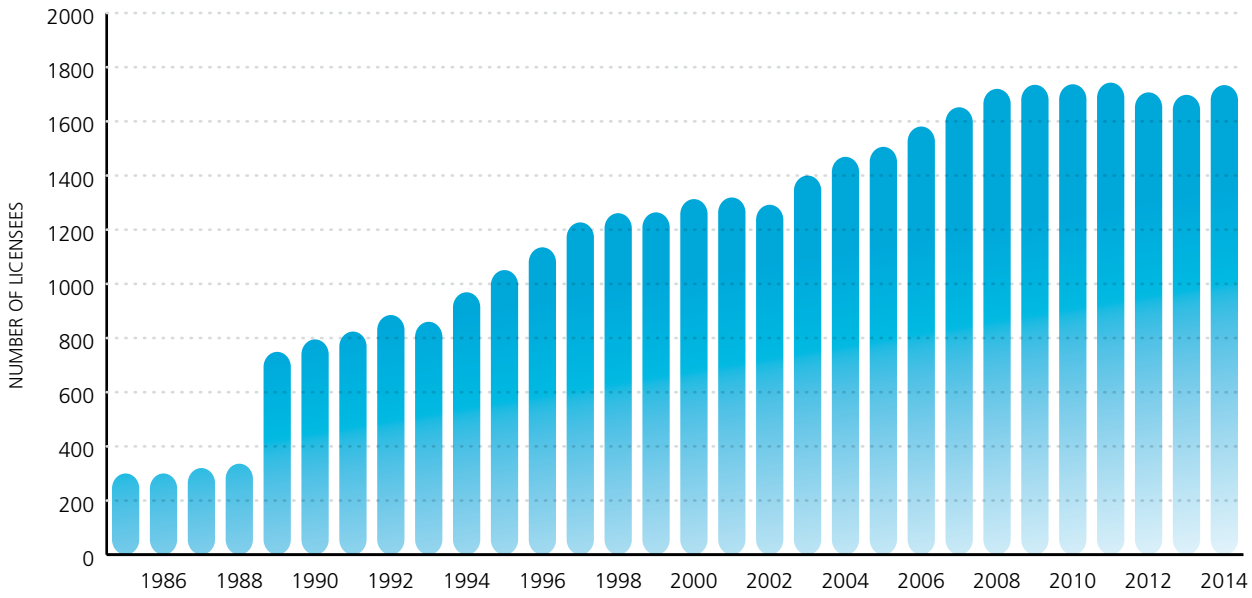
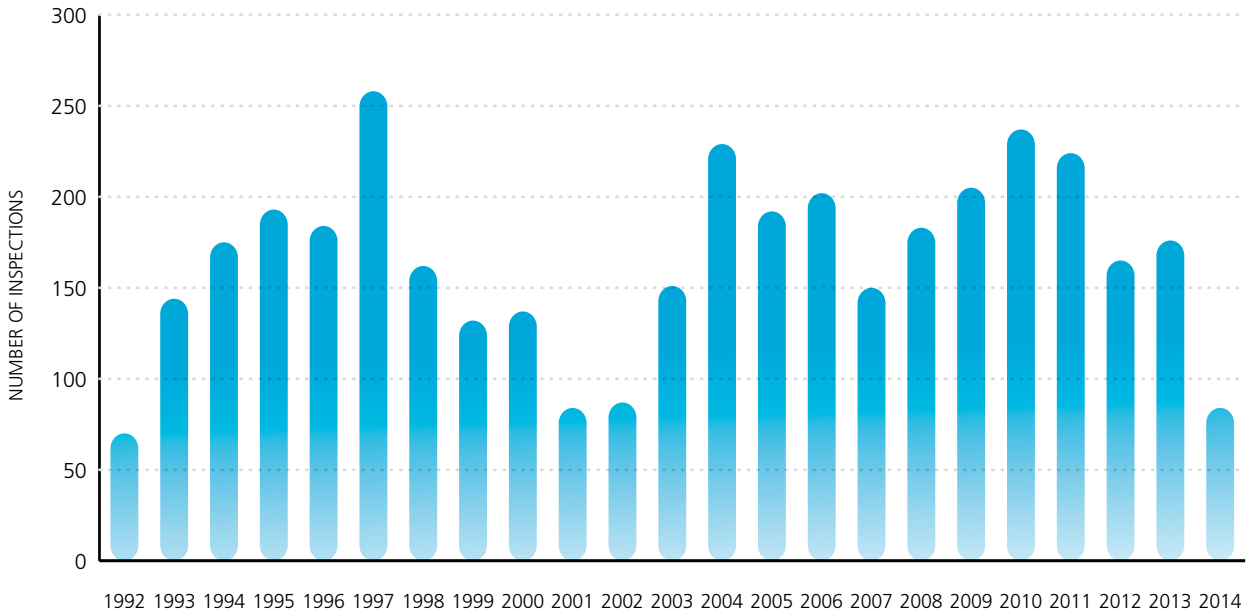


Figure 3: Inspections undertaken by the RPII, 1992 to 2014.



The RPII undertook an annual inspection programme of licensees (Figure 3) to assess the standards of radiation protection across the various sectors and the level of compliance by individual licensees with both national legislation and licence conditions. The selection of licensees to be inspected was based on a number of criteria, including the radiological risk associated with the licensees' activities, the time elapsed since their last inspection and any incidents reported within their sector of operation. Overall, the level of compliance was found to be good, with high standards of radiation protection being maintained by those licensees who were inspected.

Throughout its existence the RPII investigated a substantial number of reported incidents and abnormal occurrences in the use and handling of licensable radioactive substances. These included the inadvertent disposal of sources, stolen sources and the accidental exposure of those working with sources. While most involved sources of relatively low activity, on occasion workers were exposed to a significant radiation dose. Where radioactive sources went missing, either as a result of non-adherence to procedures or theft, the RPII followed up thoroughly to assure itself, in so far as was possible, that the source would not pose a risk to members of the public. The variety of incidents illustrated the range of potential risks associated with the custody, use and transportation of radioactive substances. They also highlighted the importance for licensees of developing and maintaining appropriate written radiation safety procedures and of ensuring that those procedures were observed by all staff members directly involved in the use of sources of ionising radiation.

The RPII invested significant effort in inspection, regular reviews of licence conditions across all sectors, and in the issuing and reviewing of Codes of Practice to ensure that licensees implemented good radiological protection practice. However, from the outset the RPII was set up to be a regulator with teeth, and the records show that it brought 50 prosecutions during its existence for non-compliance with regulations.

Regulation and Licensing (continued)

The 1990s

The European Communities (Ionising Radiation) Regulations were implemented in 1991. These regulations, which gave effect to European Council Directive laying down the basic safety standards for the health protection of the general public and workers against the dangers of ionising radiation, strengthened the RPII's regulatory powers, in particular in relation to the taking of a prosecution for failure to uphold proper standards of radiation safety. The regulations also incorporated reduced dose limits for occupationally exposed workers and members of the public, which were in harmony with the recommendations of the International Commission of Radiation Protection (ICRP).

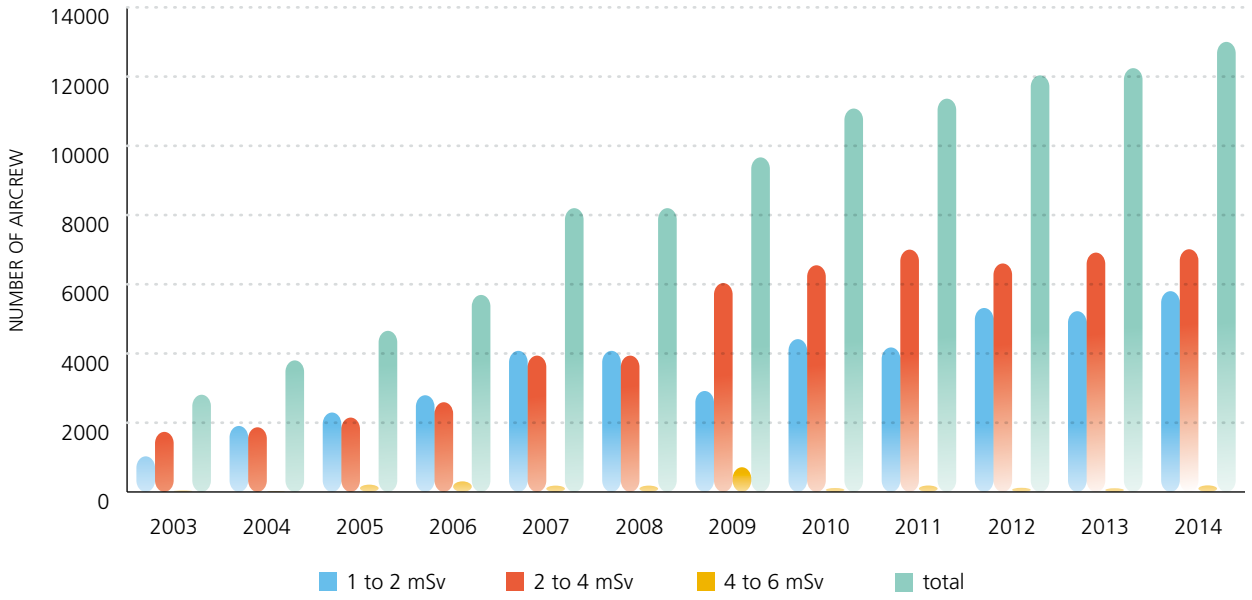
In 1994, a new Code of Practice for Radiological Protection in Dentistry was published by the RPII in consultation with the Department of Health and the Dental Council. The new Code included mandatory features for all X-ray units designed to minimise the radiation dose to patients and to reduce the risk of accidents involving over-exposure of patients and/or staff. The RPII implemented the provisions of the Code by including compliance with the Code of Practice as a condition of the licence issued to all dentists holding dental X-ray equipment.

A schedule of charges for licences was introduced in 1993 to recoup, at least in part, the cost of administering the RPII's licencing, inspection and enforcement function. Previously, this cost was borne by the State through its grant-in-aid to the RPII.

The 2000s

In order to provide assurance of its own effectiveness as a regulator, the RPII invited the International Atomic Energy Agency (IAEA) to review the effectiveness and efficiency of its Regulatory Service in 2000. The review encompassed a wide-ranging assessment of relevant legislation and of licensing, inspection and enforcement procedures. The principal findings of the review were that the essential legal infrastructure for radiation protection was well established in Ireland, that the regulatory programme was effective and that the RPII was well placed to implement the regulatory infrastructure. The review did, however, identify a need to re-examine the work priorities of the Regulatory Service in licensing, inspection and related areas, and a need for increased expertise, particularly in the area of medical uses of radiation.

Figure 4: Number of aircrew receiving radiation doses greater than 1 mSv



A legislative milestone was the bringing into force of the Ionising Radiation Order, 2000 implementing two EU Directives (1996 revision of the Basic Safety Standards Directive and Outside Workers Directive) which laid down basic standards for the protection of the health of workers and general public against the dangers arising from ionising radiation. The legislation was prepared by the then Department of Public Enterprise in collaboration with the RPII. The new Order involved the stricter application of the principles of radiation protection, including the justification principle, and dose constraints. The justification principle says in essence that any practice involving radiation exposure should overall do more good than harm, and that any intervention with the purpose to reduce existing doses also should do more good than harm. It introduced statutory requirements for all licensees to undertake risk assessments and to set down radiation safety procedures to address the risks identified. Licensees were also required to consult a Radiation Protection Adviser (RPA). The Order broke new ground in extending regulatory control for the first time to exposure of workers to natural radioactivity from such sources as high levels of radon gas in workplaces and from cosmic radiation in the case of aircrew.

The Order laid down a Reference Level of 400 becquerels per cubic metre (Bq/m^3) for exposure to radon in the workplace – a level above which remedial action to reduce the radon concentration should be considered.

Also in 2001, the RPII published guidance on the protection of aircrew from cosmic radiation setting out the practical steps to be followed by aircraft operators in order to comply with the legislation. Figure 4 shows that there was a consistent yearly increase in the number of aircrew receiving doses, but all were maintained below the figure at which control measures would need to be implemented (i.e. 6 millisievert). The increase in total numbers of air crew was attributable to the growth of demand for air travel.

An amendment to the Radiological Protection Act in 2002 authorised the Minster to make regulations for the setting of licence fees and made it a criminal offence to make a false statement on a licence application or to breach a condition of licence. On foot of a submission of a new schedule of fees and draft regulations by the RPII in late 2005, the Minister for the Environment, Heritage and Local Government approved the new fees to take effect from October 2007.

The European Communities (Medical Ionising Radiation Protection) Regulations were passed into law in 2002 and governed the protection of patients, and others, undergoing radiation exposure for medical purposes. They placed greater emphasis on the justification of medical exposures and required the involvement of both prescribers and persons carrying out procedures in the justification process. They required continued education and training after qualification. They also required member states to take steps to avoid unnecessary proliferation of radiological equipment and to ensure that quality assurance programmes were implemented. Special attention was paid to the use of appropriate equipment and techniques for medical exposure of children, health screening and for exposures involving high doses of radiation.

While the RPII had no direct role in enforcing these regulations, their introduction complemented the RPII's remit and added to the framework for radiological protection in this area. In the years following, the RPII was made aware of an anomalous situation whereby chiropractors were permitted to hold a licence from the RPII for the use of X-ray equipment, but were not permitted to take X-rays of patients for medical purposes under the Medical Ionising Regulations. In 2006, the RPII Chairman brought the RPII concerns with regard to the potential for unregulated medical use of X-ray equipment to the attention of the Minister for Health and Children, and the Minister responded that the legislative enforcement provisions would be strengthened. The regulations were amended in 2007 and 2010.

The terrorist attack in the US on September 11th 2001 brought a renewed focus on security concerns around radioactive sources and materials due to their potential use in 'dirty' bombs by terrorists. Internationally, there were a number of specific initiatives including the European Council Directive on High-Activity Sealed Sources and Orphan Sources which was transposed into Irish law in 2005. The aim of the Directive was to ensure a high level of control for the most hazardous sources. In anticipation of the requirements of the Directive the RPII, with members of the National Crime Prevention Office of An Garda Síochána, initiated a programme of inspection with a view to strengthening the security aspects of the custody of radioactive sources in Ireland.

The Directive also required national authorities to make provision for the handling of so-called orphan sources, that is, sources whose owner could no longer be identified. Because of the small number of such sources that had been discovered historically, it was agreed that the RPII would deal with them in consultation with the Department of the Environment, Heritage and Local Government (DEHLG) on a case-by-case basis. This agreement was subsequently underpinned by the development of a Temporary Operational Protocol for making safe and managing orphaned or seized radioactive sources designed to be implemented by the RPII, with the DEHLG and in conjunction with an organisation (or organisations) identified on a case by case basis to assist the RPII as Competent Authority in making arrangements for the appropriate management and temporary storage of a discovered orphan source or a source identified for seizure.

2005 saw the beginning of the expansion in the provision of diagnostic radiology, nuclear medicine and radiotherapy services in the private health sector with the licensing of two new state-of-the-art Positron Emission Tomography (PET) facilities. As the number and sophistication of medical facilities increased, there was a corresponding increase in the requirement for expert advice in radiation protection. Towards the end of 2005, in accordance with legislative requirements, the RPII launched a register for Radiation Protection Advisers (RPA). Once approved, registered RPAs could provide advice to licensees in the medical, dental and veterinary sectors on a range of radiation protection related issues.

The Health and Safety Authority and the RPII signed a Memorandum of Understanding (MoU) in 2006 focusing on the hazards associated with ionising radiation in the workplace. The MoU concentrated on a number of key areas of cooperation including the transport of radioactive materials, hazards and accidents in the workplace involving sources of ionising radiation as well as operational liaison between the two organisations. The MoU also highlighted the hazards of radon in the workplace and established a joint working group on the issue. This cooperation assisted both organisations in implementing the Safety, Health and Welfare at Work Act, 2005, that placed duties on employers in respect of ionising radiation.

In 2007, the RPII signed an MoU with the Health Service Executive for the purpose of facilitating cooperation between both agencies in discharging their respective responsibilities with regard to ionising radiation, as well as enhancing the effectiveness of both agencies.

A significant development during 2007 was the application by the Regulatory Service for accreditation to the ISO standard 17020 (General Criteria for the Operation of Various types of Bodies Performing Inspection) which was submitted to the Irish National Accreditation Board (INAB). Following a successful assessment visit in 2008, the RPII was presented with its certificate of accreditation by INAB, becoming the first regulatory authority in Europe engaged in radiation protection inspections to be certified to ISO 17020 for its inspection services. Peer reviews by external experts of the regulation by the RPII of industrial sterilisation plants and radiotherapy service providers, two sectors using very large radioactive sources licensed by the RPII, were undertaken during 2008 to ensure that the RPII implemented and enforced best regulatory practice in these areas. Both reviews concluded that the regulation and inspection regime operated by the RPII was largely appropriate to the sector and each made a number of recommendations as to how the regime could be further strengthened.

The arrangements for the establishment of a protocol and criteria for the approval of Radiation Protection Advisors (RPAs) for licensees in the industrial and third level educational sectors, and work activities involving natural radiation, were finalised and a register was developed during 2009. During 2010, the first RPAs were approved to join the register and the requirement for licensees to appoint an RPA was rolled out to licensees holding high activity sources as well as to all new licensees.

A new Code of Practice on the design of diagnostic medical facilities where ionising radiation is used was developed with the assistance of the Haughton Institute, Trinity College, updating the 1988 Code and providing details of the legislative requirements and practical radiation protection guidance for the main types of radiological and nuclear medicine facilities. Guidance was also issued on the protection of the unborn child during diagnostic medical exposures.

Legislation on the supervision and control of shipments of radioactive waste and spent fuel was implemented during 2009, updating previous requirements and bringing them into line with the most recent EU Directives.

Regulation and Licensing (continued)

The 2010s

Engagement with relevant stakeholders was an essential aspect of promoting and achieving higher standards of radiation protection throughout this period, particularly in the regulatory environment. As an example, during 2010 the RPII engaged with the Health Service Executive, the Dental Council, the Medical Council, the Veterinary Council of Ireland, the Health and Safety Authority, the Department of Education and Science, the Department of Transport, An Garda Síochána, the Revenue Commissioners (Customs), the Environmental Protection Agency, the City and County Managers Association, the Fire Engineering Systems Association, the Department of Enterprise, Trade and Innovation (Import and Export Controls), the Irish lamps industry and the Irish Aviation Authority to discuss areas of mutual interest and to identify joint tasks aimed at generating efficiencies and avoiding duplication of effort.

In line with a commitment in the RPII's Strategic Plan to enhance the transparency of its regulatory process, a highlight was the publication of the first Inspection and Licensing Activities and Annual Inspection Programme for 2011, which provided details of the processes and priorities associated with licensing and inspection.

Also during 2011, two new policies affecting the dental sector were developed following extensive review of existing practice. Under the first policy, a personal dosimetry programme was no longer mandatory for staff working in dental radiology – instead, dentists could undertake a risk assessment, in conjunction with their Radiation Protection Adviser, to determine whether or not such a programme was required. The second policy, developed jointly with the Health Service Executive (HSE), advised that staff using X-ray equipment were not required to wear lead aprons, except in very particular circumstances which were set out in the policy, and there was no need for patients to wear lead aprons.

Negotiations commenced in 2011 on a further revision of the European Basic Safety Standards Directive, which consolidated the provisions of the five existing directives that underpinned the statutory framework for radiation protection in Europe. The RPII was involved in supporting the technical and political discussions on the new Directive which was agreed during the Irish Presidency of the European Council in 2013. The Council Working Party was chaired by a Director of the RPII from July 2012 to May 2013.

Following an in-depth evaluation of its regulatory activities, and with the ever-increasing demands on staff resource, the RPII recognised that the 'one size fits all' licensing system was neither optimal nor sustainable. Towards the end of 2011, work began on a new project to develop an authorisation model that would take a risk-based or graded approach to authorisation. Such an approach would provide users with a more efficient and effective service with reduced administration. Thus it allowed more resources to be allocated to inspection activities and to the development of guidance documents for users where they were needed.

In 2012, a panel of international experts reviewed the new authorisation model as part of the validation process. The peer review panel deemed the model to be in line with international recommendations and noted that it represented a major improvement on the existing arrangements in terms of long-term sustainability. A separate critical review of the regulatory business processes was also undertaken with the aim of improving their efficiency and effectiveness for licensees and staff alike. The improvements identified in the review led to an invitation to tender for the development of a new information management system (GAMIS) in 2013.

The importance of appropriate arrangements for the safe management of radioactive waste was highlighted during 2013 by an incident involving the theft of seven items described as 'lightning preventers' from premises in Swords, Co. Dublin. The preventers contained radioactive material that could pose a health risk to anyone either remaining in close proximity to them for a prolonged period of time, or though contamination if they handled them inappropriately. The response to the incident involved the issuing of public warnings by both the RPII and the Gardaí in an attempt to recover the sources. The RPII also worked closely with the Department of the Environment, Community and Local Government (DECLG), the HSE and the Gardaí to develop response and recovery protocols for the sources, should they be found. Despite the actions taken by all parties concerned, the sources remain missing and it appears unlikely that they will be recovered.

Management of Radioactive Waste

Since the days of the Nuclear Energy Board (NEB), an aspect of particular concern was the requirement to establish a dedicated national facility for managing radioactive waste.

Radioactive waste comprises radioactive sources that are no longer in use, as well as contaminated clinical waste and discharges from hospital nuclear medicine departments. While the quantities of radioactive waste produced in Ireland were relatively small, there were a large number of sources which were no longer in use, some of which were high activity sources which can be extremely hazardous if not handled properly. These 'legacy sources' were acquired prior to the introduction of the licence condition which stipulated that sources that were no longer required must be returned to the manufacturer/ supplier.

The waste was stored under licence on the premises of users at multiple locations thus increasing the likelihood that a source might go missing or be disposed of inadvertently. Furthermore, in the event that the RPII were required to withdraw a licence from a user and take possession of a source, there was no facility to store the source. The lack of a national facility therefore represented a serious radiation protection infrastructural deficit.

In the late 1990s and early 2000s steps were taken in the planning of a national facility by the then Department of Public Enterprise with the active support of the RPII. However, the identification of a suitable site proved unsuccessful. The need for such a facility was reinforced by the obligations Ireland incurred with its ratification in 2001 of the IAEA's Joint Convention on Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. While the Irish legislative and regulatory framework satisfied Ireland's obligations, the Convention obliged contracting parties to make appropriate provision for the safe management of radioactive waste. The problem of sources of radiation that for various reasons are not under control, so called 'orphan sources', was not unique to Ireland; regulatory authorities internationally were faced with the possibility and sometimes the reality of these sources being encountered by people unaware of the risks. A number of incidents worldwide led to serious radiation injuries and, in some cases, to fatalities. In other cases, the smelting of orphan sources resulted in significant contamination of the environment requiring very extensive and expensive clean-up operations. The terrorist attack in the US on September 11th 2001 also brought a renewed focus on security concerns around radioactive sources and their possible diversion for malevolent purposes.

In order to address the issue of orphan sources, a new European Directive came into force at the end of 2002. Its purpose was to ensure that all EU member states had the necessary regulatory infrastructure and appropriate financial management and surveillance systems in place to ensure the safety of high activity and orphan radioactive sources. The EU High-Activity Sealed Sources and Orphan Sources Directive was transposed into Irish law in December 2005.

In 2006, in a report submitted to Government titled 'Towards a Radioactive Waste Management Policy for Ireland', the RPII detailed the current waste problem in Ireland and extended its advice to underline the need for the development of a national policy on radioactive waste management. Such a policy would take account both of Ireland's domestic and growing international commitments in this area and would deal with the issue of radioactive waste management in a comprehensive way – from acquisition of sources to final disposal.

For the Strategic Planning period 2008–2010, the RPII had identified the development of a national policy on radioactive waste disposal as a key area of risk that needed to be addressed to improve radiation protection in Ireland.

New legislation on the supervision and control of shipments of radioactive waste and spent fuel was implemented during 2009, updating previous requirements and bringing them into line with the most recent European Directive. The Directive provided for a compulsory and common system of notification of shipments. It also prohibited the export of radioactive waste to countries deemed not to have the resources to manage the radioactive waste safely.

Also in 2009, an inter-departmental High Level Group was established to advise Government on Ireland's management of its own radioactive waste. The RPII was represented on the High Level Group and also participated with the EPA on a project, which would underpin the work of the Group, examining the wider issues of the storage of difficult wastes.

In December 2010, the Irish Government's agreement of a national policy was a significant milestone and a clear endorsement of the RPII's long-standing advice. The agreement was to establish a national storage facility, to endorse a national source reduction programme to be coordinated by sector and to develop a temporary operational protocol to clarify the roles and responsibilities of agencies in the event of a source being seized or an orphan source being discovered. The RPII actively participated in the Implementation Committee established to bring this work to a successful conclusion.

The RPII in cooperation with other Government departments and agencies began implementation of a phased Inventory Reduction Programme in 2011. Between 2011 and 2014, approximately 99% of all disused sources with half-lives greater than ten years were successfully exported from Ireland to disposal and recycling facilities in Europe and the USA.

Exposure of the Irish population to radiation

One of the RPII's key roles was to assess the level of exposure of people in Ireland to radioactivity of both natural and artificial origin present in the environment.

Natural sources include external radiation coming from outer space (cosmic radiation); external radiation produced by naturally occurring radioactive elements contained in the earth's crust (terrestrial radiation); the radioactive gases radon and thoron which can accumulate in buildings; and radioactivity transferred to food and water which are consumed.

Artificial sources of radioactivity include nuclear weapons testing, nuclear accidents such as those at Chernobyl and Fukushima and authorised releases from nuclear facilities abroad. Irish hospitals and research facilities also release small amounts of radioactivity into the Irish marine environment.

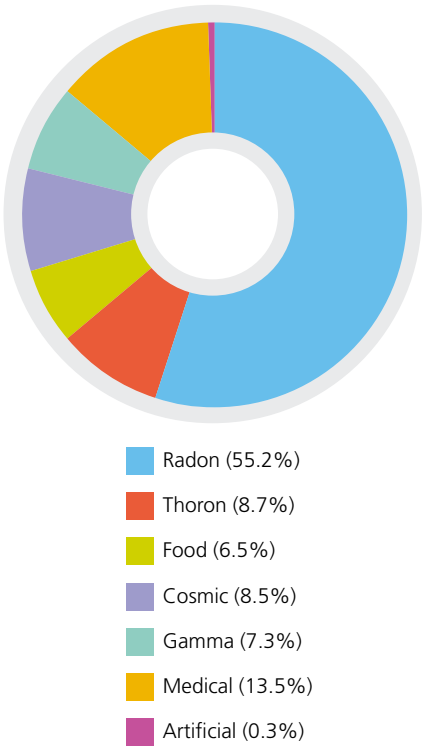
Ionising radiation is used in medicine, industry and education and can result in radiation doses being received by some workers. In the medical field, patients undergoing certain diagnostic procedures also receive measurable radiation doses.

In 2005, the RPII commenced a three year project to assess the various sources of radiation to which the Irish population was exposed. This involved examining each pathway in detail, identifying the radiation doses received by exposed individuals and calculating both the total and the average *(per caput)* dose. This work was concluded and published in 2007.

The doses to the population were re-assessed in a study completed between 2012 and 2013. This was published in 2014 in a comprehensive report: *Radiation Doses received by the Irish Population*. The study found that, on average, a person in Ireland received an annual dose of 4037 microsieverts (μSv) from all sources of radiation (Figure 5).

It identified the large variability in the dose received by individual members of the population from any given source, but, by far, the largest contribution of approximately 86% (3480 μSv) came from natural sources – mainly from the accumulation of radon gas in homes. Man-made radiation contributed approximately 14% (557 μSv), dominated by the use of radiation in medical diagnostic procedures (546 μSv). Doses from other man-made sources accounted for less than 1% per cent (11 μSv).

Figure 5 Distribution of the average radiation dose in Ireland



Radon

Exposure to radon is the largest source of exposure to ionising radiation in Ireland and the second greatest cause of lung cancer after smoking. It is calculated that exposure to radon accounts for approximately 13% of all lung cancers in Ireland, which equates to some 250 lung cancer cases each year.

Reducing exposure to radon was a major priority of the RPII and it applied a multipronged approach to dealing with the issue: identifying the extent and magnitude of the problem through a national survey; raising awareness among the public of the need to test and fix the problem; raising awareness among employers of their need to protect employees; engaging with schools to reduce the risk to children; engaging with Local Authorities with regard to the need to protect social housing tenants; and, engaging with Government and other state agencies in a national approach to solving the problem.

Magnitude and extent of the problem

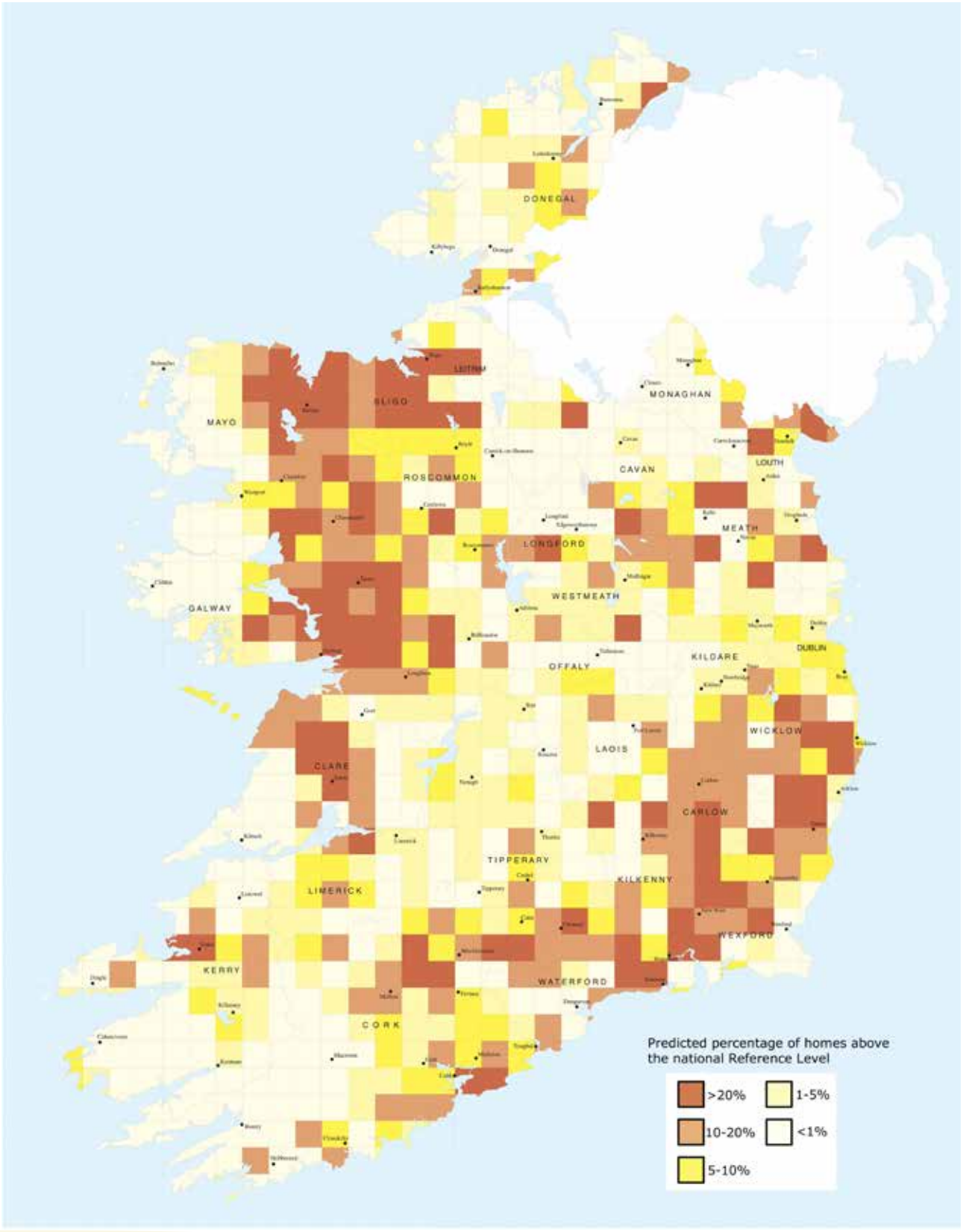
Recognising the large contribution of radon gas to the total radiation exposure of the population, in 1990 the Irish Government adopted an annual average radon gas concentration of 200 becquerels per cubic metre (Bq/m^3) as the national Reference Level for homes. This set a level above which remedial action to reduce the radon concentration in a home should be considered.

Between 1992 and 1999, the National Radon Survey was carried out by the RPII to establish the geographical distribution of radon in homes in Ireland. Based on the results of the survey, a radon map of Ireland was published (Figure 6) which indicated the probability of radon levels in homes exceeding the national Reference Level, for a particular area. Any areas where 10% or more of homes were predicted to have radon concentrations above the Reference Level were designated High Radon Areas and are shown in brown and orange on the map.

The survey was based on measurements in over 11,000 homes and it predicted that 7% of the national housing stock had concentrations of radon above the national Reference Level. When this percentage is applied to the housing stock figures from the 2011 census it equates to approximately 110,000 homes. The national survey calculated the average indoor radon concentration in Ireland to be 89 Bq/m^3.

In 2000, the Attorney General advised the State of the need to inform the public of the advisability of testing premises for radon concentrations. In 2005, the WHO established the International Radon Project, which was part funded by the Irish Government. A survey of radon levels internationally, carried out as part of this project and published in 2009, showed that Ireland has a serious radon problem having the eighth highest national average among 29 OECD countries.

Figure 6 Radon map of Ireland showing the percentage of homes above the National Reference Level



Radon (continued)

Radon measurements

In addition to the national survey, the RPII also offered a radon measurement service to homeowners on a fee paying basis. The number of measurements undertaken by homeowners (Figure 7) between 1992 and 2014 was dependent on awareness of the problem and motivation to carry out a test. Peaks in numbers undertaking tests coincided with periods where the radon issue was made prominent in the media.

By the end of 2014, over 58,000 homes had been tested by the RPII, of which 8,269 were found to be above the national Reference Level for radon (Table 1). When these figures are compared with the number of private homes of approximately 1.6 million and the predicted number of homes above the Reference Level of approximately 110,000, it is clear that the rate of measurement of houses needs to be greatly accelerated in order to identify all of the homes with a radon problem.

Between 1998 and 2002, the RPII measured radon in every classroom in all primary and second-level schools – approximately 4000 schools. In addition, the RPII undertook radon measurements in over 2500 individual workplaces.

At the end of 2014, radon had been measured in some 21,500 local authority social housing units in 21 counties. The bulk of these measurements were carried out by other radon measurement companies based in Ireland. These companies also tested a large number of workplaces.

Figure 7 Number of radon measurements in homes between 1992 and 2014

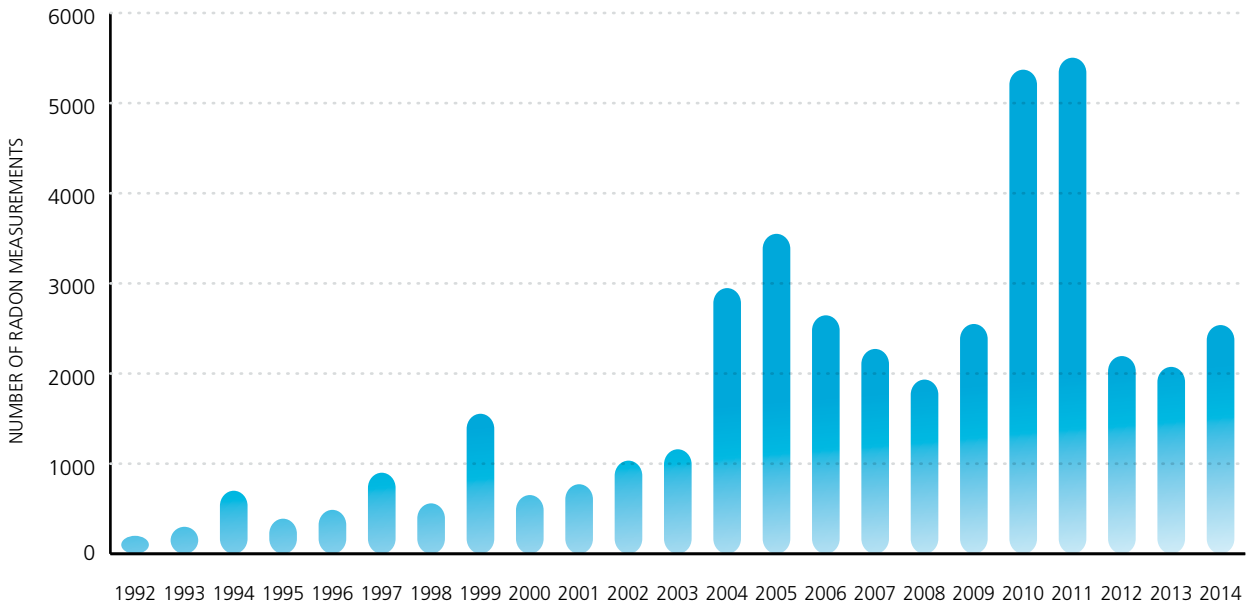


Table 1: Radon measurement results by county (based on measurements completed by the RPII up to 31 December, 2014)

County	Number of houses measured	Number of houses in categories of radon concentration			Max (Bq/m³)
		0 – 199 Bq/m³	200 – 700 Bq/m³	>800 Bq/m³	
Carlow	1277	1028	237	12	2300
Cavan	480	466	14	0	800
Clare	4275	3741	443	91	3500
Cork	6005	5258	694	53	4500
Donegal	1628	1542	84	2	3400
Dublin	3948	3714	231	3	1400
Galway	8163	6443	1500	220	4400
Kerry	4351	3634	579	138	49000
Kildare	1443	1380	60	3	1100
Kilkenny	1699	1472	210	17	2400
Laois	617	592	25	0	600
Leitrim	429	399	29	1	1600
Limerick	1486	1371	111	4	1900
Longford	338	299	38	1	900
Louth	1255	1122	130	3	1900
Mayo	4430	3659	705	66	6200
Meath	1131	1045	84	2	900
Monaghan	345	325	20	0	800
Offaly	826	807	19	0	800
Roscommon	769	685	80	4	1400
Sligo	2528	1893	530	105	5600
Tipperary	2754	2423	304	27	3400
Waterford	2672	2142	459	71	9714
Westmeath	822	751	70	1	1100
Wexford	2498	2093	367	38	4000
Wicklow	2312	1928	355	29	16400
Total	**58482**	**50213**	**7378**	**891**	

Radon (continued)

Radon Prevention and Remediation

The Government decided in 1990 that advice on methods of remedying high radon levels in buildings should be the responsibility of the then Department of Environment which published a booklet in 1991 outlining radon remediation techniques. However, notwithstanding the advice in the booklet, it was recognised, at the time, that expert advice on remediation did not exist in the country. From the mid-90s the RPII noted the increasing number of companies offering radon remediation services. However, it also noted that very few householders were motivated to remediate and the RPII sought to persuade the Government to introduce grant assistance to help and encourage householders carry out this important work.

Recognising the prevention was a more sustainable solution to the radon problem, in 1997, the Government introduced revised Building Regulations, to ensure that all new buildings had radon protection measures incorporated during construction. In the early 2000s, the RPII in collaboration with Clare and Kerry County Councils, completed surveys in the Ennis and Tralee areas of radon in homes built since the introduction of the new Building Regulations in 1997. The results of the surveys showed that both the percentage of homes with radon concentrations above the Reference Level and the average radon concentration were significantly lower in homes built after 1998 indicating that the installation of radon preventive measures at the time of construction had a positive effect on reducing radon concentrations.

In 1997, the Government announced its intention to introduce a grant scheme to assist householders in meeting the cost of remedial work. Some years later the Radiological Protection (Amendment) Act, 2002 provided the legislative basis for a scheme of grants to assist householders with the cost of remedying high radon levels in their homes – something that the RPII had been urging for some years. However, due to budgetary constraints, Exchequer funding was not available to support the scheme.

To support householders considering remediation the RPII introduced free post-remediation measurements for householders in 2000. Demand for the free service was low and indicative of low numbers of householders with high radon levels who actually undertook remedial work. Research conducted by the RPII found that as few as 25% of householders with high radon levels were undertaking remediation. This was despite the fact that remediation, particularly installation of active sumps – the most popular remediation method, was effective in reducing the radon level in the home by more than 90%.

In 2004, the RPII published a new guidance document 'Understanding radon remediation – a householders' guide' which advised householders of the various remediation options available to them to reduce high radon levels in the home.

The RPII published a report on the national survey in schools in 2004 showing that approximately 26% were found to have one or more rooms with radon concentrations above the Reference Level of 200 Bq/m^3. Remedial work had commenced on a phased basis in affected schools and proved highly effective in reducing radon levels. This was regarded as very encouraging evidence of the real benefits of a radon remediation programme.

Workplaces

In the early 1990s, the RPII co-operated with the Health and Safety Authority (HSA) in investigating the dose from radon to underground workers. This pre-dated any legislation protecting workers, but the RPII advised employers, based on measured radiation doses to workers in these workplaces, that all possible measures should be taken to ensure radiation doses to employees are kept as low as possible. To ensure workers and employers could access the necessary information on their exposure levels, the RPII introduced a personal monitoring service for all personnel likely to be exposed to significant levels of radon in underground workplaces as well as a testing service for radon in aboveground workplaces, although the numbers undertaking such measurements were initially small.

Legislation enacted in 2000 (SI 125 of 2000) laid down a Reference Level of 400 Bq/m^3 for exposure to radon in the workplace. The higher level, compared to homes, was adopted for workplaces given the lower occupancy rates.

This set a level above which remedial action to reduce the radon concentration in a workplace should be considered. The legislation marked a new phase in the RPII's work on radon as it extended regulatory control to exposure to radon in the workplace and was the main piece of legislation specifically dealing with the obligations of employers and the protection of workers and members of the public.

Although principally regarded as a workplace, schools were of particular concern to the RPII with regard to exposure of children to radon and consequently a lower Reference Level of 200 Bq/m^3 was adopted. In the early 1990s, in cooperation with the then Department of Education and Science (DES), the RPII undertook a number of pilot radon measurement programmes in schools. These led, during the period 1998–2002, to a nationwide programme to measure radon in every classroom in all primary and second-level schools.

During 2003, the RPII continued to work closely with the HSA in developing policy on the regulation of radon in the workplace. The HSA had advised that all indoor workplaces in High Radon Areas be tested for radon and all employers must refer to radon in their safety statements.

In 2004, the State Claims Agency (SCA) identified radon exposure of workers in state buildings as a potential risk of future litigation against the State. The RPII collaborated with SCA to heighten awareness of radon among state employers. Arising from this the RPII issued guidance on the Reference Level that should apply to long-stay institutions such as prisons and nursing homes.

Following its publication in 2000, the RPII became aware that employers were not actively implementing their obligations under SI 125 of 2000. Under this legislation the RPII was permitted to direct employers to take action. During 2004, the RPII directed 60 employers in Tralee and Ennis to carry out radon measurements. In 2006, the RPII took prosecutions against six employers who had failed to comply with the direction. In all cases the defendants were fined and ordered to pay costs. Three defendants were convicted. The experience of Tralee and Ennis lead the RPII to address radon in workplaces through the collaboration with the HSA and focus RPII resources primarily on homes.

Radon (continued)

The HSA and the RPII signed a Memorandum of Understanding (MoU) in 2006 highlighting the hazards of radon in the workplace and established a working group on the issue. The cooperation assisted both organisations in implementing the Safety, Health and Welfare at Work Act, 2005, regulated by the HSA. This Act requires employers to identify the hazards at the workplace, assess the risk to health and safety from these hazards and put in place measures to eliminate or reduce the risk. The HSA stated that where radon gas was identified as a hazard in the workplace the employer had a duty, as with any other hazard, to assess the risk and eliminate or reduce that risk. During 2009, the RPII worked with the HSA to provide information on radon to HSA inspectors to support the inclusion of radon in their inspections.

Engagement with the public and other stakeholders

The results of the national survey of radon in homes prompted action to address the need for greater public awareness of the radon issue and information about methods of remediating high radon levels. A range of communications activities and events were undertaken to build awareness of the radon problem among members of the public, employers, trade unions and local and central Government.

Conscious of their role in disseminating information, the RPII actively engaged with the media on the radon issue and consistently obtained widespread coverage in local and national print and broadcast media. Through its experience to date the RPII was coming to the view that a multi-agency approach to tackling the radon problem was required to achieve real success. Widespread media coverage also served to keep the topic alive in Ireland and contributed to the growing political support for an integrated national effort.

The National Radon Forum was initiated in 2002 as part of three year project, part-funded by the EU. However, the RPII continued with the initiative every year thereafter as it provided an opportunity for those with a role to play in reducing the risk from radon in Ireland to meet and discuss radon activities and concerns. Participants included international experts in the field, Government Departments and Agencies, Local Authorities, professionals such as architects, engineers and research scientists, representatives of the radon industry, national and local public representatives and the public. The forums provided the opportunity for discussion on topics such as radon measurement programmes, remediation protocols for buildings and the type of research needed to underpin national policies.

In July 2003, a house in Castleisland, Co Kerry was identified with radon concentrations of approximately 49,000 Bq/m^3. This was, by far, the highest level ever measured in Ireland and one of the highest recorded in Europe. At this radon concentration, the occupants of the house would have been subjected to an annual radiation dose greater than 1 sievert – fifty times the permitted level for a radiographer or nuclear power plant worker. Two occupants of the home died of lung cancer at an early age and while it was not possible to draw specific conclusions in this case, it was clear that that the risk of contracting lung cancer associated with a lifetime exposure at such extreme radon concentrations was very high.

The finding attracted widespread media coverage locally and nationally and precipitated a major local information campaign with the RPII writing to over 2500 householders living in the area advising them of the high level and urging them to test for radon. Following the media coverage there was a very significant increase in radon measurements undertaken by householders during 2004, with the number of tests undertaken rising from 1160 in 2003 to 2948 in 2004.

During 2005, a comprehensive review of the situation in homes was undertaken which showed that while many thousands of measurements had been made, the percentage of the total housing stock measured and the number of homes identified above the national Reference Level, both remained very low. Drawing on experience in other countries which indicated that a multi-agency approach was most likely to be effective, the RPII submitted a draft Action Plan to the Minister for the Environment, Heritage and Local Government setting out a number of initiatives aimed at increasing the rate at which high level homes could be identified.

At the same time the RPII issued a joint statement with the National Cancer Registry of Ireland (NCRI) on the health risks of exposure to radon in homes in Ireland. This collaboration reviewed a European epidemiological study of over 7000 lung cancer cases. When applied to Ireland, the risk estimates from the European study provided a best estimate value of approximately 13% of all lung cancer deaths every year in Ireland being caused by radon.

Also during 2005, the RPII initiated a series of 'radon road shows' in High Radon Areas aimed at increasing awareness of the dangers of radon among the employers and the public. Each road show included presentations to local schools, employer and employee groups and the Local Authority.

Arising from a 'radon road show' in Mallow in early 2007 one measurement identified the highest radon level ever found in a workplace in Ireland, at almost 25,500 Bq/m^3 – a level over 60 times the Reference Level for radon in a workplace. This precipitated a major information campaign in the region with the RPII writing to over 5000 householders and employers in the area advising them of the high level and urging them to test for radon. A second 'radon road show' was held later in the year, in collaboration with Mallow Town Council and Cork County Council which included public meetings. The RPII also engaged with employer representative bodies and trades unions in the area to ensure they were aware of the potential hazards from radon in the workplace.

On foot of the Mallow finding, Cork County Council (CCC) undertook a major measurement programme in local authority houses in north Cork in 2008. The RPII and CCC collaborated with the Health Service Executive (HSE) in assessing and communicating the risks to tenants and to General Practitioners in the area. This multi-agency approach led to the development of a model for implementing radon measurement programmes in social housing in other parts of the country which was published by the RPII in 2009. The publication was complemented by an extensive programme to raise awareness of the issues, particularly in counties with high radon levels.

Under the terms of the Memorandum of Understanding established with the HSE in 2007, a working group on radon was set up. During 2009, the RPII worked with the HSE to develop a joint position statement on radon, which recognised radon as an important public health hazard requiring a coordinated national response.

Following widespread media activity in 2010, and building on earlier experience from 'radon road shows', the RPII began integrated local information campaigns on radon in high risk counties. Each individual household in the county was provided with information on how to test and fix the radon problem. The campaigns were influenced by qualitative research to identify the public's perception of the radon message and to understand their motivation or de-motivation to undertake a radon test. They were also informed by market research findings which indicated that 77% of the population was aware of radon and 56% perceived radon in the home to be a risk to health. However, among those aware of radon, 61% were unlikely to have their homes tested, highlighting the real challenge of turning awareness into action.

National Radon Control Strategy

Since 2006 the RPII had advocated the adoption of a Government led National Radon Control Strategy. This approach was supported by the World Health Organisation (WHO Radon Handbook 2009) and the European Commission (in further revision of the Basic Safety Standards Directive, 2011), both of which called for member States to establish national strategies for dealing with radon.

A key milestone was reached in September 2011, with the Government decision to establish an inter-agency group to develop a National Radon Control Strategy for Ireland. The then Department of the Environment, Community and Local Government (DECLG) chaired the inter-agency group, in which the RPII was centrally involved. The group also included a broad range of Government departments, local authorities and agencies with remits covering health and housing. The task of the inter-agency group was to develop a strategy that would reduce both the overall population risk and the individual risk for people living with high radon concentrations.

Radon (continued)

An interim report on the development of a National Radon Control Strategy (NRCS) was delivered to the Minister in November 2012 recommending measures in six policy areas including radon prevention in new buildings; use of property transactions to drive action on radon; raising awareness and encouraging action on radon; advice and information for individuals with high radon results; promoting confidence in radon services and reducing radon exposure in workplaces. All the findings of the Inter-Agency Group were subsequently endorsed by Government, and the NRCS was launched in February 2014 covering the period to 2018.

During 2014, RPII worked in partnership with a number of Government Departments and Agencies to progress these actions. Priorities for Year 1 of the NRCS included training for building site staff and professionals to ensure that radon protection measures are correctly implemented in new houses; planning for a dedicated radon website to provide a one-stop-shop for radon information for the public and professionals alike; and working towards a national communications strategy to drive action on radon in Ireland. Following the merger with EPA, this work continued under the responsibility of the Office of Radiological Protection and a first report on the implementation of the NRCS was presented to the Minister in 2015.

Environmental monitoring, research and measurements services

The aims and objectives of monitoring, measuring and researching the behaviour of radioactivity in the environment were to:

- Assess doses to individuals and the population from radionuclides in the environment;
- Assess the temporal and geographical distributions of concentrations of artificial and natural radionuclides in the environment;
- Maintain the systems, procedures and expertise necessary to facilitate a rapid assessment of environmental contamination in the event of a nuclear or radiological incident so that effective countermeasures to protect the Irish public could be implemented;
- Provide up-to-date and accurate information on radiation levels in the environment to Government and the public;
- Support the RPII's role in providing high-quality scientifically based advice as an input to Government policy, in particular to assist in identifying measures necessary for the protection of individuals; and
- Support the Irish food and agriculture industry through the rigorous assessment of the radioactivity status of Irish foodstuffs. This assessment provided the basis for certification of radioactivity in produce for export.

Environmental monitoring

The RPII's environmental programme measured natural and artificial radionuclides in air, rainfall, drinking water, soils, vegetation and foodstuffs in the terrestrial environment and fish, shellfish, beach and deep sea sediments, seawater and seaweeds in the marine environment.

The results of the programme showed that the doses incurred by the Irish public as a result of artificial radioactivity in the environment did not constitute a health risk and were small compared with the dose received as a result of background radiation from naturally occurring radionuclides. All results were published in a series of monitoring reports and were made available on the RPII's website. Data were also submitted annually to the European Commission's database and data from all Member States are periodically published.

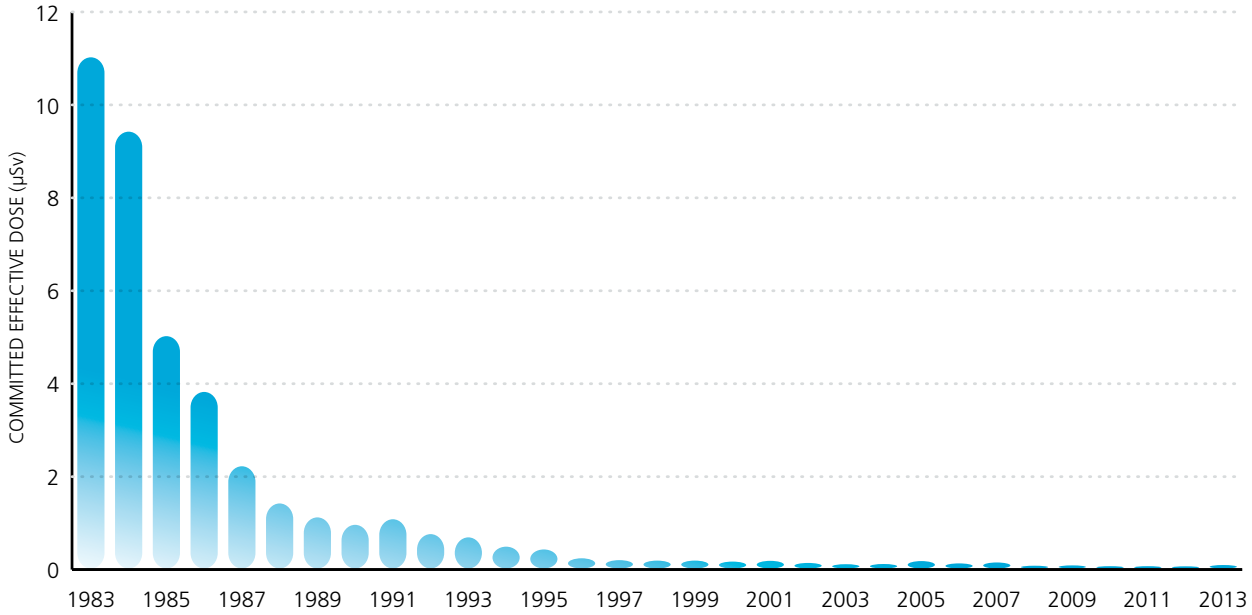
Marine monitoring programme

Since the days of the Nuclear Energy Board (NEB), the public had an on-going concern about discharges into the Irish Sea from the reprocessing of spent nuclear fuel at Sellafield. The RPII's monitoring programme scrutinised the concentration of a wide range of radionuclides including caesium-137, technetium-99, americium-241, and plutonium-238,239 and 240 in the western Irish Sea and the resulting radiation doses to members of the public from the consumption of fish and shellfish – the principal pathway of exposure.

The results of monitoring of the marine environment showed that the doses incurred by the Irish public as a result of artificial radioactivity in the marine environment reduced as annual discharges from Sellafield were reduced and were small when compared with the average annual dose to a person in Ireland from all sources of radioactivity. Figure 8 illustrates the doses to typical seafood consumers between 1983 and 2013 due to caesium-137, which accounted for the majority of the dose from this pathway.

Environmental monitoring, research and measurements services (continued)

Figure 8: Committed effective dose to typical seafood consumer due to caesium-137, 1983–2013



While for most radionuclides annual marine discharges from Sellafield peaked in the mid-1970s, discharges of technetium-99 rose sharply in the mid-1990s following the commissioning of the Enhanced Actinide Removal Plant (EARP). Throughout the remainder of the '90s and up until 2004 these discharges remained high, but fell significantly following the introduction of new waste treatment processes. Levels of technetium-99 in seaweed collected on the east coast of Ireland were found to have peaked in 1998 and began to reduce, reflecting a reduction of the annual rate of discharge from Sellafield.

Activity concentrations of technetium-99 were significantly higher in shellfish samples than for caesium-137. Despite this, technetium-99 accounted for less than 30% of the dose to a seafood consumer as, compared to caesium-137, technetium-99 delivered a much lower radiation dose per unit activity.

Since the commencement of its marine monitoring programme in the early 1980s the RPII derived its estimates of dose to the population by combining measured concentration data derived from actual samples with estimated consumption data. In 2002 the programme was subjected to a complete review resulting in an extension of the monitoring programme to include a greater range of fish, shellfish and seaweed species. Then in 2008, the RPII contracted the UK Centre for Environmental, Fisheries and Aquaculture Research (CEFAS) to undertake a marine habits survey to identify and quantify the most important pathways by which people living in Ireland were exposed to radioactive discharges from Sellafield. While the report included some recommendations for improvement, it provided broad reassurance that the existing marine monitoring programme was comprehensive and that it covered the major exposure pathways and provided a realistic estimate of the exposure to the Irish population.

Terrestrial monitoring programme

The RPII's terrestrial monitoring programme measured natural and artificial radionuclides in drinking water, milk and dairy products, milk powders and babyfoods, beef, lamb, pork and their products, whole meals and additives, soils and vegetation.

In addition, the RPII, with the assistance of Met Éireann and other organisations, operated a national environmental radioactivity surveillance network (Figure 9) which included: continuous measurement of ambient gamma dose rate; airborne particulate sampling – for assessment of radioactivity in air; and collection of rain water.

Figure 9: National environmental radioactivity surveillance network

In the early 90s, in the aftermath of the Chernobyl accident, the RPII's terrestrial monitoring programme focussed on the persistent bioavailability of radiocaesium and enhanced uptake to the food chain in poor agricultural quality upland peat soils and upland lakes. The results of monitoring showed that contamination of game fish from upland lakes was of negligible radiological significance. Extensive monitoring of sheep at farms in upland areas, at the main slaughter houses and local abattoirs and sampling of sheep meat in butchers' shops was carried out in cooperation with the then Department of Agriculture and Food. However, appropriate management practices in conjunction with rigorous monitoring ensured that consumption of sheep meat did not pose a significant hazard to health.

From 1993 to 2007, the RPII included the measurement of the radioactive gas krypton-85. The radiological significance of exposure to krypton-85, an inert gas, was relatively low, but was considered important because of the increased quantities which would be discharged with the commissioning of the Thermal Oxide Reprocessing Plant (THORP) at Sellafield.

Following a recommendation by the European Commission in 2000, a new programme of measurement of radioactivity in the typical Irish diet and in specific ingredients was undertaken in collaboration with the Food Safety Authority of Ireland to better determine the dose to individuals.

The introduction of a new high volume air sampling station in 2005 was an important addition to the RPII's monitoring network. More sensitive than the existing high volume station it allowed more accurate determination of low concentrations of radioactivity in the air.

In 2009, the monitoring programme was reviewed by a panel of five independent experts. The review panel broadly endorsed the programme and considered that it was both adequate and justified. The panel also made some specific recommendations concerning sampling and skills maintenance for consideration in future programmes.

On reports of the deteriorating situation at the Fukushima Dai-ichi nuclear power plant in 2011 the RPII increased the frequency of its sampling and analysis of air, rainwater and milk in Ireland in anticipation of the arrival of the radioactive plume in Europe. The aims of the monitoring were to assess the levels of radioactivity reaching Ireland and to provide data on which to base the RPII's advice to Government. The most useful information was gained from the high volume air sampler which detected iodine-131, caesium-134 and 137. Within seven days of first detection in airborne particulates, trace levels of iodine-131 were detected in milk. The doses from these radionuclides were calculated to be low and of no significance from a public health or food safety point of view.

Environmental monitoring, research and measurements services (continued)

Research

Radiobiology research

Research in radiobiology had been ongoing since 1989 with the principal objective of determining the risk of inducing cancer in human tissue from low dose exposure to radiation. However, in 1991 the Board reviewed the appropriateness of the programme of research and decided it should not be continued after 1992 and the programme was transferred to the Dublin Institute of Technology.

Terrestrial radioecology

Throughout the 1990s the RPII maintained a high level of participation in contract research programmes funded by the Commission of the European Communities (CEC) to underpin its expertise in monitoring and assessing the implications of environmental contamination following events such as the Chernobyl accident. This expertise was regarded as critical to the development of nuclear emergency preparedness in Ireland.

Following Chernobyl, scientists noted that the resulting contamination persisted in some environments – particularly in acid-rich and forest soils. Research in Ireland and the exclusion zone around the Chernobyl nuclear power station in the Ukraine sought to understand why radiocaesium contamination persisted in these ecosystems and for how long it would continue to transfer to food products such as grazing animals, wild mushrooms and berries. Peak concentrations in plants in upland peatlands were observed each summer with a corresponding peak in activity in sheep grazing these pastures. Mechanisms such as the role of soil adhesion to vegetation in the transfer of radionuclides to grazing animals in lowland pastures were also investigated.

In collaboration with researchers from across the European Union, Russia, Belarus and the Ukraine, the RPII investigated the development and evaluation of food production and food processing techniques aimed at maximising the decontamination of foodstuffs.

In 1993, the RPII provided consultancy services to the Bulgarian government under EU-funded PHARE technical assistance programme in the field of environmental monitoring. And, under the EU-funded TACIS technical assistance programme, the RPII collaborated with the PA consulting Group in the UK to design an early warning radiation monitoring system for the republics of Ukraine and Belarus. Under the PHARE programme the RPII also participated in providing assistance in regulatory matters to the authorities in Poland.

During 1995, the RPII was successful in its bid for EU funding to participate in two international collaborative projects: development of decision support tools to assist in the implementation of agricultural, urban and semi-natural ecosystem decontamination strategies in the aftermath of a nuclear accident (TEMAS) and the long-term dynamics of radionuclides in semi-natural environments (SEMINAT). In the latter half of the 1990s a third research project was undertaken on remediation options specifically appropriate to forest ecosystems (FORECO). In addition, the RPII provided assistance to institutions in Belarus, Russia and the Ukraine in establishing comprehensive food quality testing.

In 1999, in cooperation with the then Department of Agriculture Northern Ireland, and partially funded by the EU, the RPII investigated the effectiveness and environmental impact of countermeasures in peatland grazing pastures.

In the late 2000s, a number of studies were undertaken to address gaps in knowledge on the contribution of naturally occurring radionuclides in water and foodstuffs to the typical radiation dose to the Irish population. Two projects commenced in 2008 to determine the levels of natural and artificial radioactivity in groundwater and to estimate the contribution of the naturally occurring radioactive gas, thoron, to the population dose. A survey of natural radioactivity in bottled water was published in 2013 which showed that all water samples surveyed complied with the radiological quality requirements of SI 225 of 2007, the World Health Organisation (WHO) recommendations and the Euratom Drinking Water Directive. An assessment of the levels of natural radioactivity in food was undertaken to determine the dose to the Irish population from polonium-210, lead-210, carbon-14, radium-226 and radium-228 in the Irish diet.

Marine radioecology

The highest concentrations of Sellafield derived radioactivity in the Irish marine environment were found along the northeast coast. Research completed in 1992 showed that Carlingford Lough, an area of public concern, did not accumulate more radioactivity than other areas along the northeast coast and that sea-to-land transfer of radionuclides was negligible. The RPII also investigated, in collaboration with other European laboratories, the radiological consequences of historical discharges from the phosphate industry in research on polonium-210 in the marine environment.

During 1995, the RPII was successful in its bid for EU funding to participate in an international collaborative project on the assessment of the radiological consequences of contamination of the Arctic marine environment. The RPII's role in the project was to investigate the role of marine invertebrates in actinide biokinetics and transfer through the food chain.

In 2000, the RPII commenced participation in a research programme, partially funded by the EU, to network groups with skills and expertise on water circulation and radionuclide transportation in the Irish Sea and Atlantic Ocean. The project achieved its objectives through formal meetings, data transfer and scientific exchanges.

2003 saw the conclusion of a four year project partially funded by the EU in which the RPII together with 12 other laboratories in eight European countries undertook research into the remobilisation of radionuclides deposited on the seafloor. The results of the study showed that a significant proportion of the radionuclides which had accumulated in seabed sediments were being slowly released back into the water. It also identified transit times of radionuclides from the point of discharge to different locations on the Irish Coast.

Under the OSPAR Convention contracting parties were required to prepare national plans with regard to discharges of radioactive substances into the marine environment of the north-east Atlantic region. During 2004, an environmental impact assessment was carried out on iodine-131 discharges from hospitals to the Dublin Bay area to evaluate radiation doses to a critical group and to the general public. Because of its short half-life of eight days, contamination of the foodchain was not of concern.

A study of tritium levels in seawater was completed during 2010 in fulfilment of Ireland's commitments to the OSPAR Convention for the protection of the marine environment of the north-east Atlantic. The aim of the study was to establish a baseline against which future discharges might be measured as nuclear power production increased in Europe.

The RPII undertook a collaborative project with UCD and the Northern Ireland Environment Agency to assess radioactivity levels in Carlingford Lough. This was a follow-up to previous studies completed in the 1990s (referred to above) and allowed an assessment of changes to the measured environmental concentrations in the lough.

Collaboration between the National University of Ireland, Galway (NUIG) and the RPII was established in 2013 to assess the levels of caesium-137 in commercially important seaweeds from Ireland. The aim of this research was to provide a concise overview of the presence of man-made radioactivity in these seaweeds from the west coast of Ireland.

Environmental monitoring, research and measurements services (continued)

Radon research

In 1993, in collaboration with the Geological Survey of Ireland (GSI) and some international partners, the RPII began work on an EU-funded research project to assess the effectiveness of measurements of radon and helium in soil-gas in predicting areas in which high radon levels in houses might be found.

A pilot study of radon in drinking water in Co Wicklow was concluded in 2002. Attention had been focused on this issue by a European Commission recommendation in 2001 that proposed that surveys should be undertaken in Member States to determine the scale and nature of exposures caused by radon in domestic drinking water supplies. The study concluded that, while the number of households likely to be affected was small, radon in drinking water may pose a significant additional health risk, in the longer term, to some consumers who depend on a private groundwater supply as their primary source of water.

Under research partially funded by the EU and co-ordinated by the Building Research Establishment (BRE) in the United Kingdom the RPII commenced a three-year project in 2002 for the co-ordination and dissemination of scientific knowledge of radon related issues at a European level – ERRICCA. Two reports were prepared under the project on radon mapping and measurement techniques in Europe.

During 2002, research was undertaken to evaluate the doses to workers exposed to Naturally Occurring Radioactive Materials where these materials could accumulate in the industrial process, for example as scale in the processing of gas and coal, or as ash from burning coal or peat for electricity production.

In 2004 the RPII published the report of the national survey of radon in schools carried out between 1998 and 2002. The report initiated an evaluation of the effectiveness of different radon remediation techniques in schools, and this evaluation was published in 2007.

In 2010 new seasonal correction factors for radon measurements in Irish homes were determined in collaboration with UCD. Two surveys were conducted in 2011, the first looking at costs, methods and householder experience of remediation and the second looking at remediation rates and motivation by householders to undertake remediation.

Under an EU funded research project – RADPAR (Radon Prevention and Remediation) network, data was gathered on the effectiveness of radon remediation techniques from across Europe. Further work under this project, published in 2012, was the development of a model to compare the cost-effectiveness of the strategic options considered in developing the national radon control strategy for Ireland.

Measurement services

In addition to its primary role of environmental monitoring, the RPII laboratories provided specialist radiation measurement services including: Analytical Services, Product Certification, Instrument Calibration, Radon Measurement and Personnel Dosimetry. These services were provided to a wide range of customers, including industry, the health sector, the education sector, other state agencies and the general public.

Following the Chernobyl accident many countries outside Europe importing Irish goods required them to be certified as having radioactivity content below prescribed national or international limits. As the national centre for the measurement of radioactivity in the environment and foodstuffs the RPII provided valuable support for Ireland's large export trade in agriculture and other products to overseas markets through the provision of this Product Certification service.

The Calibration Service provided a commercial testing service for instruments, in support of those working with radiation, including survey meters, contamination monitors, personal dosimeters and alarms. This testing verified the accuracy of these instruments in response to radiation of different energies using equipment calibrated to international standards.

Until 2012 the RPII provided a Personnel Dosimetry Service to monitor personal doses of radiation to occupationally exposed workers. The provision of this service was one of the main functions established in the early days of the NEB

and it was an essential radiation protection service that was not available elsewhere in Ireland. Over the years, changes in technology and ease of access to alternative services meant that the requirement for such a service to be provided by the RPII alone was reduced. On foot of a strategic decision to reallocate resources to more essential services the Personnel Dosimetry Service was discontinued in 2012 when the RPII moved from being a direct provider of dosimetry services to taking on a supervisory role in relation to dosimetry services operating in Ireland. An approval process for dosimetry services and a National Dose Register were established at the same time.

The RPII participated regularly in international inter-laboratory comparison programmes in all of the areas in which it operated. It also contributed to a number of international measurement and metrology fora such as the Ionising Radiation Metrology Forum, the International Atomic Energy Agency Secondary Standard Dosimetry Network, the Personal Radiation Monitoring Group and the European Dosimetry Group.

In support of the RPII's commitment to achieving and maintaining the highest standards in its scientific work and as the national centre for measurement of radioactivity, during 1996, the RPII implemented a formal quality system and in October 1997 was awarded ILAB accreditation by the National Accreditation Board.

During 2000, two of the technical services were awarded ILAB Accreditation by the National Accreditation Board. The Dosimetry Service was accredited previously when it used film dosemeters and following conversion to thermoluminescent dosemeters (TLDs), ILAB Accreditation was secured afresh for the new system. The Radon Measurement Service also gained ILAB Accreditation during 2000 adding to accreditations already held by the Environmental Laboratory and the Calibration Service.

In 2002, the Environmental Laboratory completed the process of converting its quality system to become compliant with the international standard – ISO 17025. Prior to the reorganisation of the RPII in 2005, three separate quality management systems were in place in the radio-analytical laboratory, the radon measurement service and dosimetry/calibration services. During 2006, these were reorganised into a single system based on one quality manual under a single quality manager. This rationalisation led to improved efficiencies and the resulting synergies greatly improved the value of the system.

Emergency Preparedness

The National Emergency Plan for Nuclear Accidents (NEPNA), which was published by the Government in 1992, was designed to provide a rapid response to possible radiation exposure in Ireland as a consequence of an accident involving the release of radioactive materials into the environment. The RPII played a central role in the implementation of the plan through various roles including; emergency notification and activation of response; technical assessment of the potential or actual consequences of a nuclear accident; participation with many state agencies and Government departments in a collective response; and providing advice to Government and information to the public.

The 1990s

In its role of providing technical assessment, the RPII operated an extensive network of continuously operational environmental radiation monitoring equipment to quickly identify the magnitude and extent of radioactive contamination of the country in the event of a nuclear accident abroad. The network evolved over time from a simple low density network of ambient gamma dose rate monitors and low volume air samplers in the late 1980s to a sophisticated largely automated network by late-2000s (Figure 10) consisting of ambient gamma dose rate monitors, rainfall detectors, precipitation collectors, on-line and off-line air samplers and a high volume air sampler.

Figure 10: National environmental radioactivity surveillance network

In the early nineties the network was expanded with additional precipitation samplers, gamma dose rate monitors, a high volume air sampler and field monitoring equipment. The network was supplemented by the Irish Army Observer Corps, and latterly the Defence Forces, equipped with portable environmental radiation monitors. In addition, arrangements were put in place with the Civil Defence Volunteer Force for environmental monitoring and collection of samples for analysis by the RPII. In 1995 the RPII began participation in EURDEP (European Data Exchange Platform) to exchange radiological monitoring data with other European countries.

As the national competent authority, the RPII implemented European Community arrangements, known as ECURIE, for the early exchange of information in the event of a radiological emergency. The RPII was also the competent authority for the purpose of the IAEA Convention on the Early Notification of Nuclear Accidents, known as EMERCON. Both systems were regularly tested using simulated nuclear accident data to notify of an accident abroad and activate emergency arrangements within Ireland. The RPII operated a 24-hour Duty Officer system to evaluate notifications and activate an emergency response quickly, should the need arise.

In 1992, a major exercise of NEPNA, code named Saferay, took place over two days involving the RPII, the inter-departmental Emergency Response Co-ordination Committee (ERCC) and limited functions of Government departments. In 1996, in an exercise organised by the Nuclear Energy Agency (NEA) of the OECD, a notable feature of the Irish exercise was the use of a team of experienced journalists to simulate the information demand.

Such tests were essential to maintain the plan in a state of readiness and to expose any weaknesses. In 1998, the approval by the Government of revised arrangements for the operation of the National Emergency Plan for Nuclear Accidents was a very positive development. Most importantly, a Committee of Ministers was established to provide policy direction regarding countermeasures which might be implemented in an emergency. This was a major step in ensuring that, following a serious nuclear accident affecting Ireland, crucial decisions would be taken speedily at an appropriate political level. Secondly, a Consultative Committee on Nuclear Emergency Planning was set up for the purpose of regular exchange of views on the implementation, testing and updating of the Plan.

The advice provided in the early phase of a nuclear accident relies primarily on the use of modelling tools and computer simulations of the transfer of radioactivity in the environment. This is because both information and data are very scarce in the early phase of an accident. As the situation progresses, analysis of samples collected in the field as well as real-time monitoring data are used to refine the initial assessment and advice. In 1999 the RPII adopted the ARGOS (Accident Reporting and Guiding Operation System) decision support tool to assist in the technical assessment of the potential or actual consequences of a nuclear accident and for recommending measures to be taken to minimise the radiation exposure of members of the public. The RPII worked closely with Met Éireann to provide online up-to-date numerical weather prediction data for the system. The RPII also worked in partnership with an international consortium, led by the Danish Emergency Management Agency, to further develop ARGOS. In particular, the RPII provided expertise in the area of predicting radioactivity concentrations in foodstuffs.

The 2000s

The most notable development affecting the RPII during 2001 was the intense focus of public interest, following the September 11th terrorist attacks in the US, on the possible consequences for Ireland of a terrorist attack on Sellafield. Attention focused on both the potential danger to people in this country which might result from such an attack and, arising from that, on the capability of the National Emergency Plan for Nuclear Accidents to deal adequately with the situation which could arise. Earlier in the year, as part of a review and audit of NEPNA, a major test of the plan was commissioned by the Department of Public Enterprise and exercised over two days in July and November. The exercises were realistic, rigorous and provided a valuable learning opportunity for all participants. A number of areas requiring review were identified including the location of the control centre for emergency response and arrangements for providing information to the public.

The national monitoring network was reviewed in 2002 in light of potential operational weaknesses, advances in technology since the original system was commissioned and adequacy of the geographic coverage. In 2004 the RPII began a major upgrade of the network which included full automation, on-line and off-line air samplers, rainfall measurement at each station and publication of data to the internet. In addition, the RPII concluded arrangements with the relevant UK authorities for the automated exchange of gamma dose rate monitoring data between

Emergency Preparedness (continued)

the UK Radioactive Incident Monitoring Network (RIMNET) and the Irish national monitoring network.

An emergency exercise in 2005, designed by the NEA, tested the decision-making processes after simulated serious radioactive contamination had taken place. The focus was on the implementation of agricultural countermeasures and food restrictions while moving towards full recovery following a nuclear accident. Earlier in the year the RPII had added a Food Dose Model (FDM) to the ARGOS decision support system. The FDM had been customised to Irish agricultural practices in collaboration with Department of Agriculture and Food, Food Safety Authority of Ireland, Teagasc and the Central Statistics Office.

Following on from the NEA exercise, a major exercise of NEPNA was undertaken in November 2007 involving over 40 participants including ERCC, Department of Agriculture Fisheries and Food (DAFF) and the Food Safety Authority of Ireland (FSAI). One of the main objectives was to test the applicability to Ireland of a European handbook on contaminated food production systems. Subsequently, in 2009, DAFF established an expert group to produce a customised Irish version of the more general European handbook. The RPII participated in the expert group providing advice on countermeasures and the handling of contaminated food products.

In 2006, a Framework for Major Emergency Management was launched by Government intended to enable the principal response agencies to prepare for and make a coordinated response to major emergencies. The RPII assisted in drafting the protocol for multi-agency response to radiological/nuclear emergencies. The protocol linked NEPNA with the major emergency plans of the principal response agencies.

In the mid- to late 2000s, a full and critical review of the RPII's sub-plan under NEPNA was undertaken which resulted in better internal information management and control, defined team roles, improved coordination and emergency response arrangements, quality assurance and a training regime to ensure skills and experience were maintained and optimised.

In addition to its internal emergency exercises, the RPII participated in numerous international emergency exercises. Of note, in 2009, was an exercise designed to test exchange of information on national responses to a simulated radiological incident in a European tourist area where many countries' citizens were affected.

The 2010s

The RPII's emergency response arrangements and the wider capability within the Irish public service to respond to a nuclear accident abroad was tested during the response to the Fukushima accident which occurred in Japan on 11th March 2011. As part of the National Co-ordination Group (NCG) the RPII's role was to provide information on the evolving situation at Fukushima, on the protective actions being applied in Japan and the results of environmental monitoring being carried out in North America and Europe, including Ireland. While the releases from the nuclear plant were substantial, the transit time and significant dilution across the large distance from Japan to Ireland meant that increases in levels of radioactivity here were extremely small and not of concern from a public health point of view.

In a subsequent review of its response to the Fukushima accident, it was felt that the RPII generally responded well to the demands put on it in dealing with the situation, but a number of areas for improvement were identified, including internal communications, resource allocation and training of additional staff. One of these improvements was the commissioning of a microwave link between the RPII and Met Éireann which allowed the Met Éireann forecaster assigned to the RPII's Technical Assessment Team to have direct access to a suite of forecasting tools run from Met Éireann HQ in Dublin.

During 2012, the RPII completed a major upgrade of the ARGOS decision support system used to predict the potential health impact to the Irish population from nuclear accidents abroad as well as the consequences for the Irish food production and agriculture sector. Procedures for using the long-range air dispersion model, Hybrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT), developed by the US National Oceanic and Atmospheric Administration (NOAA) were also updated in 2012, based on the experience of using it in response to the Fukushima accident in 2011.

In 2013, the RPII benefited from the work undertaken by Met Éireann to customise its HYSPLIT dispersion model for use during an emergency response in Ireland. For assessments of events in the vicinity of Ireland, the system uses high-resolution meteorological data produced by Met Éireann's own weather forecast system, where previously lower resolution global data had to be used. This customisation allowed greater precision in estimating the consequences for Ireland of a nuclear accident abroad.

Also during 2013, the RPII began working on the PREPARE research project funded under the EC's 7th Framework Programme. The collaborative project with 45 partners from around Europe aims to address the issues in nuclear and radiological preparedness identified following the Fukushima nuclear accident in 2011. The particular focus of the RPII's contribution is the development of strategies, guidance and tools for the management of contaminated goods, taking account of the views of producers, the processing and retail industries and consumers.

Safety of nuclear facilities abroad

An important component of the RPII's work was the assessment of the significance for Ireland of nuclear activities in other countries, and particularly the United Kingdom. Foremost in this regard was the nuclear fuel reprocessing plant at Sellafield because of:

- its proximity to Ireland and the nature of activities conducted there;
- incidents and faults in equipment and procedures that occurred;
- proposals for new or expanded activities at the site.

Close attention was paid to the effluent discharges from the plant into the Irish Sea but more especially from the risk of an accident or terrorist attack which might result in significant radioactive contamination of the Irish environment.

The RPII's scientific advice was a crucial component in the formulation of Government policies aimed at bringing pressure to bear on the UK government for the phasing out of activities at Sellafield. The RPII also had the responsibility to provide the Irish public with an objective appraisal of the actual risks to Ireland.

The 1990s

Public concern about the Thermal Oxide Reprocessing Plant (THORP) at Sellafield intensified in the early '90s. In 1993 the RPII provided scientific support to the then Department of Energy in the preparation of a detailed and wide-ranging submission to the UK authorities on draft authorisations for radioactive discharges with the commissioning of THORP. In addition to arguing that discharge authorisations ought to be more stringent, it also argued strongly that THORP was neither technically nor economically justifiable and that the plutonium produced carried a proliferation risk.

In subsequent years the RPII also prepared submissions in relation to the safety of the ageing Magnox Power Stations in the UK, scrutinised issues relating to the Highly Active Storage Tanks (HASTs) used for storage of highly radioactive liquid waste from reprocessing at Sellafield as well as proposals by UK Nirex for a deep repository for radioactive waste at a site close to Sellafield. In this latter case the project was dropped in 1997; the UK Secretary of State for the Environment recognised the legitimacy of Ireland's interest in the matter.

On a wider international front the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was adopted by Diplomatic Conference in Vienna in 1997. In conjunction with the earlier Convention on Nuclear Safety (1994) it provided an international framework for implementation of recognised standards of safety on nuclear installations and management of radioactive waste. Ireland, ably supported by the RPII, played a significant role in the negotiation of both conventions.

Three issues regarding operations at Sellafield, to which the Irish Government objected, required significant input by the RPII in the late '90s.

These were:

- the application by British Nuclear Fuels plc (BNFL) for permission to operate its Mixed Oxide Fuel (MOX) plant;
- revision of authorisation for discharges into the Irish Sea – particularly technetium-99;
- and the on-going storage of high level liquid radioactive waste with its attendant accident risk.

In the latter case, while it was recognised that a programme was in place to immobilise these wastes, an increase in the rate of vitrification (incorporation into glass) was sought to decrease the risk to Ireland. Furthermore, an opportunity was sought for scrutiny by the RPII of detailed documentation incorporating the risks associated with the HASTs.

In 1999, it was revealed that data relating to quality assurance checks on fuel from the MOX Demonstration Facility had been falsified. As one of three reports at the time on safety related issues at Sellafield published in 2000 by the UK's Nuclear Installations Inspectorate (NII), it resulted in widespread media commentary and ultimately sweeping changes in management of BNFL.

The 2000s

Following a visit by RPII staff to Sellafield in 2000, the Institute prepared a report on the safety of the HASTs. The report was based on scrutiny of detailed safety documentation hitherto only available to UK authorities. The RPII's capacity to carry out an independent critical review of this type enabled it to play a valuable watchdog role in respect of the risks to Ireland from nuclear facilities such as Sellafield.

In the aftermath of the terrorist attacks in the US on September 11th 2001 there was intense public and media interest on the possible consequences for Ireland of a terrorist attack on Sellafield including the vulnerability of the HASTs and the four Calder Hall reactors on the site. Attention focussed on both the potential danger and on the capability of Ireland's National Emergency Plan for Nuclear Accidents (NEPNA) to deal adequately with the situation which could arise.

A number of events at the end of 2001 intensified public and media interest in these matters following the announcement by the UK Government on 3rd October of its approval for the commissioning of the Sellafield MOX Plant; a major exercise of the National Emergency Plan which took place on 10th November; and the legal action taken by Ireland against the UK regarding the MOX Plant under the United Nations Convention on the Law of the Sea (UNCLOS), the preliminary proceedings of which were heard by the International Tribunal on the Law of the Sea in Hamburg in late November. The RPII had necessarily played a key role in support of the intensified political and legal measures taken by the Government in opposition to activities at Sellafield. In particular the RPII had substantial involvement in preparing the scientific and technical foundation for legal actions taken under UNCLOS and the OSPAR convention.

The RPII's statutory remit with regard to nuclear safety in general and provision of advice to Government was brought into sharp focus in 2003 with three events requiring significant input. These were the hearing of the legal case taken by Ireland under UNCLOS in relation to the operation of the MOX Plant at Sellafield; the Ministerial Meeting of the OSPAR convention on the

Protection of the Marine Environment of the North East Atlantic, and the first review meeting of the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management held in November 2002 in Vienna.

The four Calder Hall reactors on the Sellafield site were closed down in March 2003 for commercial reasons. In 2004, the decision was taken to stop electricity production at the Chapelcross nuclear power station in Western Scotland. The RPII had expressed concern on a number of occasions about the continued operations of these reactors given their age, lack of secondary containment and apparent vulnerability to terrorist attack.

In 2004, a Bilateral Agreement was signed between the Governments of Ireland and the UK. The Agreement covered the early notification of accidents and incidents involving any UK nuclear reactor, fuel cycle facility or transport and storage of nuclear fuels including spent nuclear fuels or radioactive wastes. The RPII was designated as one of the parties to receive notification under the Agreement.

Safety of nuclear facilities abroad (continued)

A key event during 2004 was the visit to the Sellafield site by five of the RPII's senior staff. The purpose of the visit, which was preceded in August by a detailed briefing session with the UK nuclear regulators, was to see at first hand a number of the key facilities of particular interest and concern to Ireland and to explore the changing nature of operations at the site. The subsequent report published by the RPII highlighted the complexity and inter-dependency of operations at the site and prospective longevity of operations there until full decommissioning around 2150.

By arrangement with the UK's Nuclear Installations Inspectorate, RPII staff were accompanied by the UK's Environment Agency on a visit to the Wylfa nuclear power plant in Anglesey, North Wales in 2006. The visit provided a comprehensive overview of the management, regulation and operation of the facility. In 2007, as part of a memorandum of understanding with the French nuclear regulatory authority ASN, the RPII visited the Flamanville nuclear power plant and La Hague reprocessing plant. The purpose of these visits was to ensure the RPII was in a position to provide accurate and up-to-date advice to Government on a wide range of nuclear issues.

The RPII closely monitored the progress in emptying – by sending liquid waste to vitrification – the HASTs at Sellafield. In the late 2000s the volume in the tanks remained constant or decreased slightly because of lower than expected throughput due to ongoing technical difficulties reprocessing spent fuel. At the same time the RPII closely monitored the development of plans in the UK to build new nuclear power plants to replace those scheduled to close over the following decades.

The 2010s

Following the events at Fukushima in 2011, the European Council requested a review of safety at all European nuclear power plants. The European Nuclear Safety Regulators Group (ENSREG) produced criteria and a plan for the so-called 'stress tests', which required plant operators to reassess the safety of nuclear plants against the type of extreme events that occurred at Fukushima. All EU member states with operating nuclear power plants, together with Switzerland and Ukraine, participated in the process. Each country's nuclear safety regulator, including the RPII, then reviewed the operators' reports and commented on their findings, identifying areas for further work and/or plant improvements.

In late 2012, the Department of Environment, Community and Local Government (DECLG) published a summary of an assessment of the risks to Ireland from the Sellafield site and the low-level waste repository located nearby. The assessment was conducted by a team of independent, international nuclear experts. The RPII provided technical support to the DECLG throughout the project and worked with the international experts to assess the environmental dispersion of radioactivity released from various accident scenarios. The assessment concluded that an accident at Sellafield or at the low-level waste repository would result in no observable health effects in Ireland, but that some severe incidents would have the potential to create significant socio-economic impacts.

In May 2013, the RPII completed and published its assessment of the likely effects on the environment in Ireland of the planned programme to build new nuclear power stations in the UK. The assessment found that any radioactive contamination in the air would be transported away from Ireland most of the time. The routine operation of the proposed nuclear power plants would have no measurable radiological impact on Ireland. In the case of the severe accident scenarios examined, with the wind blowing towards Ireland, food controls and agricultural protective measures would be required and in the case of the most severe accident, short-term measures such as sheltering would be required.

By the mid-2010s, the RPII was monitoring the UK's planned programme of new nuclear build, as well as their plans to develop a geological disposal facility by 2040. It also monitored progress made by Sellafield against key safety-related targets.

International activities

Two principal objectives of the RPII were to co-operate with relevant authorities in other states and with appropriate international organisations and to monitor developments abroad relating to nuclear installations and radiological safety generally, and keep the Government informed of their implications for Ireland.

To achieve these objectives the RPII actively engaged with the development of radiological protection and nuclear safety standards in expert groups and working parties of the European Union, the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA) of the OECD as well as those associated with international conventions such as the OSPAR Convention, London Dumping Convention, Nuclear Safety Convention and the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. Engagement ensured that an Irish viewpoint was brought to bear on decision-making at international fora concerned with radiological protection and nuclear issues, and also that the direction of the RPII's work was guided by up-to-date knowledge of international developments.

European Union

The requirements of the EURATOM Treaty, and the operation of many elements of the European Union, necessitated the substantial involvement by the RPII in EU activities.

In the early 1990s of particular importance was the negotiation of a revised Directive on Basic Safety Standards for the protection of the health of workers and the general public against the dangers arising from ionising radiation. The RPII had a substantial part to play in the discussions through the Council of Ministers Working Party on Atomic Questions.

The RPII actively participated with the Department of Health and Children at European Council level discussions on the development of a revised Council Directive on the health protection of individuals against the dangers of ionising radiation in relation to medical exposures and in 1997 the Directive was approved.

In the late 1990s and early 2000s the RPII was actively involved in discussions on Commission proposals for the multi-annual framework programme of the European Atomic Energy Community for research and training activities aimed at the creation of the European Research Area. The programme included research into thermonuclear fusion, safety of nuclear installations and fuel cycle, radiation protection, managing nuclear emergencies, exposure to natural sources such as radon and environmental transfer of radioactivity.

The RPII also provided a delegate to the statutory Group of Experts convened under Article 37 of the Euratom Treaty to advise the Commission on the potential impact of plans for the disposal of radioactive wastes. In addition, the RPII participated in the consultative committee for the management of nuclear fission safety programme which dealt with the safety of the nuclear fuel cycle and radiation protection research and in a committee established under Article 35 of the EURATOM Treaty covering radioactivity monitoring in the European Union.

In the early 2000s, the RPII provided a delegate to the Working Party on Nuclear Safety established to assess the safety of nuclear power reactors in EU candidate countries.

A decision of the European Commission in 2007 established the European Nuclear Safety Regulators Group (ENSREG) as an independent authoritative expert body composed of the heads and senior officials from national regulatory and nuclear safety authorities from all 27 Member States. Its central mission is to strive for the continuous improvements in nuclear safety and radioactive waste and spent fuel management and their regulation, and to promote openness and transparency in those areas. The RPII was an active participant in the work of ENSREG, including providing a deputy Chair.

A milestone development during 2009 was the adoption by the European Council of a Directive establishing a Community framework for the safety of nuclear installations. The RPII contributed to the development of the Directive through ENSREG. The Directive essentially gave legal force to the main international nuclear safety standards established by the IAEA and the principal obligations provided for in the Convention on Nuclear Safety. It aims to maintain and promote the continuous improvement of nuclear safety and its regulation and to ensure that EU Member States provide appropriate national arrangements to protect workers and the general public against the dangers arising from nuclear installations.

As part of the cycle of continuous improvement of radiological protection standards, the RPII was again involved in supporting the technical and political discussions on further revisions of the Basic Safety Standards Directive and the new Drinking Water Directive, both of which were agreed during the Irish Presidency of the European Council in 2013.

International Atomic Energy Agency

A major development in 1994 was the conclusion, under the auspices of the IAEA, of an international Convention on Nuclear Safety. This was the first time that the principles of safety of nuclear installations were formally agreed at an international level. The Irish delegation convened a group of like-minded countries whose objective was to ensure that the interests of smaller countries were taken into account in drafting the Convention; the RPII assisted with the preparation and attended review meetings of the Convention in subsequent years.

In the mid-1990s, Ireland held the seat on the Board of Governors of the IAEA and the RPII provided technical advice and assistance to Ireland's Governor as well as Ireland's Permanent Representative to the Agency. There was considerable input from Ireland on most topics of debate but particularly on the safeguarding of nuclear materials, the principles of radioactive waste management, the IAEA's system for the production of safety standards and guides and the establishment of a satisfactory treaty on nuclear liability.

In 1997, work in which Ireland played a significant negotiation role was brought to a successful conclusion when the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management was adopted by Diplomatic Conference in Vienna. In conjunction with the earlier Convention on Nuclear Safety (1994) it provided an international framework for implementation of recognised standards of safety on nuclear installations and management of radioactive waste. The Convention was ratified by Ireland in 2001 and thereafter the RPII contributed to the preparation and presentation of Ireland's national reports and reviewing national reports of other countries.

International activities (continued)

Nuclear Energy Agency of the OECD

In the early 1990s, the RPII represented Ireland on the governing board, known as the Steering Committee, of the NEA and the Radioactive Waste Management Committee. On-going support in the following decades was provided by the RPII to the Committee on Radiation Protection and Public Health (CRPPH) made up of regulators and radiation protection experts, with the broad mission to provide timely identification of new and emerging issues. Sub-groups and expert groups of the CRPPH and the CNRA (Committee on Nuclear Regulatory Activities) were also supported by the RPII.

OSPAR Convention

The 1992 OSPAR Convention is the instrument guiding international cooperation on the protection of the marine environment of the north-east Atlantic. It combined and up-dated the 1972 Oslo Convention on dumping waste at sea and the 1974 Paris Convention on land-based sources of marine pollution. The RPII participated in the work of the OSPAR Commission and its Working Group on Radioactive Substances. It acted as the scientific adviser to the Irish Government on the implementation of the OSPAR strategy for radioactive substances, signed by all contracting parties in 1998, which requires progressive and substantial reductions in discharges of radioactive substances by the year 2020.

UK/Ireland Liaison

The RPII actively participated in two standing arrangements that existed for liaison between Irish and UK authorities in matters of radiological protection and nuclear safety. The UK/Ireland Contact Group provided twice yearly meetings between representatives of UK government departments and agencies and Irish Government departments and agencies.

In respect of more technical aspects of the safety of nuclear installations, a formal arrangement for the exchange of information existed between the RPII and the then Nuclear Installations Inspectorate of the UK's Health and Safety Executive. Under this arrangement an annual meeting took place where the RPII gained an insight into the stance of the UK regulatory authority in relation to nuclear safety issues arising in the UK.

At the first meeting of the British-Irish Council (Environment Sectoral Group) in 2000, it was agreed there were many areas of common interest which could be taken forward with added value to all participants. One area in which the RPII participated, through the Irish delegation, dealt with radioactive waste from Sellafield. Meetings for the exchange of information also took place with the Northern Ireland Office and with the Environment and Heritage Service, Northern Ireland.

ICRP

During 2005, one RPII staff member was elected to membership of Committee 4 of the International Commission on Radiological Protection (ICRP). The ICRP is the primary international organisation providing basic guidance on radiation protection and its Committee 4 is charged with the practical implementation of this guidance.

International Missions

The RPII provided experts to international peer reviews and radiation protection training missions. These included missions under the IAEA's model project for upgrading radiation protection infrastructure in developing countries and missions to support new EU Member States in meeting EU requirements in radiation protection. As well as providing experts for missions, the RPII regularly hosted visiting scientists under the IAEA's Technical Cooperation Programme.

Public Information

The RPII had a responsibility to disseminate objective and factual information on radiological protection and associated issues and to increase access to and understanding of its activities. Throughout its existence, the RPII undertook a range of communications activities and events to build awareness.

The RPII engaged with a variety of audiences ranging from highly technical experts to members of the public including schoolchildren. Communicating technical information to diverse audiences presented many challenges particularly when the issues were emotive. On controversial or politically charged topics the RPII constantly maintained its independence, relying on scientific fact as the basis for advice. Conscious of the role played by the media in disseminating information, the RPII actively encouraged reporting on radiological protection issues of public concern.

The 1990s

Public fears about the hazards of ionising radiation, particularly the risk posed from emissions from Sellafield, were real, but not always well founded. The RPII recognised the major task of helping the public to relate the risks from radiation in a balanced way to other risks which affected them. In 1993 the Board took the important step of extending the range of expertise available to it by the establishment of three advisory committees, on Environmental Radiation, Medical Radiation, and Information and Public Relations. The role of the latter advisory committee was especially important to communications in the early 1990s.

At this time, the RPII also intensified its communication efforts to create an informed public recognition of the health hazard posed by radon gas in buildings. As part of the RPII's policy of striving for maximum effectiveness in the dissemination of information, it established a presence on the internet with the launch in 1999 of a website.

The RPII hosted a number of successful conferences during the 1990s. Two notable meetings were held – one on the implementation in Irish law of two new EU Directives, and the other, an international event held in conjunction with the EU Commission, on "Cosmic Radiation and Air Crew Exposure: Implementation of European Requirements in Civil Aviation".

Public Information (continued)

The 2000s

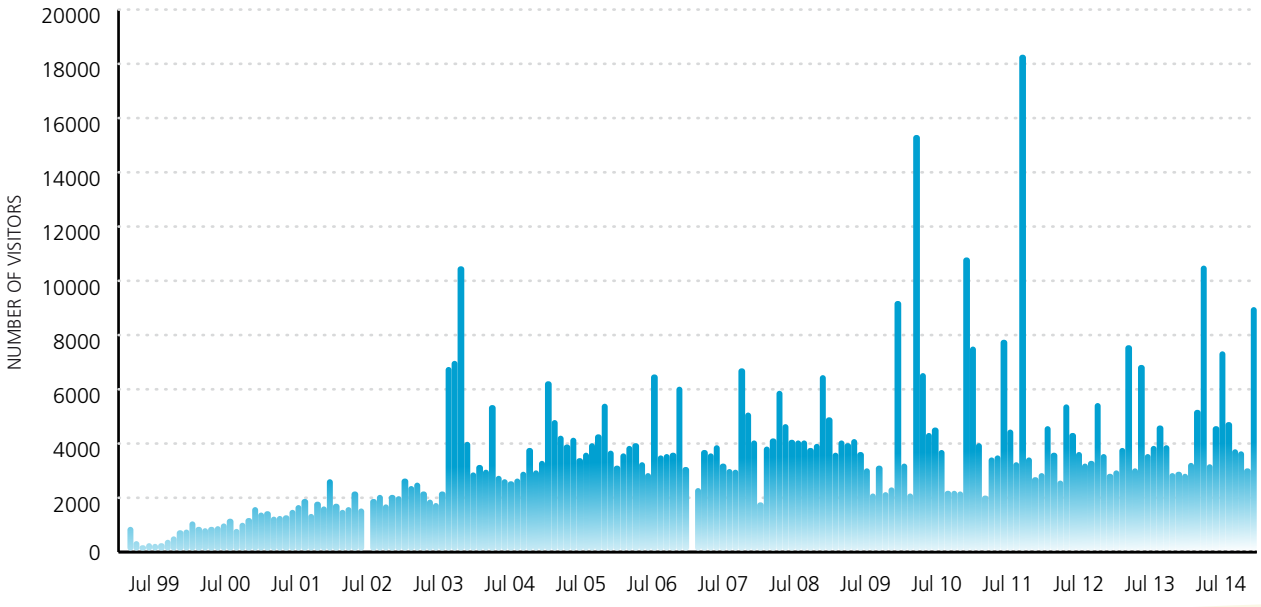
During 2002, following the coming into force of the European Communities (Medical Ionising Radiation Protection) Regulations, governing the protection of patients, and others, undergoing radiation exposure for medical purposes, the RPII assisted in the organisation of an EU funded international conference on medico-legal exposures that provided a forum to discuss the ethical, legal, social and technical problems encountered with these practices.

In 2004, to underpin planning on public communications, the RPII commissioned market research among the public to measure attitudes and awareness of radiation. The research found that the population was reasonably well aware of the issues surrounding radioactivity. Over half the population had concerns about radiation or radioactivity levels in Ireland with over 75% aware of radon gas. TV and newspapers/magazines were identified as the main sources of information.

In the mid-2000s, the RPII initiated a series of 'radon road shows' whose main objective was to heighten the awareness of the dangers of radon exposure amongst the public, employers, and local authorities. The areas visited were Ballina, Sligo, Kilkenny, Waterford, Tralee, Clonmel, Galway, Carlow and Mallow, all of which are situated in High Radon Areas. Each road show included presentations to local schools, employer groups and the Local Authority. Other outreach activities included information stands at the National Ploughing Championship and other agricultural shows. These road shows were highly successful, receiving significant local and national media coverage and increased the number of radon measurements made.

A key milestone during 2007 was the development of the RPII's Strategic Plan covering the period 2008–2010. The starting point for the development of this strategy was a thorough review of the previous strategy and of the environment in which the RPII operated. Furthermore, a communications audit was carried out to examine the internal mechanisms and processes that were in place for the generation and delivery of external communications. The review and audit noted that the organisation would benefit from greater clarity in the setting and measuring of strategic objectives and by dedicating greater resources to its communications and advocacy role.

Figure 11: Number of visitors per month to the RPII website 1999–2014



In 2007, over 200 delegates – mostly medical physicists – attended a seminar, hosted by the RPII in collaboration with the Association of Physical Scientists in Medicine, on new recommendations from the International Commission on Radiological Protection. This seminar provided a forum for review of the latest science behind the basic principles of radiological protection which are critical to the application of ionising radiation in medicine.

An important element in the promotion of good radiation practice, for members of the public exposed to radon in their homes and for people using ionising radiation in the workplace, is the availability of readily accessible and understandable information. Recognising the increasing availability of internet access and its growth as a primary information source the RPII launched a newly updated website in May 2009.

Features on the website included:

- an interactive radon map where visitors could enter their home address to determine if they lived in a High Radon Area;
- a radiation dose calculator which allowed users to estimate their own radiation dose;
- on-line application and payment for radon measurement services;
- access to the RPII's monitoring network and access to monitoring programme data;
- and on-line administration for customers of the dosimetry service.

The number of visitors to the website (Figure 11) increased from 1999 to 2014 with spikes in visitor numbers for any particular month coincident with successful RPII activity in the media.

The 2010s

In early 2010, the RPII worked closely with a journalist to develop a special feature on radon which was later broadcast on RTÉ's Prime Time programme which gave rise to increased awareness of the issue. Capitalising on the heightened level of awareness, and building on earlier experience from its successful 'radon road shows' the RPII began running integrated local information campaigns in the following months and years in counties identified as having high radon levels. The campaigns included: distribution of awareness literature to every household in the county; advertising and interviews on local radio and newspapers; promotional activities; social media; public meetings; and tailored briefing sessions for local and national public representatives and business/industry groups. The local campaigns were very successful and resulted in a substantial increase in the number of radon measurements undertaken by householders in each high radon area targeted. Following an external review of the campaigns in 2012, it was recognised that the campaigns would require a national drive to achieve the market penetration and drive householder action on radon.

During the 2010s, the RPII undertook a number of market research and focus group activities (in 2010, 2011 and 2013). This was prompted by a growing realisation that the information disseminated by the RPII was not having the desired effect. The aim of the research was to help understand the needs and concerns of the RPII's stakeholders, including the general public, so that communications could be better crafted and targeted.

The findings indicated that between 2004, when market research was first undertaken, and 2013 concern about radiation or radioactivity had declined to less than 40%. In 2013 about one in two people believed that a nuclear accident in the UK would have a significant or catastrophic impact on their health. And radon gas in the home was considered by the population to be less of a risk than Sellafield, nuclear power stations abroad or mobile phone masts, pointing to a widespread imbalance between perceived risk and actual risk.

These findings were underpinned by focus group research and some face-to-face interviews with key stakeholders undertaken in 2011 to determine attitudes towards radiation in the environment. The research found the two greatest concerns related to the low-level pollution of the Irish Sea from Sellafield and the possibility of a major accident as a result of terrorist attack on Sellafield. The research also highlighted the importance of openness and transparency for organisations such as the RPII in its dealings with the public.

Public Information (continued)

Between 2004 and 2013, the public's awareness about radon grew. By 2013 the majority of the public had some awareness of radon with one in two claiming to know a little or more about it. Despite this apparent high awareness, only one in three claimed to be concerned about it in their home. This highlighted the real challenge of turning awareness into action.

These findings were underpinned by focus group research undertaken in 2010 to identify the public's perception of the radon message and to understand their motivation or de-motivation to undertake a radon test. One important finding was that the message should be endorsed not just by the RPII but by relevant Government departments and agencies, such as the Department of Environment, Heritage and Local Government (DEHLG), Local Authorities and the HSE. Other aspects of this research informed subsequent awareness campaigns and communications in general.

The response to the damage at the Fukushima Nuclear Plant in Japan caused by the earthquake/tsunami in March 2011 was a major challenge for the RPII in 2011. As part of the overall response at national level, the RPII's role was to provide information on the evolving situation at Fukushima, on the protective actions being applied in Japan and the results of its environmental monitoring being carried out Ireland.

The RPII's laboratories analysed samples of air and milk and this and other related information was posted on its website. The response was Ireland's first live test of communication in an emergency situation since the Chernobyl accident in 1986. In spite of Ireland's distance from Fukushima and the negligible contamination detected, the demand for technical information about possible impacts on Ireland was intense. The response was widely acknowledged as positive and proactive, reinforcing the RPII's reputation as a trusted and expert authority.

In an ongoing commitment to the continued development of the website as the primary communications channel for the RPII, and keeping pace with developments in the use of hand held devices a mobile version of the website was developed in 2012. Social media was also rapidly growing as a key communications channel. Social media tools were incorporated into the RPII website and Facebook and Twitter accounts established to engage with a broader audience.

Members of the Board and Advisory Committees

Members of the Board 1992–2014

Name	Term of office	
Dr Mary Upton	1992–1999	Chairperson 1992–1999
Prof William Reville	1992–1997 & 2012–2014	Chairman 2012–2014
Dr Francis J Mulligan	1997–2006	Chairman 2000–2006
Prof Eugene Kennedy	2006–2011	Chairman 2006–2011
Dr Dermot Cantwell	1992–1997	
Dr Patrick Connellan	1992–2008	
Mr Flor Crowley	1992–1997	
Dr George Duffy	1992–2001	
Mr Alan Ellard	1992–1997	
Mr Thomas Hayden	1992–1997	
Dr Frank Keeling	1992–1997	
Prof James F Malone	1992–1997	
Dr Geraldine O'Reilly	1992–2001	
Prof Philip Walton	1992–1997	
Mr Gregory Burke	1997–2007	
Dr James Carr	1997–2000	
Dr Edward Fitzgerald	1997–2004	
Mr James Gibney	1997–2002	
Dr Lesley Malone	1997–2007	
Ms Darina Muckian	1997–2014	
Ms Adi Roche	1997–2014	
Dr William Blunnie	2000–2005	
Mr Francis J Turvey	2001–2009	
Ms Anita Dowling	2001–2006	
Ms Mary Coffey	2000–2003	
Mr James Fitzmaurice	2002–2014	
Prof Kieran Byrne	2003–2007	
Dr Sean Darby	2004–2006	
Dr Michael Hurley	2005–2008	
Mr Patrick Gilligan	2006–2014	
Dr Niall McEniff	2007–2010	
Ms Fionnuala Barker	2007–2012	
Dr Kevin Kelleher	2007–2014	
Ms Nuala Ahern	2008–2011	

Members of the Board and Advisory Committees (continued)

Members of the Board 1992–2014 (continued)

Name	Term of office	
Dr Maurice Fitzgerald	2008–2014	
Dr Éamann Breatnach	2008–2011	
Mr John O'Dea	2009–2014	
Dr Stephanie Ryan	2010–2014	
Dr Patricia Cunningham	2012–2014	
Dr Paraic James	2012–2014	

Medical Radiation Advisory Committee

This Committee advised the Board on the uses of ionising radiation in medicine and dentistry.

Name	Term of office	
Dr George Duffy	1993–2009	Chairman 1993–2009
Ms Helen Allen	1993	
Dr Jane Buttimer	1993–1997	
Dr Dermot Cantwell	1993–1996	
Dr James Carr	1993–2000	
Ms Mary Coffey	1993–2007	
Dr Nuala Corcoran	1993–1996	
Mr Padraig Couglan	1993	
Mr John D. Cunningham	1993–2001	
Dr Jerry Dowsett	1993–1996	
Mr Alan Ellard	1993–1996	
Dr Edward Fitzgerald	1993–2005	
Dr Gerard Gavin	1993–1996	
Dr Gerry Hurley	1993	
Dr Frank Keeling	1993–1996	
Dr Bernard McCartan	1993–1996	
Prof James F Malone	1993–1996	
Dr Lesley Malone	1993–2009	
Dr James Masterson	1993–2005	
Ms Máire Ní Aonghusa	1993–1996	
Dr Seamus O'Cathail	1993–1996	
Dr Tom O'Flaherty	1993–2002	
Mr Francis J Turvey	1993–1996	
Prof Donal MacErlaine	1994–1996	
Ms Kate Mathews	1994–2008	
Mr Brendan Mee	1994–1996	
Ms Bernadette Moran	1994–1996	
Dr Dan Murphy	1994–2004	
Dr Pat Kenny	1996–2009	
Dr Brendan McClean	1996–2009	
Dr David McInerney	1996	
Dr Jacinta McLoughlin	1996–1999	
Dr Michael Moriarty	1996–2008	
Mr Liam Murray	1996–2003	
Dr Noel O'Connell	1996–1998	

Members of the Board and Advisory Committees (continued)

Medical Radiation Advisory Committee (continued)

Name	Term of office	
Dr Anthony O'Dwyer	1996	
Dr Geraldine O'Reilly	1996–2009	
Prof Wil Van der Putten	1997–2009	
Ms Fionnuala Barker	1997–2009	
Dr David Clarke	1997–2009	
Dr Lynn Johnston	1997–2007	
Dr Ann McGarry	1999–2009	
Dr Stephanie Ryan	2001–2004	
Ms Louise Diamond	2002–2006	
Mr Dermot Howett	2004–2007	
Dr Tom Ryan	2004–2009	
Dr Stephen Skehan	2006–2009	
Dr Mark McEntee	2006–2007	
Ms Susan Dennan	2008–2009	
Mr Christopher Hone	1993–1995 & 1998–2009	Scientific Secretary 1993–1995
Mr David Fenton	1996–2007	Scientific Secretary 1996–2001
Dr Stephen Fennell	2002–2009	Scientific Secretary 2002
Ms Tanya Kenny	2004–2007	Scientific Secretary 2003–2007
Ms Noeleen Cunningham	2008–2009	Scientific Secretary 2008–2009

Environmental Radiation Advisory Committee

This Committee provided advice to the Board on radioactivity in the environment.

Name	Term of office	
Dr Geraldine O'Reilly	1992–2008	Chairperson 1992–1995
Mr Gregory Burke	1996–2007	Chairman 1996–2007
Dr Tony Colgan	1992, 1996–2008	
Mr John D. Cunningham	1992–2001	
Mr Thomas Hayden	1992–1996	
Prof Ian R. McAulay	1992–2008	
Dr Ann McGarry	1992–2008	
Prof James P. McLaughlin	1992–2008	
Prof Peter I. Mitchell	1992–2008	
Prof Palmer Newbould	1992–1996	
Dr Noel V. Nowlan	1992–1999	
Dr Tom O'Flaherty	1992–2002	
Prof Philip Walton	1992–2008	
Ms Darina Muckian	1996–2008	
Prof William Reville	1996–2008	
Ms Adi Roche	1997–2008	
Prof Wil van der Putten	1997–2004	
Mr Dermot Howett	2002–2008	
Dr Barbara Raffetry	2002–2008	
Mr David Fenton	2002–2008	
Mr David Pollard	1993–2008	Scientific Secretary 1993–1998
Dr Tom Ryan	1998–2002	Scientific Secretary 1999–2002
Ms Stephanie Long	2002–2008	Scientific Secretary 2002–2008

Members of the Board and Advisory Committees (continued)

Ionising Radiation Advisory Committee

This Committee acted as a high level scientific advisory body on any matter concerning ionising radiation, with particular emphasis on public health matters, referred to it by the Board or by the Executive of the RPII. From January 2010 this Committee replaced the Environmental Radiation and the Medical Radiation Advisory Committees.

Name	Term of office	
Dr Éamann Breatnach	2009–2011	Chairman 2009–2011
Dr Paraic James	2012–2014	Chairman 2012–2014
Dr Nuala Ahern	2009–2011	
Dr Michael Casey	2009–2014	
Dr Harry Comber	2009–2014	
Dr Dominique Crowley	2009–2010	
Dr Peter Finnegan	2011–2014	
Dr Maurice Fitzgerald	2012–2014	
Mr Sean Hogan	2009–2014	
Dr Jean Luc-Godet	2009–2014	
Prof Ian R. McAulay	2009–2014	
Prof Brendan McClean	2009–2014	
Prof James P. McLaughlin	2009–2014	
Dr Jill Meara	2009–2014	
Prof Peter I. Mitchell	2009–2014	
Dr Neil O'Donovan	2009–2014	
Dr Geraldine O'Reilly	2009–2014	
Dr Jane Renehan	2009–2014	
Prof Wil van der Putten	2009–2014	
Ms Stephanie Long	2009–2014	Scientific Secretary 2009–2014

Audit Committee

The audit committee supported the Board in ensuring the integrity of internal financial control, effective risk management and sound corporate governance.

Name	Term of office	
Dr Francis J Mulligan	2004–2006	Chairman 2004–2006
Dr Patrick Connellan	2004–2008	Chairman 2006–2008
Mr Patrick Gilligan	2008–2013	Chairman 2008–2013
Mr James Fitzmaurice	2004–2013	
Ms Darina Muckian	2008–2013	
Prof Ciarán Ó'hÓgartaigh	2008–2013	
Ms Glenda Griffin	2011–2013	Secretary 2011–2013

Communications Advisory Committee

This Committee provided advice relating to communication with the public.

Name	Term of office	
Prof William Reville	1992–1996	Chairman 1992–1996
Mr James Fitzmaurice	2004–2014	Chairman 2004–2014
Mr Alan Ellard	1992–1996	
Mr Ray Gordon	1992–1994	
Dr Tom O'Flaherty	1992–1996	
Dr Geraldine O'Reilly	1992–1996	
Mr Stephen O'Byrnes	1995–1996	
Mr Gregory Burke	2004–2006	
Dr Ann McGarry	2004–2010	
Dr Barbara Rafferty	2009–2010	
Dr Tony Colgan	2004–2009	
Ms Fionnuala Barker	2007–2012	
Mr John O'Dea	2011–2014	
Mr Brian Trench	2011–2014	
Ms Annette Cahalane	2013–2014	
Ms Darina Mukian	2013–2014	
Ms Marie Kelly	1992–1996 & 2004–2010	Secretary 1992–1996
Ms Lucy Doody	2011–2012	Secretary 2011–2012
Ms Linda Coyne	2013–2014	Secretary 2013–2014

Comptroller and Auditor General

Report for presentation to the Houses of the Oireachtas

I have audited the financial statements of the Radiological Protection Institute of Ireland (now dissolved) for the period ended 1 August 2014 under the Radiological Protection (Miscellaneous Provisions) Act 2014. The financial statements, which have been prepared under accounting policies set out therein, comprise the statement of accounting policies, the income and expenditure account, the statement of total recognised gains and losses, the balance sheet and the related notes. The financial statements have been prepared in the form prescribed under Section 16 of the Radiological Protection Act 1991 and in accordance with generally accepted accounting practice in Ireland.

Responsibilities of the Institute and of the Environmental Protection Agency.

The Institute was responsible for the preparation of the financial statements, for ensuring that they give a true and fair view of the state of the Institute's affairs and of its income and expenditure, and for ensuring the regularity of transactions.

The Institute was dissolved on 1 August 2014 and its assets and liabilities transferred to the Environmental Protection Agency, as outlined in the statement of accounting policies.

Following dissolution of the Institute, the Environmental Protection Agency is responsible for the preparation of the financial statements in accordance with Section 11 of the Radiological Protection (Miscellaneous Provisions) Act 2014.

Responsibilities of the Comptroller and auditor General

My responsibility is to audit the financial statements and report them in accordance with applicable law.

My audit is conducted by reference to the special considerations which attach to State bodies in relation to their management and operation.

My audit is carried out in accordance with the International Standards on Auditing (UK and Ireland) and in compliance with the Auditing Practices Board's Ethical Standards for Auditors.

Scope of audit of the financial statements

An audit involves obtaining evidence about the amounts and disclosures in the financial statements, sufficient to give reasonable assurance that the financial statements are free from material misstatement, whether caused by fraud or error. This includes an assessment of:

- whether the accounting policies are appropriate to the Institute's circumstances, and have been consistently applied and adequately disclosed
- the reasonableness of significant accounting estimates made in the preparation of the financial statements, and
- the overall presentation of the financial statements.

I also seek to obtain evidence about the regularity of financial transactions in the course of audit.

Opinion on the Financial Statements

In my opinion, the financial statements, which have been properly prepared in accordance with generally accepted accounting practice in Ireland, give a true and fair view of the state of the Institute's affairs at 1 August 2014 and of its income and expenditure for the period then ended.

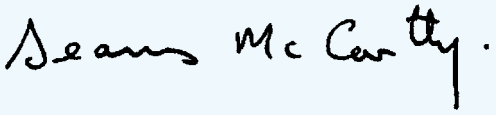
In my opinion, proper books of account were kept by the Institute. The financial statements are in agreement with the books of account.

Matters on which I report by exception

I report by exception if:

- I have not received all the information and explanations I required for my audit, or
- my audit noted any material instance where money has not been applied for the purposes intended or where the transactions did not conform to the authorities governing them, or
- the statement on internal financial control does not reflect the Institute's compliance with the Code of Practice for the Governance of State Bodies, or
- I find there are other material matters relating to the manner in which public business has been conducted.

I have nothing to report in regard to those matters upon which reporting is by exception.



Seamus McCarthy
Comptroller and Auditor General

2 April 2015

Statement on Internal Financial Controls

As provided by the Radiological Protection (Miscellaneous Provisions) Act 2014 the Radiological Protection Institute of Ireland was dissolved on the 1 August 2014 and all assets, liabilities and staff transferred to the Environmental Protection Agency. Up to the date of dissolution the Radiological Protection Institute of Ireland was responsible for reviewing and ensuring the effectiveness of the Radiological Protection Institute of Ireland's system of internal Finance control.

I as Director General of the Environmental Protection Agency make the following statements based on the work of the former Chief Executive, now a member of the Environmental Protection Agency Board and Chairperson of the Radiological Protection Institute of Ireland.

During the period 1 January 2014 to 1 August 2014 the Board of the Radiological Protection Institute of Ireland was responsible for reviewing and ensuring the effectiveness of the organisation's system of internal financial control.

The system of internal financial controls can provide only reasonable and not absolute assurance that assets are safeguarded, transactions are authorised and properly recorded, and that material errors or irregularities are either prevented or would be detected and rectified in a timely manner.

Key Procedures to Provide Effective Internal Financial Control

i) The Board of the Radiological Protection Institute of Ireland has taken steps to ensure an appropriate control environment within the Radiological Protection Institute of Ireland by:

- Publishing the Radiological Protection Institute of Ireland's Strategy Statement 2014–2015. This Strategy covers the period to 2015 and sets out the Radiological Protection Institute of Ireland's organisational goals. Implementation of the Strategy is monitored and reported to the Board of the Radiological Protection Institute of Ireland on a periodic basis.
- Agreeing a detailed work programme for each year and monitoring and evaluating progress against the work programme on a regular basis.
- Holding regular Board meetings and monthly management meetings where the agenda includes strategic issues such as Corporate Governance and Financial Management.
- Adopting a set of financial procedures to control the significant financial elements of the Radiological Protection Institute of Ireland's business and publishing these in the Employee Handbook.
- Maintaining a comprehensive schedule of insurances to protect the Radiological Protection Institute of Ireland's interests.
- Establishing an Internal Audit Committee, and appointment of an internal auditor as part of the ongoing systematic review of the control environment and governance procedures within the Radiological Protection Institute of Ireland.
- Establishing and operating a Risk Management Policy and Framework.
- Clearly defining management responsibilities, delegating appropriate functions, and reviewing and approving key Radiological Protection Institute of Ireland policies and procedures.
- Adopting a Code of Business Conduct for Directors and Staff in accordance with the requirements of the Code of Practice for the Governance of State Bodies.
- Ensuring compliance with the Ethics in Public Office Acts requirements and Paragraph 21 of the First Schedule of the Radiological Protection Act 1991 relating to the Declaration and Disclosure of Interests.

ii) During the period to 1 August 2014 the Radiological Protection Institute of Ireland's Risk Registers were reviewed in accordance with the Radiological Protection Institute of Ireland's Risk Management Policy and a Corporate Risk Register was prepared.

iii) The system on internal financial controls is based on a framework of regular management information, a system of delegation and accountability, a set of financial procedures, administrative procedures including segregation of duties. In particular it includes:

- A comprehensive budgeting system with an annual budget, which is reviewed and approved by the Board.

Statement on Internal Financial Controls (continued)

- The assignment of budgets and budgetary authority and responsibility for specific functions to selected senior managers.
- Restricting authority for authorising all payments of Radiological Protection Institute of Ireland's monies and applying limits to the amounts authorised.
- Regular reviews by the Board of periodic and annual financial information and reports (including management accounts), which indicate financial performance against budgets.
- A system of control on the overall approval of capital and consultancy contracts.

iv) The financial implications of business risks have been considered through the formal business risk assessment process and in the preparation of the Radiological Protection Institute of Ireland's Internal Audit Plans.

Procedures have been issued to control the significant financial elements of the Radiological Protection Institute of Ireland's business, and authorisation limits have been set by the Board for purchasing.

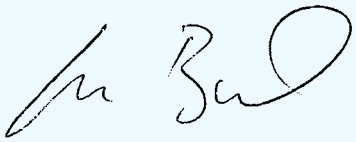
v) The Radiological Protection Institute of Ireland's Audit Committee is comprised of three members of the Board and an external person with financial and audit expertise.

In May 2014, Deloitte conducted a review of Internal Financial Controls with respect to the period 1 January 2014 to 1 August 2014. There were no critical findings identified in this audit. This report was reviewed by the Radiological Protection Institute of Ireland's Audit Committee in June 2014 and subsequently approved by the Radiological Protection Institute of Ireland's Board.

Annual Review of Controls

I confirm that the Radiological Protection Institute of Ireland conducted a review of the effectiveness of the system of internal controls in respect of the period commencing 1 January 2014 up to the dissolution date of 1 August 2014.

Signed on behalf of the Board



Laura Burke
Director General (EPA)

31 March 2015

Statement of responsibilities of the Environmental Protection Agency

The Radiological Protection Institute of Ireland was established in 1992 in accordance with the Radiological Protection Act, 1991. The Radiological Protection Institute of Ireland was the national organisation with responsibility for ensuring that people and the environment in Ireland are protected from the harmful effects of ionising radiation. The Radiological Protection Institute of Ireland fulfilled its remit by providing strong and effective regulation of all those who use radiation sources and by working in partnership with other regulatory authorities. The Radiological Protection Institute of Ireland monitored people's exposure in Ireland to radiation from occupational and environmental sources. In addition, it provided advice to the public and the Government on radiation sources and on the corresponding risks and their management. The Radiological Protection Institute of Ireland had a central role in ensuring Ireland's emergency preparedness in the event of a nuclear accident abroad and was responsible for monitoring developments in relation to nuclear installations abroad.

The functions of the Radiological Protection Institute of Ireland included:

- To provide advice to the Government, the Minister for Environment, Community and Local Government 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 control by licence the custody, use, manufacture, importation, transportation, distribution, exportation and disposal of radioactive substances, irradiating apparatus and other sources of 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 and 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 relevant to radiological safety.
- 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.

Responsibilities of the Environmental Protection Agency

The Radiological Protection Institute of Ireland was dissolved on the 1st of August 2014 under statutory instrument pursuant to the Radiological Protection (Miscellaneous Provisions) Act, 2014. On that day all of its functions together with its assets, liabilities and staff transferred to the Environmental Protection Agency.

The Environmental Protection Agency is required under Section 11 of the Radiological Protection (Miscellaneous Provisions) Act 2014 to prepare final accounts, which give a true and fair view of the Radiological Protection Institute of Ireland (now dissolved) and of its income and expenditure for the period. The Environmental Protection Agency did not have any governance or operational responsibility for the Radiological Protection Institute of Ireland during the period of account.

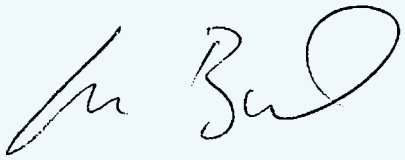
In preparing those financial statements the Environmental Protection Agency is required to:

- Select suitable accounting policies and then apply them consistently
- Make judgements and estimates that are reasonable and prudent
- Prepare the financial statements on the going concern basis
- Disclose any material departures from applicable accounting standards

Statement of responsibilities of the Environmental Protection Agency (continued)

The Environmental Protection Agency has complied with the above requirements in preparing the financial statements.

The Board of the Environmental Protection Agency approved the financial statements on 31 March 2015.



Laura Burke
Director General (EPA)

Ann McGarry
Board Member

31 March 2015

Statement of accounting policies

1. Basis of Preparation

Dissolution of the Radiological Protection Institute of Ireland

The Radiological Protection (Miscellaneous Provisions) Act 2014 provided for the dissolution of the Radiological Protection Institute of Ireland. As all the functions, operations, assets and liabilities of the Institute transferred to the Environmental Protection Agency (EPA) on a going concern basis, the accounts have been prepared on a going concern basis.

A summary of the amounts transferred is set out below:

Fixed Assets	477,825
Banks & Cash	891,378
Debtors	298,091
Creditors	(119,178)
Provision for disposal of Sources	(24,600)
Income in Advance	(465,204)
Capital Grant in Advance	(257,749)
Deferred Pension Fund	26,777,950
Pension Liability	(26,777,950)
Value of Assets transferred to the EPA	**800,563**

The Financial Statements are prepared on an accruals basis, except as stated below, and under the historical cost convention, in accordance with generally accepted practice. Financial reporting standards recommended by the recognised accountancy bodies are adopted as they become applicable. The unit of currency in which the financial statements are denominated is the Euro.

The Financial Statements are in the format approved by the Minister for the Environment, Community and Local Government with the consent of the Minister for Public Expenditure and Reform.

2. Income

Income shown in the Financial Statements under State grant represents actual cash receipts in the year.

Licence fees are recognised as income in line with the licence terms. Fees received in advance are recognised as income in advance.

3. Fixed Assets

Fixed Assets are stated at cost less accumulated depreciation. Cost includes the estimated cost of disposal of radioactive sources. Depreciation was calculated on a straight line basis by reference to the expected useful lives of the assets concerned.

The rates used were as follows:

Office & Laboratory Furniture & Equipment: 20%

Leasehold Improvements are depreciated over the life of the lease.

4. Superannuation

The Radiological Protection Institute of Ireland operated a defined benefit pension scheme which is funded annually on a 'pay-as-you-go' basis from monies provided by the Minister for the Environment, Community and Local Government and from contributions deducted from staff salaries.

Pension costs reflected pension benefits earned by employees in the period and were shown net of staff pension contributions which were retained by the Institute. An amount corresponding to the pension charge was recognised as income to the extent that it was recoverable, and offset by grants received in the year to discharge pension payments.

Actuarial gains or losses arising on scheme liabilities are reflected in the Statement of Total Recognised Gains and Losses and a corresponding adjustment is recognised in the amount recoverable from the Department of the Environment, Community and Local Government.

Pension liabilities represent the present value of future pension payments earned by staff to date. Deferred pension funding represents the corresponding asset to be recovered in future periods from the Department of the Environment, Community and Local Government.

All pension benefits, costs and liabilities arising and accruing from the Radiological Protection Institute of Ireland Pension Scheme transferred to the Environmental Protection Agency with effect from 1 August 2014 in accordance with the transfer of members of staff of dissolved body provision of the Radiological Protection (Miscellaneous Provisions) Act 2014.

5. Capital Account

The Capital Account represents the unamortised amount of income used to purchase fixed assets.

6. Provision for Disposal of Radioactive Sources

The Institute held a number of sources, some of which will be held for several years. It made a provision for the cost of the disposal of the material in the year in which it received new sources.

Income and Expenditure Account

for the period 1 January 2014 to 1 August 2014

2013 €		1 Jan to 1 Aug 2014 €
	INCOME	
3,283,859	State Grant (Note 1a)	2,063,000
1,166,538	Net Deferred Funding for Pensions (Note 9b)	688,809
192,736	Transfer from/(to) Capital Account (Note 3)	97,552
4,643,133		2,849,361
49,286	Calibration Service	27,608
130,815	Radon Measurement Service	64,000
275,018	Radiation Monitoring Service	197,102
769,419	Regulatory Service	435,490
16,496	Miscellaneous/Contract Income	7,279
1,241,034		731,479
5,884,167		3,580,840
	EXPENDITURE	
2,860,403	Salaries (Note 5)	1,636,844
1,397,018	Pension (Note 9c)	823,877
5,145	Calibration Service	11,190
30,567	Radon Measurement Service	25,480
119,646	Radiation Monitoring Service	97,008
57,579	Regulatory Service	23,951
176,125	Public Information & Communications	129,713
31,267	Nuclear Safety & Emergency Planning	22,710
48,825	Library & Document Management	32,239
591,106	Accommodation & Insurance	351,182
111,697	Travel & Subsistence	61,437
44,202	Recruitment & Training	46,268
70,161	MIS, IT & Customer Service	42,748
49,071	Postage, Phone & Office Supplies	26,980
11,515	Audit Fees	9,000
32,023	Professional Fees & Miscellaneous	15,562
392,736	Depreciation	328,255
(3,503)	Bad Debts	(1,177)
(45,490)	(Profit)/Loss on Disposal of Fixed Assets	4,297
(33,343)	Provision for the disposal of radioactive sources (Note 12)	
5,946,750		3,687,564
(62,583)	SURPLUS/(DEFICIT) FOR YEAR (Note 4)	**(106,724)**
492,045	Balance as at 1 January	429,462
429,462	Balance as at 1 August 2014	322,738

The Statement of Accounting Policies and Notes 1 to 15 form part of these Financial Statements

Laura Burke
Director General (EPA)

Ann McGarry
Board Member

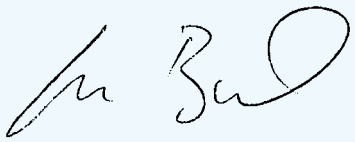
31 March 2015

Statement of Total Recognised Gains and Losses

for the period 1 January 2014 to 1 August 2014

2013 €		Notes	1 Jan to 1 Aug 2014 €
(62,583)	Surplus/(Deficit) for year		(106,724)
(675,000)	Experience / Gains on pension scheme liabilities		(199,000)
(763,000)	Change in assumptions underlying the present value of pension scheme liabilities		3,483,000
(1,438,000)	Actuarial (Gain)/Losses on Pension Liabilities	*9(f)*	3,284,000
1,438,000	Adjustments to Deferred Pension Funding		(3,284,000)
(62,583)	Total recognised gain/(loss) for the year		(106,724)

The Statement of Accounting Policies and Notes 1 to 15 form part of these Financial Statements



Laura Burke
Director General (EPA)

Ann McGarry
Board Member

31 March 2015

Balance Sheet

as at 1st August 2014

2013 €		Notes	As at 1 Aug 2014 €
766,255	FIXED ASSETS	*2*	477,825
	CURRENT ASSETS		
1,280,988	Cash on Hand & at Bank		891,378
156,518	Debtors	*10*	298,091
1,437,506			1,189,469
	CREDITORS – amounts falling due within one year		
155,001	Creditors	*11*	119,178
24,600	Provision for Disposal of Radioactive Sources	*12*	24,600
761,572	Income in Advance	*1(b)*	465,204
66,871	Capital Grant in advance	*13*	257,749
1,008,044			866,731
429,462	NET CURRENT ASSETS		322,738
1,195,717	TOTAL ASSETS LESS CURRENT LIABILITIES		800,563
22,805,141	Deferred Pension Funding	*9(d)*	26,777,950
(22,805,141)	Pension Liability	*9(e)*	(26,777,950)
1,195,717	NET ASSETS		800,563
	Financed by:		
429,462	Income and Expenditure Account	*4*	322,738
766,255	Capital Account	*3*	477,825
1,195,717			800,563

The Statement of Accounting Policies and Notes 1 to 15 form part of these Financial Statements

Laura Burke
Director General (EPA)

Ann McGarry
Board Member

31 March 2015

Notes to the Financial Statements

for the period 1 January 2014 to 1 August 2014

1. Income

(a) State Grant

The Oireachtas Grant is provided under section 15 of the Radiological Protection Act, 1991. The amount of the grant received for administration from the Department of Environment, Community and Local Government under subhead C.4 was €1,481,000 for the period 1 January to 1 August 2014, (Total 2013 €2,205,859).

An amount of €582,000 for the period 1 January 2014 to 1 August (Total 2013 €1,078,000) was received from the Environment Fund.

(b) Income in Advance

Income in advance includes the portion of licence fees received that relates to the unexpired term of the licences at year-end. The licence fees are brought to income on a monthly basis as the licence term expires. Income in advance at 1 August will be brought to account in the years 2014–2017 as shown below.

	€
2014	215,452
2015	185,095
2016	51,771
2017	224
	452,542

Income in advance also includes income in relation to an EU funded project called PREPARE of which RPII is a participant. The income is being recognised over the life of the project which runs to January 2016.

	€
2014	3,518
2015	8,441
2016	703
	12,662

Notes to the Financial Statements (continued)

for the period 1 January 2014 to 1 August 2014

2. Fixed Assets

	Leasehold Improvements €	Office and Laboratory Furniture and Equipment €	Total €
Cost:			
At 1 January 2014	788,301	5,380,763	6,169,064
Additions		44,122	44,122
Disposals		(29,127)	(29,127)
At 1 August 2014	788,301	5,395,758	6,184,059
Depreciation:			
At 1 January 2014	660,245	4,742,564	5,402,809
Charge for year	25,617	302,638	328,255
On disposals		(24,830)	(24,830)
At 1 August 2014	685,862	5,020,372	5,706,234
Net Book Value at 1 August 2014	102,439	375,386	477,825
Net Book Value at 31 December 2013	128,056	638,199	766,255

3. Capital Account

	2014 (At 1 August) €	2014 (At 1 August) €	2013 €	2013 €
Balance at 1 January 2014		766,255		1,025,862
Allocated to acquire fixed assets	235,000		200,000	
Less Disposals				
Fixed Assets Disposed	29,127		2,560,058	
Accumulated Depreciation on Disposed Assets	(24,830)		(2,560,058)	
	4,297		-	
Amortised in Line with Depreciation	(328,255)		(392,736)	
Transfer (to) Income & Expenditure Account		(97,552)		(192,736)
Transfer (to) Capital Grant in Advance		(190,878)		(66,871)
		477,825		766,255

4. Accumulated Surplus

	2014 (At 1 August) €	2013 €
Balance at 1 January 2014	429,462	492,045
Surplus/(Deficit) for the Year	(106,724)	(62,583)
Balance at 1 August 2014	322,738	429,462

The Board approved essential expenditure during 2014 which resulted in a planned deficit for the period 1 January to 1 August 2014.

5. Salaries and Pensions

	2014 €	2013 €
Gross Salaries	1,553,126	2,715,440
Employers P.R.S.I.	83,718	144,963
	1,636,844	2,860,403

The CEO received salary payments of €79,494 for the period 1 January 2014 to 1 August 2014 (Total 2013 – €141,114). The CEO received recoupment of travel and subsistence expenses of €7,082 for the period 1 January 2014 to 1 August 2014. The CEO is a member of an unfunded defined benefit public sector scheme and her pension entitlements do not extend beyond the standard entitlements in the public sector defined benefit superannuation scheme.

€100,216 was deducted from staff by way of pension levy and was paid over to the Department of the Environment, Community and Local Government.

The average number of full-time persons employed, excluding Board members, in the financial year was 44 (2013 – 46).

6. Commitments & Lease Obligations – operating leases

3 Clonskeagh Square

Lease commitments payable in the next twelve months amount to €300,000 on the basis of current rental rates and comprise rental payments on a leasehold interest, the term of which expires on 1 October 2018.

1 Clonskeagh Square

Lease commitments payable in the next twelve months amount to €140,000 on the basis of current rental rates and comprise rental payments on a 20 year leasehold interest. The rent is subject to review at five-yearly intervals. The next review is in 2018.

7. Capital Commitments

The value of capital commitments authorised at 1 August 2014 amounted to €0.

8. Board Members' Interests

The Board adopted procedures in accordance with guidelines issued by the Department of Public Expenditure and Reform in relation to the disclosure of interests by Board members and these procedures have been adhered to in the period. There were no transactions of any significance in the period in relation to the Institute's activities in which the Board members had any beneficial interest. A breakdown of Board members' fees paid during the period 1 January to 1 August 2014 is as follows:

	€		€
Professor W. Reville (Chairman)	6,983	Ms D Muckian	3,848
Mr M Fitzgerald	4,489	Ms A Roche	3,848
Mr J Fitzmaurice	3,848	Mr P Gilligan	3,848
Mr J O'Dea	3,848		
Dr S Ryan	3,848		

Travel and subsistence expenses incurred by Board Members during the period 1 January 2014 to 1 August 2014 amounted to €7,553.

9. Pensions

(a) Pension Scheme

The disclosures below have been prepared for the Radiological Protection Institute of Ireland (RPII) in relation to benefits payable from the Radiological Protection Institute of Ireland Superannuation Scheme ("the Scheme").

The Scheme is a defined benefit type, providing retirement benefits based on final salary, in accordance with the Public Sector model rules. The Scheme is funded annually on a pay as you go basis from monies provided by the Minister for the Environment, Community and Local Government and from contributions deducted from staff salaries.

The valuation used for FRS17 disclosures has been based on a full assessment of the liabilities of the Scheme as at 1 August 2014. The present values of the defined benefit obligation, the related service costs and any past service costs were measured using the projected unit credit method.

All Pension benefits, costs and liabilities arising from the RPII Scheme transferred to EPA with effect from 1 August 2014 in accordance with the Radiological Protection (Miscellaneous Provisions) Act 2014.

The principal assumptions used by independent qualified actuaries to calculate the liabilities under FRS17 are set out below:

	At 01/08/2014	**At year-end 31/12/13**	**At year-end 31/12/12**
Discount rate	2.85%	3.75%	3.75%
Inflation assumption	1.75%	2.00%	2.00%
Future Salary Increases	2.75%	3.00%	3.00%
Future State Pension Increases	1.75%	2.00%	2.00%

9. Pensions (continued)

(b) Net Deferred Funding for Pensions in Year

	01/01/2014 to 01/08/2014 €'000s	Year to 31/12/13 €'000s	Year to 31/12/12 €'000s
Funding Recoverable in respect of Current Year			
Pension Costs	912	1,588	1,574
State Grant Applied to Pay Pensions and Gratuities	(223)	(421)	(612)
	689	1,167	962

(c) Analysis of Total Pension Costs Charged to Expenditure

	01/01/2014 to 01/08/2014 €'000s	Year to 31/12/13 €'000s	Year to 31/12/12 €'000s
Current Service Cost	402	704	547
Interest Cost	510	884	1,027
Employee Contributions	(88)	(191)	(185)
Total Cost	824	1,397	1,389

(d) Deferred Funding Asset for Pensions

The RPII recognises amounts owing from the State for the unfunded deferred liability for pensions on the basis of a number of past events. These events include the statutory backing for the superannuation scheme, and the policy and practice in relation to funding public service pensions including the annual estimates process. While there is no formal agreement and therefore no guarantee regarding these specific amounts with the Department of Environment, Community and Local Government, the RPII has no evidence that this funding policy will not continue to progressively meet this amount in accordance with current practice. The deferred funding asset for pensions as at 1 August 2014 amount to €26,778 million (2013 : €22,805 million).

(e) Movement in Net Pension Liability During the Financial Year

	01/01/2014 to 01/08/2014 €'000s	Year to 31/12/13 €'000s	Year to 31/12/12 €'000s
Net Pension Liability at 1 January	22,805	23,076	19,274
Current Service Cost	402	704	547
Interest Cost	510	884	1,027
Benefits paid in year,	(223)	(421)	(612)
Actuarial (gains)/losses on liabilities*	3,284	(1,438)	2,840
Past Service Costs			
Curtailments			
Settlements			
Net Pension Liability at 1 August	26,778	22,805	23,076

**includes impact of changes to the assumptions*

9. Pensions (continued)

(f) History of Experience Gains and Losses

	01/01/2014 to 01/08/2014 €'000s	Year to 31/12/13 €'000s	Year to 31/12/12 €'000s
Experience (gains)/losses on scheme liabilities amount:	(199)	(675)	(635)
As a percentage of the present value of scheme liabilities	(0.07%)	(2.95%)	(2.75%)
Total actuarial gains/(losses) recognised in STRGL	(3,284)	1,438	(2,840)
As a percentage of the present value of scheme liabilities	-12.30%	6.30%	(12.30%)
Cumulative amount of gains/(losses) recognised in STRGL^	(5,643)	(2,359)	(3,797)

^ *represents cumulative gains/losses from 31/12/2002 inclusive*

The mortality assumptions are based on standard mortality tables which allow for future mortality improvements. The mortality basis explicitly allows for improvements in life expectancy over time, so that life expectancy at retirement will depend on the year in which a member attains retirement age (age 65 years). The table below show the life expectancy for members attaining age 65 in 2014 and 2034

Year attaining age 65	**2014**	**2034**
Life expectancy – Male	87.7	90.1
Life expectancy – Female	89.0	91.1

10. Debtors

	2014 (As at 1 August) €	2013 €
Debtors for Services	93,320	48,092
Bad Debts Provision	(2,070)	(4,345)
Prepayments	206,841	112,771
	298,091	156,518

11. Creditors

	2014 (As at 1 August) €	2013 €
Creditors and Accruals	114,538	123,735
Revenue Commissioners	4,640	31,266
	119,178	155,001

12. Provision for disposal of radioactive sources

	2014 (As at 1 August) €	2013 €
Opening Provision	24,600	125,556
Utilised		(67,613)
Provided		
Over provision in Prior year		(33,343)
Closing Provision	24,600	24,600

13. Capital grant in advance

This represents Capital Grants received in respect of projects that were not completed during the year:

	2014 (As at 1 August) €	2013 €
Opening Balance at 1st January	66,871	-
Transfer (to)/from Capital Account	190,878	66,871
	257,749	66,871
This figure comprises:		
Capital Expenditure for the Year	(44,122)	(133,129)
Grant Received	235,000	200,000
	190,878	66,871

14. Merger of RPII and EPA

The Radiological Protection (Miscellaneous Provisions) Act 2014 was signed into law by the President in July 2014. On the 1 August the Radiological Protection Institute of Ireland was dissolved and all assets, liabilities and functions of the RPII were transferred to the Environmental Protection Agency from that date in accordance with the legislation.

15. Approval of Financial Statements

The financial statements were approved by the Board on the 31 March 2015.

Radiological Protection Institute of Ireland
An Institiúid Éireannach um Chosaint Raideolaíoch

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