

## A peer review of the RPII monitoring programme

P. McGinnity, L. Currivan and D. Pollard

*Radiological Protection Institute of Ireland, 3 Clonskeagh Square, Dublin 14, Ireland*

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**Abstract.** The Radiological Protection Institute of Ireland (RPII) has carried out a programme to monitor environmental radioactivity for many years. In 2009, a group of independent, international experts was requested to undertake a comprehensive strategic review of the programme. Here the objectives, terms of reference and process of this review are presented. As background, the legislative framework in which the programme is operated is laid out. The current programme is also summarised. Finally, the main conclusions and recommendations are described along with relevant changes to the programme which were subsequently enacted by the RPII.

### 1. INTRODUCTION

The Radiological Protection Institute of Ireland (RPII) has since the early 1980s carried out a programme to monitor environmental radioactivity in air, food and water. The primary focus of this programme has been the assessment of human exposure and the protection of human health. The programme aims to meet Irish and European Union legal requirements, other national and international commitments and to support the RPII's advisory and information provision functions. An important additional objective is to maintain the capability required for effective response to a nuclear or radiological incident.

### 2. LEGISLATIVE FRAMEWORK

The Irish and European Union (EU) legal requirements which the programme aims to meet are:

- *The Radiological Protection Act, 1991* [1]. This act establishes the legal basis for radiological protection in Ireland. The act defines a number of general functions relevant to the RPII's environmental monitoring programme.
- *The Radiological Protection Act, 1991 (Ionising Radiation) Order, S.I. No. 125 of 2000* [2]. This order transposes the EU Basic Safety Standards (BSS) (Council Directive 96/29/EURATOM) [3] into Irish law. The BSS requires EU Member States to assess the contribution to the exposure of the population as a whole from all practices and to ensure that these are as realistic as possible.
- *The Euratom Treaty*. This requires Member States to carry out monitoring to ensure compliance with the basic standards for the protection of the population. Article 35 requires the establishment of facilities necessary to carry out continuous monitoring of environmental radioactivity. Article 36 requires reporting of the results of this monitoring to the European Commission (EC). A Commission Recommendation (2000/437/Euratom) [4] sets out detailed practical guidance for Member States on how to discharge their obligations under Article 36. This recommendation constitutes an important influence on the design of the RPII's monitoring programme.

A number of other national and international commitments are of relevance. These include:

- *OSPAR Radioactive Substance Strategy (RSC)* [5]. In part fulfilment of Irish responsibilities under the RSC, the RPII has commitments regarding routine sampling and testing of radioactivity in fish, shellfish, seaweed, sediments and seawater.
- *EU Drinking Water Directive (DWD) (Council Directive 98/83/EC)* [6]. The DWD has been transposed into Irish law [7]. It sets limit values for a range of parameters including radioactivity (tritium and Total Indicative Dose) in drinking water. Although rules and procedures

covering monitoring frequencies, methods and locations have yet to be finalised, Commission Recommendation 2000/437/Euratom specifies that 'monitoring of levels of radioactivity in drinking water should be such as to ensure compliance with the DWD'.

- *Emergency management.* The RPII has responsibilities for environmental monitoring in the event of a nuclear or radiological incident [8, 9]. In the event of an emergency, exchange of radiological monitoring data between EU Member States is required by ECURIE (European Community Urgent Radiological Information Exchange) based on Council Decision 87/600/Euratom [10].

### 3. THE CURRENT MONITORING PROGRAMME

The current RPII monitoring programme comprises four key elements: marine, food, drinking water and ambient radioactivity.

Marine monitoring is focused primarily on the Irish Sea and is intended to assess the impact of the discharge of low level liquid waste into the northeast Irish Sea from the Sellafield nuclear facility in the UK [11] and to provide accurate data on which to base information provided to Government and the public. This element of the programme includes sampling and testing of seawater, seafood and other marine environmental samples.

The foodstuffs monitoring element of the programme aims to assess the levels of artificial radioactivity generally in the Irish food chain and to determine the resulting radiation dose to the Irish population. The programme design is based on Commission Recommendation 2000/437/Euratom and is focused primarily on milk and mixed diet. Milk is considered a key indicator matrix for the general food chain.

Drinking water is monitored in accordance with Commission Recommendation 2000/437/Euratom. Major water supplies are sampled from all 26 counties in rotation so that each county is sampled approximately every four years.

The monitoring of ambient radioactivity utilises a network of fixed sampling stations located throughout Ireland. Both round-the-clock measurements of external gamma dose rates and sampling and laboratory testing of air and rainwater are performed. The aim of this monitoring is to measure background levels of radiation in the atmosphere and to give a rapid indication of environmental contamination in the event of a major accident.

Continuous monitoring is complemented by specific projects which investigate particular aspects of terrestrial and marine radioactivity. Recent examples include a national survey of groundwater drinking water supplies (in collaboration with the Environmental Protection Agency), currently nearing completion, and a marine habits survey along the north east coast of Ireland (conducted by the Centre for Environment, Fisheries and Aquaculture Science (CEFAS) in the UK on behalf of the RPII) [12].

### 4. PEER REVIEW OBJECTIVES, TERMS OF REFERENCE AND PROCESS

Since it began, the RPII monitoring programme has evolved to reflect, *inter alia*, available resources and changes in the levels and radionuclides discharged from nuclear installations abroad. The monitoring plan is reviewed annually and, in 2007, aspects of the programme were reviewed by a team of experts from the European Commission and found to comply with Article 35 requirements [13]. Additionally, in 2009, a group of independent, international experts was requested to undertake a comprehensive strategic review of the programme.

The key objective of the review was to consider whether the RPII environmental monitoring programme is meeting its stated aims and objectives and to provide recommendations for improvement if required. The terms of reference of the review were:

- *Aims and objectives of the programme.* Assessment of the scope of the programme to ensure that it is optimal; sufficiently broad to cover statutory requirements and other national and international commitments; and complies with international best practice.

- *Capacity of the current programme to meet stated aims and objectives.* Evaluation of the effectiveness of the RPII environmental monitoring programme as implemented.
- *Emergency response capability.* Consideration of the strategic value of the programme with respect to the capability to respond effectively in the event of a nuclear or radiological emergency and challenges regarding the maintenance and retention of expertise and analytical capability.
- *Value for money.* Consideration of the effectiveness and efficiency of the programme in achieving stated aims and objectives.
- *Future needs and scope for innovation.* A ‘catch-all’ item including general recommendations for future environmental monitoring; comment on sampling frequencies and densities with reference to trends in monitoring results; suggestions for potential future project-based monitoring and research needs; identification of areas of emerging interest; and consideration of the skills mix of the RPII staff involved in the programme with recommendations for future training and development if required.

A group of five independent experts were appointed by the RPII to conduct the peer review on the basis of expertise and knowledge in different aspects of radiation protection and environmental monitoring. Peer Review Group (PRG) members were asked to apply all relevant experience to complete the objectives of the review and to contribute independent conclusions and recommendations.

The PRG met twice in Dublin. In advance of the first meeting it was provided with a number of documents describing the current RPII monitoring programme and relevant statutory requirements and national and international commitments in detail. The main deliverable of the peer review was a report containing the PRG’s conclusions and recommendations based on a thorough analysis of these documents [14].

## 5. CONCLUSIONS, RECOMMENDATIONS AND SUBSEQUENT CHANGES

The PRG’s overall impression of the RPII monitoring programme was positive. In general, it considered that the current programme was both adequate and justified, both from the perspective of public reassurance and from the need to provide accurate and scientifically-sound advice to Government.

The PRG made a number of suggestions for further improvement and reprioritisation of resources in the programme. These recommendations may be grouped into two broad categories. The first comprises general recommendations for the future sustainability of the RPII’s monitoring programme. The second category includes specific recommendations concerning technical aspects of the programme, in the main related to its marine element.

Following the peer review, the RPII reviewed the aims and objectives of the programme and considered in detail the peer group’s recommendations. Based on this analysis, a revised monitoring programme has been developed. The relevant recommendations from the peer review and resultant changes implemented by the RPII are summarised here.

### 5.1 General Recommendations

#### 5.1.1 Aims and Objectives

Following the recommendations of the peer review and subsequent internal discussions, the aims and objectives of the monitoring programme have been revised and incorporated into the RPII’s general strategic planning process. Firstly, the following *strategic priority* has been defined:

- Provide the expertise, technical capability and information essential to the protection of the Irish population and the environment.

This strategic priority incorporates the following *objectives*:

- Undertake targeted monitoring and research to assess the sources of radiation exposure to the public and the environment.

- Strengthen our core emergency response capability while supporting national planning activities.
- Specific *goals* of the RPII's environmental monitoring programme are:
- To comply with statutory and international obligations concerning environmental monitoring and individual and population dose assessment.
  - To maintain the capacity to make rapid and effective assessment of environmental contamination in the event of a nuclear or radiological incident.
  - To provide current and historic information on radiation levels in the environment and the food chain to the public, the scientific community and Government.
  - To provide the data to underpin the provision of high quality scientifically-based advice to decision makers and other stakeholders.

### 5.1.2 Core Analytical Techniques

The PRG recommended that the RPII should identify the core analytical capability which it considers appropriate to maintain and develop in-house. Subsequently, the following analytical techniques have been identified as priorities:

- High resolution gamma spectrometry of a wide range of sample matrices and radionuclides using high purity germanium detectors.
- Determination of Sr-90 activity concentrations in milk by radiochemical separation followed by liquid scintillation counting.
- Liquid scintillation counting of aquatic samples (including tritium and radon activity concentrations in water and possible future measurement of total alpha and beta concentrations in drinking water).
- Total alpha and beta concentrations by gas flow proportional counting (including air filters and drinking water).
- Alpha spectrometry (specifically plutonium and americium).

### 5.1.3 Skills

The PRG was concerned by the likely shortage of suitably-qualified and experienced personnel available for future recruitment, particularly in the field of radiochemistry, and by the need to proactively manage the skills retention and the motivation of current staff. Various suggestions were made for addressing these somewhat related concerns including maintaining a research component within the monitoring programme; enhancing liaison with the third level education sector; making effective use of intercomparisons and proficiency tests; and continuing to offer opportunities for training and development.

## 5.2 Technical Recommendations

### 5.2.1 Marine Programme

The following changes have been implemented as recommended by the PRG to improve the efficiency and to maintain the scientific integrity of the programme.

- Rather than directly measuring radionuclides in seawater for time series data, greater use of seaweed, specifically the *Fucus* species, will be made as a general purpose bio-indicator. Given the current levels in the environment, the additional effort required for direct water measurement is no longer justified.
- The number of actinide measurements (plutonium and americium) will be increased. Given the long term presence of these radionuclides in the Irish Sea, their relative contribution to marine critical group doses will continue to increase.

- Following the introduction of new waste treatment at Sellafield in 2004, Tc-99 discharges and concentrations in the Irish Sea have reduced substantially [15]. As a result, Tc-99 now has a lower priority for the RPII, both in relation to routine monitoring and emergency response capability and may cease completely beyond 2011.
- The number of coastal sampling points will be reduced but sampling frequency will be increased at an east coast open sea location sufficiently far north so as to be subject to the minimum seasonal variation resulting from the western Irish Sea gyre.
- Some minor changes to the seafood sampling will be implemented. These include changes to the species sampled to ensure the programme continues to best reflect current Irish seafood landing and consumption patterns and rationalisation of sampling locations to improve the efficiency of the programme.

### 5.2.2 Other Aspects of the Programme

Changes to other elements of the programme are relatively minor. More frequent mixed diet sampling at a single rather than three disparate locations was recommended on the basis that there are no significant regional variations in consumption habits or food origins in Ireland. Annual sampling of one large surface water reservoir has been added to the drinking water programme in order to more explicitly meet Commission Recommendation 2000/437/Euratom stipulations for surface water sampling.

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