REVIEW OF
FOOD STANDARDS AGENCY
RADIOLOGICAL MONITORING PROGRAMMES

February 2006

GLOSSARY

CBRN	**Chemical, Biological, Radiological, Nuclear**
CEFAS	**Centre for the Environment, Fisheries and Aquaculture Science**
CFIL	**(European) Council Food Intervention Levels**
COGEMA	**Compagnie Générale des Matières Nucléaires**
CoRWM	**Committee on Radioactive Waste Management**
Defra	**Department for Environment, Food and Rural Affairs**
DTI	**Department of Trade and Industry**
EA	**Environment Agency**
EC	**European Commission**
EU	**European Union**
Euratom	**European Atomic Treaty**
FSA	**Food Standards Agency**
HPA-RPD	**Health Protection Agency, Radiation Protection Division**
KMEI	**Key Marine Environmental Indicators**
LoD	**Limit of Detection**
NDA	**Nuclear Decommissioning Authority**
NRPB	**National Radiological Protection Board (now HPA – RPD)**
OBT	**Organically-Bound Tritium**
OECD	**Organisation for Economic Co-operation and Development**
OSPAR	**Oslo and Paris Convention**
PSRE	**Public Sector Research Establishments**
RIFE	**Radioactivity in Food and the Environment**
RSA 93	**Radioactive Substances Act 1993**
SEPA	**Scottish Environment Protection Agency**
TDS	**Total Diet Study**
TNORM	**Technologically-enhanced Naturally-Occurring Radioactive Material**
UKAS	**United Kingdom Accreditation Service**
VLA	**Veterinary Laboratories Agency**

CONTENTS

ANNEX 1 DOCUMENTS SUPPLIED TO THE PANEL

EXECUTIVE SUMMARY

This report describes the review of the Food Standards Agency's radiological monitoring programmes, the outcome and objectives and the panel's recommendations for the future size and scope of the programmes.

The overall aim of the review was to consider the overall balance between the benefits of the programme; namely ensuring that intakes of radioactivity in the diet are not harmful to health, delivering the Agency's statutory obligations and the strategic value of the programme, against the resources required to deliver the programme.

The specific objectives of the review were:

- To consider whether the Agency was meeting the stated aims of the programmes.
- To advise on the future size and scope of the programmes, balancing the resources required against the stated aims and obligations, and taking into account the trends in results.
- To comment on the strategic value of the programmes.
- Specifically, to consider the scope for reducing the number of samples and costs whilst maintaining the strategic value of the programmes.
- To comment on the flexibility within the programmes to meet potential future needs.
- To consider what scope there may be for innovation in the programmes.

The panel considered that the programmes met the Agency's remit to protect public health and ensure that doses of man-made and natural radioactivity in foods did not pose an unacceptable risk to consumers.

For man-made radioactivity and also natural radioactivity enhanced by man, the programmes were of sufficient size and scope to ensure that annual doses to critical or vulnerable groups of consumers could be calculated to compare to EU dose limits, as defined in UK legislation by the Basic Safety Standards Directive 96/29/Euratom.

The panel considered that the programmes fulfilled the Agency's obligations for monitoring and reporting on concentrations of man-made and natural radionuclides in foods to show compliance with Euratom Treaty Articles 35 and 36 and OSPAR commitments.

The panel also considered that the programmes were of sufficient breadth to ensure that any new or potential pathway of significant exposure to consumers would be identified and monitored, if necessary.

However, the panel concluded that the ability of the programmes to meet the four stated aims of the radiological monitoring programmes and the minimum requirements of EURATOM and OSPAR could probably be met by a smaller programme than that currently in place. Although this would be at the expense of losing some data, the panel considered that some savings could be made without compromising the strategic value of the Agency's programmes.

Potential savings in resources were identified on merit against the framework assumptions and equally covered work funded by industry (cost-recoverable) and that wholly funded by the Agency (non-cost recoverable) programmes.

1. INTRODUCTION

This report describes the review of the radiological monitoring programmes that are currently the responsibility of the Emergency Planning, Radiation and Incidents Division (EPRI) of the Food Standards Agency (the Agency).

The review was carried out by a panel of four independent experts. This report describes the review, the outcome and objectives and the panel's recommendations for the future size and scope of the radiological monitoring programmes.

2. OBJECTIVES OF THE RADIOLOGICAL MONITORING PROGRAMMES

2.1 Background

The aim of the Food Standards Agency's radiological monitoring programmes is to ensure that doses from the presence of both man-made and natural radioactivity in foods do not pose an unacceptable risk to consumers.

Doses to consumers are calculated from the measured concentrations of each radionuclide in each individual food in the diet, combined with consumers' annual consumption data and with a value representing the radiotoxicity of each radionuclide in the body.

For man-made radioactivity, and also natural radioactivity enhanced by man, the programmes aim to ensure that doses to consumers are within prescribed EU annual dose limits, as defined by the Basic Safety Standards Directive 96/29/Euratom, particularly with regard to critical or vulnerable groups of consumers in high-risk areas.

For radioactivity that is entirely of natural origin there are no legal dose limits. However, concentrations of radioactivity in foods vary across the UK. For example, concentrations in some terrestrial foods may vary because of differences in rainfall patterns and soil characteristics, and a range of values is observed in seafood around our coast. The programmes include sampling of representative consumer diets in order to put the dose from man-made radioactivity into context, to provide information on background levels of radioactivity in food and to be able to distinguish if background levels have been enhanced by discharges of man-made radioactivity from industry.

The programmes also aim to monitor and report on concentrations (not consumer doses) of a range of man-made and natural radionuclides in foods to show compliance with Euratom Treaty Articles 35 and 36 and OSPAR commitments on monitoring and reporting.

Finally, the sampling strategy within the programmes is also aimed at ensuring that any new or potential pathways of significant exposure to consumers can be identified and if necessary be appropriately monitored.

2.2 The Food Standards Agency's Statutory Requirements

The Basic Safety Standards require assessments to be undertaken of total retrospective dose to the general public, from all sources of man-made radioactivity via all possible pathways of exposure. This is co-ordinated by EA (and SEPA in Scotland) with the Agency providing estimates of doses from food, which is the largest contributor to the total dose from discharges.

The Euratom Treaty requires Member States of the EU to monitor and report the concentrations of a range of specific radionuclides in representative diets and in a number of foods every year. The Agency is the relevant nominated competent authority for the UK.

In the event of the EU declaring an emergency after a radiological incident, EC Council Regulation (EURATOM) 3954/87 would come into force and the Agency would have a statutory obligation to ensure that no foods were offered for sale in which concentrations of radioactivity exceeded the European Council Food Intervention Levels (CFILs).

There is no statutory obligation for the Agency to monitor background levels of natural radioactivity in foods.

2.3 The Agency's Radiological Programmes

The Agency's programmes are divided into monitoring around industrial sites or areas known to have high levels of radioactivity and monitoring away from these sites.
In terms of monitoring around industrial sites, the Agency has a set of programmes to sample and analyse a wide range of locally grown foods and seafoods that comprise local diets around nuclear or industrial sites that discharge or have in the past discharged man-made or enhanced-natural radioactivity. The results are used to estimate annual retrospective doses to consumers to compare with EU annual dose limits, as required by the Basic Safety Standards.

In terms of monitoring elsewhere, the programme samples a range of foods that comprise general diets and measures the concentrations of man-made and naturally-sourced radioactivity. This part of the programme serves to comply with annual requirements and recommendations under the Euratom Treaty. Other samples are also taken far from nuclear sites, the Channel Islands and Isle of Man and around the UK's coasts, to comply with OSPAR obligations and to track the far effects of discharges of man-made radioactivity in seawater.

The Euratom samples are also supplemented and analysed for a further range of natural and man-made radionuclides over and above the requirements of the Treaty. Although there is no statutory obligation to do this, the Agency obtains the benefit of being able to compare the results with the data obtained from around nuclear sites and so put the latter into perspective. The data also provides estimates of background levels of radioactivity in food and estimates of doses to the general public as a result of natural radioactivity. This monitoring also enables the Agency to distinguish if there has been any man-made enhancements of natural radioactivity.

The programme of monitoring remote from industrial sites also includes areas known to have high levels of radioactivity, both man-made and naturally-sourced, on land and in the sea. An example of one of these locations is Hurd Deep in the English Channel.

In some cases, environmental indicators are sampled and analysed and the results used in models to predict concentrations in foodstuffs. This can be a cost effective method of monitoring, particularly in relation to animal products.

The scope of the Agency's programmes extends throughout England and Wales, the Channel Islands and the Isle of Man; it also includes Northern Ireland dairies and the coastal waters of the British Isles. They are undertaken and reported independently of the industries that discharge the radioactive wastes.

The scope of the monitoring programme is subject to detailed annual review at the end of each year. In addition, the Agency meets with the nuclear industry and the Environment Agency to discuss the content of the Food Standard Agency's individual nuclear site programmes. In this way the programmes are tailored for the following year to reflect current practices at nuclear sites such as decommissioning or changes to site authorisations, the results of local consumers' dietary surveys, recent research and sample collectors' feedback on local food availability.

The results from the programmes and the calculated potential doses to consumers are published annually in the series of reports commonly abbreviated to RIFE (Radioactivity in Food and the Environment). The RIFE report also includes data from the Environment Agency, the Scottish Environment Protection Agency and the Northern Ireland Environment and Heritage Service, thereby providing a single comprehensive report on all government radiological monitoring data on food and the environment in the UK.

The costs of the radiological monitoring programmes undertaken around nuclear sites and the Agency staff time involved are recovered from the nuclear industry under the Radioactive Substances Act 1993.

3. THE REVIEW OF THE RADIOLOGICAL PROGRAMMES

3.1 The Aim of the Review

The aim of the review was to consider the overall balance between the benefits of the programme; namely ensuring that intakes of radioactivity in the diet are not harmful to

health, delivering the Agency's statutory obligations and the strategic value of the programme; against the resources required to deliver the programme. The general trends in the results are one important factor in deciding on the resources that are warranted.

The recommendations from the review are those of an independent panel. They should be taken into consideration by the Agency in shaping the future scope of the programme from March 2007.

3.2 The Terms of Reference of the Review

The specific objectives of the review were:

- To consider whether the Agency was meeting the stated aims of the programmes.
- To advise on the future size and scope of the programmes, balancing the resources required against the stated aims and obligations, and taking into account the trends in results.
- To comment on the strategic value of the programmes.
- Specifically, to consider the scope for reducing the number of samples and costs whilst maintaining the strategic value of the programmes.
- To comment on the flexibility within the programmes to meet potential future needs.
- To consider what scope there may be for innovation in the programmes.

3.3 The Review Panel

The review was carried out by a panel of experts, each with knowledge of different aspects of the field of radiological protection. The review panel was independent of the Agency and was comprised of four individuals, one of whom was elected chairman. One of the panel members declared an interest in one part of the programme because they had research funded with the Agency and they took no part in decisions on this part of the programme. The other three experts had not been involved in the programmes.

The four panel members were as follows:

1. Dr Bernie Wilkins, who acted as chair of the panel (Group Leader of Environmental Investigations, Environmental Assessments Department of the Health Protection Agency - Radiological Protection Division (HPA-RPD).
2. Dr Tom Ryan (Radiological Protection Institute of Ireland and a former European Commission Seconded National Expert to the Radiation Protection Unit H4 at DGTREN, Luxembourg.)
3. Professor Jack Pearce (President of the Institute of Food Science and Technology).
4. Professor Gregg Butler (University of Manchester and Director of Integrated Decision Management Ltd.).

The secretariat was provided by the Agency.

3.4 The Review Panel Meetings

The panel met three times.

Meeting 1: An initial meeting was held on 14 October 2005 to bring the panel members together, to clarify procedures, to outline the key parameters of the programmes and to explain and discuss what was required for the review.

The panel was provided with the documents listed in Annex 1 to support the review.

The panel members discussed and then set out the framework under which they would be undertaking the review

Between meetings one and two the panel members requested and received further information by e-mail exchange.

Meeting 2: The purpose of the second meeting on 23 November 2005 was to give the panel members an opportunity to discuss their combined response.

Between meetings two and three the Agency undertook to send details of queries and follow-up actions the panel members had requested. A draft report was circulated for comment.

Meeting 3: The final meeting on 20 January 2006 discussed the combined contributions from the panel members and produced the final draft of the report to be presented to the Agency.

The panel noted that the observations expressed in this report were their own personal views and not representative of their organisations.

4. THE REVIEW

4.1 Approach Adopted

The panel had been requested to advise on the future size and scope of the programmes. To do this they needed to consider the overall balance between the benefits of the programmes and the need to deliver the Agency's statutory obligations against the resources required to deliver the results, whilst maintaining the strategic value of the programmes. The panel examined each of these issues in turn.

First, the panel set out the background assumptions that they would use as a framework for the review.

4.2 The Framework of the Review

The panel considered it important to determine a framework against which the review should be conducted. The factors within this framework included the following:

- The programmes ought to monitor and assess doses for any foodchain pathway of significant exposure to consumers from either man-made or naturally-sourced radioactivity.
- All 23 nuclear sites discharging radioactivity into the environment should be monitored. Although the resource allocation should be based primarily on consumer dose, it is recognised that the Agency must also take into account local, political and international concerns, dose trends and sampling costs.
- The programmes ought to fulfil all statutory obligations at least at minimum reporting levels (the EU annual dose limit, Euratom Treaty and OSPAR commitments). Any analyses undertaken over and above minimum requirements ought to be justified and have a clear value-added benefit to the Agency.
- It was essential that the Agency retained the ability to respond rapidly to incidents and emergencies in terms of sampling and analysis. The programmes ought to maintain resilience for such events by dividing the routine programme between two laboratories at different locations. Both should be capable of handling a large throughput of samples and be independent of

the nuclear industry. Sustainability of the laboratories ought to be maintained by keeping levels of skilled staff at the laboratories above purely minimum levels (critical mass), to ensure capability to respond rapidly at any time on the Agency's behalf and to 'escalate' the programmes in response to emergencies.

- In order to calculate consumers' annual dose, sampling strategies ought to include all foods locally grown that comprised an annual diet. This would include an example from each food type (or indicator material if not available), plus those foods identified as eaten in local consumer dietary surveys and foods recognised as 'accumulators' of certain radionuclides e.g. honey.
- Sampling frequency should be the minimum to reflect the half-life of the radionuclide and any seasonal and temporal variations e.g. annually for crops, end of summer for animals, milk taken weekly but bulked for monthly analysis, shellfish bulked quarterly.
- Due to the importance of milk in the diet, the number and location of dairy farms around nuclear sites that were sampled for milk should be carefully considered. The number of farms sampled at each site should be proportionate to the potential for site discharges to contribute to consumers' dose and farms should ideally be evenly spread in a circular windrose around the site. In addition there was little justification for sampling at milk farms beyond 5 miles (8 kilometres), as past history had shown that routine discharges of radioactivity are not detected in milk beyond this distance and there were already sufficient baseline data available.
- Decisions on the analyses to be carried out should take account of all radionuclides listed in current or past site authorisations, as well as any radionuclides carried from other nuclear sites by long-range transport. Analyses should be undertaken only to appropriate Limits of Detection (LoDs) to obtain a meaningful estimate of consumer dose, and use should be made of sequential radiochemistry methods wherever possible and strive to use the most cost-effective analytical method to suit the required LoD.
- The review covered the Food Standards Agency's radiological monitoring programmes throughout England, Wales, the Channel Islands, Isle of Man, some Northern Ireland dairies and the coastal waters of the British Isles. Scotland has its own radiological monitoring programme undertaken by the Scottish Environment Protection Agency and was not considered within this review. The review was

confined to the programmes of sampling and measurements, the assessment and publication of data being outwith the remit.

4.3 The Agency's Statutory and EU Commitments

The panel then identified the Agency's statutory and EU commitments. These included the following components.

The programmes around the 23 nuclear sites should be of sufficient size and scope to ensure that the Agency could accurately assess annual total retrospective doses to critical or vulnerable groups of consumers from all sources of man-made and industry-enhanced naturally-sourced radioactivity via all possible pathways of exposure. The estimated doses could then be compared with EU dose limits as defined under UK legislation in the Basic Safety Standards Directive 96/29/Euratom.

The programmes should fulfil the Agency's obligations for monitoring and reporting on concentrations of man-made and natural radionuclides in foods to show compliance with both the Euratom Treaty Articles 35 and 36 and OSPAR commitments.

For the Euratom Treaty this involved three requirements.

(1) Monitoring of milk at monthly intervals from a network of regional dairies, sufficient to ensure representative coverage of the Member State (including England and Wales, Northern Ireland, the Channel Isles and the Isle of Man). Minimum reporting standards under the Euratom Treaty were for concentrations of the radionuclides caesium-137, strontium-90 and potassium-40.

(2) Quarterly monitoring of samples of complete canteen meals at 3 regional locations in England, Wales and Northern Ireland (the so-called 'sparse network') as an indicator of public exposure from mixed diet. Minimum reporting standards under the Euratom Treaty for this requirement were for concentrations of the radionuclides caesium-137, strontium-90 and carbon-14.

(3) Quarterly monitoring of samples of mixed diet from a number of locations sufficient to ensure representative coverage of the Member State (including England

and Wales, Northern Ireland, the Channel Isles and the Isle of Man (the so-called ‘dense network’) as an indicator of public exposure from mixed diet. Minimum reporting standards under the Euratom Treaty were for concentrations of the radionuclides caesium-137 and strontium-90.

Within the UK’s commitments to OSPAR, the Agency had a requirement to monitor 3 aquatic marine foods (a fish, a crustacean and a mollusc) as Key Marine Environmental Indicators (KMEIs) at 9 representative locations around the UK and the Channel Islands. Minimum reporting standards under the terms of the OSPAR Strategy were for concentrations of the radionuclides tritium, carbon-14, cobalt-60, strontium-90, technetium-99, caesium-137, plutonium-239 + 240, and americium-241.

In the event of a radiological incident (originating either in the UK or overseas) being declared by the EU, Council Regulation (EURATOM) 3954/87 would come in force and the Agency would have a statutory obligation to ensure that no foods were offered for sale in which concentrations of radioactivity exceeded the European Council Food Intervention Levels (CFILs). In the event of an overseas radiological incident which might have widespread consequences in the UK, this obligation demands the ability to understand and model foodchain pathways in the UK. It also underpins the need for a comprehensive regional monitoring system, rather than one based solely around UK nuclear sites.

Finally, in the event of a nuclear site exceeding its routine discharge authorisation limits or its weekly discharge Advisory Levels, the Agency would increase the frequency of monitoring of local foods. Although this reassurance monitoring is not a statutory requirement because no radiological incident would have been declared by the EU, it would demonstrate whether enhanced concentrations of specific radionuclides in foods were significantly contributing to increased consumer dose.

4.4 The Benefits of the Programme

In addition to fulfilling the Agency’s commitments and obligations, the panel identified the following benefits of the radiological monitoring programmes to the Agency and to consumers :

- To demonstrate to consumers that intakes of radioactivity in the diet are not harmful to health.
- The monitoring of radioactivity in foods around nuclear sites confirmed compliance with existing site discharge authorisations, which would have been set at levels using computer model predictions and would not be able to take account of unusual situations.
- The programmes provided radiological monitoring data for judging the adequacy of new, proposed or amended nuclear site discharge authorisations by comparing past experiences of actual concentration data with predicted data from computer modelling.
- The routine monitoring might detect undisclosed or previously undetected releases of man-made radioactivity from sites within the UK or from overseas.
- The programmes can help the Agency limit radiological pollution at source. The results provide early warning of rising concentrations of radioactivity in indicator materials (such as seaweeds) before food is affected. If concentrations in food were allowed to increase over the course of a year, then estimated annual doses to high risk consumers might exceed the EU annual dose limit. This early warning of rising concentrations has proved valuable in providing evidence to the environment agencies who issue the nuclear sites with authorisations to discharge radioactivity, so that preventative action can be taken if necessary.
- The monitoring results established baseline data for man-made radionuclides in foods, both in the vicinity of nuclear sites and elsewhere. This data would be used as a benchmark to judge whether foods were recently contaminated and also as a possible guide for clean-up levels after a future radiological or CBRN incident.
- The data gathered over and above the minimum reporting levels for the Euratom Treaty Article 35 requirements established background levels of man-made and naturally-sourced radioactivity in food and could therefore detect levels of technologically enhanced naturally-occurring radionuclides (TNORM) arising from industry, such as carbon -14.
- The consumer dose as a result of man-made radioactivity could be put into context by sampling a representative consumer diet well away from nuclear industry sources. This enabled the Agency to put the doses from man-made radioactivity

into perspective and demonstrated that consumer doses were usually dominated by naturally-sourced radioactivity.

- The programmes provided data to inform Agency policy on EU and international initiatives such as the recent CODEX proposals.
- The surveys of consumers' consumption patterns that support the programmes were able to identify new or emerging pathways of radiological significance to consumers that might require regular monitoring or indicate a need for specific research. Examples include the discovery of high levels of radioactivity in sea-mice from fishermen's by-catches at Sellafield and higher levels than predicted of tritium in fish near Cardiff.
- Finally, the programmes were able to track the far effects of marine discharges of man-made radioactivity in seawater and provided an independent evidence base of data on radioactivity in foods. This data could be for used for example, in dealing with radiological food safety issues raised by either green Non-Governmental Organisations (NGOs) in the UK or other Member States.

5. OUTCOME OF THE REVIEW

The panel had been requested to consider the following specific objectives under the terms of reference of the review

1. To consider whether the Agency was meeting the four stated aims of the programmes.
2. To advise on the future size and scope of the programmes, balancing the resources required against the stated aims and obligations, and taking into account the trends in results.
3. To comment on the strategic value of the programmes.
4. Specifically, to consider the scope for reducing the number of samples and costs whilst maintaining the strategic value of the programmes.
5. To comment on the flexibility within the programmes to meet potential future needs.
6. To consider what scope there may be for innovation in the programmes.

5.1 The Stated Aims of the Programmes

The panel considered that the programmes met the Agency's remit to protect public health and ensure that doses of man-made and natural radioactivity in foods did not pose an unacceptable risk to consumers.

For man-made radioactivity and also natural radioactivity enhanced by man, the current programmes were of sufficient size and scope to ensure that annual doses to critical or vulnerable groups of consumers could be estimated for comparison with EU dose limits, as defined in UK legislation by the Basic Safety Standards Directive 96/29/Euratom.

The panel considered that the programmes fulfilled the Agency's obligations for monitoring and reporting on concentrations of man-made and natural radionuclides in foods to show compliance with Euratom Treaty Articles 35 and 36 and OSPAR commitments. In some cases the Agency had taken the opportunity to analyse the existing samples for radionuclides in addition to those required. The panel had considered all the evidence and agreed that in most cases the extra analyses were justified on both cost and scientific grounds. For a very little extra cost the Agency had gained valuable data on variations in concentrations of radioactivity in foods across the UK and in seafood around the coast. The data allowed the Agency to put the dose from man-made radioactivity into context, to provide information on background levels of radioactivity in food and to be able to distinguish if background levels had been enhanced by discharges of man-made radioactivity from industry.

However, the panel did make recommendations for some resource savings in this part of the programme.

The panel also considered that the programmes were of sufficient breadth to ensure that any new or potential pathway of significant exposure to consumers would be identified and monitored if necessary. This was considered essential as discharges were invariably specified in terms of activity (Becquerels), while the risks being guarded against were measured by dose (Sieverts). These include contributions from both current discharges and those from previous years and would only be revealed by monitoring programmes such as these.

5.2 The Future Size and Scope of the Programmes

In the terms of reference of the review, one of the specific objectives for the panel was to advise on the future size and scope of the programmes, balancing the resources required against the stated aims and obligations, and taking into account the trends in results. The panel was also asked to consider any duplication, overlaps or gaps compared with other programmes. Finally the panel was asked to consider whether the relative importance of site specific aspects had been correctly addressed and the effectiveness of the project management framework.

(i) Resources

Having examined the four stated aims of the radiological monitoring programmes and the minimum requirements of EURATOM and OSPAR, the panel considered that the benefits of the programmes could be retained in the future by a smaller programme than that currently in place. Although this would be at the expense of losing some data, the panel considered that some savings could be made without compromising the strategic value of the Agency's programmes.

The panel also recommended that the supporting laboratories should be situated in the UK so that the Agency could command a full national, committed and rapid response to UK emergencies.

In addition they noted that the programmes had been extensively reviewed in 2001 and resource savings worth almost £500,000 and a loss of 2 staff posts at the Agency had already been implemented. They also emphasised that the Agency staff already undertook an annual review of the size and scope of their monitoring programmes. Taken together, this meant that the potential for rationalisation and savings was limited compared with what would have been expected had the programmes remained static for a number of years.

The panel wanted it noted that the potential savings in resources were identified on merit against the framework assumptions and covered both the work funded by industry (cost-recoverable) and that wholly funded by the Agency (non-cost recoverable) programmes.

(ii) Duplication, Overlaps and Gaps

The panel considered that on the whole there was very little duplication or overlap with other radiological programmes, but where there was a clear case of duplication they had made recommendations for resource savings.

There was only one small gap in the programme that was identified by the panel. There was no uranium monitoring undertaken in animal offal around nuclear sites that discharged uranium into the environment. This modest addition to the programme was considered to be justifiable because it was identified as a potential pathway of significance.

(iii) Site Specific Aspects

The panel considered that the relative importance of site specific aspects of the programme had been correctly addressed, so that the resources allocated to monitoring around each site were proportionate. Site specific issues took account of the following: total public dose; local, political and international concerns; and historic issues. For example. members of the public who received the greatest dose in 2004 were seafood consumers around the Sellafield site and 60% of the total programme resource was devoted to monitoring around this site. Monitoring at other sites was generally proportionate with consumer potential dose and minor sites with consumer dose less than 5 microsieverts a year only had grass and soil indicator samples taken annually.

(iv) Dose Trends

In addition the panel considered that content of the programmes were suitably tailored each year as a result of survey information and dose trends. For instance, monitoring resources had been increased around Cardiff due to findings of tritium bio-accumulation in seafood, whereas monitoring had completely ceased around the ICI Billingham site because trends showed that the radiological dose pathways were insignificant. Another example was the Ascot site where the monitoring programme had been decreased and now consisted of only 2 grass samples per year because the discharges and therefore the public dose was decreasing and was estimated to be much less than 5 microsieverts a year in 2004.

(v) Programme Management

The panel considered that the effectiveness of the project management was very good. The annual review summarised in section 2.3 ensures that the programmes are tailored each year to reflect current practices at nuclear sites and changing circumstances in other areas. The panel also considered that the various contractors used by the Agency were delivering value for money. All contractors carrying out analyses were formally accredited under ISO 17025. In addition, they are part of the UK Analysts Informal Working Group. This group meets regularly to discuss developments in radiochemical analysis, thereby providing an important input into reviews of working practices at individual laboratories.

5.3 Strategic Value of the Programmes

The third specific objective for the review was for the panel to comment on the strategic value of the programmes with regard to radiological emergencies. The panel made the following comments:

- It was very important to maintain strategic capability at national laboratories with UKAS accredited laboratory staff on-call on an all-year-round basis for the analysis of samples. In the event of a radiological or CBRN incident the routine analytical programme could be shelved and trained laboratory staff diverted to analysing samples in support of the response. This response could be rapidly expanded and scaled up to reflect the severity an incident originating either in the UK or overseas.
- The panel considered that the programmes should maintain resilience for emergencies by dividing the routine programme between two national laboratories at different geographical locations, capable of handling the required throughput of samples and retaining independence from the nuclear industry.
- In order to be of strategic benefit to the Agency, the panel recommended that the laboratories should have sufficient flexibility, expertise and staff to be capable of resourcing not just radiological incidents, but also either R and N of CBRN incidents. This included both the collection and the analysis of samples and again emphasised the need for the laboratories to be situated in the UK, rather than based overseas.

- The panel were in strong agreement that the programmes should maintain a 'critical mass' of suitably trained staff at the laboratories, with equipment and capability to reliably analyse and rapidly screen a large number of samples from a variety of foods. This capability should encompass the wide range of radionuclides that might be encountered in accidents or incidents.
- They also agreed that it would be an advantage to maintain the current situation where the laboratories were members of the Public Sector Research Establishments (PSREs) partnership known as the Interlab Forum (reference http://www.hsl.gov.uk/news/collaboration.pdf of 16th August 2005). These laboratories have signed a co-operation agreement to work closely together to increase effectiveness and share knowledge on topics of strategic importance such as emergency response. Should one laboratory be closed by a crisis or a localised radiological or CBRN incident, the facilities, equipment and staff at the other laboratory would endeavour to provide assistance.
- The panel also felt that participation in the UK Analysts Informal Working Group should be encouraged. The panel regarded this forum as a platform for exchanging best practice to aid resilience for the UK as a whole, whilst still maintaining unique practices that made the laboratories individual.
- The panel considered that the one of the strategic values of the programmes with regard to radiological emergencies was the utilisation of the existing network of trained sample collectors already in place in England and Wales and familiar with sampling strategies and techniques. The collectors were accustomed to the method of taking specialised samples and the Agency had in place a logistics set-up and contracts for methods for transport of these samples from farms and dairies to laboratories by overnight post.
- In this context, the panel noted that the current system for milk was to collect samples on a weekly basis and to bulk as appropriate at a later date prior to analysis. The delay means that weekly samples were available for analysis if, for example, an unexpected release of radioactivity occurred from a nuclear site. The panel felt that this system had worked well in the past and should be maintained. Any reductions in costs associated with less frequent sampling would be offset by the need for larger individual samples and the consequent increase in the cost of

shipping. The panel felt that “hidden costs” such as these should be fully quantified as part of any review of programme structure.

- Finally the panel noted that it would be of strategic value to maintain robust IT links and compatible software between the analytical laboratories and the Agency. In the event of a radiological emergency this would allow the speedy transfer of accredited laboratory data so that Agency could formulate timely advice on food safety.

5.4 Scope for Savings within the Programmes

In the fourth specific objective of the review the panel was asked to consider the scope for reducing the number of samples and costs whilst maintaining the strategic value of the programmes

As noted above, the panel considered that the benefits of the programmes could be retained by a smaller programme than that currently in place. There was some scope for a reduction in costs and numbers of samples both in the aquatic and terrestrial programmes. Although this would be at the expense of losing some data, the panel considered that some savings could be made without compromising the strategic value of the Agency’s programmes whilst all of the Agency’s statutory obligations could still be met.

The panel grouped potential options for resource savings into three categories.

- **Recommended:** savings that ought to be made and would have no direct effect on the strategic value or benefit of the programmes.
- **Possible:** savings that could be made but would have some minor drawbacks or disadvantages, although still retain the strategic value of the programmes.
- **Considered, but not recommended:** savings that would definitely have disadvantages to the benefits of the programme and would adversely affect the strategic value of the programmes, especially the ability of the laboratories to respond to emergencies as discussed in 5.3 above.

The panel had examined the key parameters of the programme and the stated sampling strategy of the Agency and made recommendations for reducing numbers of samples or costs for a number of reasons. These reasons included:

- Areas where there was clear duplication with another Agency's programmes.
- Areas where the responsibility for monitoring lay with another government department.
- Reducing and/or dropping completely the number of samples taken, due to dose trends, past history of negative results or identification that samples contributed to a minor foodchain pathway to consumers' dose.
- Reducing the number of analyses undertaken, by bulking samples that were required to be analysed. This would be particularly apposite where recent data had indicated that levels of long-lived radionuclides were always extremely low across the year.
- Dropping analyses that were excessively expensive for the relatively small contribution that they made to the estimation of consumer's dose.
- Reducing the programme of sampling from regional towns.
- Reducing the number of dairies sampled for Euratom Treaty obligations.
- Reducing the frequency of sampling fish from UK coastal ports (except those bordering the Irish Sea).

5.5 Flexibility within the Programmes

In the fifth specific objective of the review the panel was asked to comment on the scope for flexibility in the current programmes. The panel agreed that the current programmes were sufficiently flexible. Examples included:

- The sampling capability within the routine programmes could be rapidly expanded in the event of radiological or CBRN incident, originating either in the UK or overseas.
- Suitably trained staff at laboratories had the equipment and capability to reliably analyse and rapidly screen a large number of samples from a variety of foods for a wide range of radionuclides that might be released in the event of a future incident or nuclear accident.
- The current programme was flexible enough to identify new or emerging pathways of radiological significance that might require additional monitoring or be added to the annual routine programme.

- The content of the annual programmes were not ‘set in stone’. The scope of each programme was regularly reviewed at the end of each year and the following years’ programmes were amended in the light of new information.
- The panel noted that the Agency currently sponsored research on a variety of topics relevant to the radiological monitoring programmes and the results had been incorporated into the future programmes. The research ranged from desk top studies on the potential for significant consumer exposure from unusual foodchain pathways (such as the report on Uncommon Seafoods) to sampling studies to determine possible seasonal variations in foods (such as the report on Seasonal Variations in Crabs and Lobsters).

  The results of these studies were reported in the annual Radioactivity in Food and the Environment reports and the conclusions were incorporated in the following year’s monitoring programme. For instance, the report on Seasonal Variations in Crabs and Lobsters concluded that there were no significant seasonal or short term variations that affected the uptake of technetium-99 into crustacea and therefore the subsequent sampling programme did not need to be modified for seasonal bias.

  Other reports had made recommendations that had been implemented and resulted in modifications or reductions in the programmes, for instance a reduction in the numbers of lobsters that were required to be sampled.

5.6 Scope for Innovation and Horizon Scanning

Finally, the panel was asked to consider what scope there might be for innovation in the programmes and any potential issues on the horizon that ought to be taken into account in planning for the future programmes.

The panel considered that the Agency ought to keep a sound base of sufficient expertise in all key areas of sampling and analysis that might be needed in the future. If all analyses of one particular radionuclide were to cease, then the time and cost involved in returning to operational status could be considerable. In addition, the current archive of original laboratory samples which were kept viable in a variety of food matrices was an important asset, if it was found necessary to go back to undertake additional analyses for other radionuclides.

The panel recommended that the Agency consider that future contracts for collection and analysis of samples would benefit from being on a 5 year basis. This would be beneficial to both parties because the laboratories could invest in the specialist laboratory equipment that was required for the detection of low-level radioactivity while the running costs incurred by the Agency would be reduced.

The panel noted that the prospect of further nuclear power station build in the UK was currently a possibility. They considered that this added to the importance of the current programmes in maintaining the facilities and expertise to enable future expansion if required. It would be extremely difficult to restart some elements of the programme again, such as the development of laboratory staff expertise and the network of sampling capability.

In addition to the prospect of new build, the panel noted other current initiatives which would have an impact on the future size and scope of the programmes. These included the publication and recommendations from CoRWM (http://www.corwm.org.uk) on the Low Level Waste Review which will report in June 2006, and the implications of the clean-up of the Magnox nuclear sites which would involve the treatment of radwaste on the NDA sites.

It was considered likely that these on-site activities would involve the potential release of radionuclides specifically associated with decommissioning, rather than an increase in discharges of existing radionuclides. The programmes would need to remain flexible to respond quickly to these activities, including the potential to develop new analytical methodology for the radionuclides associated with decommissioning and the ability to identify and monitor different food pathways if doses were considered to be significant.

On horizon scanning, the panel noted that there was a need to keep the current monitoring schedule for the UK's KMEIs until the OSPAR review in 2009. This was a UK commitment from the OSPAR Convention for the Protection of the Marine Environment of the NE Atlantic. After 2009 and until 2020 there might be a need to increase the current monitoring arrangements to show compliance with the UK commitment to reduce the concentrations of radionuclides in the marine environment to

close-to-zero to historic levels. Therefore, the panel recommended that developments in this area be kept under review.

The panel found it notable that public reassurance and public understanding were not expressly stated objectives of the programme. Indeed, an examination of Agency documentation and the Agency Website showed little that would aid public understanding – referring queries directly to technical papers that are far from 'stakeholder friendly'. In fact, the Agency is the custodian of a regime that uses conservative assumptions and models to limit the exposure of maximally affected groups to risks well below one in 10,000 per annum. The panel felt that this was surely a powerful message deserving more public attention, especially against the background of likely near term debates and developments in nuclear waste and nuclear power policy. The panel felt that better integration of the radiological monitoring programme into the overall stakeholder and public engagement programme was justified, and this would of itself increase the benefit of the programme to both the public and the Agency.

6. CONSIDERATIONS OF THE PANEL

- The panel considered that the programmes met the Agency's remit to protect public health and ensure that doses of man-made and natural radioactivity in foods did not pose an unacceptable risk to consumers.
- For man-made radioactivity and also natural radioactivity enhanced by man, the programmes were of sufficient size and scope to ensure that annual doses to critical or vulnerable groups of consumers could be calculated to compare to EU dose limits as defined in UK legislation by the Basic Safety Standards Directive 96/29/Euratom.
- The panel considered that the programmes fulfilled the Agency's obligations for monitoring and reporting on concentrations of man-made and natural radionuclides in foods to show compliance with Euratom Treaty Articles 35 and 36 and OSPAR commitments.
- The panel also considered that the programmes were of sufficient breadth to ensure that any new or potential pathway of significant exposure to consumers would be identified and monitored if necessary.

- However, the panel concluded that the ability of the programmes to meet the four stated aims of the radiological monitoring programmes and the minimum requirements of EURATOM could probably be met by a smaller programme than that currently in place. Although this would be at the expense of losing some data, the panel considered that some savings could be made without compromising the strategic value of the Agency's programmes.
- The panel recommended that savings should not be made at the expense of undermining the ability of the Agency to respond to emergencies, changing circumstances, reductions in the programme and hence in resources and income at the laboratories which supplied both sample collection and analysis.
- The panel noted that the programmes had been extensively reviewed in 2001 and resource savings had already been implemented. Together with the annual reviews of the size and scope of the programmes this meant that there had been less scope for rationalisation and potential savings as might have been expected. In short, many of the questions had already been raised internally, debated and responded to.
- Potential savings in resources were identified on merit against the framework assumptions and equally covered work funded by industry (cost-recoverable) and that wholly funded by the Agency (non-cost recoverable) programmes.

7. ACKNOWLEDGEMENTS

The panel wishes to record its thanks to those staff of the Agency and the contract analytical laboratories that responded positively and promptly to requests for information.

ANNEX 1

Documents supplied to the Review Panel

- The Radioactivity in Food and the Environment (RIFE) report number 9 for 2003 with CD disc of previous editions of RIFE.
- The Radioactivity in Food and the Environment (RIFE) report number 10 for 2004, as soon as it was published at the end of October 2005.
- Papers describing the scope of the programmes :
    - for the aquatic and terrestrial programmes around nuclear sites
    - for the aquatic and terrestrial programmes well away from nuclear industry sites
    - All sample contractors' requirements' documents plus details of costs.
    - Laboratory analytical requirement schedules and overall costs
- Article 35 and 36 Euratom Treaty requirements and recommendations
    - Copies of the relevant legislation
    - Documents describing the Agency's 'Total Diet Study' and project costs
    - Documents describing the Agency's 'Canteen meals' project and costs.
    - Map of the location of the dairies sampled in England and Wales.
- Summary record 2005 of the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic with locations of sampling positions for fish, seaweed and seawater around Europe
- Examples of other EU monitoring programme report
    - The latest EU Environmental Radioactivity in the European Community report
    - Ireland marine monitoring reports
    - Norwegian monitoring report
    - The COGEMA report from France (only available in French)
- Independent reports of the Agency's monitoring programmes from the two EU Euratom Treaty Article 35 Inspections:
    - around Dungeness in 1999
    - around Sellafield in 2004

- Relevant research reports that had informed the direction of the monitoring programmes
    - CEFAS report on the variability of radionuclide concentrations between individual crabs and lobsters (defined the minimum number of animals per sample in order to minimise sampling uncertainties)
    - University of Liverpool report on Seasonal Variations in Radionuclide Concentrations in Crabs and Lobsters (recommendations for the Agency's strategy on sampling frequencies for crabs and lobsters)
    - Westlakes report on potential pathways of exposure to consumers via seaweeds sourced from UK, Irish and Norwegian waters (implications for the content of the sampling programmes if seaweeds containing significant quantities of radioactivity were getting into the foodchain)
    - NRPB (now HPA-RPD) reports on potential pathways of exposure from naturally and artificially-sourced radionuclides in hedgerow and wild foods (implications for the content of the sampling programme via this foodchain pathway if consumers' doses were considered to be significant)
    - CEFAS study on levels of Organically Bound Tritium (OBT) and carbon –14 around the known UK discharge points (implications for the need to include OBT measurements in seafood in the routine sampling programmes if OBT levels were significantly elevated above tritium seawater levels)
    - CEFAS study on the transfer of OBT through the marine foodchain (informs the programmes about the selection of marine species for sampling)
    - CEFAS report on the transfer of radioactivity from fishmeal in animal feeding stuffs to man (implications for including samples of fishmeal in the routine programmes)
    - CEFAS report on the potential for farmed fish to concentrate levels of radionuclides as a consequence of feeding with fishmeal (implications for including annual samples of farmed fish in the programmes)

- CEFAS report on the potential for uncommon, non-commercial seafoods that could be eaten by ethnic minority groups to be overlooked by the monitoring programmes.