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chairman's statement

I am pleased to introduce the Annual Report and Accounts for the Radiological Protection Institute of Ireland for 1998. A number of events which give grounds for satisfaction have occurred during the year.

The approval by the Government of revised arrangements for the operation of the National Emergency Plan for Nuclear Accidents, following the outcome of an exercise of the existing Plan, was a very positive development. Most importantly, the establishment of a Committee of Ministers to provide policy direction, regarding countermeasures which might be implemented in an emergency, is a major step in ensuring that, following a serious nuclear accident affecting Ireland, crucial decisions would be taken speedily at an appropriate political level.

Over a number of years the Institute has been drawing attention to a legal anomaly whereby it has been obliged to grant licences for the use of X-ray apparatus solely on the basis of adequacy of equipment and facilities, and without any regard to whether an applicant for a licence was deemed by the relevant qualifying body to be a suitable person to hold such a licence. This issue has been of particular significance in respect of chiropractors. I am pleased that the Government has introduced legislation to correct this anomaly, in the form of the Radiological Protection (Amendment) Bill, 1998.

Another need to which the Institute has been drawing attention for a long time is the lack of a national facility for the conditioning and storage of waste resulting from uses of radioactive substances in medicine, education, industry and elsewhere. Such a facility is required in order to minimise the risks associated with storage of radioactive waste at multiple locations, and also to fulfil the requirements of the recently agreed international Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management, of which Ireland is a signatory. It is encouraging that steps in the planning of such a facility are now being taken by the Department of Public Enterprise, with the active support of the Institute.

Assessment of the risks to health from exposure to high levels of radon gas continues to be an important element of the Institute's work. As the national survey of radon in dwellings nears completion a new programme of radon measurement in all the country's schools has got under way. One concern in this regard which remains outstanding is the relatively low incidence of implementation of remedial action by householders whose homes have been found to have radon values above the Reference Level.

A matter of some concern also arises in connection with the transposition into Irish law of EU Directives relating to radiological protection. Two closely-related Directives, one concerning protection of workers and the public, and the other concerning protection of medical patients, have to be implemented in Irish law by May 2000. Close harmonisation of the two sets of legislation is essential, to avoid duplication of effort and significant inconsistencies in regulation of uses of ionising radiation in the medical sector. The Institute will continue to press for the taking of the necessary steps to ensure that this harmonisation takes place.

I drew attention in last year's Annual Report to the need for change in the Institute's staffing structure to create enhanced promotional opportunity for the Institute's scientists. I am very pleased that sanction for the required change has since been granted. I am confident that this development will pay real dividends in the enhanced effectiveness of the Institute in the years ahead. In saying this, I wish to record my appreciation of the dedication and expertise which has at all times characterised the work of the Institute's staff. I also wish to thank the members of the Board for their generous service to the Institute, and to acknowledge the contribu-

tions of the members of the Institute's Advisory Committees who give their time voluntarily to assist the Institute in its work.

Finally, I wish to record the Institute's appreciation for the support received from the Minister for Public Enterprise, Ms Mary O'Rourke, TD. The Institute is particularly indebted to the Minister of State with responsibility for Nuclear Safety, Mr Joe Jacob, TD, for his active encouragement for the Institute's work. I must also acknowledge the co-operation received at all times from the officials of the Department of Public Enterprise and other Government Departments, and also the assistance received from other national organisations and from third-level educational institutions.

Mary Upton
Chairman (to 28 October 1999)*

* On her election to Dáil Éireann on the above date, Dr. Upton ceased to be Chairman of the Institute.

ráiteas an chathaoirligh

Cúis shásaimh dom an réamhrá seo a chur le Tuarascáil Bhliantúil agus Cuntais na hInstitiúide Éireannai um Chosaint Raideolaíoch le haghaidh na bliana 1998. Thit nithe áirithe amach le linn na bliana atá ina n-ábhar sásaimh dúinne.

Ba chéim mhaith chun tosaigh é gur cheadaigh an Rialtas na socruithe athbhreithnithe le haghaidh fheidhmiú an Phlean Náisiúnta um Thimpistí Núicleacha. Rinneadh amhlaidh i ndiaidh gur baineadh triail as an bPlean atá ann faoi láthair. Níos tábhachtaí ná sin bhí an cinneadh chun Coiste Airí a chur ar bun chun treoir a thabhairt maidir le polasaithe i leith frithbhearta a d'fhéadfaí a chur i bhfeidhm i gcás éigeándála. Céim mhór é sin i dtreo a chinntiú go mbeadh na cinnidh rithábachtacha á ndéanamh go sciobtha, ag an leibhéal cuí polaitiúil, dá mbeadh mórthimpiste núicléach le titim amach go mbeadh tionchar aici ar an dtír seo.

Le roinnt blianta anuas tá an Institiúid ag iarraidh aird a tharraingt ar aimhrialtacht dhlíthiúil a fhágann go mbíonn orainn ceadúnais a bhronnadh le haghaidh trealamh X-Gha a úsáid gan aon slat tomhais ach cé chomh sásúil agus atá an trealamh agus na háiseanna, gan aird a bheith againn ar cháilíochtaí an duine atá ag lorg an cheadúnais, mar shampla, ar chinn an eagraíocht cháilithe chuí é/í a bheith oiriúnach le haghaidh a leithéid de cheadúnas. Tá an scéal seo ina ábhar suime faoi leith do chíricleachtóirí. Cúis shásaimh agam a rá go bhfuil an Rialtas tar éis reachtaíocht a chur ar aghaidh chun an aimhrialtacht seo a réiteach, mar atá An Bille um Chosaint Raideolaíoch (Leasú) 1998.

Easnamh eile a bhfuil an Institiúid ag tarraingt airde air le fada ná gan aon áis náisiúnta a bheith ann le haghaidh dramhaíl a chóireáil agus a stóráil de réir mar a chruthaítear í mar thoradh ar úsáid substaintí raideolaíocha i gcúrsaí míochaine, san oideachas, sa tionsclaíocht agus i réimsí eile saoil. Teastaíonn a leithéid seo de áis chun an chontúirt a bhaineann le stóráil dramhaíle raideolaíoch ag ionaid éagsúla a mhaolú agus freisin chun go gcoifídh Éire le dhá chomhghnás a comhaontaíodh le déanaí agus a bhfuil ár n-ainm curtha leo, is é sin An Comhghnás um Bainistiú Sábháilte Breosla Ídithe agus An Comhghnás um Bainistiú Sábháilte Dramhaíle Raideolaíoch. Is ábhar misnigh go bhfuil beart á dhéanamh ag an Roinn Fiontar Poiblí i leith a leithéid d'áis a phleanáil, le lánchabhair na hInstitiúide.

Paírt thábhachtach leanúnach d'obair na hInstitiúide is ea an chontúirt don tsláinte a bhaineann le nochtadh do ardleibhéil ghás radóin a mheas. De réir mar a dhruideann an suirbhé náisiúnta ar radón i bhfoirgnimh chónaithe chun deiridh, tá tús curtha le clár nua chun radón a thomhas i ngach scoil sa tír. Cúis imní a bhaineann leis seo ná nach bhfuil ach sciar beag d'úinéirí tí ag gníomhú chun an scéal a leigheas i ndiaidh go n-aimsítear leibhéal radóin os cionn an Leibhéil Tagartha ina dtithe.

Údar imní eile is ea Treoirlínte de chuid an Aontais Eorpaigh a bhaineann le cosaint raideolaíoch a aistriú i ndlí na hÉireann. Tá dhá Threoirlíne a bhfuil gaol gairid acu le chéile, ceann amháin a bhaineann le hoibrithe agus an pobal a chosaint agus ceann

eile a bhaineann le hothair atá faoi chúram míochaine a chosaint, agus caithfidh iad a bheith daingnithe i ndlí na hÉireann faoi Bhealtaine 2000. Ní mór an dá fhoireann reachtaíochta sin a chomhdhlúthú, chun nach mbeidh an obair chéanna á déanamh faoi dhó agus chun an ceann is fearr a fháil ar phointí suntasacha míréire maidir le húsáid na raideolaíochta ianúcháin san earnáil mhíochaine a rialú.

Cúis díomá is ea nach ndearnadh aon bheart chun an comhdhlúthú riachtanach sin a chur i gcrích, ar feadh ár n-eolais. An Roinn Fiontar Poiblí atá freagrach as an reachtaíocht a chlúdaíonn na hoibrithe agus an pbobal, agus tá an Institiúid ag saothrú i ndlúthpháirt leis an Roinn sa phróiseas dréachtaithe. Bíodh sin mar atá, is ar an Roinn Sláinte agus Leanaí atá an fhreagracht i leith na reachtaíochta sin a chlúdaíonn othair atá faoi chúram míochaine agus tá imní nach beag ar an Institiúid nach ndeachthas i gcomhairle leis an Institiúid ina leith, cé nach bhfuil mórán ama fágtha le haghaidh an reachtaíocht seo a chríochnú. Ní léir ach oiread go ndearnadh aon mhachnamh maidir leis an dá fhoireann reachtaíochta a bheith oiriúnach dá chéile. Beidh an Institiúid ag iarraidh go dtógfar na céimeanna atá riachtanach chun an comhdhlúthú sin a chur i gcrích.

Tharraing mé aird, i dtuarascáil na bliana seo caite, ar an ngá atá le hathruithe a chur i bhfeidhm ar struchtúr foirne na hInstitiúide le go mbeidh deiseanna níos fearr ag eolaithe na hInstitiúide arduithe céime a bhaint amach. Tá mé an-sásta gur cheadaíodh na hathruithe sin agus tá gach dóchas agam go mbeidh toradh maith air maidir le héifeachtúlacht na hInstitiúide a fheabhsú sna blianta atá amach romhainn. Le linn dom bheith ag caint ar an ábhar seo ba mhaith liom mo bhuíochas a chur in iúl as an díograis agus as an sainchumas a bhain le hobair fhoireann na hInstitiúide riamh. Ba mhaith liom freisin buíochas a ghabháil leis na comhaltaí Boird as an tsairbhís fhial a thug siad don Institiúid agus fós le comhaltaí na gCoistí Comhairleacha a bhunaigh an Institiúid as an gco-maoin a d'fhág siad orainn le linn dóibh bheith ag cabhrú linn ar bhonn deonach.

Mar fhocal scoir, is mian liom buíochas na hInstitiúide a chur in iúl as an tacaíocht a fuarthas ón Aire Fiontar Poiblí, Mary O'Ruairc, Uasal, TD. Tá an Institiúid faoi chomaoin ag an Uasal Joe Jacob TD go háirithe, an tAire Stáit a bhfuil cúram na sábháilteachta núiclé air, as obair na hInstitiúide a spreagadh. Ní mór dom a lua freisin go raibh oifigigh an Roinn Fiontar Poiblí agus Ranna eile Rialtais i gcónaí sásta obair i bpáirt linn agus go bhfuarthas cabhair ó eagraíochtaí náisiúnta eile agus ó institiúidí tríú leibhéal.

Mary Upton
Cathaoirleach (go 28 Deire Fóir, 1999)*

* Ar an lá sin d'éirigh Dr. Upton as bheith na Cathaoirleach ar an Institiúid, nuair a toghadh na Teachta Dála í.

members of the board

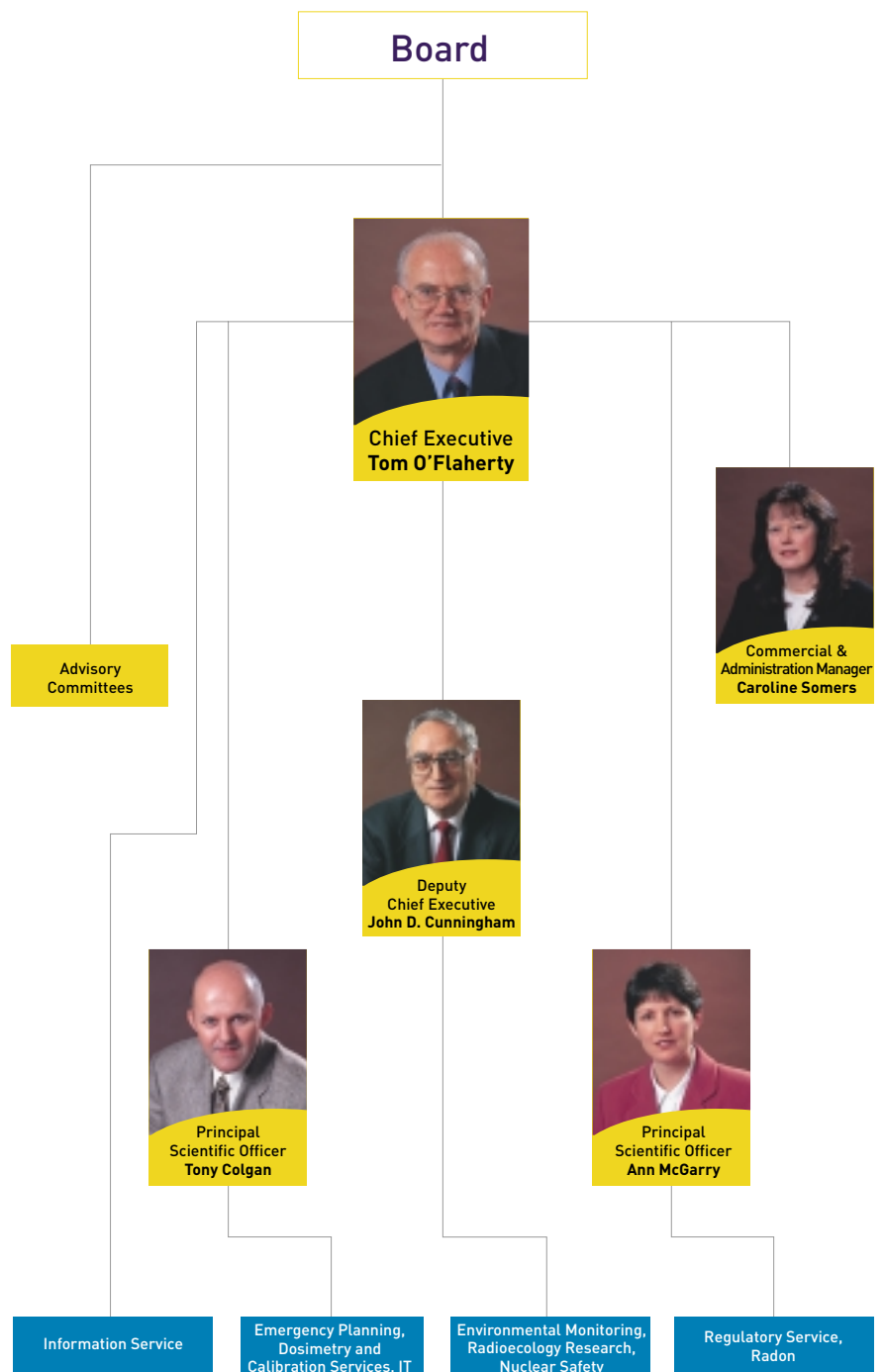
The members of the Board were appointed in 1997 by the then Minister for Public Enterprise, six of them on the nomination of particular organisations, as provided for in the Radiological Protection Act, 1991.

The membership of the Board throughout 1998 is set out below, showing where appropriate the nominating organisations, with the number of meetings attended by the respective members. There were eight meetings of the Board during the year ended 31st December 1998.

Membership of the Board throughout the year

Chairman	Mary Upton	8
	Gregory Burke Institute of Food Science and Technology of Ireland	7
	James Carr Medical Council	5
	Patrick Connellan Dental Council	6
	George Duffy	5
	Edward Fitzgerald Faculty of Radiologists RCSI	5
	James Gibney	7
	Lesley Malone Irish Nuclear Medicine Association	8
	Darina Muckian	8
	Frank Mulligan	6
	Geraldine O'Reilly Association of Physical Scientists in Medicine	6
	Adi Roche	5

staff structure



objectives of the institute

The Institute's principal objectives are:

- To provide advice to the Government, the Minister for Public Enterprise and other Ministers on matters relating to radiological safety.
- To provide information to the public on any matters relating to radiological safety which the Institute deems fit.
- 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 provide a personnel dosimetry and instrument calibration service for those who work with ionising radiation.
- 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 provide a radioactivity measurement and certification service.
- To prepare codes and regulations for the safe use of ionising radiation.
- 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.



main developments

Concerns about Sellafield OSPAR Convention

The Institute participated in the Irish delegation at the Ministerial Meeting of the OSPAR Convention in July 1998, at which a landmark agreement was reached on reduction of discharges of radioactive substances into the marine environment. Acceptance by the UK of the agreement is seen as a major step towards bringing about very substantial reductions in the discharge of radioactive waste from Sellafield into the Irish Sea.

Accident Risk

In another important development relating to Sellafield, British Nuclear Fuels Ltd (BNFL) acceded to Irish representations that they should allow the Institute access to documentation incorporating assessment of the risks of a major accident to the tanks holding highly-active liquid radioactive waste on the Sellafield site. These tanks have been identified as representing possibly the greatest risk of an accident at Sellafield which could have serious consequences for Ireland. Accordingly, the Institute has put in train arrangements to have this documentation examined.

Technetium Discharges

Particular public concern was aroused by the steep rise in levels of technetium-99 in the marine environment, following a large increase from 1994 onward in discharges of this radionuclide from Sellafield. In 1998, levels of technetium-99 in seaweed collected on the east coast of Ireland appeared to have peaked and began to reduce, reflecting a reduction of the annual rate of discharge after 1995. Levels, however, still remained far above pre-1994 values, and further marked reduction in discharges of this radionuclide is clearly desirable.

Regulatory Issues

During the year the Institute brought three successful prosecutions for non-compliance with legislation relating to radiological protection. However, it is a matter of regret that a prosecution did not ensue in respect of the year's most serious radiological incident, in which an employee of a company carrying out industrial radiography received a recorded dose of 36 millisieverts (mSv), well in excess of the legal dose limit of 20 mSv.

A prosecution for an offence under the relevant legislation would have had to be taken by the Director of Public Prosecutions. On the matter being referred to him by the Institute, the DPP decided that there was insufficient evidence to support a prosecution against the employer in question. In consequence, the Institute is taking further legal advice as to the admissibility of dose measurements by its Dosimetry Service as evidence in criminal proceedings.

Radon in Buildings

The Institute published two further reports on the results of its national survey of radon in dwellings - one for counties Cork and Kerry, and another for counties Clare, Limerick and Tipperary, leaving only the results for counties Galway and Mayo still to be reported.

A major development was the commissioning by the Minister for Education and Science of a survey by the Institute of radon levels in all primary and secondary schools in the State. The survey is to be carried out over three successive school years, and began in 1998-99 with the measurement of radon in every ground-floor classroom and office in some 800 schools in the east and north-east.

New Legislation

The Institute collaborated closely with the Department of Public Enterprise in the preparation of a Consultation Document on the legislation, which has to be brought into force by May 2000, to implement the 1996 EU Directive laying down basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation (the new Basic Safety Standards Directive). It is hoped that wide circulation of the Consultation Document will ensure that a full spectrum of views will be taken into account in the final drafting of the legislation, which will have major significance for radiological protection in Ireland for a considerable time to come.

Conferences

The Institute was pleased to host two successful conferences during the year, 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".

Tom O'Flaherty
Chief Executive



staff & resources

Staff

It is a matter of satisfaction to be able to report the successful outcome of a long-standing application by the Institute for sanction for the upgrading of three Scientific Officer posts to Senior Scientific Officer. This development contributes significantly to alleviating a severe shortage of promotional opportunities for the Institute's scientific staff.

A further positive development is the creation of improved promotional opportunities for administrative staff under the provisions of the Programme for Competitiveness and Work.

Equality

The Institute is committed to a policy of equal opportunity in all aspects of its activities. Particular attention is given to equality in recruitment, conditions of employment and access to promotion, training and career development. The Institute operates a number of schemes which provide staff with options in relation to meeting their career and personal needs, such as job-sharing, study leave and career breaks.

Participation Forum

The Institute's Participation Forum, established under the terms of the Worker Participation (State Enterprise) Act, 1988, provides a representative mechanism for consultation between staff at the various levels in the organisation about all matters, other than industrial relations issues, affecting the operation and effectiveness of the Institute.

Safety, Health and Welfare

The Institute is committed to complying fully with the requirements of legislation relating to safety, health and welfare at work. In accordance with the provisions of the Safety, Health and Welfare at Work Act, 1989, a safety committee is in place and a safety representative is elected by staff members. A safety statement has been prepared and is kept under continuing review.

Cur chun cinn na Gaeilge

Deineann an Institiúid iarracht an Ghaeilge a úsáid a mhéid is féidir. I bhfógraíocht, baintear úsáid go rialta as an leagan Gaeilge d'ainm na heagraíochta taobh leis an ainm Béarla. Chomh maith leis sin, glactar le beagnach gach cuireadh a thugtar chun bheith páirteach i gcláracha Gaeilge ar na meáin chumarsaíde.

Information Technology

Following an external audit in 1997 of the Institute's IT requirements, a major upgrading programme was put in place and this continued throughout 1998. The Institute continues to employ an outside consultant to oversee the modernisation programme and an in-house steering committee deals with technical decisions and advice on priorities.

To date, operating systems have been standardised and the replacement of outdated hardware is almost complete. Following a tendering process, separate contracts have been signed for the installation of new software for the Regulatory Service, the Dosimetry Service, the

Radon Measurement Programme and the National Emergency Plan.

As part of the overall IT programme, an exhaustive review had been undertaken of "Year 2000 compliance" issues within the Institute. This review extended beyond computer hardware and software to include all electronically controlled systems and items of equipment. A programme has been put in place to ensure that no aspect of the Institute's operations or services will be adversely affected by Year 2000 problems.

Finance

The Institute's income in 1998 was £2.263 million, made up of grant-in-aid of £1.507 million and £0.756 million in earnings from dosimetry, product certification and other services, licence charges, and research and consultancy contracts. Capital expenditure, principally on information technology, including provision for Year 2000 compliance, and on equipment for monitoring of radioactivity in the environment, was £247,000. Income for the year exceeded expenditure by £1,000.



environmental monitoring

The Institute carries out extensive monitoring of radioactivity in foodstuffs and the environment in fulfilment of its statutory obligation to “monitor activity or ionising radiation levels in any thing in the State or in waters surrounding the State”. This monitoring is divided between marine and terrestrial programmes and involves the sampling and analysis of foodstuffs and environmental materials. Through these programmes the Institute assesses the level of exposure of the Irish population from radioactivity in our environment.

The Institute’s laboratory is the national centre for measurement of radioactivity. It is accredited by the Irish National Accreditation Board. The results of all monitoring programmes are available in a series of reports published by the Institute and, in addition, marine monitoring results may be viewed on the Internet. The numbers and types of samples tested during 1998 are shown in Table 1. The total has increased from 2083 in 1997 to 2770 in 1998, due mainly to increased exports of agricultural products.

Marine Environment

The main source of radioactive contamination in the Irish marine environment continues to be the discharge of low-level waste from the British Nuclear Fuels reprocessing plant at Sellafield in Cumbria. As in previous years the dominant exposure pathway for this source was the consumption of seafood. Samples of fish and shellfish were regularly collected from major landing ports, while seawater, sediment and seaweed were sampled from coastal locations. Seawater and sediment samples were also collected from the western Irish Sea in July using the Marine Institute’s research vessel, the Celtic Voyager. The sampling programme is carried out by Institute staff and by Fishery Quality Officers of the Department of the Marine and Natural Resources.

Technetium-99 activity concentrations in seawater and seaweed from the east coast increased in line with increased discharges from Sellafield since 1994. These discharges reached their peak in 1995 when 190 TBq were discharged. The discharge in 1998 was about 50 TBq. In 1998, technetium-99 was analysed on about 80 samples of coastal seawater and seaweed, offshore seawater, and fish and shellfish from landings at the major fishing ports.

Table 1
Radioactivity Testing on Environmental Samples and Foodstuffs, 1998

Air	531
Beef	181
Lamb	43
Pork/Poultry	18
Drinking water	89
Fish and shellfish	194
Seawater, sediments and seaweeds	214
Milk and dairy products	681
Rainwater	56
Soil and vegetation	251
Miscellaneous	512
Total	2770

The highest seawater and seaweed technetium-99 activity concentrations were recorded in samples taken in late 1997 and early 1998, respectively, approximately two years after the peak discharges from Sellafield in 1995. The highest seawater values were 65 Bq/l in 1997 and 38 Bq/l in 1998, a small decrease. The highest concentration in seaweed was 1675 Bq/kg (wet) in a sample collected on the north-east coast in March 1998, corresponding to a 28-fold increase compared with data for the period 1988-93 before the increase in technetium-99 discharges. Technetium-99 activity concentrations in seaweed for the north-east coast were approximately 350 times higher than those on the south and west coasts in 1998. Concentrations in fish (cod, plaice, whiting, ray, herring and mackerel) and shellfish (lobster, prawns, mussels and oysters) continued to be low and did not vary significantly during the year.

In 1998 the dose to heavy consumers of seafood due to artificial radionuclides was estimated to be 1.3 microsieverts (μSv)*, of which 0.78 μSv was attributable to caesium-137, 0.25 μSv to technetium-99 and the remainder to other radionuclides. The doses associated with other marine-based activities such as swimming, walking or fishing are considerably smaller. These figures may be put into context by comparing them to the annual dose to a member of the Irish public from all sources of radiation, which can range from about 2000 μSv up to 20,000 μSv , or even higher in cases of exceptional exposure to radon gas. The dose to the Irish public resulting from the presence of artificial radioactivity in the marine environment is therefore small and does not pose any significant health risk. While the Institute's marine monitoring programme provides continued reassurance about the safety and quality of Irish seafood and the Irish marine environment, it is considered that the increased technetium-99 discharges should be terminated and the discharges of other radionuclides further reduced in line with commitments made under the OSPAR Convention (see page 29).

Terrestrial Environment

The Institute's terrestrial monitoring programme assesses the exposure to the Irish population arising from radioactivity in the food chain and the terrestrial environment. The 1998 programme included continuous sampling and testing of air and rainwater, sampling and analysis of drinking water, milk and other foodstuffs, and in-vivo monitoring of sheep in certain upland areas. Sampling of environmental materials and foodstuffs was undertaken on a nationwide basis in conjunction with Met Éireann, the Department of the Environment and Local Government and the Department of Agriculture and Food. Airborne particulate and rainwater sampling sites are shown in Figure 1. Additionally, gaseous krypton-85 concentrations in air were measured at Clonskeagh in Dublin.

The monitoring of sheep was continued in 1998 in conjunction with the Department of Agriculture and Food with live sheep being monitored in a limited number of upland areas and local slaughterhouses in those areas. These upland areas are in parts of the north-west, north-east and south of the country. The results indicate that while their radiocaesium activities continue to decrease slowly some sheep grazing these upland areas continue to have radiocaesium activities above the level considered suitable for marketing. However, before being slaughtered, sheep from these upland areas are grazed on lower pastures where their radioactivity levels decrease rapidly. The results of monitoring at local slaughterhouses indicate that regular consumption of sheep meat does not constitute a significant health hazard.

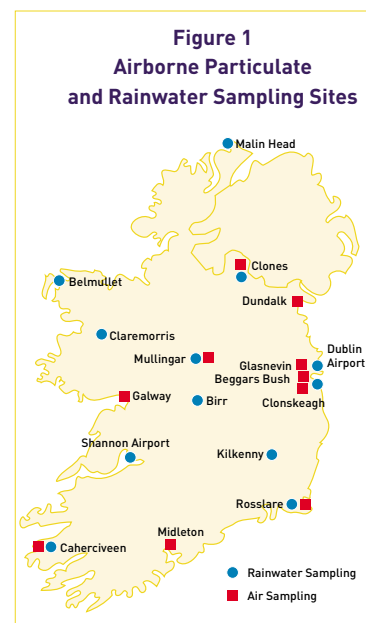
The mean concentration of krypton-85 measured in air by the Institute at Clonskeagh during 1998 was 1.46 Bq/m³, a small increase over the 1997 value of 1.43 Bq/m³ and the 1996 value of 1.3 Bq/m³. Krypton-85 is released to the atmosphere almost exclusively as a result of the reprocessing of spent nuclear fuel at Sellafield, at La Hague in France and in Russia. Some of the increase can be attributed to the THORP reprocessing plant at Sellafield whose krypton-85 discharges increased from 47,000 TBq in 1996 to 99,000 TBq in 1998 as a consequence of reprocessing more spent fuel. The doses due to krypton-85 are very low and not radiologically significant.

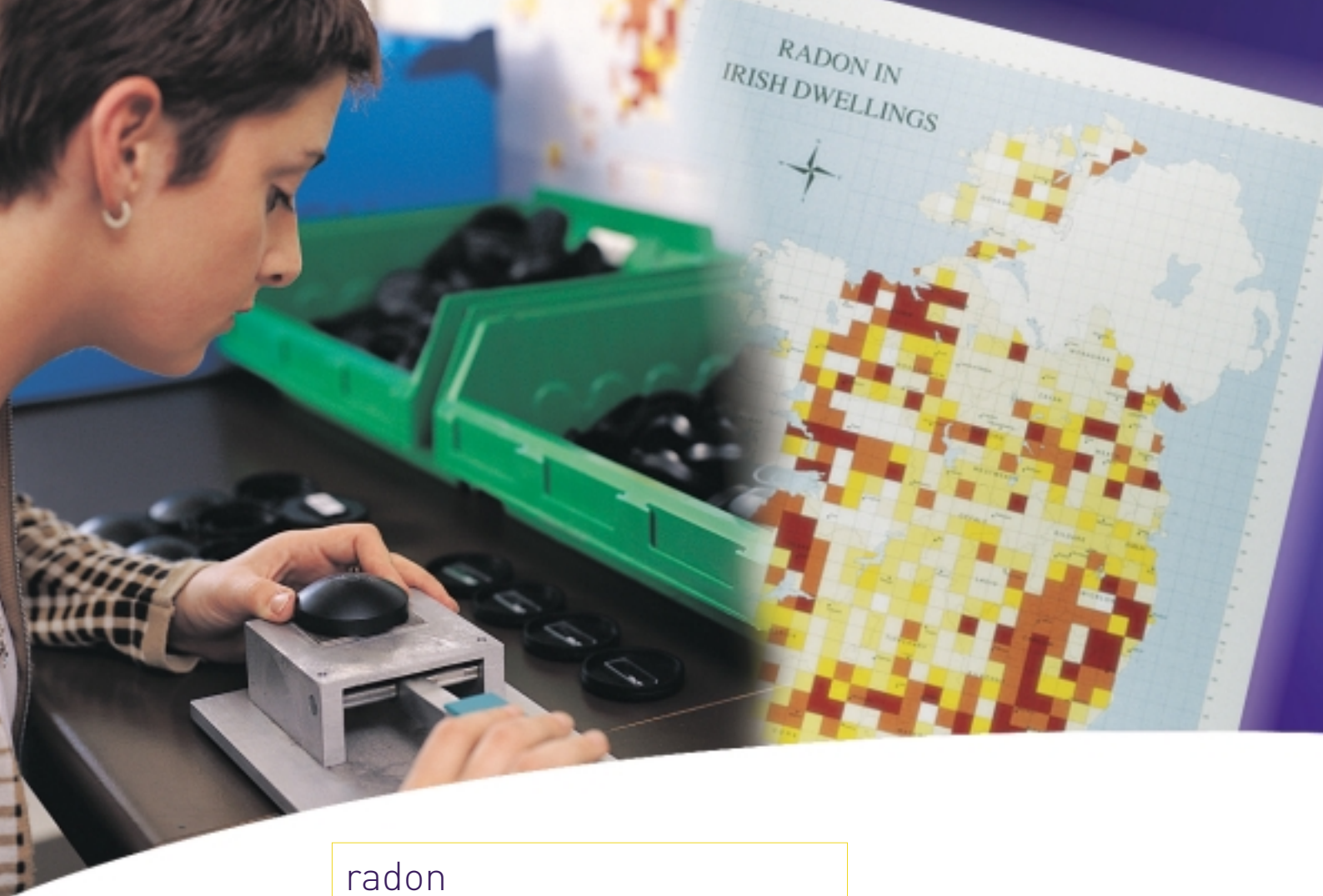
The measurements carried out during 1998 show that the levels of radioactivity in air, water and the food chain remain low and are virtually indistinguishable from global background levels. Background levels arise both from the presence of naturally occurring radioactivity and from global fallout of artificial radioactivity, which occurs in the main from past atmospheric weapons testing. The programme gives continued reassurance that in Ireland the levels of artificial radioactivity in the terrestrial environment do not give rise to public health concern.

Radioactivity in Export Products

The Institute provides a testing and certification service to exporters of Irish food and other products. Many countries importing Irish goods require certification to demonstrate that the radioactivity content is below prescribed national or international limits. In 1998 the Institute issued 4862 certificates in relation to Irish exports compared with 5815 in 1997, 4767 in 1996 and 5600 in 1995.

* The microsievert is a unit of radiation dose. Radiation dose can be used as a basis for calculating the risk that cancer could result in later life from the quantity of radiation to which a person has been exposed.





radon

Since the early 1990s, growing public awareness concerning the health risk associated with long-term exposure to radon gas has been reflected in an increased demand for radon measurements to be carried out both in homes and in workplaces. The number of detectors issued each year by the Institute has increased dramatically from approximately 2000 detectors in 1991 to over 13,000 in 1998 (Figure 2).

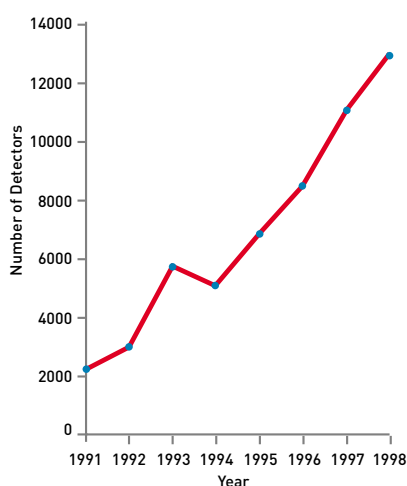
At the end of 1998, radon measurements had been carried out in approximately 14,000 houses, 800 schools and 22 workplaces. These measurements were carried out either at the request of the householder/employer or as part of one of the Institute's surveys. Over 1500 of the houses measured had radon levels exceeding the Reference Level of 200 becquerels per cubic metre (Bq/m³). It is a matter of continuing concern to the Institute that only a small number of these householders have carried out work to reduce the radon level, presumably because of the cost involved.

In conjunction with the Department of Public Enterprise, work on the drafting of legislation to implement the new Basic Safety Standards Directive, was continued throughout 1998. Following the coming into force of the legislation in 2000, it is likely that exposure to radon in workplaces, where high levels are likely to be found, will have to be investigated and remedial measures undertaken where necessary. If remedial measures are unsuccessful, a system of radiation protection will have to be introduced in the workplace to ensure that exposure of workers or members of the public is kept to a minimum.

National Survey of Radon in Dwellings

In January and February of 1998, radon detectors were issued to householders living in County Galway, the final county to be surveyed as part of the Institute's national survey of radon in dwellings. The survey was initiated in 1992 with the aim of identifying regions of the country where elevated radon levels are located. It involves the measurement of radon, over a twelve-month period, in a random selection of houses in each 10 km x 10 km grid square throughout the country. The results are used to predict the percentage of houses in each grid square in which the radon concen-

Figure 2
Number of Radon Detectors
Issued, 1991-'98



tration is greater than the Reference Level. Grid squares where this prediction exceeds 10% are designated high-radon areas.

During the year the Institute published two reports detailing the latest results for the national survey. One report presents the results for counties Cork and Kerry, and the other results for counties Clare, Limerick and Tipperary. Measurements were completed in a total of 4261 dwellings in these counties with mean annual indoor radon concentrations ranging from 41 Bq/m³ in Co. Limerick to 71 Bq/m³ in Co. Cork.

The results show that a large part of Co. Clare stretching from the Burren to the Shannon Estuary is classified as a high-radon area. In the other counties a number of high-radon areas have been identified, but the majority of grid squares within these counties have less than 10% of houses predicted to have radon concentrations above the Reference Level.

The highest indoor radon level measured in any house surveyed to date was in a house in Co. Kerry. The concentration measured was 1924 Bq/m³ which represents an estimated radiation dose of 48,000 microsieverts (μSv) per year to the occupants of the house from radon. This compares with the maximum legal limit of 20,000 μSv on the dose to a radiation worker.

Revised Building Regulations came into force in July 1998. Every new house is now required to incorporate some degree of radon preventive measure at the time of construction. The degree of protection required is dependent upon the radon classification of the area in which the building is taking place. Architects and engineers involved in the planning stages of new houses are advised to consult the Institute's *Radon in Irish Dwellings* map (Figure 3) which shows the radon designation for each grid square across the country.

Radon Measurement Service

The Institute provides a radon measurement service to householders and to occupiers of other buildings who wish to have the radon levels measured in their houses or workplaces. During the year the Institute carried out almost 560 such measurements in houses and 22 measurements in workplaces.

Radon in Schools

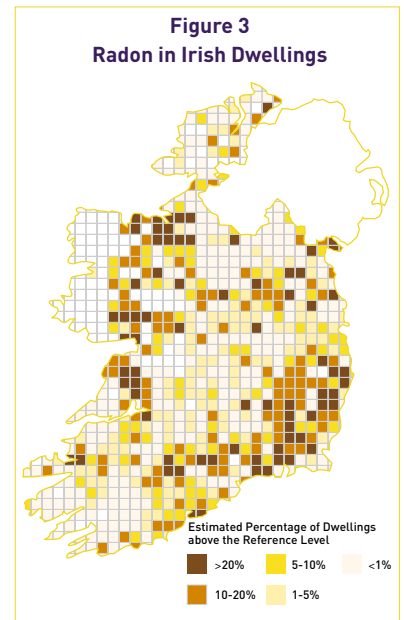
In February, the Minister for Education and Science announced the introduction of a survey of indoor radon levels in all schools throughout Ireland. The survey is being carried out by the Institute on behalf of the Department of Education and Science and involves radon measurements in approximately 4000 schools throughout Ireland. The project will be carried out on a phased basis and will involve the measurement of radon in all ground floor classrooms and offices in each school. The expected completion date is the end of 2001.

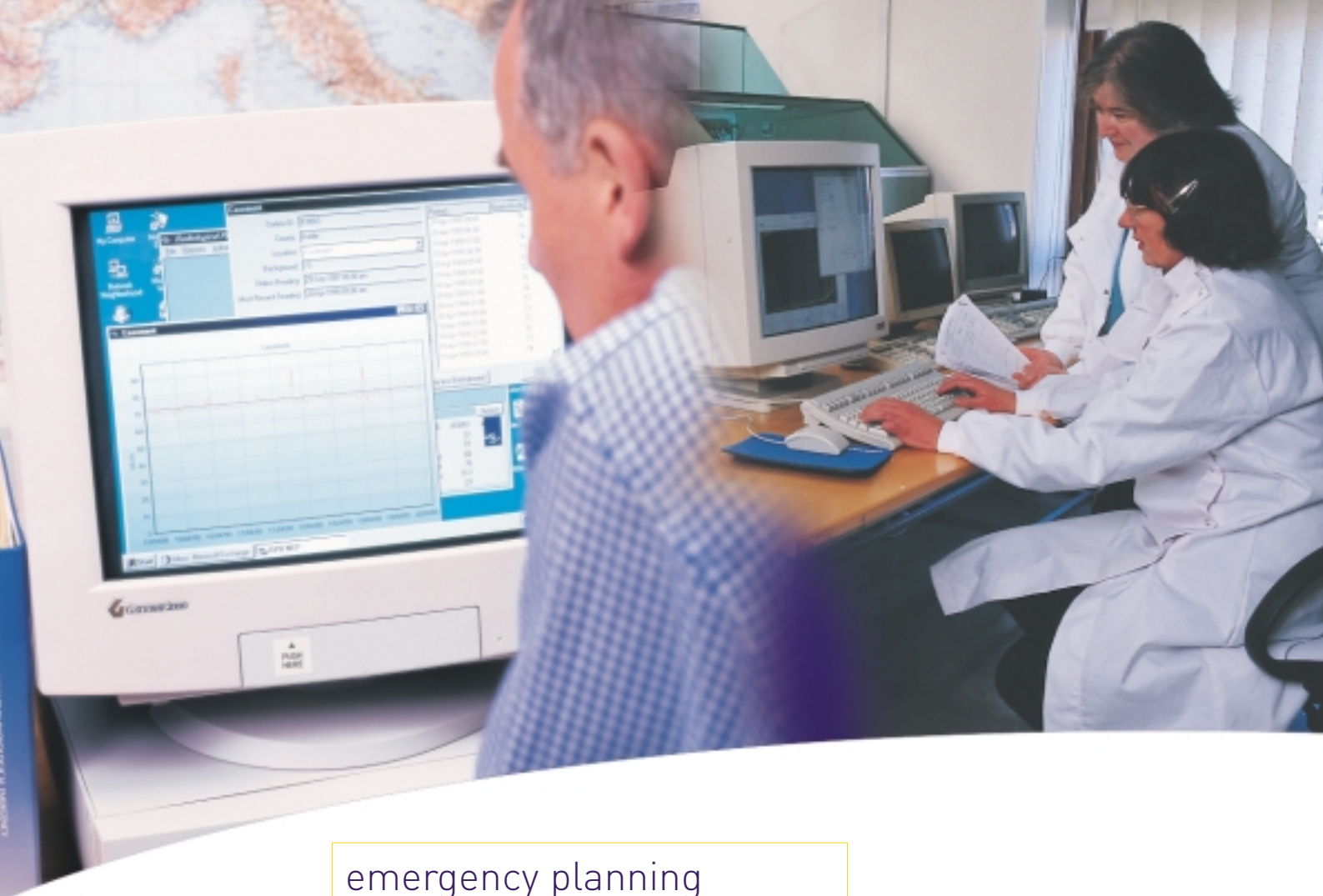
The first phase of the survey began in April 1998 with invitations to participate being sent to schools in counties Carlow, Cavan, Kildare, Kilkenny, Louth, Meath, Monaghan, Westmeath, Wexford and Wicklow. Invitations were sent to a total of 977 primary and post-primary schools and 80% of the schools contacted agreed to participate in the survey. A total of 8880 detectors were issued to these schools during September and October to coincide with the start of the school year. The detectors were to remain in place for the duration of the 1998/99 school year.

Radon in Show Caves

Personal monitoring of staff employed by the operators of three commercial show caves was carried out during the 1998 operating season. A total of 22 staff were monitored and radiation doses to individual staff members ranged from about 500 μSv up to 11,400 μSv.

Such exposure to radon in show caves will be subject to regulation following the coming into force in 2000 of national legislation to implement the new Basic Safety Standards Directive.





emergency planning

One of the most significant developments during 1998 was the approval by the Government of a revised National Emergency Plan for Nuclear Accidents. The main changes to the previous emergency arrangements relate to two principal areas. Firstly, a Committee of Ministers which has been established to give policy direction on recommended countermeasures. Secondly, a Consultative Committee on Nuclear Emergency Planning is to be set up for the purpose of regular exchange of views on the implementation, testing and updating of the Plan.

The responsibilities assigned to the Institute in the revised Plan are similar to those already in place. These include responsibility for the operation of an on-call service for the receipt of messages giving early notification of a nuclear accident, assessing the consequences of the accident for Ireland and, where necessary, recommending countermeasures to reduce radiation exposure of the population.

Monitoring Systems

The programme for the operation and servicing of the national monitoring systems for the continuous measurement of gamma dose rate, and the measurement of radionuclide concentration in air and rainwater, was maintained throughout the year. Results for the above measurements indicated that there were no increases detected in the level of radioactivity due to man-made sources. As in the previous years, there were some temporary elevated gamma dose rate readings associated with radon washout. The maximum increase due to radon washout was 52 nanosieverts per hour (nSv/h)* above the normal value for the measuring station in question. The variability in gamma dose rate at the Shannon Airport monitoring station is shown in Figure 4.

During the year a new database for the storage and analysis of gamma dose rate readings was installed. The new database provides more flexibility in operation and better graphic displays, both of which will assist in the response to any emergency.

* 1000 nanosieverts (nSv) = 1 microsievert (μ Sv)

The Institute continues to participate in the regular exchange of summary gamma dose rate information with other European countries. This exchange of data is co-ordinated by the EU Commission's Joint Research Centre at Ispra, Italy, where a computer programme and central database for the receipt, storage and distribution of data is located. Some European countries outside the EU also contribute data and the total number of participants has now reached nineteen.

Emergency Exercises

As previously mentioned, the Institute has responsibility for the provision of an on-call service for the receipt of messages giving early notification of any radiological accident which may affect Ireland. There are two international early warning systems in operation: the ECURIE system which is operated by the EU and the EMERCON system provided by the International Atomic Energy Agency (IAEA). Messages issued by either system are received at the national contact point (the Garda Communications Centre in Dublin) and relayed immediately to the Institute's on-call duty officer.

The communication links used by both systems are routinely tested to ensure that the contact names and addresses are up-to-date and that messages are rapidly transferred to the national competent authorities. Such testing was successfully completed on a number of occasions during the year.

In October, representatives from the Institute took part as observers in a UK emergency exercise based on a hypothetical accident at the nuclear power plant at Wylfa, North Wales. In November, Ireland participated in an international emergency exercise, co-ordinated by the Nuclear Energy Agency (NEA) of the OECD and based on an accident at a nuclear power plant in

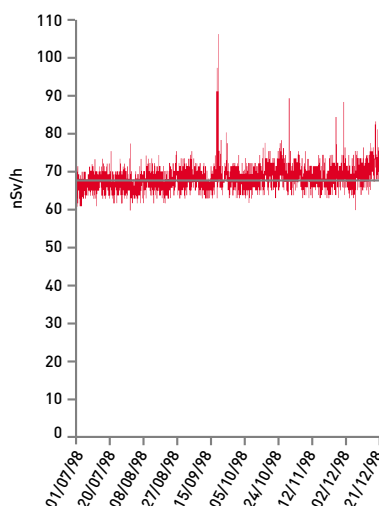
Hungary. The nature of the accident was such that the implications for Ireland would not have been significant. Nevertheless, the testing of the communications networks was, in general, a success although some minor modifications have been highlighted as being desirable.

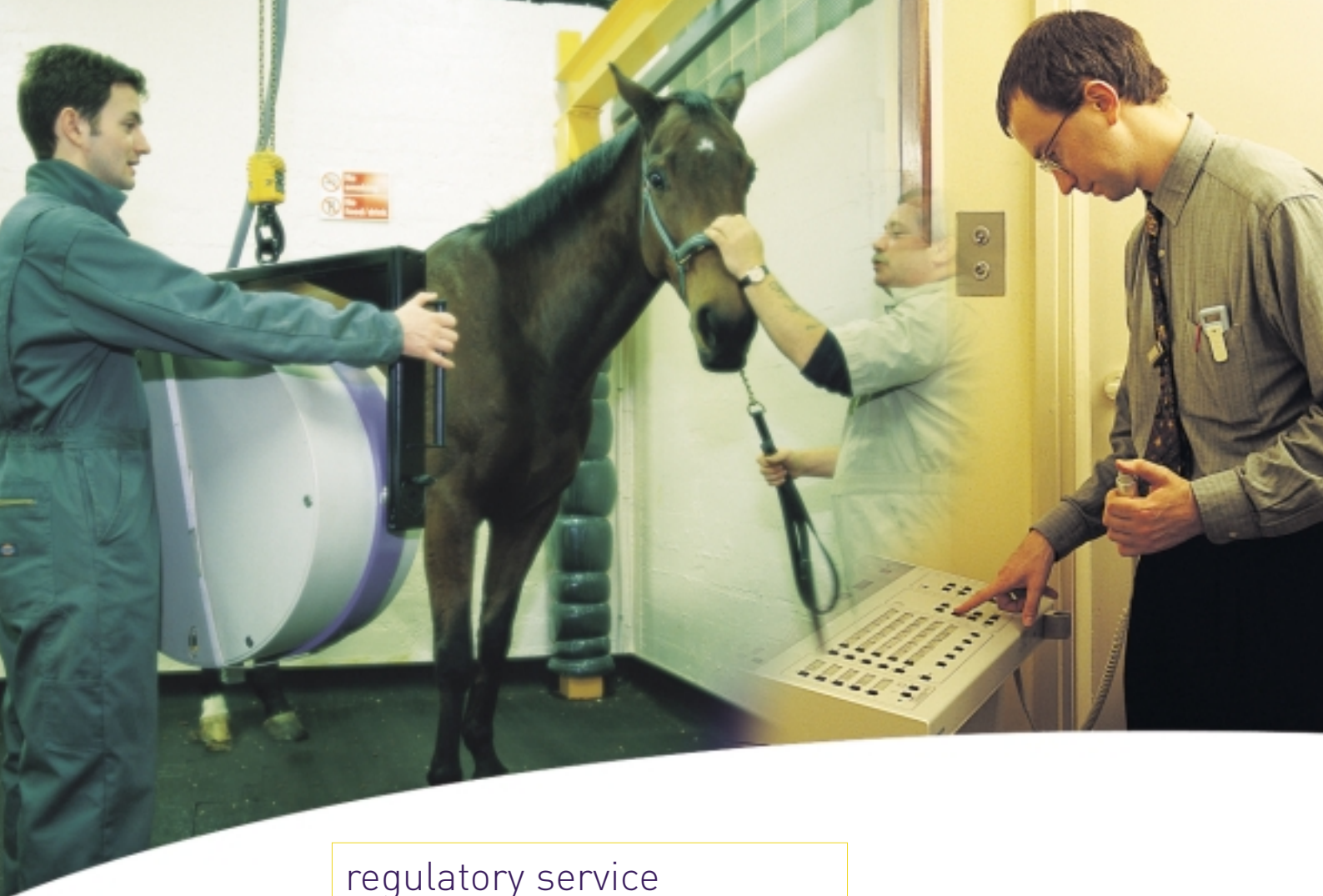
Incidents

Reports on incidents and accidents at nuclear installations around the world were received through the IAEA information service. For incidents in the UK, reports were also received from the UK authorities. A total of 44 incidents were noted during the year of which 26 were in the UK. None of these incidents had any direct effect on Ireland.

Figure 4
Gamma Dose Rate Reading
Shannon Airport
1 July to 31 December 1998

The peak readings are due to radon washout during heavy rainfall





regulatory service

Throughout 1998, the Regulatory Service continued its efforts to ensure that all activities involving the use of ionising radiation are carried out in a safe manner. The principal means by which this responsibility is discharged is through the Institute's licensing system.

Licensing and Inspection

The number of licence holders at the end of 1998 was 1261 compared with a total of 1227 at the end of 1997. The principal increase was in the number of dentists licensed. Inspections of 162 licensees were carried out, priority being given to those licensees where the greatest potential radiological risks exist. The breakdown of licences and of inspections by licence category is given in Table 2.

Incidents and Prosecutions

A number of incidents requiring the intervention of the Regulatory Service occurred during the year. The Institute brought successful prosecutions against a dentist and two commercial companies.

In March 1998, it was reported to the Regulatory Service that an industrial radiographer had received a whole-body dose of 36 mSv. The exposure occurred when the guide-tube, through which the radiographic source travels between its shielded container and the structure being radiographed, was distorted, preventing the source from returning to its container. A mobile "cherry-picker" type lift was used to manoeuvre the radiographer close enough to repair the damage. The lift malfunctioned leaving the radiographer stranded close to the source. It took a number of minutes to get the lift to work again, and it was during this time that the radiographer received the dose.

Table 2
Licence Categories and Inspections, 1998

Category	Licences	Inspections
Dental Surgeons	713	5
Hospitals	101	45
Veterinary Surgeons	119	4
Industrial Gauges	88	35
Laboratory Instruments	89	17
Distributors	53	5
Research Laboratories	27	6
Industrial Radiography	23	15
Lightning Preventors	10	5
Static Controllers	6	2
Process Irradiation Facility	3	3
Miscellaneous	29	20
Total	1261	162

A whole-body dose of 36 mSv is in excess of the annual dose limit for exposed workers of 20 mSv set out in Irish legislation. The prosecuting authority for breaches of this legislation is the Director of Public Prosecutions. On the matter being referred to him by the Institute, the DPP decided that there was insufficient evidence to support a prosecution against the employer in question. In consequence, the Institute is taking further legal advice as to the admissibility of dose measurements by its Dosimetry Service as evidence in criminal proceedings.

A second incident involving industrial radiography also took place during the year. In that case, two large container tanks, situated end to end, were to be radiographed. Upon seeing some staff leave the second tank, the radiographic crew assumed that all other staff had vacated the area and proceeded to radiograph the first tank. However, one staff member, unaware that radiography was in progress, remained in the second tank while the first tank was radiographed. An inspector visited the scene and assisted in a reconstruction of the incident, which showed that the individual concerned did not receive a measurable dose.

A contributory factor in both incidents was that the staff concerned did not adhere to their Radiation Safety Procedures which detail the measures to be taken to prevent accidental exposure.

While the second incident did not result in a significant exposure to a worker, it was potentially a very serious incident. In order to reduce the risk of a recurrence of such incidents, the Regulatory Service has insisted that both companies review their Radiation Safety Procedures and pay particular attention to the observance by staff of the procedures.

During the year two separate incidents occurred where radioactive material was detected in consignments of scrap metal entering a steel manufacturing plant in Co. Cork. In each case the consignment was isolated and returned to the company who had supplied the scrap metal. On both occasions an inspector visited the supply company in question and assisted in isolating the source which caused the alarm. The sources are now held in secure storage.

In the first incident, the source was identified as a large number of thoriated tungsten welding rods. The welding rods were removed from the scrap and the remaining bulk of the consignment was cleared by the inspector and returned to the steel plant for processing.

In the second incident the radioactive source was found to be radium-226, a naturally occurring radionuclide, which had become absorbed onto the lining of a tank.

The potential hazards associated with these incidents were highlighted by a serious incident that occurred in a steel recycling plant in southern Spain in May. In that case, a caesium-137 source, which was included in a consignment of scrap metal entering the plant from abroad, was accidentally melted down while the plant's radioactivity detection system was not in full service. Fortunately, none of the operators at the plant was seriously exposed, but the clean-up operation was extremely expensive, costing an estimated IRE20 million.

The Institute's Regulatory Service carried out an investigation at the time to ensure that the caesium-137 source had not originated in Ireland. The incident highlighted the need for continuous monitoring of all scrap metal entering steel recycling plants and this point has been brought to the notice of steel recycling plants in this country.

- In the industrial sector, the Institute brought successful prosecutions against two companies for the unlicensed distribution of radioactive substances. In the first case the company was unaware of the requirement to hold a licence to distribute radioactive substances. In the second case the company continued to distribute radioactive substances even though its licence had expired. In each case the company was fined and ordered to pay costs.
- A successful prosecution was also brought against a dentist for the unlicensed custody of an X-ray unit. Having received no response to notices sent to the dentist advising him of the requirement to take out a licence, an inspection of the surgery was carried out. The inspection revealed that the X-ray machine in question did not meet the performance standards specified in the Code of Practice for Radiological Protection in Dentistry. The dentist, who has subsequently taken out a licence for a new X-ray unit, was fined and ordered to pay costs.
- In June 1998, the inadvertent transport of a lightning preventor containing radium-226, from a premises in Co. Cork, to a warehouse in Dublin Port was investigated by the Regulatory Service. The preventor had been attached to the roof of a grain silo and was mistakenly included with the metal from the silo, which had been disassembled for transport. After locating the device an inspector assisted in isolating the source in Dublin Port. The lightning preventor was subsequently returned to the licensee, for safe storage under licence.

- In its 1997 Annual Report the Institute noted its concern about the need for improved facilities for the storage of radioactive waste at a major Dublin hospital. The Institute is pleased that the hospital in question has now successfully brought into service a new radioactive waste store which fully meets regulatory requirements.

New Legislation

The Regulatory Service played its part, throughout 1998, in the Institute's continuing preparation of legislation to implement the new Basic Safety Standards Directive. This legislation, which must be implemented into Irish law by 13 May 2000, will strengthen existing legislation governing the uses of artificial sources of ionising radiation. It will also introduce a number of regulations that deal with the issues of exposure of air crew to cosmic radiation and the exposure of workers to natural sources of radiation.

The Regulatory Service was also involved in the preparation of the Carriage of Dangerous Goods by Road Act, 1998 and the Regulations pursuant to this Act. This legislation will have important consequences for the road transportation of dangerous goods, including radioactive substances, in Ireland.

Year 2000 Compliance

Passage into the year 2000 has the potential to disrupt some computer services and equipment, including equipment which produces ionising radiation used by the Institute's licensees.

In July 1998, the Regulatory Service wrote to all licensees alerting them to the fact that the millennium bug might have implications for the safe operation of licensed equipment and advising them that equipment which could not operate safely would not be licensed for use. Licensees were asked to advise the Regulatory Service of the Y2K compliance status of all licensed equipment.

The replies received indicated that most licensees were aware of the potential problems and that they were implementing assessment and remedial programmes. The situation will continue to be monitored by the Regulatory Service during 1999.

Lectures and Presentations

The staff of the Regulatory Service gave a total of eighteen presentations during the year on various aspects of the regulation of uses of ionising radiation. As in previous years, staff were invited to address the Radiological Protection Course at NUI Galway as well as the Diploma in Safety, Health & Welfare at Work course (Occupational Hygiene) at University College Dublin.

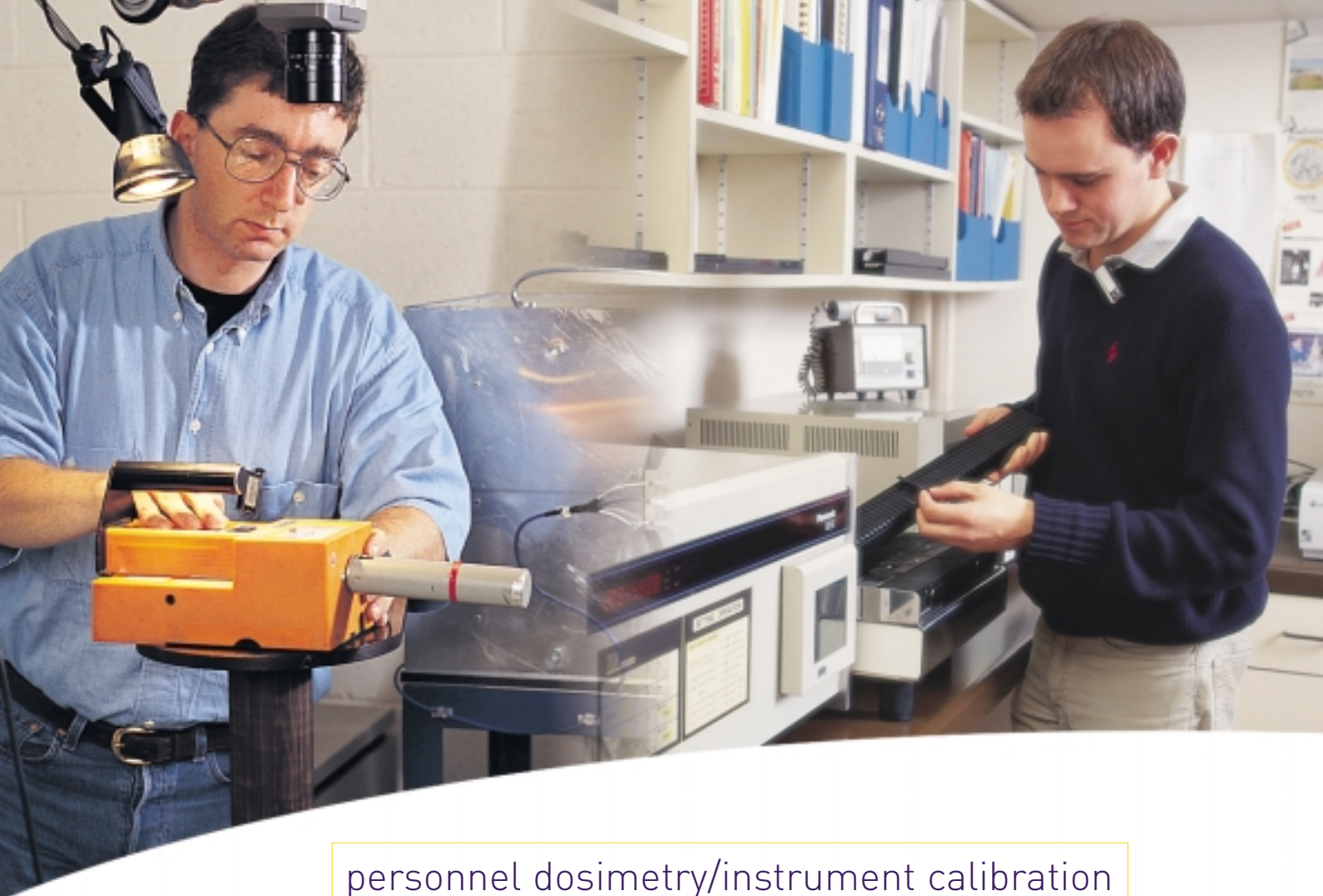
Presentations were given to non-radiology hospital doctors at Cork University Hospital and Beaumont Hospital and to staff at Trinity College, Dublin and the Royal College of Surgeons in Ireland. In addition, staff were invited to lecture at in-house Radiation Protection Seminars organised by Becton Dickinson Ltd, Irish Sugar plc and Irish Cement Ltd.

Regulations governing ionising radiation in dental radiology in Ireland were the subject of a lec-

ture given at two seminars organised by the Dublin Dental Hospital and the Mid-Western Health Board.

Staff from the Regulatory Service also gave presentations on the two new EU Directives which will form the legal basis for radiological protection in Ireland into the foreseeable future. These presentations were given at a workshop organised by the Institute in March and at the Annual Scientific Meeting of the Association of Physical Scientists in Medicine.

A presentation on the regulation in Ireland of naturally occurring radioactive material (NORM) of low specific activity was given at a workshop in Edinburgh in April. The workshop was co-sponsored by the European Commission and the UK Health and Safety Executive.



personnel dosimetry/instrument calibration

The Institute supplies a comprehensive range of personnel dosimeters for assessing the dose resulting from occupational exposure to ionising radiation. The dosimeter types available include whole-body dosimeters capable of determining the dose from X- or gamma rays, beta rays and neutrons and extremity dosimeters that measure the dose from X-, gamma or beta rays. A total of 57,000 dosimeters were issued in 1998, comprising approximately 53,000 whole-body TLDs, 3,200 extremity dosimeters and 800 fast neutron dosimeters. Approximately 6200 workers were registered with the service during 1998.

The highest monthly whole-body dose recorded in 1998 was 36.1 mSv, exceeding the annual dose limit of 20 mSv. The dose was received as a result of an incident where an industrial radiographer was accidentally exposed to an iridium-192 source. Further details surrounding the incident are described in the report of the Regulatory Service (page 18).

There were an additional four cases of monthly whole-body doses exceeding 1 mSv. The highest of these was 4.4 mSv. In all four instances the doses were received by industrial radiographers using sealed sources. Three of the doses in question were received by the same worker, whose whole-body dose for the year was 8.2 mSv.

Measurable extremity doses to hands and head were recorded by personnel working in research and in the cardiology, radiotherapy and nuclear medicine departments of hospitals. The highest annual extremity dose of 97.3 mSv was received by a hospital physicist.

As part of a study of personnel monitoring procedures in EU Member States commissioned by Directorate General XI of the European Commission, the Institute compiled data on whole-body doses received in 1997 by Irish workers occupationally exposed to radiation. The data were taken primarily from the Institute's own database with supplementary data being provided by the Mater Misericordiae and Beaumont hospitals. Workers were considered under three general categories of medical, industrial and educational applications and each of these was further bro-

Table 3
Distribution of Radiation Doses among Occupationally Exposed Workers (1997)

WORK SECTOR	TOTAL WORKERS	Dose Range (mSv)					
		0-0.1	0.1-0.2	0.2-0.5	0.5-1.0	1.0-2.0	2.0-5.0
Medical							
Diagnostic	2100	1629	283	147	23	12	6
Radiotherapy	128	81	38	7	1	1	-
Nuclear Medicine	139	96	22	16	5	-	-
Dentistry	1888	1840	32	15	1	-	-
Veterinary	320	314	6	-	-	-	-
Other Medical	149	114	27	7	1	-	-
	(4724)	(4074)	(408)	(192)	(31)	(13)	(6)
Industrial							
Radiography-fixed	70	52	15	2	1	-	-
Radiography-mobile	55	28	9	3	6	4	5
Transport	20	18	2	-	-	-	-
Industrial Irradiation	40	24	8	8	-	-	-
Other	512	422	64	18	3	4	1
	(697)	(544)	(98)	(31)	(10)	(8)	(6)
Education							
Higher Education	447	395	45	7			
Safety/Inspection	4	4	-	-			
	(451)	(399)	(45)	(7)			

ken down into more specific categories. The data show that 81% of those monitored for radiation are employed in the medical field, while 85% of all monitored personnel recorded radiation doses during the year below the minimum detectable level of 0.1 mSv. A more detailed breakdown of the data is shown in Table 3.

Instrument Calibration Service

The highlight of the past year for the Institute's Calibration Service has been the awarding to it of accreditation by the Irish National Accreditation Board. Accreditation requires compliance with procedures issued by the European Co-operation for Accreditation of Laboratories. This award confirms the high quality of measurements performed by the laboratory and creates confidence in the work carried out on behalf of customers.

The RPII offers a calibration service for:

- Ionising radiation dose/doserate meters used to measure ambient radiation intensity.
- Surface contamination monitors, typically used to detect radioactive spillage on benches.
- Personal monitors/alarms used to give a direct reading of radiation dose to an individual.

Depending on their application, instruments are checked for compliance with the manufacturer's

specification by exposing them to radiation of different energies and/or doserates using equipment calibrated and traceable to a primary standard. Calibration of an instrument involves exposing it to a known quantity of radiation and comparing the instrument reading with the standard. A computer controlled distancing table varies the radiation intensity and a closed circuit TV system displays the instrument scale. A calibration certificate containing the test data is issued to the client. In 1998, 241 instruments were tested, of which three failed to meet the manufacturer's specification.

Licensees holding sealed radioactive sources are required to have them tested every two years for leakage. Testing is carried out by wiping the source or source housing and analysing the radioactivity content of the wipe. In 1998 a total of 353 sources were checked. None contained greater than the regulatory limit of 185 becquerels of radioactivity.

During the year the Calibration Laboratory also participated in an International Atomic Energy Agency (IAEA) intercomparison for TLDs used to assess exposure to caesium-137. Evaluation of the results showed no significant deviation between those reported by the Institute and those of the IAEA.



research programmes

Marine Radioecology

The Institute continued its participation in an arctic marine radioecology (ARMARA) project to assess potential consequences for the European seafood consumer of radioactive contamination of the Arctic waters. Thirteen European laboratories from nine countries are involved in the project which is partially funded by the European Union under its Nuclear Fission Safety Research Programme.

The Institute's role in the project is to investigate the influences of bio-turbation on plutonium concentrations in marine sediments due to the activity of sedentary invertebrates in sediments and the role they play in the transfer of contamination into the food chain. Much of this research has direct relevance to understanding the processes occurring in the Irish Sea.

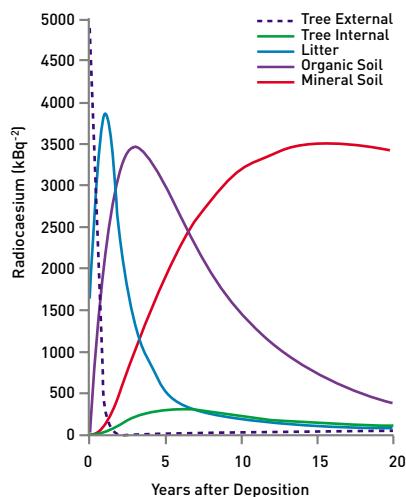
The 1998 work programme concentrated on the laboratory analysis of samples collected during the previous year from the seabed near Thule, Greenland. This area had suffered significant plutonium contamination some years previously. The samples were mainly sediment cores and invertebrates and they were analysed for their plutonium content. The data will be compared with data from the Irish Sea and will lead to a better understanding of plutonium uptake processes in the Irish Sea.

Terrestrial Radioecology

Ecosystem modelling - forests

Under the EU-funded research programme entitled "SEMINAT", the Institute, in collaboration with seven other European laboratories, continued its investigation into the movement of radiocaesium in forest ecosystems. The data collected from sites in forests of five European countries are being used to calibrate a computer model describing this movement. A typical output from this model is shown in Figure 5. The model shows that radiocaesium is quickly lost from the surface of the tree, including the canopy, to the forest floor and, subsequently, is bound up in the mineral soil. However, the long residence time in the forest floor leads to long-term transfer of contamination to wood.

Figure 5
Predicted Long-term Behaviour of
Radiocaesium within a Forest
Ecosystem after a Pulse Deposition



Ecosystem modelling - peatlands

The SEMINAT programme also involves studies of radiocaesium dynamics in semi-natural grazing systems. During 1998 an intensive programme of field sampling and analysis of radiocaesium behaviour in soils and plants in an Irish peatland ecosystem was completed. This data set and comparative data from Alpine pastures in Northern Italy and Southern Germany form the basis of a new ecological model of semi-natural grazing systems. The results, so far, suggest that radiocaesium behaviour in such marginal agricultural systems does not conform to behaviour patterns observed in intensive agriculture. This emphasises the need to give special attention to these systems in a radiation protection context.

Restoration strategies

As part of an EU-funded international programme entitled "TEMAS", the Institute continued to collate information on the effectiveness and consequences of restoration of radioactively contaminated agricultural land. A "decision support tool", in the form of computer software, is in development which presents, to the decision maker, options for remediation of both rural and urban contamination scenarios.

The data upon which this tool is established have been drawn from the scientific literature and from direct field trials of remediation technology. In Ireland, the Institute tested one such remediation option - application of potash on a peatland grazing system. Important assessment criteria for remediation options are effectiveness, duration and secondary effects of the action. Potash was found to be effective in reducing the transfer of radiocaesium to peatland plants but the effectiveness was shown to vary between plant species. However, the duration of effect was less than one year, indicating the need for repeated application of this measure. No secondary effects on the vegetation were observed.

In addition to radiological considerations, the social and economic impacts of large scale radioactive contamination can be significant and are of ongoing concern in the former Soviet Union. The effectiveness of remediation strategies for contaminated forests and their impact on the daily life of residents in the forested areas, is the focus of the Institute's research, under a second EU funded project, the "FORECO" project, conducted in co-operation with scientists from Belarus, Russia and the Ukraine. One aspect of this work explored, through direct interview with residents of a forested region in Russia, local perception of the level of contamination and of the local authority's approach to radiation protection. The Institute's participation in the project involved analysis of the data collected. It confirmed that, while most of the people interviewed adhered strictly to the local authority's guidelines, there was little expression of faith in the efficacy of these measures. This lack of trust indicates that the well-being of the individual remains compromised even though the radiological risk is reduced. Such social and psychological considerations are essential to a holistic approach to post-nuclear accident management.



international liaison

The Institute continued to support at international level improvements in radiation protection and nuclear safety standards by participation in the relevant committees, expert groups and working parties of the European Union, the International Atomic Energy Agency (IAEA) and the Nuclear Energy Agency (NEA) of the Organisation of Economic Co-operation and Development (OECD), as well as those associated with international conventions such as the Ospar Convention for the prevention of pollution of the marine environment.

The Institute was involved in a formal exchange of information on nuclear licensing and safety issues with the Nuclear Installations Inspectorate of the UK Health and Safety Executive. It also joined the Department of Public Enterprise in the exchange of information on a wide range of radiation and nuclear issues with the UK Department of the Environment, Transport and the Regions and other appropriate UK Departments, with Northern Ireland government agencies and with representatives of the Government of the Isle of Man.

Some of the areas in which the Institute provided advice and participated in discussions included: -

Sellafield Related Issues

- The UK Minister of State at the Department of the Environment, Transport and the Regions is considering an application from British Nuclear Fuels plc (BNFL) for permission to operate its new Mixed Oxide Fuel plant (MOX). This plant produces nuclear fuel containing a mixture of uranium and plutonium isotopes. Serious questions had been raised about the justification for this plant and Ireland made representations expressing concerns and objecting to its operation.
- The same UK Minister of State is also considering an application by BNFL for a revision of its authorisation for discharges from Sellafield to the Irish Sea. Ireland made representations expressing its strong objections to discharges from Sellafield to the Irish Sea and calling, in particular, for immediate reductions of all

discharges and elimination of the discharges of technetium-99.

- The storage of highly radioactive wastes in liquid form in tanks at Sellafield with its attendant accident risk continues to be a source of concern. Whilst a programme is in place to encapsulate these wastes in a vitrified glass form, an increase in the rate at which this is being done was sought with a view to decreasing the risks to Ireland.

European Union

The Institute participated with the Department of Public Enterprise in preparing proposals for the implementation of the 1996 Council Directive revising the basic safety standards for the protection of the health of workers and the general public against the dangers arising from ionizing radiation. These proposals will be the basis for a new statutory instrument to replace the existing regulations contained in S.I. No. 43 of 1991 and S.I. No. 151 of 1993. A second Council Directive supplementing the basic safety standards Directive lays down the general principles of the radiation protection of individuals undergoing medical exposures. It is being implemented by the Department of Health and Children and both new sets of legislation must come into force by May 2000.

The Council of Ministers approved the fifth framework programme for research and training of the European Atomic Energy Community (Euratom). There are two key actions, one covering research into controlled thermonuclear fusion and the second into nuclear fission. The objectives of the latter are to enhance the safety of Europe's nuclear installations, improve competitiveness, ensure the protection of workers and the public from radiation and contribute towards maintaining a high level of expertise and competence in nuclear technology and safety. In addition to the two key actions, there will be research and

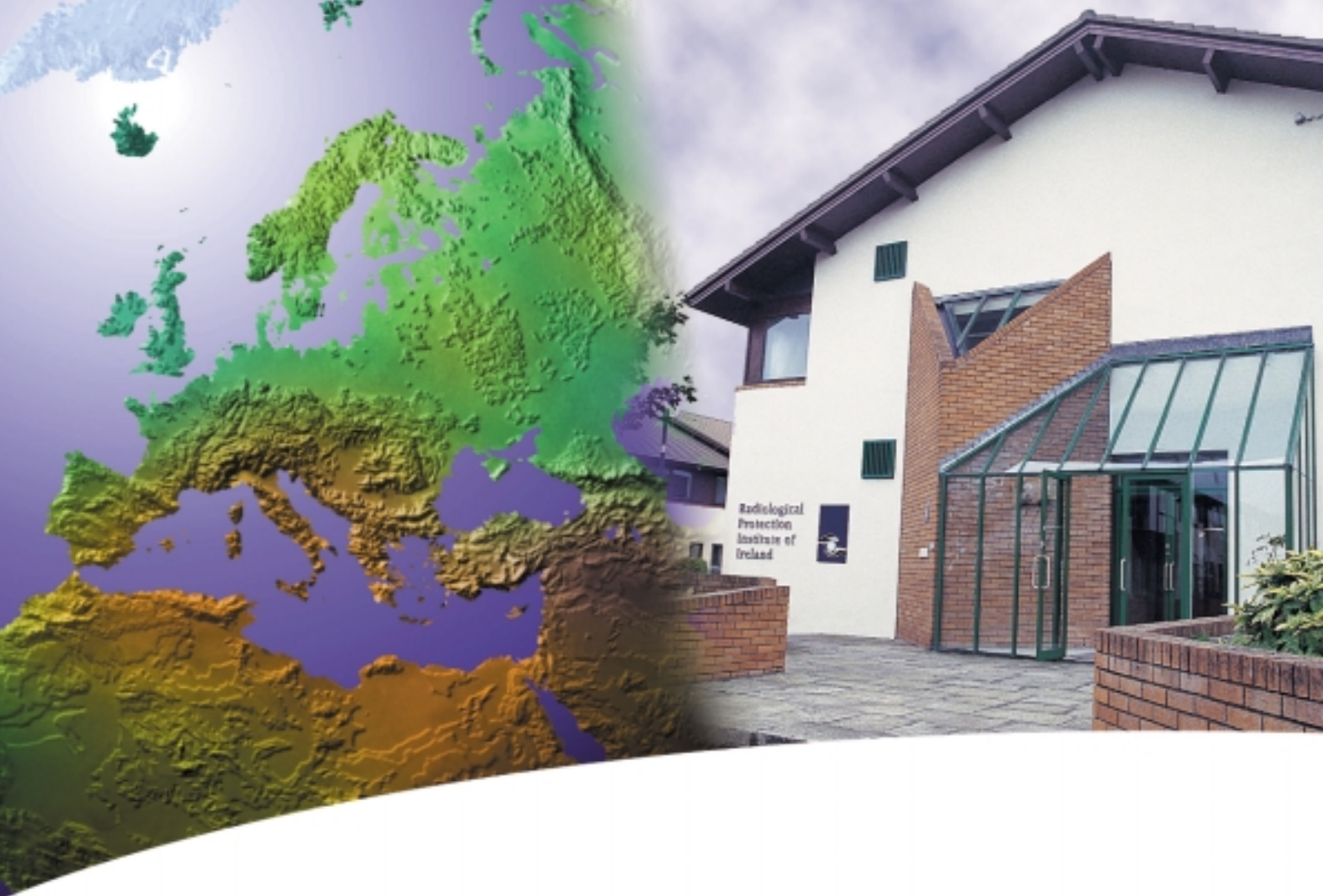
technological development activities of a generic nature. The objectives of these are to consolidate and advance European knowledge and competence in the radiological sciences essential for the safe use of nuclear fission and ionising radiation.

The Institute participated in the Consultative Committee and the External Advisory Group to assist the Commission in its formulation of the fission safety component of the fifth framework programme. The latter group will evaluate the programme as it is being implemented against its strategic objectives.

The Institute continued to provide a delegate to the Statutory Group of Experts convened under Article 37 of the Euratom Treaty to advise the Commission on the possible effects on other Member States of a plan by a Member State to dispose of radioactive wastes. The Commission is required to consult this Group of Experts before issuing its formal opinion of such a plan.

Article 35 of the Euratom Treaty deals with the monitoring of radioactivity levels and the Institute provided the national delegate to the group which established common criteria and standards for the EU.

Of concern in the EU during 1998 was the importation of some contaminated foodstuffs from eastern Europe. The ad hoc group established under an earlier Council Regulation reviewed the situation and issued a revised Regulation reinforcing the control of imports.



The safety of nuclear power stations and other installations of the nuclear fuel cycle in eastern Europe and the countries of the former Soviet Union is assisted through the European Union's PHARE and TACIS technical assistance programmes. The Institute provided a delegate to the group of nuclear experts advising the Commission on the implementation of these programmes. During 1998 particular attention was paid to radioactive waste management problems and emergency planning.

Convention on Nuclear Safety

Preparations continued during 1998 for the first Peer Review meeting in 1999 of countries participating in this Convention relating to the regulation, management and operation of nuclear power plants. Countries have submitted national reports detailing their compliance with the objectives of the Convention.

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

This Convention was opened for signature in 1997 and by the end of 1998 had been signed by some 30 countries. Ireland was among the early signatories. The Convention contains a number of objectives relating to all aspects of the management and safety of spent nuclear fuel and radioactive wastes. Like the Convention on Nuclear Safety, the Convention provides for a powerful mechanism to review compliance with its objectives. It is hoped that the Convention will come into force in the near future and become an effective instrument for the enhancement of safety worldwide.

Nuclear Energy Agency (NEA) of the OECD

The Institute provides national representation on the Steering Committee of the NEA and on the Agency's Standing Committees on Radiation Protection and Public Health, Radioactive Waste Management and the Safety of Nuclear Installations. These Committees deal with a wide range of radiation protection and safety issues. The ad

hoc Expert Group established at the request of the Oskar Convention in 1997 continued its work during 1998 on evaluation of the radiological impact of spent fuel management options i.e. the reprocessing and non-reprocessing options.

Oskar Convention

The Institute participated in the work of the Oskar Convention on radioactive discharges and related issues. The Convention's RAD group met in January and among the more important matters on its agenda was the development of an Oskar strategy for radioactive substances. This strategy was adopted by all participating countries after further negotiation at the Oskar Ministerial Meeting in Portugal in June. The strategy states that

by the year 2000

the Commission will, for the whole maritime area, work towards achieving further substantial reductions or elimination of discharges, emissions and losses of radioactive substances.

by the year 2020

the Commission will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero.

Participating countries are required to submit to the Commission in 1999 national reports on how this strategy will be implemented. This will be reviewed at the January 2000 meeting of the RAD group and a report submitted to the Oskar Annual Meeting in June 2000.



information service & publications

The Institute provides an information service to keep the public informed on issues relevant to its activities. There is a continuing demand for information on the Institute and its activities with over 1000 enquiries received by the Information Service in 1998. The library at the Institute houses a specialised collection of books, technical reports and journals on radiological protection and nuclear safety. The library services the needs of the staff of the Institute and is also open to outside readers and provides a reference service to researchers, students and members of the public.

During 1998, the RPII issued 10 news releases on a variety of subjects including radon surveys and results of radioactivity monitoring programmes and almost 170 media requests for information were answered. Staff were interviewed for radio and television programmes on over 50 occasions throughout the year.

Staff regularly participated in conferences, seminars and exhibitions both nationally and internationally and the Institute provided speakers to public meetings, third level institutions, hospitals and other organisations. In 1998, many visitors with an interest in radiological protection, from home and abroad, were welcomed to the Institute by staff who gave presentations and tours of the facilities and laboratories.

During 1998, the RPII organised two conferences, both of which were concerned with the implementation of two new European Council Directives. In March 1998, a workshop was held which successfully introduced discussions of the proposals for implementing the Directives in Ireland. In July, in co-operation with the European Commission, an international conference on Cosmic Radiation and Air Crew Exposure was held with the objective of assisting both the airline industry and the national regulatory organisations in identifying the means available to comply with the requirements of the new Basic Safety Standards Directive insofar as they relate to the exposure of air crew to cosmic radiation.

The IAEA's International Nuclear Information System (INIS) is an information system set up by the IAEA and its Member States with the purpose of identifying publications related to nuclear science and its peaceful applications. The database is highly relevant to the Institute's areas of activity and the Institute provides the Irish Liaison Officer for the INIS system. Items relevant to the database and published in Ireland are input to the system using software supplied by the IAEA and the data is sent using electronic mail.

During the year, the RPII continued with its programme of publishing scientific reports, which are widely distributed among interested groups.

Publications

RPII Reports

Long, S., Pollard, D., Hayden, E., Smith V., Fegan, M., Ryan T.P., Dowdall, A., Cunningham, J.D. 1998.

Radioactivity monitoring of the Irish marine environment 1996 and 1997. Radiological Protection Institute of Ireland, RPII-98/2.

McGarry, A.T., Fennell, S.G., Mackin, G.M., Madden, J.S., 1998.

Radon in dwellings - The National Radon survey Cork and Kerry. Radiological Protection Institute of Ireland. RPII-98/1.

McGarry, A.T., Fennell, S.G., Mackin, G.M., Madden, J.S., O'Colmáin, M. 1998.

Radon in dwellings - The National Radon survey Clare, Limerick and Tipperary. Radiological Protection Institute of Ireland. RPII-98/3.

Scientific Papers

Belli, M., Rafferty, B*, Synnott, H*, Sansone, U. 1998. Countermeasures in forest ecosystems: A preliminary classification in terms of dose reduction and ecological quality.

In **Proceedings of the 1998 International Radiological Post-Emergency Response Issues Conference** held in Washington, D.C. USA 9-11 September 1998. EPA 402-S-98-001. p. 129-136.

Berrow, S.D., Long, S.C*, McGarry, A.T*, Pollard, D*, Rogan, E., Lockyer, C. 1998. Radionuclides (¹³⁷Cs and ⁴⁰K) in harbour porpoises *Phocoena phocoena* from British and Irish coastal waters.

Marine Pollution Bulletin, 36, [8], p. 569-576.

Haberhauer, G., Rafferty, B*, Strebl, F., Gerzabek, M.H. 1998.

Comparison of the composition of forest soil litter derived from three different sites at various decompositional stages using FTIR spectroscopy. **Geoderma**, 83, p. 331-342.

Howett, D., O'Colmáin, M. 1998.

Measurement of krypton-85 in air at Clonskeagh Dublin 1993-1997.

Journal of Radiological Protection, (18), 1, p. 15-21.

Long, S., Hayden, E., Smith, V., Ryan, T., Pollard, D., Cunningham, J., 1998. An overview of the Irish marine monitoring programme.

Radiation Protection Dosimetry, 75, [1-4], p. 33-38.

Pollard, D., Ryan, T., Dowdall, A. 1998.

The dose to Irish seafood consumers from ²¹⁰Po. **Radiation Protection Dosimetry**, 75, [1-4], p. 139-142.

Rafferty, B., Synnott, H. 1998.

FORECO. Countermeasures applied in forest ecosystems and their secondary effects. A review of literature.

Agenzia Nazionale per la Protezione Dell'Ambiente, Series Documenti 6/1998.

Rafferty, B., Synnott, H., Dawson, D. 1998.

Remediation options for agricultural land: Evaluation and strategy development.

In **Proceedings of the 1998 International Radiological Post-Emergency Response Issues Conference** held in Washington, D.C. USA 9-11 September 1998. EPA 402-S-98-001. p. 123-128.

Synnott, H., Rafferty, B., Dawson, D. 1998.

Secondary effects of important agricultural countermeasures on the yield and quality of selected crops.

TEMAS project deliverable number RPII-TEMAS-1/98.

General Articles

Howett, D. 1998.

Monitoring of krypton-85 in air.

The Irish Scientist - 1998 Yearbook, (6), p.116.

* RPII staff in conjunction with other authors.

advisory committees

Environmental Radiation

This Committee provides advice on radioactivity in the environment and on the co-ordination with other bodies of joint work programmes in this area.

Chairman

Gregory Burke
Tony Colgan
John D. Cunningham
Ian R. McAulay
Ann McGarry
James P. McLaughlin
Peter I. Mitchell
Darina Muckian
Noel V. Nowlan
Tom O'Flaherty
Geraldine O'Reilly
Adi Roche
Tom Ryan
Philip Walton
David Pollard

Scientific Secretary

Medical Radiation

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

Chairman

George Duffy
Fionnuala Barker
James Carr
Mary Coffey
John D. Cunningham
Edward Fitzgerald
Christopher Hone
Lynn Johnston
Pat Kenny
Brendan McClean
Lesley Malone
James Masterson
Kate Matthews
Michael Moriarty
Dan Murphy
Liam Murray
Noel O'Connell
Tom O'Flaherty
Geraldine O'Reilly
Wil van der Putten
David Fenton

Scientific Secretary

financial statements

Prompt Payment of Accounts Act 1997

The Prompt Payment of Accounts Act 1997 (the Act) came into operation on 2 January 1998. The Radiological Protection Institute of Ireland comes under the remit of the Act. The payment practices of the Radiological Protection Institute of Ireland are reported on below for the year ended 31 December 1998 in accordance with Section 12 of the Act.

- (a) It is the policy of the Radiological Protection Institute of Ireland to ensure that all invoices are paid promptly. Specific procedures are in place to enable it to track all invoices and ensure that payments are made before the due date. Invoices are registered daily and cheques are issued as required to ensure timely payment.
- (b) The system of internal control incorporates such controls and procedures as are considered necessary to ensure compliance with the Act. The organisation's system of internal control includes accounting and computer controls designed to ensure the identification of invoices and contracts for payment within the prescribed payment dates defined by the Act. These controls are designed to provide reasonable, and not absolute, assurance against material non-compliance with the Act. The accounts department produces a report that identifies unpaid outstanding invoices and this report is reviewed regularly.
- (c) During the year the total number of late payments, with individual values in excess of IRE250, was two and they were, on average, 15 days over the due date. The total value of these late payments was IRE3148, representing 0.1% of total payments made by the Institute, with associated penalty interest payments of €20. Approximately 99.9% of all payment demands were paid within the prescribed timeframe.

T O'Flaherty
Chief Executive

29 October 1999

Report of the Comptroller and Auditor General pursuant to Section 13 of the Prompt Payment of Accounts Act, 1997

Responsibilities of the Institute and of the Comptroller and Auditor General

The Institute is obliged to comply with the Act and, in particular, is required to ensure that it

- pays its suppliers within the payment periods specified in the Act
- pays penalty interest on late payments and furnishes information on such interest to suppliers as laid down in the Act
- submits a report on its payment practice as set out in Section 12 of the Act

Under Section 13 of the Act, it is my responsibility, as auditor of the Radiological Protection Institute of Ireland, to report on whether, in all material respects, the Institute has complied with the provisions of the Act.

Basis of Opinion

My examination included a review of the payment systems and procedures in place and checking, on a test basis, evidence relating to the operation of the Act by the Institute during the year.

I obtained all the information and explanations which I considered necessary for the exercise of my function under Section 13 of the Act.

Opinion

Nothing came to my attention which in my opinion indicated that the Institute had not complied in all material respects with the provisions of the Act during the year ended 31 December 1998.

John Buckley
For and on behalf of the
Comptroller and Auditor General

24 November 1999

report of the comptroller & auditor general

I have audited the financial statements on pages 36 to 40.

Responsibilities of the Institute and of the Comptroller and Auditor General

The accounting responsibilities of the Institute are set out in the Statement of Responsibilities of the Institute on page 35. It is my responsibility, under Section 16 of the Radiological Protection Act, 1991, to audit the financial statements presented to me by the Institute and to report on them. As a result of my audit I form an independent opinion on the financial statements.

Basis of Opinion

In the exercise of my function as Comptroller and Auditor General, I plan and perform my audit in a way which takes account of the special considerations which attach to State bodies in relation to their management and operation.

An audit includes examination, on a test basis, of evidence relevant to the amounts and disclosures in the financial statements. It also includes an assessment of the significant estimates and judgements made in the preparation of the financial statements, and of whether the accounting policies are appropriate, consistently applied and adequately disclosed.

My audit was conducted in accordance with auditing standards which embrace the standards issued by the Auditing Practices Board, and in order to provide sufficient evidence to give reasonable assurance that the financial statements are free from material misstatement whether caused by fraud or other irregularity or error. I obtained all the information and explanations that I required to enable me to fulfil my function as Comptroller and Auditor General and, in forming my opinion, I also evaluated the overall adequacy of the presentation of information in the financial statements.

Opinion

In my opinion, proper books of account have been kept by the Institute and the financial statements, which are in agreement with them, give a true and fair view of the state of affairs of the Radiological Protection Institute of Ireland at 31 December 1998 and of its income and expenditure for the year then ended.

John Buckley
For and on behalf of the
Comptroller and Auditor General

24 November 1999

statement of responsibilities of the institute

Section 16(1) of the Radiological Protection Act, 1991, requires the Institute to prepare financial statements in such form as may be approved by the Minister with the concurrence of the Minister for Finance. In preparing these financial statements, the Institute 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 unless it is inappropriate to presume that the Institute will continue in operation.

The Institute is responsible for keeping proper books of accounts which disclose with reasonable accuracy at any time the financial position of the Institute and which enable it to ensure that the financial statements comply with section 16(1) of the Act. The Institute is also responsible for safeguarding the assets of the Radiological Protection Institute of Ireland and for taking reasonable steps for the prevention and detection of fraud and other irregularities.

Patrick Connellan
Board Member

George Duffy
Board Member

statement of accounting policies & principles

1. General

The Radiological Protection Institute was established in April 1992 in accordance with the provisions of the Radiological Protection Act, 1991.

Its functions include the provision of advice, the regulation of activities relating to the use of ionising radiation, the preparation of safety codes and the promotion of knowledge, proficiency and research in nuclear science and technology. Other functions are to monitor and measure levels of radioactivity in the environment, to assess their significance, to maintain a national laboratory for this purpose, and to assist in the development of national plans for emergencies arising from nuclear accidents.

The Radiological Protection Act, 1991 provided for the dissolution of the Nuclear Energy Board and the subsequent transfer of its functions and net assets to a new body to be known as the Radiological Protection Institute of Ireland. The Nuclear Energy Board was dissolved on 1st April 1992.

2. Accounting Convention

The Financial Statements have been prepared under the historical cost accounting convention.

3. Grants

Income shown in the Financial Statements under Oireachtas grants represent actual cash receipts in the year.

4. Fixed Assets

Fixed Assets are stated at cost less accumulated depreciation. Depreciation is calculated on a straight line basis by reference to the expected useful lives of the assets concerned. The rates used are as follows:

Office & Laboratory, Furniture & Equipment:	20%
Motor Vehicles:	20%
Leasehold improvements are depreciated over the life of the lease.	

5. Superannuation

A Superannuation Scheme under Section 14 of the Nuclear Energy (An Bord Fuinnimh Nuicleigh) Act, 1971 was in operation up to 31st March 1992. A new scheme has been drawn up in accordance with the provisions of Section 13 of the Radiological Protection Act, 1991 and is awaiting final approval. Contributions of £63,149 in 1998 were credited against salaries. No provision has been made in the Financial Statements in respect of future superannuation liability. Superannuation benefits are met from revenue as they arise.

6. Capital Account

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

7. Contract Income

Contract Income includes amounts received from the European Community under contracts for fixed periods. Amounts received under these contracts have been treated as deferred credits, and released as income proportionately over the lives of the related contracts.

8. Income in Advance

Income in advance relates to licence fee income paid in advance by licensees in respect of future periods.

income & expenditure account

For the year ended 31 December 1998

1997		1998	
£		£	£
	Income		
1,279,000	Oireachtas Grant in Aid	1,507,000	
53,553	Transfer (to)/from Capital Account (Note 2)	(59,353)	
<u>1,332,553</u>	Used for Current Purposes		1,447,647
169,149	Dosimetry Service	153,836	
181,412	Product Certification	174,799	
143,905	Contract Income	279,985	
2,198	Interest Income	373	
56,592	Other Income	57,942	
87,887	Licence Fees	89,817	
<u>641,143</u>			<u>756,752</u>
<u>1,973,696</u>			<u>2,204,399</u>
	Expenditure		
1,100,781	Salaries and Pensions (Note 3)		1,293,733
58,859	Dosimetry Service		54,488
54,866	Library and Information Service		47,298
50,847	Radon and Radioecology		79,412
28,770	Emergency Plan		29,367
62,267	Environmental Monitoring		44,714
201,729	Accommodation and Insurance (Note 4)		222,568
96,454	Travel and Subsistence		78,653
132,277	Telephone, Postage and Office Supplies		121,424
23,322	Recruitment and Training		11,830
45,218	Miscellaneous including Professional Fees		32,188
170,224	Depreciation (Note 1)		187,749
<u>2,025,614</u>			<u>2,203,424</u>
(51,918)	Surplus/(Deficit) for year		975
229,336	Balance at 1 January		177,418
<u>177,418</u>	Balance at 31 December		<u>178,393</u>

The Statement of Accounting Policies and Principles, and notes 1 to 4 form part of these Financial Statements.

Patrick Connellan
Board Member
Date: 04/11/99

George Duffy
Board Member
Date: 04/11/99

balance sheet

As at 31 December 1998

1997 £		Notes	1998 £
715,534	Fixed Assets	1	774,887
	Current Assets		
195,654	Cash on Hand and at Bank		317,270
189,302	Debtors and Prepayments		104,039
<u>384,956</u>			<u>421,309</u>
	Creditors - amounts falling due within one year		
(137,744)	Creditors and Accruals		(190,833)
(69,794)	INCOME IN ADVANCE		(52,083)
<u>(207,538)</u>			<u>(242,916)</u>
177,418	Net Current Assets		178,393
<u>892,952</u>	Net Assets		<u>953,280</u>
	Financed by:		
177,418	Income and Expenditure Account		178,393
715,534	Capital Account	2	774,887
<u>892,952</u>			<u>953,280</u>

The Statement of Accounting Policies and Principles, and notes 1 to 4 form part of these Financial Statements.

notes to the financial statements

For the year ended 31 December 1998

1 Tangible Fixed Assets

	Leasehold Improvements £	Office and Laboratory Furniture and Equipment £	Motor Vehicles £	Total £
Cost:				
At 1 January 1998	620,838	2,600,602	15,955	3,237,395
Additions	-	247,102	-	247,102
Disposals	-	(8,567)	-	(8,567)
At 31 December 1998	<u>620,838</u>	<u>2,839,137</u>	<u>15,955</u>	<u>3,475,930</u>
Depreciation:				
At 1 January 1998	197,190	2,318,289	6,382	2,521,861
Charge for year	20,173	164,385	3,191	187,749
On disposals	-	(8,567)	-	(8,567)
At 31 December 1998	<u>217,363</u>	<u>2,474,107</u>	<u>9,573</u>	<u>2,701,043</u>
Net Book Value at				
31 December 1997	<u>423,648</u>	<u>282,313</u>	<u>9,573</u>	<u>715,534</u>
Net Book Value at				
31 December 1998	<u>403,475</u>	<u>365,030</u>	<u>6,382</u>	<u>774,887</u>

2 Capital Account

	1998 £
Balance at 1 January 1998	715,534
Transfer from Income and Expenditure Account:	
Grants allocated for Capital purposes	247,102
Grants amortised in year	<u>(187,749)</u>
	59,353
Balance at 31 December 1998	<u>774,887</u>

notes to the financial statements

continued

3 Salaries and Pensions

	1998 £	1997 £
Gross Salaries	1,325,268	1,125,316
Employer's P.R.S.I.	31,614	36,252
Pension Deductions	<u>(63,149)</u>	<u>(60,787)</u>
	<u>1,293,733</u>	<u>1,100,781</u>

Breakdown of Salaries and Pensions

Administration	251,050	163,792
Regulation/Dosimetry	319,549	322,992
Environmental Monitoring	327,196	283,019
Information/Radon/Radioecology	299,142	229,347
Emergency Plan	77,521	56,106
Nuclear Safety	<u>19,275</u>	<u>45,525</u>
Charged to Income and Expenditure Account	<u>1,293,733</u>	<u>1,100,781</u>

4 Commitments and Lease Obligations - Operating Leases

3 Clonskeagh Square

Lease commitments payable in the next twelve months amount to £195,000 on the basis of current rental rates and comprise rental payments on a leasehold interest, the term of which expires on 1 October 2018. The rental is subject to review at five-yearly intervals. The last such review was 1 October 1998.

Floor 1, Block 1, 1 Clonskeagh Square

Lease commitments payable in the next twelve months amount to £10,000 on the basis of current rental rates and comprise rental payments on a leasehold interest, the term of which expires on 11 January 2002.