The Changing Role of the Radiation Protection Professional

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Abstract: There is a synergism between the development of radiation protection infrastructures and the evolution of the role of radiation protection professionals. This paper provides a personal view of the challenges facing radiation protection and how these interact with the role of the professional. It draws on the authors experience with NRPB and as President-Elect of the UK Society for Radiological Protection. Whilst written from a UK perspective many of the challenges are common to other countries.

1. INTRODUCTION

Most European Union countries have a robust and mature radiation protection and regulatory infrastructure. In part it will have been shaped by going through the implementation of a series of European Basic Safety Standards (BSS) Directives and the various collaborative projects under the EU Framework Research Programmes. These have provided a harmonising effect, but there are other national drivers that shape the radiation protection and regulatory infrastructures. For example the presence of a civil or military nuclear programme affects the scale and range of professional radiological expertise needed. Similarly the national safety culture and regulatory approach to Health and Safety in general have an impact. Some countries find that a prescriptive regulatory approach works for them, whereas others find a goal setting approach is more appropriate.

These factors and others have synergistically interacted with the evolution of the radiation protection profession, in that strong professional input has been beneficial to the development of infrastructures and their effectiveness. The various national professional societies have had a significant impact in this respect, as has the growth of the international umbrella organisation, the International Radiological Protection Association (IRPA).

This paper provides a personal view of some of the challenges to the radiological protection profession. It is written from a UK perspective but many of the challenges are common to other countries, or have the potential to become so. Here it is perhaps worth reflecting on the fact that there are a number of EU applicant countries at varying stages of development of their radiological protection and regulatory infrastructures. The same is true of many trading partners around the world. We need to recognise that their priorities may be different eg, attaining a critical mass of expertise before honing the finer points of radiological protection. One of the challenges to the radiation protection profession is to ensure we learn from each other and nurture development.

2. THE UK SCENE

2.1 Professional Bodies

The leading radiological protection professional body in the UK is the Society for Radiological Protection (SRP). There are other sector specific professional bodies that are also relevant

- Institute of Physics and Engineering in Medicine (IPEM).
- Association of University Radiation Protection Officers (AURPO).
- Institute of Radiation Protection (IRP).
- British Institute of Radiology (BIR).
- College of Radiographers (COR).

Many professionals, whether they be from operators, consultants or regulators, are members of SRP and one or more of the other societies. Collectively they have a strong impact on radiation protection within the UK. The Societies often take the lead, with support from the competent authorities in developing sector specific guidance.

2.2 Certification of Qualified Experts

The Ionising Radiations Regulations, 1985 [1] (IRR85) implemented the earlier European BSS [2] and in particular introduced the need for most radiation users to appoint a "Qualified Expert", or as it is referred to in UK legislation, a "Radiation Protection Adviser" (RPA). In many sectors e.g. nuclear, medical and academic, RPAs already existed, albeit under a variety of titles, but the IRR85 had the effect of raising the profile of the radiation protection professional: with a corresponding positive impact on the standards achieved in practice. Although the professional bodies developed and operated Certification of Competence schemes, these certifications had no standing in law.

Over the last couple of years, one of the most tangible aspects of the changing role of radiation protection professionals has been the introduction in the Ionising Radiation Regulations 1999 (IRR99) [3], which implemented the latest BSS [4], of the requirement for an RPA (an individual or a corporate body) to meet "such criteria of competence as may from time to time be specified in writing by the Executive". Here the "Executive" is the Health and Safety Executive (HSE), the relevant Competent Authority. In addition to publishing criteria of competence HSE have also set out standards they require before they will approve an Assessing Body [5] to issue an RPA Certificate of Competence. There are currently 2 Assessing Bodies in the UK, one run by British Nuclear Fuels plc for its own staff and RPA2000 open to all applicants, established and operated by SRP in conjunction with the other professional bodies.

The HSE criteria require applicants to demonstrate

i. Basic knowledge and training – as a minimum this must cover the training syllabus set out in reference 5, which is based on the syllabus in paragraph 2, Annex 1 of the Official Journal of the European Communities C133, 30 April 1998.. Typically someone having a relevant science degree and having attended NRPB's Post Graduate Radiation Protection (PGRP) course or the replacement Radiation Protection Training Scheme (RPTS) core module, should be able to meet this requirement.
ii. Practical competencies – Here the applicant has to provide a portfolio of evidence to demonstrate that he/she understands the knowledge and can put it into practice. The evidence has to cover 9 main competencies

    - Supporting Risk Control
    - Updating Radiation Safety policies
    - Assessing Risk
    - Establishing Radiation Controls
    - Cultivating Safety Awareness
    - Legislation Compliance
    - Training of Staff
    - Contributing to Advances in Safety

    each with 2 to 4 sub competencies. For full details see http://www.srp-uk.org/rpa2000. Typically there will be 15 to 25 pieces of evidence e.g. reports, documents, risk assessments, accident investigations etc that would fill a 3 to 5 cm ringbinder. A new entrant to the profession would typically require 3 years to accumulate sufficient evidence.

The RPA2000 scheme has an Assessment Panel of senior members of the profession with relevant experience, who must themselves maintain a Continuing Professional Development (CPD) file. For each applicant, a Lead Assessor and 2 Additional Assessors are appointed. The former provides a written evaluation of the portfolio of evidence, which the Additional Assessors can either accept or opt to see the evidence themselves.

Both those preparing the Portfolios of Evidence and those assessing them have been through a steep learning curve. As at August 2002 the numbers in the RPA2000 scheme are as given in Table 1 There are still many challenges in this area: not least of which will be processing all the expected applicants before the transitional arrangements in IRR99 (which allows RPAs appointed under IRR85 to continue for a limited period) end on 31 December 2004.

Table 1 Status of RPA2000 applications as at 31/8/02

Status	Qualified Expert	Specialist* Certificates
Total Applicants	126	50
Awarded	80	33
Rejected	11	6
Outstanding	35	11

*Some are joint applications for qualified expert and specialist certificates, whilst others are stand alone specialist certificates.

2.3 Suitability of RPAs

A portfolio of evidence is likely to be restricted to work in the sector that the applicant has worked in for the last couple of years. This begs the question that if Certificated as an RPA would that person be suitable to work in another sector? For example there are clearly differences in the experience needed to act as a "suitable" RPA in a radiotherapy department and that needed for a plutonium handling facility. One way to address this might be through sector specialisation endorsements to the basic certification. Both the societies and HSE felt that to legally require this would be too bureaucratic and a hindrance to job mobility, but equally both were happy for endorsement arrangements to be offered were members thought they might be useful. The key to answering the question is "suitability" and the regulations place an onus on the employer to consult a suitable RPA. In assessing this suitability it is a case of identifying the range of advice to be sought and comparing this with the existing experience of the candidate.

2.4 Developing the Specialists

RPAs are just one part of the profession. There are also those involved in the research work and the specialists in the various areas e.g. personal dosimetry, metrology, environmental discharges, emergency planning etc. As radiation protection infrastructures develop so there is more specialisation. Do we need to put more effort into recognising and encouraging the various specialisations? Many professional bodies have special interest or topic groups that help to fill this need and there are a variety of national and European wide groups that fulfil a similar function.

2.5 Enough Professionals for the Future?

In the UK in the 60s and early 70s there was a rapid expansion of the nuclear programme (and increased uses of radiation elsewhere) which led to an expansion of the number of radiation protection and other relevant professionals. Many of these have either retired or are nearing the end of their career. They are taking with them much "Corporate Knowledge" and experience which will be difficult to replace. This is particularly so in the nuclear industry, where in the UK we have a major decommissioning programme to deal with. In response a number of companies are putting increasing effort into keeping track of their former employees in case they need to tap into their knowledge.

Similarly are we doing enough to promote our profession as an attractive career and investing the resources to ensure we have sufficient suitably qualified professionals to deal with the profile of radiation

protection challenges? In the UK in the late 80s to late 90s the nuclear industry went through a period of rationalisation/"downsizing" with little recruitment. One impact of this has been the reduction of academic courses covering nuclear engineering and radiation protection. A further relevant factor is the image of the profession in the minds of the new graduates. They have grown up through a period where in the media, the demise of the nuclear industry has been regularly prophesised and where news bearing the "radiation" tag generally creates a bad image.

In the UK the Department of Trade and Industry has established a Nuclear Skills Group (www.nuclearskills.com) to undertake a two phase project that encompasses not only the nuclear sector, but radiation uses in the healthcare, defence and other sectors. The first phase is taking a quantitative 'snapshot' of the industries current needs and available skilled workforce, whilst the second phase, the "foresight exercise", will use alternative scenarios to predict the possible future shape, and form of the industry, and thereby identifying the demand for skilled people. These phases will be brought together in a report to provide the foundation for a 'stimulation' phase to encourage new blood into the industry and to expand education and training programmes in schools, universities and industry to develop the required skills. In parallel SRP is looking at ways of promoting the profession to the those in school and further education.

3. COMMON STANDARDS FOR QUALIFIED EXPERTS

The Article 31 Group established under the Euratom Treaty has set up a Working Group on Education and Training. One of its objectives is "To propose common, standard criteria for the training and qualification of the Qualified Expert in radiation protection, to allow for mutual recognition by Member States". The Working Group's initial look at this identified a wide variety of definitions, roles and requirements for Qualified Expert in member countries, making mutual recognition difficult. As a result a study has been initiated to investigate the respective regulatory frameworks and existing functioning of Qualified Experts in all Member States as well as applicant countries.

The results of this study are awaited with interest. Personal experience suggests that the standards and roles are quite diverse and it will be a major achievement if some convergence can be achieved. In areas of specialisation, such as environmental modelling and metrology, the scientific component dominates and harmonisation may be easier**.** However where the qualified expert is required to advise on achieving legal compliance, the diversity and complexity of national legislations mitigates against mutual recognition.

4. BROAD CHALLENGES

4.1 Non Ionising Radiation (NIR)

Although not expressly covered in this meeting, it has to be recognised that NIR has an increasing profile. NIR was not a feature in the early years of many of the older professionals; but increasingly new entrants need to be competent in both IR and NIR (particularly outside the nuclear sector). The two areas provide different types of challenges. IR is largely associated with mature technology and standards (international & national), but as we will see later there are proposals for simplification of the System of Radiological Protection. In contrast the field of NIR is faced with rapidly changing technology and the problem of developing Standards, both at the international level through the International Commission on Non-Ionising Radiation Protection (ICNIRP), and at the national level to deal with the practical problems. Denmark, who have the current presidency of the EU have put forward an initiative to have an EC Physical Agents Directive covering NIR. It is highly likely that the new generation of RP professionals will have to deal with this challenge during their career.

Another reason for addressing NIR issues is that for many outside the profession eg, public, media and politicians, the distinction between NIR and IR is not apparent or at best blurred. Of course the common feature is the 'radiation' tag. This means that controversies in either area can have a perceptional impact on the other.

4.2 Credibility and Communication

When many joined the profession decades ago, we, as scientists, were regarded as bastions of truth and guides to a better tomorrow. Unfortunately as Oscar Wilde observed "the truth is never pure and rarely simple" – or in our language, uncertainty is ever present to some degree and there are many parameters that affect the outcome of a situation. We all like simple answers: but when shown to be not so simple or shown to involve someone else making a valued judgement on what is safe, there is a tendency to adopt a more questioning attitude. Similarly if information is scarce, misleading or badly presented, the result can be allegations of a cover up. The damage done in such cases extends far beyond a week or two's drubbing in the media. Credibility suffers and confidence is shaken.

Over the last few decades there have been many challenges to the credibility of scientists in general eg, Chernobyl, "mad cow disease" (BSE), Foot and Mouth, combined measles, mumps and rubella (MMR) injections etc. Intermingled with this is the issue of Independence of advice. These overlay the issues of public concern specific to "radiation". The pursuance of these issues by activists and reporting in the media impacts on the public and the politicians, and in turn this influences the allocation of resources, scientific research programmes and strategic decisions at a national level. Collectively and individually the profession needs to improve how we communicate with the various audiences. Here we first need to accept that communication is a two way street; listening as well as giving advice and information. There have been a number of good conferences addressing the subject [6,7]. Much has been done, and is being done to address the subject but it is perhaps on the listening side that more effort is required:

- research to identify the audiences and stakeholders
- how to ascertain their views
- identification of what they really want to know
- how to involve them in the decision making process.

Important as the communication issues are we must not lose sight of the need to ensure the quality of the underlying science.

4.3 Proposals from ICRP

Some of us are still recovering from the challenges of implementing in national legislation the 1990 recommendations of ICRP [8] as incorporated in the BSS [4]. Thus it was perhaps no surprise that there were some sharp intakes of breath when ICRP announced their intention to review the recommendations on the system of protection. However this should not have come as a complete surprise in that the Commission has stated that its recommendations should be reviewed at a frequency of not less than 10 to 15 years – and the gestation period is significant. Consultation on ICRP 60 was much wider than for previous recommendations and this time round ICRP have set out with the intent of fully embracing consultation and stakeholder involvement. The first round centred on a paper from the Commission's Chairman on 'Controllable Dose' [9] which was a major source of discussion at the IRPA 11 conference in Hiroshima. The Main Commission have now considered draft recommendations for "Radiological Protection at the Start of the 21st Century and it is envisaged that they will be available for consultation before the end of 2002. Clearly the consideration of these proposals and whether they will meet the demands of the changing environment we live in will be a major challenge for the profession.

There is also one other potentially major change being developed by ICRP. Up until now ICRP has not dealt with radiological protection of the environment on the premise that the human habitat has been considered to be adequately projected through the application of the current system for protecting humans. However direct means of demonstrating this are lacking. The Main Commission of ICRP therefore decided to set up a Task Group with the aim of developing a policy and framework for the protection of non-human species. Again the Commission is pursuing an open consultation process and the draft report is accessible at http://www.org/draft-nonhuman.htm.

5. SOME CHALLENGES VIEWED FROM NRPB

This section of the paper provides a brief personal "bullet point" review of some of the challenges encompassed in NRPB's work programme.

5.1 NRPB Strategic Review: Communications

Communicating with the public is not formally part of NRPB's remit – BUT in practice it is a major activity. How we communicate with the public, or more precisely the publics as there are may sub-sets, was part of a Strategic Review carried out by the Board. Some key initiatives stemming from this are given below.

- The Board has established a Radiation, Risk and Society Advisory Group (R,RSAG) to develop new ways for NRPB to listen to Public concerns and use the results to influence its scientific work and publications.

- Website consultants were commissioned to research the needs of the various audiences and advise on ways forward. We are currently in the middle of a major revision of the website, with an increased focus on the needs of the public.

- NRPB will create more information in plain English, so that its work and advice will be more accessible and understandable to the public. The aim is to introduce plain English abstracts, as well as scientific abstracts, for our reports. All the material in the At-A-Glance leaflets is being transferred to a web version.

- Whilst hard copy will still be the primary publication route for the "Documents of the NRPB" they will be made available on the website. However, the website is now the primary route for other publications (the old R- and M- series publications have been replaced with a new W- series).

5.2 Electromagnetic Fields

Well established effects such as those on the central nervous system (for low frequencies) and of whole and partial body heating (for high frequencies) provide the basis for exposure standards. There is, however, concern that exposure to such fields may also be implicated in the development of cancer or may influence the function of the nervous system. Providing appropriate advice about possible health effects therefore presents a challenge.

- Initial studies with mice have so far provided no evidence that RF radiation characteristics of mobile phones affects animal behaviour.

- Further work is being undertaken under

    - Mobile Telecommunications Health Research (MTHR) Programme: this follows on from the Stewart Report of the Independent Expert Group on Mobile Phones (IEGMP),
    - An industry funded study with European collaborators.

- The IEGMP's recommendation to accept ICNIRP's Guidelines for mobile phones and base stations, provides some practical problems if applied across the frequency spectrum and the implications are being reviewed.

- Work is also continuing on studies of the possible effects of power frequency EMFs.

5.3 Optical Radiations

The Board's Advisory Group On Non-Ionising Radiations (AGNIR) has recently published a comprehensive report "Health Effects from Ultraviolet Radiation" [10]. The challenge here is to get the public to take notice of the real risks associated with UVR. This year has seen the start of a co-ordinated campaign with government departments and agencies, the voluntary sector and Devolved Administrations, for UV health promotion.

5.4 Low dose controversies

We are faced with different groups using diametrically opposed arguments over the shape of the dose response curve at low doses, namely:

- "a threshold dose exists": this cannot be proved one way or the other with epidemiological data, but the hypothesis ignores physics and cellular biology- and perhaps as important, the need for a pragmatic precautionary approach.

- "low doses from internal radiations from man-made sources are far more dangerous than those from natural radionuclides": again this hypothesis seems to be contrary to the vast majority of peer reviewed science. Nevertheless NRPB is committing resources to support the Committee Examining Radiation Risks from Internal Emitters (CERRIE). This was set up by the Environment Minister to review models used to estimate health risks from radioactive materials taken into the body. The Committee's review will take into account the views of all parties in the debate on risks of radiation. Its aim is to reach consensus where possible. On topics where different views remain after its deliberations, it will explain the reasons for these and recommend research to resolve them.

5.5 Epidemiology

- This is a key area underpinning much of RP. Well designed studies that have the power to yield valuable results, take time and must be rigorous – attributes that are not found in some studies that attract media attention. Indeed, an ongoing challenge to the profession is the significant amount of effort that has to be put into critiquing such work.

- The National Registry for Radiation Workers (NRRW) was set up in 1976 and the second analysis reported in 1999 included 120,000 people. It produced a risk estimate that was consistent with that recommended by ICRP and inconsistent with risk estimates about 4 times higher [11].

5.6 Environmental issues

- Estimates of peoples exposure often involve the use of mathematical models of radionuclide transfer in the environment. The ongoing challenge is to keep these "fit for purpose" as our knowledge base and understanding of pathways develops. A particular area of interest for NRPB in the next year or so is that of the behaviour of radionuclides in marine environments (as an aid to EC and UK input to OSPAR).

- Contaminated land and materials will provide a range of challenges as parts of our nuclear (and other industrial) facilities come to the end of their useful life. NRPB is currently developing a methodology for deriving doses for a number of uses of contaminated land.

- The development of a national policy on Waste disposal seems to be a perennial problem partly because of the failure to develop a consensus among stakeholders. A recent government Consultative Document from DEFRA [12] addresses this topic and importantly, significant emphasis is given to the various options for consulting the public.

5.7 Radon and Medical Exposures

- These two sources of exposure are the largest components of exposure of the public, but in many ways are the Cinderellas of public interest. As one of my colleagues put it " If we could only get the public to show the same level of interest in a mSv from radon or medical sources as they show in a μSv from discharges, it would be a great step forward".

- High dose medical X-ray procedures, such as Computed Tomography (CT) and interventional radiography, particularly when carried out on children, are of particular concern. In collaboration with appropriate professional bodies and the Department of Health, NRPB is developing methods and

protocols for establishing UK reference doses for common CT examinations and for checking local performance.

5.8 Occupational exposure control

- For the majority of practices, control of occupational exposures is reasonably good; ALARA has become part of the safety culture. In large part, this is felt to be due to the professionalism and influence of RPAs. Here the challenge is more one of avoiding complacency. One aspect of this is making sure we have and maintain appropriate feedback mechanisms to learn the lessons from accidents and good practices.

- One long standing problem area is that of industrial radiography, particularly site radiography. Improving the training and supervision is a challenge, but another fruitful approach might be through client power exercising "Zero tolerance" of poor practices on their premises.

- It is not clear to what extent employers, particularly in Radon Prone Areas, have assessed radon levels in the workplace, and where necessary taken action.

5.9 Orphan Source issues

- Around the world there has been a series of serious accidents involving "orphan sources": these have given rise to significant health and environmental/economic consequences.

- The metals recycling industry, which is international in nature, is where many orphan sources end up. As a result the UK metals recycling industry has had to invest heavily in Portal monitoring systems. Whilst they protect the industry from smelling significant sources they also detect other radioactivity, often radium luminised items or naturally occurring radioactive material which causes them to incur further high costs for their disposal.

- The same high cost of disposal is the reason many organisations store disused sources rather than dispose of them in a timely manner. As time passes source security may diminish or disappear altogether – an accident waiting to happen!

- The proposed EC Directive covering High Activity Sealed Sources (HASS) may provide the catalyst for action. It will require financial provision for disposal to be made at the time of purchase. The mechanics of setting up an equitable scheme will be a major challenge in itself, but this still leaves the legacy source issue. Perhaps the solution adopted by the French has a lot to commend it: a legal amnesty period coupled with government funding for the declared disused sources.

5.10 Emergency response issues

- NRPB is currently considering the Recommendations of the 2nd UK Working Group on Stable Iodine Prophylaxis [13]. In addition it is looking at the need to have Emergency Reference Levels (ERLs) for planning purposes for the exposure of onsite personnel. As a result the opportunity is being taken to review all our advice on ERLs.

- Undoubtedly the biggest challenge in the Emergency Response sector comes from the legacy of the 11 September atrocity in New York. It fundamentally redefined the range of the credible potential for terrorist activities involving Chemical, Biological, Radiological or Nuclear (CBRN) elements. As a result this area has a much raised profile and is receiving priority attention from a range of organisations across government.

6. CONCLUSIONS

This paper has given a brief personal view of some of the scientific and presentational challenges that our profession is facing. The list has been by no means exhaustive and undoubtedly there are many more important issues. However, whatever the issues, the key threads of our profession's response must include

- ensuring the quality of the scientific base for standards and policies,
- being able to communicate information with different audiences: both listening and providing information, and
- being inclusive in the consultation process.

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