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The role of radiation protection societies in tackling the skills shortage and development of young professionals and researchers

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Abstract

Over the last 10 years there have been increasing concerns raised about a potential skills gap in the field of radiation protection (RP). Noting these concerns in 2019, the Society for Radiological Protection, the UK's Chartered Professional Body, launched a study to determine the RP demand in the UK going forward along with the capacity of the profession. The initial results show that over 50% of the SRP membership retires in the next 10−15 years, coupled with an increase in RP demand across the nuclear fuel cycle, medical sector and advancement of new technologies or applications requiring RP advice. This provides strong evidence supporting the concerns of a future skills gap. This paper presents a framework highlighting three core objectives that need to be met to resolve the skills gap. A review of the existing initiatives being undertaken by the Society of Radiological Protection to meet these objectives is included, identifying both areas of good practice and areas for further work and development. A key theme in tackling this challenge has been identified as the need to foster greater collaboration between RP professionals, and organizations both within the UK and abroad, such as IRPA, national societies, employers, academia and industry. This brings a unique opportunity to direct

efforts and resources toward a common goal, allowing the sharing of good practice, whilst reducing the strain and burden on any one organization. Another key output of the review was the need to embrace new and innovative solutions to developing our profession and importantly inspiring and communicating into the future of the profession.

Keywords: professional development, skills gap, radiation protection

(Some figures may appear in colour only in the online journal)

1. Introduction

Over the last two years, the Society for Radiological Protection (SRP) has been undertaking an exercise to determine the radiation protection (RP) demand going forward along with the capacity of the profession.

This has been a result of re-occurring concerns of a skills gap being raised by both members of the society, employers [1], UK Government [2] and conversations with other RP professional bodies both within the UK and abroad.

Figure 1 shows an overview of the current age demographic of the RP workforce in the UK who are members of the SRP. It should be noted that looking at this data in isolation it can be difficult to determine if this is a fair reflection of the profession; however, given the size of the data set (roughly 2200 members), and lack of data from other RP-related professional bodies, this is a reasonable starting point.

The data shows that at present, >25% of the membership are either retired or approaching retirement, and 50% will be retired in the next 10–15 years.

Even if the demand for RP professionals remains constant, this age demographic alone highlights a potential skills gap. However, in reality, we are also seeing an increase in demand across a number of sectors as described below:

- **New Nuclear Build**. Across the world we are seeing a resurgence in nuclear new builds with a current estimated 160 new reactors planned for construction and an additional 300 proposed. In the UK alone, plans are under way for the construction of six new commercial reactors, using two different reactor designs (EPR & HPR1000) and increasing investment in the development of small modular reactors [3].
- **Aging Nuclear Fleet/Decommissioning**. At the same time, we are seeing an increasing demand throughout the nuclear fuel cycle with a number of operating stations across the UK and wider world entering the decommissioning phase of their lifecycle. Due to the age of these plants, with a number having very little consideration of decommissioning within the design, these will present both a RP and radioactive waste management challenge [3].
- **Medical Demands**. Within the sedical sectors, we are also seeing an increase in the demand for RP professionals, both due to an increase in patients as the population's life expectancy increases and as new technologies, such as proton beam therapy, are increasing in use [4].
- **New Technologies & Applications**. In addition, we are tracking a number of new technologies and applications on the horizon, including fusion, space and new medical technologies, all requiring additional RP resources [3].
- **Small Users & Industry**. Our industry members have also, at the same time, reported seeing an increase in demand across industries and small users, such as veterinary and manufacturing, with a number of RP service providers struggling to keep up with the demand.

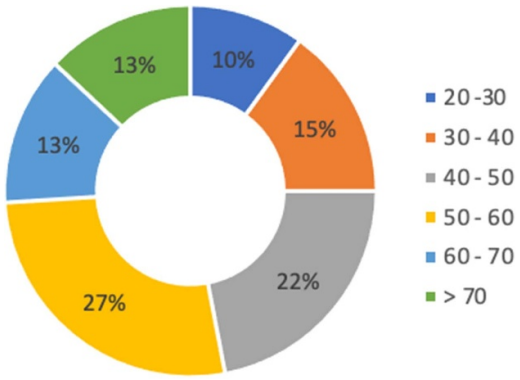


Figure 1. Age demographic of the Society for Radiological Protection as of 2019.

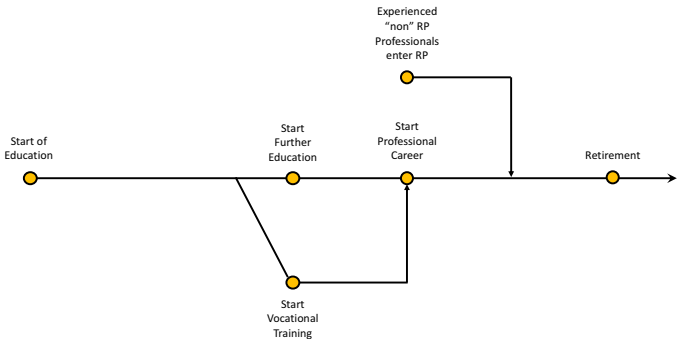


Figure 2. Typical career path of a RP professional.

This increase in demand within each of these areas only heightens concerns about a skills gap.

If we accept there is a reasonable degree of evidence supporting a potential challenge in the capacity of RP professionals going forward, what can we do both as RP professionals and professional bodies to tackle this issue?

2. Developing a framework for tackling the RP skills gap

If we look at the typical career path of a RP professional, as highlighted in figure 2, then we can see that individuals enter the RP field via one of three possible routes: via a traditional education route, where the individual enters the profession post university studies in a RP-related subject; via a vocational route, such as starting as a health physics monitor or surveyor; or later on during their professional career, as a change in career.

Noting the scale of the potential skills gap, and the time period to develop individuals from a young age, through to university, we need to be able to encourage and develop professionals across all three routes to meet the future RP demand.

To do this, three core objectives have been identified:

- Objective #1 – Encourage students to study science, technology, engineering or mathematics (STEM) subjects through school and further education/vocational training.
- Objective #2 – Encourage students and non-RP professionals into RP or its allied fields as a profession.
- Objective #3 – Professional development of those working in the RP field throughout their career and retention within the field.

Each of these objectives is discussed further in the subsequent sections, highlighting what existing work is being done within the UK, and what further areas are needed for development.

3. Objective #1 – encourage into STEM

By encouraging students into STEM subjects from a young age, this will help establish a solid foundation of knowledge, on which a career in RP could be built, regardless of by which route the individual ends up in RP.

In 2012, the SRP started an outreach program to encourage school students into STEM subjects, and ultimately to become the future generation of RP professionals. This started when the society organized a 'schools event' as part of the IRPA 13 Congress in Glasgow.

In the following years, there were a number of smaller events held at schools. However, in 2016 the SRP took the plunge into National Public Outreach with their first stand at the UK Big Bang Science Fair. This is a four-day national schools' event attracting between 70 and 80 000 school children from all over the UK.

Due to the success of the event, the SRP has continued to annually support the Big Bang Science Fair, along with other national events such as New Scientist Live. This has continued to grow, with the SRP's Outreach Programme reaching up to an estimated 100 000 students a year.

As part of the STEM events, the SRP provides interactive activities to students ranging from 8 to 18 years of age. Examples of this are shown in figure 3, including students undertaking monitoring of a lab technician who has been contaminated with a radioactive simulant, and students learning about radiation shielding by using a gun firing foam darts to simulate an x-ray generator [5].

The SRP also provides educational resources to school teachers both at the events and freely available on its website [6]; this includes lesson plans and educational posters.

However, the SRP also recognizes that despite the huge success of the Outreach Programme, it is currently only reaching 1.15% of the total number of students in the UK, and further work is needed to broaden its reach, including tackling those schools in the country which may not be able to attend the large National Science Fairs.

To reach a wider audience there are a number of opportunities to consider, but also challenges to overcome.

The main limiting factor in expanding any outreach program is mainly down to limited resources, including finances, materials and number of volunteers. However, is there not an opportunity to pool the resources of professional bodies, such as the SRP, along with industry and academia? After all, the skills gap is one that not only impacts professional bodies, but also those who rely on the profession or employ RP professionals. Is co-branded or unbranded outreach an option? Is this where we stop all going to the same events, but rather coordinate and spread our limited resources, allowing us to tackle a much larger number of events and regions?

Figure 3. Photos of interactive activities run at the SRP Outreach Events. Top: students undertaking monitoring a lab technician who has been contaminated with a radioactive simulant. Bottom: students learning about radiation shielding, by using a gun firing foam darts to simulate an x-ray generator.

We also need to explore more innovative ways of communicating with students and educators, including those who may not be fortunate enough to attend these large STEM events. For instance, the SRP has previously had requests about whether any of its interactive exercises are also available on YouTube, an initiative we are now in the process of implementing.

So, why are we not using social media more? And using a range of platforms, such as Instagram, Snapchat, Facebook, Twitter and TikTok, noting that each platform is suitable for a different age or demographic? As seen in [7], the rapid growth of social media not only presents a means of getting a message across to a large audience, but also provides a unique opportunity to predict users' real-life interests from online text and photos. This gives the ability to effectively target individuals who will most be interested or inspired to follow a career in STEM, maximizing effort in the right areas.

Could engaging with the media also be an option to explore? Allowing us to not only encourage students into STEM subjects, but also raise general public understanding and awareness of radiation and RP as a profession?

4. Objective #2 – encourage into RP careers

Over the last 10 years, we have started to see a rise in the number of students choosing to study STEM-related subjects [8]; however, we are often finding that despite this they are not picking careers in science, including RP.

But why is this? How aware are people of RP as a career path? I suspect that if we spoke to a typical STEM subject student, it would not be an area they are familiar with.

In recent years, the SRP has been working on initiatives to help encourage students into careers in RP; however, in reality there has been limited work in this area, and a significant

concerted effort is needed to drive forward. Current initiatives have included attending university careers fairs and student events/conferences, and publishing articles in careers magazines, with both giving students an opportunity to hear from RP professionals and learn about the opportunities available. Examples of which are seen in figure 4.

The SRP has also launched a number of educational sponsorship schemes, including the Higher Education Scheme, paying up to £5000 per year to support student studies in RP-related fields, and the Research and Innovations Scheme, funding university and academic research.

In addition, the SRP has created a free grade of student membership, so that those in full-time education can benefit from membership to the SRP, access to the Journal for Radiological Protection, and access to *ad hoc* funding to attend SRP or other RP events.

But how do we reach the wider student audience? What about those professionals going down the vocational path or looking for a career change? And how do we compete with other career paths, such as in IT or finance, which are more visible and often perceived as more lucrative?

This all comes down again to communication, and we need to carefully consider:

- How we communicate? Are we reaching the right people and demographic?
- What we are communicating? Do we make RP sound exciting and a rewarding career move—both intellectually and financially? Does it feel like an inclusive field? Do we give people enough information to help them decide whether it is a career for them?
- What is the best mechanism to communicate? Careers fairs and written articles have their place, but what role could social media and mainstream media play?

Consideration also needs to be given to the development and support of apprenticeship schemes (vocational routes), so that RP can be maintained and seen as an inclusive profession regardless of educational background, with multiple routes of access.

However, to do this we again need to consider working with both industry and academia and should remember that as RP professionals we are not experts in communication. Therefore, it is important that we engage and inform our communication plans with experts in this area, including media and social media specialists.

5. Objective #3 – professional development and retention

Getting individuals into RP as a profession is only part of the challenge; developing and retaining them is an equally important part.

Noting this in 2010, the SRP established its Rising Generation Group (RGG), a dedicated part of the SRP specifically designed to support developing those in the first 10 years of their career in RP.

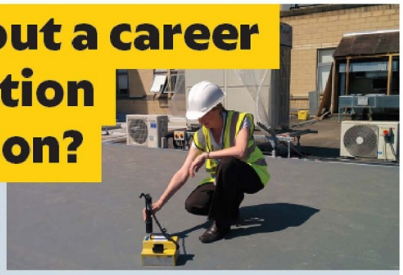
A conscious decision was made to not reference age in the title of the group, such as calling it a Young Generation Network, to ensure it remained inclusive to all individuals within the first 10 years of their career regardless of age.

The SRPs RGG has been operating for 10 years, and has successfully been running and supporting the development of events, including training programs, courses and webinars, to support those in the early parts of their RP careers.

The RGG was instrumental in launching a mentoring scheme, matching less experienced RP professionals with senior members of the SRP who are able to offer advice and guidance. This includes helping with a particular project or problem, guidance during a course of study, advice on career progression or assistance with a paper publication or a competition entry. This

RADIATION PROTECTION

How about a career in Radiation Protection?



There is more than meets the eye!

Ever had an x-ray and wondered why the person taking it has to leave the room when the x-ray is taken? The answer is Radiation Protection. We know repeated exposure to radiation and radioactivity can lead to health issues over a period of time, so Radiation Protection puts in place controls to reduce people's exposure to radiation.

Radiation Protection (or RP), is defined as "The protection of people from harmful effects of exposure to ionizing radiation, and the means for achieving this." Exposure can be from a source of radiation external to the human body or due to internal irradiation caused by the ingestion of radioactive contamination. In the modern world, radiation is used in a wide range of industries including nuclear power, medicine (including dentistry and veterinary medicine), industrial radiography, thickness gauging, the oil and gas industry, and in research and development.

This is a diverse profession – the Society for Radiological Protection is the UK chartered professional society for everyone who works in the RP field. We have members in hospitals, universities and the nuclear industry, at all levels from Health Physics technicians who take the measurements to Radiation Protection Advisors (RPAs) and Radioactive Waste Advisers (RWAs), who are appointed under legislation and give specific advice to keep people safe. In the medical field those overseeing the use of radiation are known as Medical Physics Experts.

How do you get into a career in Radiation Protection?

The profession requires a solid grounding in a scientific discipline and whilst this is often physics, it can be any STEM subject. Since it often involves working with people to ensure work with radiation is carried out safely and legally, then a high level of interpersonal skills is required.

Some Masters courses are available in Radiation Protection and Medical Physics and some employers offer on the job training often as part of their graduate training schemes which support graduates working towards a professional appointment and professional registration.

People working in the field can work towards obtaining professional registration from Technical Radiation Protection professional (TechRadP) and Incorporated Radiation Protection professional (IRadP) through to Chartered Radiation Protection professional (CRadP), and towards obtaining a relevant Certificate of Competence to giving advice on the relevant legislation. SRP can help by matching you up with a mentor in an appropriate sector.

Radiation Protection can be an exciting and rewarding profession with members getting involved with the protection of employees and the public, in planning for potential emergencies and in developing interesting new protection techniques. Our members have been involved in the operation and decommissioning of nuclear power stations, and industrial premises, and in waste disposal all over the world. They play a central role in developing and applying medical diagnostic techniques and treatments for cancer. For more information see our website **https://srp-uk.org/careers/overview/**

THE SOCIETY FOR RADIOLOGICAL PROTECTION

The Society for Radiological Protection (SRP) is a professional and learned society founded in 1963 and incorporated by Royal Charter in 2007. Its Royal Charter states that the object of the Society is to "promote the science and art of radiation protection and allied fields for the public benefit".

The Society offers support to members by offering conferences and training courses, professional registration and access to our scientific journal. It also offers a mentoring scheme. SRP can sometimes offer support to those undertaking relevant courses.

For more information see the SRP website: **https://srp-uk.org/careers/overview**

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Figure 4. Top: photo from a SRP stand at the University of Manchester Careers Fair. Bottom: example article in a careers magazine.

Figure 5. Top: photo of Katherine Raines receiving the SRP YPA Award at the SRP 2019 Annual Conference. Bottom: photo of the attendees at the Joint Japanese Health Physics Society (JHPS), SRP and Korean Association for Radiation Protection (KARP) Young Professionals Event in Sendai, 2019.

has been a successful endeavor with positive feedback being received not only from members in the UK, but abroad as well.

Additionally, the SRP has launched a number of awards. The UK Young Professionals Award (YPA) is run every two years, and the winner of this is entered into the International Radiation Protection Association (IRPA) Young Scientist and Professionals Award (YSPA) competition, receiving a £500 prize and an all-expenses paid trip to the IRPA Congress (figure 5, top). There is also the RGG Award, which runs annually for the best presentation given at the SRP annual conference by a RGG member. This also awards a prize of £500, and in previous years has included an all-expenses paid trip to the JHPS, SRP and KARP Young Professionals Event in Sendai, Japan (figure 5, bottom). Both competitions have been hugely successful, with the SRP often having to turn down entries due to the number of applicants.

The SRP has also recently restructured its membership grades to give voting rights to those younger professionals who may not have sufficient experience to become full members of the SRP. This was an important step in empowering all those working in the field of RP in having a say in the development of the profession, and encouraging an inclusive environment. This also gives the professionals early on in their career the ability to apply to be a formal member of the SRP executive council, with 2020 seeing our first member of the council who was also part of the RGG.

Furthermore, the SRP was actively involved in supporting the development of the IRPA Young Generation Network and continues to be an active participant, working with other

National Radiation Protection Societies both in the UK and abroad to support the development of its professionals in the early stages of their RP careers.

However, professional development does not stop after the first 10 years. It is important that we continue to support the development and retention of RP professionals throughout their careers. The SRP therefore continues to run a diverse events program, with dedicated sessions for various sectors, such as nuclear and medical, and wider and so-called 'soft' skills, such as communication.

The society also more recently launched a free webinar program, in partnership with the Association of University Radiation Protection Officers, with eight events run so far and up to 350 attendees per event.

Funding is also available for all its members to support attendance at SRP events or other RP related training where they are unable to raise funds.

Finally, the SRP also offers three grades of professional recognition, allowing individuals to be recognized for their knowledge, experience and competence in RP, showing their peers and employer that they have demonstrated a commitment to professional standards, and to developing and enhancing competence.

Despite this, there is still further work to be done to support the development of RP professionals and retain them in the field, but this is not something that can be done alone. This needs employer 'buy in' to support the development (professional and career) and retention of their staff, whether it be:

- Developing training programs internal or external to their organization,
- Ensuring there is career progression for those professionals working in RP in their organization,
- Supporting attending external training and events, and
- Developing mechanisms to support those non-RP professionals that want to convert to a career in RP.

On this basis, the SRP is currently investigating the potential introduction of a 'pledge', where employers are given the option of signing up to a set of principles with the aim of increasing the number of 'Young Professionals' in RP and its allied fields in the UK from 17% to 25% by 2025. It is hoped that this pledge will support the development of a healthy and supportive culture within these employers in driving the development of the RP profession forward.

Moreover, greater collaboration is needed between not only employers, but internationally. For instance, a recent survey run by the IRPA YGN [9] showed that one of the main reasons people left the field of RP was due to a lack of progression and mobility, and that greater mobility within the field to work in different sectors, countries, and employers would help retain people in the profession.

This is a large issue to tackle, one that will require collaboration on an international scale and an area that IRPA and the various national professional bodies will need to play a key role in supporting.

6. Conclusions

An ongoing study in the UK has heightened concerns about an RP skills gap with over 50% of the SRP membership retiring in the next 10−15 years, coupled with an increase in RP demand. A review of the existing initiatives being undertaken to close this gap by the SRP has identified

some areas of good practice; however, given the scale of the challenge it has also identified that there is further work that needs to be done.

Key to tackling this challenge is the need to work together as RP professionals and develop relationships and partnerships between organizations both within the UK and abroad, such as IRPA, the national societies, employers, academia and industry, but also with non-RP professionals such as media and social media specialists.

By working together, this brings the unique opportunity to pool our efforts and resources into a common goal, allowing us to share good practice, whilst reducing the strain and burden on any one organization and offering the opportunity to maximize our impact.

However, to do this we need a framework to encourage and foster that collaboration, and IRPA and the various national professional bodies must play a key role in establishing this. Could this be an opportunity to establish an international set of common principles that we should all sign up to and work toward? Or a committee or working group to share our progress, challenges and areas of good practice in tackling the skills gap?

As a profession, we must also accept that to solve this challenge we need to step out of our comfort zone and embrace new and innovative solutions to developing our profession and importantly inspiring and communicating to the future of the profession. In the words of Socrates, remember: 'The secret of change is to focus all of your energy not on fighting the old but on building the new!'

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References

[1] Bryant P A and Hicks A 2014 Closing the skills gap, an SME's perspective *Nucl. Futures* **10** 41–6
[2] HM Government Sustaining our nuclear skills Nuclear Sector Skills Strategy: Government and Industry in partnership
[3] Hinson S 2020 Briefing paper—new nuclear power House of Commons Library, Number CBP 8176
[4] IAEA 2015 Radiation protection in medicine—setting the scene for the next decade *Proc. Int. Conf.* (*Bonn, Germany*, *3–7 December 2012*)
[5] Cole P *et al* 2015 Strategies for engaging with future radiation protection professionals: a public outreach case study *J. Radiol. Prot.* **35** N25–32
[6] Society for Radiological Protection 2020 Radiation protection school resources (available at: https://srp-uk.org/public-and-schools/resources-for-schools)
[7] He L, Murphy L and Luo J 2016 Using social media to promote STEM education: matching college students with role models *Machine Learning and Knowledge Discovery in Databases. ECML PKDD 2016* vol 9853 ed B Berendt Lecture Notes in Computer Science 3 (Rome: Springer) pp 79–95
[8] Bryant P A 2018 Closing the gap—meeting the skills demand for the UK's low carbon future Energy UK—Energy and our environment—a collection of essays marking the tenth anniversary of the Climate Change Act
[9] Andresz S, Bryant P, Heaps J, Beaumont T, Vecchiola S and Caldeira Ideias P 2018 Young professionals in radiation protection: challenges and perspectives—outcomes of an international survey *Radioprotection* **54** 35–40