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Health Physics Resources in the UK Nuclear Industry Sector

A Review on behalf of the Nuclear Decommissioning Authority

SUMMARY

This review set out to analyse the current situation with regard to the supply and demand for key skills in the Health Physics field. Any skill shortage in the field has the ability adversely to affect the decommissioning programmes under the control of the Nuclear Decommissioning Authority.

The overall conclusion of the review is that the current situation sees the industry just coping with the demand slightly exceeding the supply in all areas. Whilst the detailed issues behind the situation differ amongst the three aspects of health physics examined, it is clear that in order to prevent there being a skill shortage over the next decade, action needs to be taken.

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INTRODUCTION

For a considerable time there has been an impression around that there is, or is about to be, a shortage of people with Health Physics skills in the nuclear industry which could become a real constraint in the nuclear decommissioning programmes in the UK. If this is correct then this would be a serious risk to the Nuclear Decommissioning Authority (NDA) and therefore they wish to find out whether this is a real problem so that they can take action to address any skills gap.

This issue has been raised previously and some work was carried out by COGENT and was included in a Nuclear Skills Study carried out by Mr Tony Coverdale who published a report in 2002. (1)

The NDA therefore commissioned this review with the objective “to analyse the current situation with respect to Health Physics Services within the nuclear sector”. The scope of the reviews was to :

- Analyse the demand and supply, the projected trends over the next decade or so
- Identify, review and summarise the challenges facing both suppliers and users of these services
- Gather suggested approaches to meeting these challenges currently and in the future

The approach taken to this task was to consult with a number of organisations and companies representing different aspects of work in the nuclear sector. This included Site Operators, larger prime contractors who make use of HP service and large and small providers of HP services to the nuclear industry. Face to face discussions were held with certain organisations and telephone discussions with others. All of the organisations interviewed gave willingly of their time and spoke openly and frankly of the issues as they saw them. This allowed an overall view of the situation to be gained. Each of the interviews covered (within the experience of those involved) three aspect of these services e.g. Health Physicists/RPAs, Dosimetry, HP Monitoring and explored issues including recruitment, retention, skills and training and future trends.

Organisations Interviewed

UKAEA (Dounreay)
BNG (Sellafield)
AWE (Aldermaston)
Nukem
Studsvik
Aurora HP
AMEC/NNC
Society for Radiological Protection

UKAEA (Southern Sites)
BNG (Magnox)
British Energy
Mitsui Babcock
Nuclear Technologies
Alstec
Radwise

The information gathered was then considered and summarised. The general view of the situation was remarkably consistent and therefore the overall position was relatively easily summarised and conclusions reached.

HEALTH PHYSICISTS/RADIATION PROTECTION ADVISERS

Background

This is the specific aspect of Radiation Protection that has attracted the most attention in recent years, as a key skill under threat. Since the new requirements for the certification of Radiation Protection Advisers (RPAs) under the Ionising Radiations Regulations 1999, there has been a decline in the number of legally appointed RPAs in the UK, in all sectors. Many older, more experienced Health Physicists did not feel motivated to go to the effort of preparing a portfolio of evidence. In addition, there was a significant time period, a decade or so ago, when there was very little recruitment and training of Health Physicists leading to an effective 'gap' in the age profile and a subsequent loss of experience in the industry.

The Regulations require that any appointed RPA hold a Certificate of Competence which demonstrates a knowledge and understanding of certain key technical areas and a basic competence in applying this knowledge in practice (experience). They also require, that in appointing an RPA an Employer assesses the *suitability* of the appointee to advise in his particular circumstances. Within the nuclear sector, where there is a developed understanding of these requirements, it is recognised that once someone has attained the Certificate of Competence it will take some time for them to achieve a level of experience which makes them fully competent to advise on the complex radiation protection issues which can arise on a nuclear facility. Within the consulting sector however, there are some organisations which consider that once a person has attained their certificate that they are 'marketable' as an RPA to their clientele.

All of these factors have led to a significant increase in the remuneration packages attracted by RPAs.

On nuclear sites it is also recognised that to achieve good standards of radiation protection it is wise to take advice on more practical issues and to involve radiation protection professionals in a wider range of circumstances than those explicitly specified in the legislation. Although there are different models in different parts of the sector it is common to have staff giving a level of direct support to projects some of whom will be experienced practitioners without the academic background to become RPAs and others who will be training towards certification as well as those formally appointed as RPAs.

Recruitment and Retention

For some years, across all sectors, the demand for experienced Health Physicists and RPAs has exceeded the number of qualified people. As there were losses within the Nuclear sector for the reasons explained above, it proved difficult to find and recruit

qualified staff and the remuneration packages which could be demanded increased significantly. The larger organisations (e.g. nuclear site operators and larger contract companies specialising in Radiation Protection services) re-started campaigns of recruiting and training people. It has been found however challenging to retain staff in the role. The role of Health Physicist/RPA is seen as a stressful one with a limited opportunity for progression career wise and so is not seen as an attractive career path. Good capable people can be attracted to other roles within an organisation where career prospects are seen as better or to work in the consultancy field where remuneration is perceived as being better and the work more stimulating. With a general deficit in this skill area and with staff moving around, the vacancies or 'holes' tend to move around also.

The nature of their business or geographical location can be another perceived disadvantage, although in most cases these are also the places which offer greater advantages for training and experience (e.g. Aldermaston and Dounreay). This can mean that they might recruit and train graduates who then move on almost as soon as they obtain their Certificate of Competence. As a result the 'holes' tend to gravitate in those places.

Training

Most site operators have recognised that locally recruited staff are less likely to move on and so there has been a tendency recently to concentrate recruitment of trainees to within the local workforce rather than on graduates. It is important to recognise however that there has to be a balance within a group of Radiation Protection professionals of people with more practical background and those with an academic background. The risk of 'dumbing down' was acknowledged by several people. There were concerns that whilst practical health physics advice was being competently given, there could develop a shortage of people capable of developing policy and standards in the future and of dealing with more intellectually demanding situations.

Most of the major organisations consulted have training programmes in place for trainees in the radiation protection field. These schemes generally combine some externally obtained training on the more theoretical aspects together with in-house modules and a programme of on-the-job training to gain experience in all of the key competencies. External training is available in the form of short courses run by the Health Protection Agency, distance learning packages offered by some Institutions (e.g. Strathclyde University with AURPO) through to diploma and MSc course offered by the University of Surrey.

Future Trends

From the survey across the sector the general picture is one where the supply and demand of RPAs is roughly in balance at present. There was a belief that this balance was very fragile and without careful management of the situation a shortage would result which could have a deleterious effect on the national decommissioning programme.

As to future demand within the sector, it was the general opinion that over the next decade or so it would remain relatively level, although it was likely to increase where decommissioning programmes were accelerated in line with the NDA's wishes. The

situation would be further exacerbated if the UK were to embark upon a nuclear new-build programme. For some sites the demand would not decrease for many decades. For others however, the decommissioning programmes were less than a decade, and for those, retention of qualified RP staff towards the end of their programme could be challenging as people sought other places to pursue their careers. This is a situation likely also to occur in other skill areas.

Conclusion

The situation for professional Health Physicists and RPAs is that the current demand is slightly in excess of the availability of qualified people. The Site Operators and their contractors are generally coping with the situation, although in most places this has required significant management to keep the necessary resources available to support the safe and legally compliant execution of the work programmes. Due to the demand, the remuneration packages have increased markedly and it is a 'suppliers market' with experienced staff at a premium.

There is sufficient ability and willingness within the nuclear sector to train people in this key skill area, although management of trainees' expectations and career development opportunities needs to be further addressed. There is a view, that the NDA can assist in this by encouraging (and paying) its contractors to continue to train and develop people in these skills and by helping to ensure that the basic education to support this development remains available. It may also be necessary to accept that the movement of staff, well trained within the sector, to other sectors (including industrial, medical and academic) whilst detrimental to our work, is to the general benefit of the UK.

DOSIMETRY

Background

All nuclear sites need to carry out dosimetry in order to measure or assess the radiation exposure to the workforce or visitors in order to comply with the Ionising Radiations Regulations 1999. Under these regulations only dosimetry services approved by the HSE (Approved Dosimetry Services (ADS) may carry out these functions. Approvals are given for three areas of the work viz. External Dosimetry, Internal Dosimetry and Record Keeping. There are a significant number of organisations in the UK and beyond who are approved to provide External Dosimetry services and record keeping services. The number who are approved for Internal Dosimetry however is small, particularly in the assessment of doses from the intake of Actinides.

Resources, Recruitments and Retention.

In practice there are only three organisations who routinely carry out internal dosimetry assessments for intakes of actinides; these being AWE, BNG and Nukem. These organisations all carry out a wide range of Dosimetry services and have a significant

number of staff working in the general field. When it comes to the internal dose assessments however each has only a small number of people who might be considered as experts in the field and who have the knowledge, expertise and experience to carry out the assessments required. In total there are between six and eight practising experts in the UK (there are also a number of 'theoreticians' within the HPA who do not routinely carry out practical assessments). With such small numbers the situation is considered fragile and each of the organisations mentioned has endeavoured to recruit new staff to train in this skills area. Whilst all have been able to recruit trainees, they have all experienced difficulties in retaining these staff. With the small numbers involved new recruits do not see this specialised field as being a career with good prospects. It is a complex field to learn and the actual number of cases is small (due to modern radiation protection practices), giving limited opportunity for practicing the skills for real. The tendency has been to recruit very able staff into this field because of the skills required, but then these staff have become rather 'bored' and have little difficulty in moving on to other areas of work with better prospects for career development. The solution which each of the organisations is implementing is both to recruit existing employees into the field and to develop them in a wider role within the broader radiation protection profession.

Training

There has been a tendency in the past for Health Physicists and RPAs to have a rather low level of knowledge in dosimetry and to rely on their expert colleagues. By including a deeper understanding of Dosimetry in the training programme for Health Physicists, a pool of people who can then develop this expertise either in preparation for the retirement of the existing experts in a planned manner or in response to the unexpected loss of any such person. Other than the more academic training which is mostly in common with other aspects of radiation protection, training in this field is, and has to, take place on the job. In such a small area of expertise there are no formal training courses and so the learning has to be done this way. It is a close community however and there is much co-operation and support amongst the experts in the different companies. This applies to all aspects of dosimetry, not just the internal dosimetry area.

Future Trends

The demand for this area of expertise is likely to remain reasonably constant, or even increase over the lifetime of the operation and decommissioning of facilities. External dosimetry and record keeping are required in all areas of work with Ionising Radiation including in the industrial, medical and academic as well as nuclear sectors. There is sufficient expertise available in this area that it is a stable situation.

In the case of internal dose assessment expertise however, especially for actinides, the demand is likely to increase slightly as major decommissioning of old facilities starts and then to diminish as that decommissioning progresses. This will mean that the fragile situation with such a small number of experts is likely to become even more acute.

Conclusion

For most aspects of dosimetry for ionising radiation there is a relatively large demand across the wider industrial community and there is a relatively healthy number of companies and organisations available to offer the required services. As such this is not an area of significant concern. In the particular area of internal dose assessments, particularly for actinide intakes, the situation is very fragile with a very small number of experts in the country. This situation is likely to get even worse in future years and needs careful management. Training and retention of staff in this area is also challenging and the plans currently being implemented to give staff in other aspects of radiation protection a better basic background in dosimetry in order to have a 'feedstock' when necessary is a wise one. This approach should be encouraged and the situation needs to be kept under close scrutiny to ensure that a cohort of expertise is retained nationally.

HEALTH PHYSICS MONITORS/SURVEYORS

Background

In order to carry out the monitoring of the workplace for radiation and radioactive contamination, staff require to be trained to carry out measurements and to interpret the results at a basic level. These measurements and assessments are used to demonstrate that the conditions in the workplace are acceptable (an assurance function) or to indicate what steps are required to make work in the area safe for workers. Such monitoring is a requirement under the Ionising Radiations Regulations 1999. More complex interpretation of the results and formal advice on safe working practices then comes from the Health Physicist or RPA. Over the years the most common practice to develop is to have a group of workers with these particular skills who are variously referred to as Health Physics Monitors or Health Physics Surveyors. In most organisations other staff are also trained to a lower level to allow some degree of the monitoring of radiation and contamination to be carried out by the staff directly carrying out work. In some cases (e.g. Power Stations) this approach has been taken to a level where the majority of work is carried out by this multi-skilled workforce with only the assurance monitoring and that of the most hazardous situations being carried out by the more highly trained staff dedicated to that role. Most radiation protection professionals however believe that it is an important part of an overall radiation protection programme to have a significant level of independent monitoring carried out by a group of sufficiently trained staff. These staff can give immediate advice on the consequences of the results of that monitoring and who can act as 'champions' or 'advocates' for good radiation protection practices and standards.

Historically, most site operators have carried out this monitoring from within their own workforce. In more recent years there has been an increasing use of sub contracted suppliers of health physics monitoring services. Such contractors are sometimes used to complement an in-house team during times of peak demand (e.g. reactor outages), to support specific project teams (e.g. a decommissioning implementation contractor on a UKAEA site or a 'ring-fenced' operation like the Sellafield pipeline) or, in the case of UKAEA a contractor to supply a wholly managed health physics monitoring service to the site.

Recruitment and Retention

When all of this work was carried out from within dedicated teams, within well staffed site health physics departments with well defined in-house training programmes, recruitment and retention were not a significant issue. In more recent times however this situation has changed considerably. Operators of power plants have moved more towards manning levels which are required for efficient normal operations and then to contract in resources for outages. Other site operators have become more aware of the costs of the monitoring programmes and have in general reduced the high level of manning previously accepted seeking better efficiency.

The result of these changes has been that the number of well trained and experienced Health physics Monitors has reduced whilst the demand, due to the decommissioning programmes has increased. In addition these trained resources are now spread over a larger number of companies.

Overall discussions indicate that supply was somewhat lagging behind demand at the current time although in general this is under control. The major users and suppliers of these operations have relatively large numbers of staff (e.g. BNG, AWE, Nukem, Radwise) which in itself gives some stability. There are however a growing number of companies employing a smaller number or seeking to sub-contract relatively modest levels of support in this area. The whole dynamic of the situation changed due to these issues and the use of 'manpower agencies' to address peak demands, primarily for reactor outages. Most of the larger employers have found that they have been losing staff to work as self employed through agencies to cover reactor shutdowns. Individuals find that with the long hours they can work and the higher rates of pay, they can earn in the summer shutdown season as much as they would earn in a year as an employee on a nuclear site.

There was some concern voiced that the levels of training and on-going competence in some of these groups is not sufficiently high and they were treated very much as a body shop rather than as a skilled workforce. (*More on this in the section on training*). This is in addition to a more general concern that as the standards of radiation protection have improved over the years, staff have less and less real experience in dealing with hazardous and emergency situations. This reduces the confidence that they would be able to cope should such situations arise in the future, especially as the decommissioning of some old facilities with uncertain conditions increases.

Although the supply is very nearly keeping up with the current demand, there is a danger that the average remuneration packages are increasing (as with the Health Physicists) and there is some indication that these costs are indeed beginning to escalate as resources are 'poached'. This is another area where there is perceived to be limited opportunity for progression and it is often found that the more able staff move on to other functions on the site.

Training

Training of this group was seen as a concern to most of those consulted. In the larger, more established companies there are well developed and long practised training programmes which include the more academic background aspects together with the more practical skills and competencies required to carry out these functions. It has been common practice in some of the organisations to supplement this with a longer term aim of further education for this skill group, leading to a qualification from the City and Guilds institute. There are two levels of City and Guilds in Radiation Safety Practice and these were taught and assessed by various colleges across the country. In recent years however the number has dwindled and there are now only one or two places left who do these courses on day release or by distance learning. More recently there has been a growing view that the N(S)VQ qualifications would be more appropriate since they are more competence based. This is seen as being closer to the real needs and has the advantage of being workplace based reducing the demand for whole groups of staff being offsite regularly for training with the knock-on effect this has on cover on the sites. Although a basic NVQ L2 syllabus was developed some years ago, it was never actually put in to practice and had no awarding body operational. This work was resurrected in 2005 and in early 2006 the new National Occupational Standard was approved by the Qualifications Curriculum Authority. This needs to be developed into a NVQ (probably L2) and awarding bodies identified. Over the last year or so there seems to have been several organisations and groups looking into this. There is a working group from the major nuclear operators (Under the auspices of the Safety Director's Forum), some individual site operators and some independent companies. This work has not been co-ordinated however and to date none of it has come to fruition. The consensus was that it is vital that an independent qualification exists for Health Physics Monitors to ensure that there is a consistent standard across the industry.

Future Trends

There was a view that the demands in this field were unlikely to reduce in the near future and indeed that should the decommissioning programme accelerate, as the NDA desires, and if there were any nuclear new build then the demand would increase. In the current circumstances, companies are only just coping and there are already difficulties in the summer months during reactor outages when decommissioning support can become very difficult. In addition costs are already increasing as the demand outstrips supply and market forces take an effect. Although this has not reached the levels that it has for the professional staff it is heading that way.

Conclusion

As in the other areas the overall view was that whilst things seemed to be under control at the moment and most sites were just about coping there was a supply problem 'just below the surface'. In addition the lack of a consistent training and qualifications framework was making the situation more difficult and could lead to a diminution of standards which could adversely affect safety on the nuclear sites. The main requirement here is to ensure that there is a co-ordinated approach to finalising the N(S)VQ for Health Physics Monitors and the identification of appropriate awarding bodies and the adoption of this as the standard for such workers.

SUMMARY AND KEY ISSUES

This review set out to analyse the current situation with regard to the supply and demand for key skills in the Health Physics field which has the ability adversely to affect the decommissioning programmes under the control of the Nuclear Decommissioning Authority.

The overall conclusion of this review was that the current situation sees the industry just coping in the field and the demand slightly exceeding the supply in all areas of Health Physics and that in order to prevent there being a skill shortage over the next decade some actions need to be taken.

In general, the site operating companies and their contractors and other major employers in these skill areas know what needs to be done and are working hard to address the issues and avoid problems in the future. There is a need however for the overall situation to be kept under review and for some better co-ordination in some aspects. In addition it is important the NDA ensures that it does not take other actions which will dissuade the site operating companies from taking the appropriate actions e.g. by interpreting the NDA's drive for efficiency as a requirement not to recruit and train as insurance for the future.

The issues in the three areas reviewed are summarised as follows.

Health Physicists/RPAs

The situation for professional Health Physicists and RPAs is that the current demand is slightly in excess of the availability of qualified people, although due to the demand the remuneration packages have increased markedly and it is a 'suppliers market' with experienced staff at a premium. The Site Operators and their contractors are generally coping with the situation although in most places this has required significant management to keep the necessary resources available to support the safe and legally compliant execution of the work programmes. There is a view, that the NDA can assist in this by encouraging (and paying) it's contractors to continue to train and develop people in these skills and by helping to ensure that the basic education to support this development remains available. It may also be necessary to accept that the movement of staff, well trained within the sector, to other sectors (including industrial, medical and academic) whilst detrimental to our work is to the general benefit of the UK.

Dosimetry

For most aspects of dosimetry for ionising radiation there is a relatively large demand across the wider industrial community and there is a relatively healthy number of

companies and organisations available to offer the required services. As such this is not an area of significant concern. In the particular area of internal dose assessments however, the situation is very fragile with a very small number of experts in the country. Training and retention of staff in this area is also challenging and the plans currently being implemented to give staff in other aspects of radiation protection a better basic background in dosimetry in order to have a 'feedstock' when necessary should be encouraged and the situation needs to be kept under close scrutiny to ensure that a cohort of expertise is retained nationally.

Health Physics Monitors

As in the other areas the overall view was that whilst things seemed to be under control at the moment and most sites were just about coping there was a supply problem 'just below the surface'. In addition the lack of a consistent training and qualifications framework was making the situation more difficult and could lead to a diminution of standards which could adversely affect safety on the nuclear sites. The main requirement here is to ensure that there is a co-ordinated approach to finalising the N(S)VQ for Health Physics Monitors and the identification of appropriate awarding bodies and the adoption of this as the standard for such workers.

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Peter Thompson	UKAEA (Dounreay)
Kathleen Stevenson	UKAEA(Southern Sites)
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Trevor Taylor	
John Reilly	
Chris James	BNG(Magnox)
Rupert Cottrell	AWE (Aldermaston)
Andrew MacKrell	
Mike Mekisich	British Energy
Richard Birch	Nukem
David Smith	
Paul Fisher	Mitsui Babcock
Pauline Johnson	Studsvik
Nick Drury	Nuclear Technologies
Allan May	Aurora HP
Andrew Doubt	Alstec
Stuart Cripps	AMEC/NNC
Paul Allan	Radwise
Colin Partington	Society for Radiological Protection

Other companies who were contacted but with whom an interview was not possible were; Safety and Ecology Group, Vectra, BNG(Projects), MoD.