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Notes from the Chair

I am pleased to be able to introduce this, our fourth Newsletter, to all existing and new members of the Nuclear Industry Group (NIG) of the Institute of Physics. It is pleasing that so many physicists, working in the various branches of the nuclear industry, are members; and that so many have attended the events we have run.

Before saying anything else, I want to say a heartfelt thanks to Heather Beaumont, who has been doing a sterling job of getting the newsletters together for several years. Without her, we might well not have a newsletter.

In the last year there have been a mixture of events and lectures, which have mainly been very successful in terms of attendance. We held lectures at Gloucester for the first time (very successful – we had to turn people away), Warrington again (a good turnout again) and London (one good, one poor attendance). We appreciate that with the industry spread across the country there are difficulties in attending, if the event is not near where you live. We have therefore investigated filming or webinar, but the costs are high, so we have not gone forward on this at the moment but the new IOP HQ may have better facilities. As an alternative, which is not as good, we are trying to get the presenters to allow us to put their slides on the web. If anyone can suggest a cheaper way to deliver the talks to a wider audience, please get in touch with us. We have also, thanks to Chris O’Leary, set up a LinkedIn group which we hope will enhance networking within the NIG. The address for the LinkedIn page is here:

<http://www.linkedin.com/groups?home=&gid=8119099>

Unfortunately, we had to postpone the first event of the year (our year starts after each AGM in March), as we did not get the information out quick enough and only a handful of members registered; we feel that, unless there is a reasonable audience, we should not expect a lecturer to give up their time. This lecture, by Ciara Walsh on ‘Innovative approaches to optimise the management of higher activity radioactive wastes’ will now be held in September in Gloucester. Later in the newsletter, you will find details of other talks in Birmingham and London, as well as a

seminar on nuclear data which we are co-sponsoring with the nuclear physics group. I hope that the range of topics and venues will encourage a wide attendance. The Committee puts its communal head together to think of events, but we don't have a monopoly on ideas; if anyone wants to offer a talk, or suggest a topic and lecturer we will be pleased to consider/accept the suggestion(s) (contact details please to the secretary, Andy Quinn).

The NIG is keen to promote career development, and we have had articles on gaining chartered status in previous newsletters. In this issue, Vishal Shethwood explains how to maintain the chartered status once achieved. Vishal also has provided an article about mentoring in the IOP.

This year, we have been asked to agree to a bursary for a student to attend an international conference. These bursaries are a good way to support the careers of physicists who may be looking to join the nuclear industry. If you feel you could qualify, do apply through the IOP (not directly through the NIG).

Another area the committee gets involved in is supporting IOP in its responses and submissions to questionnaires from government bodies and other organisations. Recently, we responded to a select committee questionnaire on Small Modular Reactors (SMRs). Zahid Riaz did a fine job of collating views; see his report on the evening lecture on SMRs later in this issue.

Last year we welcomed three new members onto the committee (one, Chris O'Leary as Treasurer) and I would like to thank the retiring members for their efforts. The retirees were all founder members, so the existence of the NIG is partly due to their efforts. I would also like to give thanks to Michael Gifford who retired as Treasurer, but has stayed on the committee to give us the benefit of his knowledge; Michael also retains the chair for the Prize Committee. This year, several committee members must stand down, having reached the end of the four-year period decreed by IOP. Most are intending to stand again, but there will be an opportunity for new members when we call for nominations in the autumn with an election held, if necessary, in the New Year.

Finally, as we await the EU's view on whether the UK government has provided an 'illegal' degree of state aid for Hinckley Point C, let me wish you all well in your careers and hope that you will be able to take part in the future in the activities that the NIG is providing.

Geoff Vaughan
Chair
IOP Nuclear Industry Group

Nuclear Industry Group Prizes 2014



The Nuclear Industry Group was pleased to award an Early Career Prize this year at the AGM. Selecting the prize winner this year was,

again, a difficult decision as the calibre of the entrants was very high. We are delighted to announce that this year's prize was awarded to, Chris Holland of AMEC for his work on Lower Ports Nuclear Analysis project for the ITER fusion reactor.

Chris's project had to tackle three design challenges:

- The complexity of the geometry is such that traditional, manual, geometry specification is no longer practical.
- Complex coupled neutron activation and gamma transport problems are required, leading to the requirement for new method development.

- 3D maps of the radiation field are desired. This is a significant challenge for Monte Carlo calculations, which led to the development of global variance reduction techniques.

In addition to Chris's technical work, his additional CPD activities contributed to his selection by the committee for this year's prize. In particular, he has devoted a great deal of his own time to the development of others. This has included acting as a Science, Technology, Engineering and Mathematics (STEM)

ambassador working with young people to encourage them to pursue careers in these fields. He has given presentations at several 'Engineering Your Future' events to promote the nuclear industry to young people, and to encourage them to consider careers in the industry.

The calling notice for the 2015 Nuclear Industry Group prizes will be released later this year. The deadline for submissions will be 31 January 2015.

Committee Elections

As noted earlier, we will be looking for nominations for the NIG Committee later in the year. IOP rules allow for a four-year period, either as officer or member of the committee, before a re-election is needed. No officers have reached this point this year, but five members will. This is a good proportion of the committee strength (12 in all), so there has not been a better chance for anyone who would like to contribute to the NIG as a committee member. The retiring members are all founder members, and most intend to stand again (but don't let that put you off). The call for nominations will go out in late autumn. Elections, if necessary, will be held in January 2015. Incidentally, the maximum period on the Committee is 12 years but, of course, you are not committing to that period by standing.

What the Committee does.

As we are asking for nominations for the committee, it was felt useful to give a brief overview of what the role of committee members is and what the committee does.

There are three officers (Chairman, Secretary and Treasurer) and 10 members, one of whom is co-opted from the Nuclear Physics Group. The roles of the officers are fairly obvious, but include liaising with IOP through the 'Groups Forum'. Some of the committee members take on specific roles such as, e.g. being members of the prize committee, newsletter editor; others may do one-off tasks such as organising an event or lecture.

The committee organises the events and lectures that currently are held about four or five times a year. Possible joint events with other IOP groups, or sponsoring events outside IOP, are discussed and promoted. One of the less publicised activities of the committee is commenting on IOP documents and responding to requests for views on government consultation documents to inform the IOP response. As the type of event and subject of lectures is determined by the committee, a strong, knowledgeable membership is necessary to maintain the successful start to the life of the NIG.

Co-Sponsorship

In September 2013, the NIG co-sponsored a workshop organised by the STFC to promote Knowledge Exchange on Nuclear Physics. This brought together the industry and academia to look for areas where nuclear physics information was needed in support of all branches of the nuclear industry. The membership of the NIG were sent the link to the proceedings shortly after the workshop: however for new members and those that have

forgotten the proceedings can be found at <http://nuclearphysics.stfc.ac.uk/index.html>. At this meeting the concept of a one-day seminar on Nuclear data was suggested, as an area of common interest. This seminar has been arranged for 30th October (see "Future Events" at the end of this newsletter for details).

Meet the Committee

A brief introduction to the committee of the Nuclear Industry Group

Chairman: Mr Geoffrey Vaughan CPhys MInstP

Geoff joined the nuclear industry over 40 years ago as a research scientist in the UKAEA, mainly working on what has become to be called 'steam explosions'. He then spent nearly ten years as head of Fast Breeder Reactor (FBR) safety in NNC (now part of AMEC). Here, amongst other things, he part-wrote and edited a safety case for a UK Commercial Demonstration FBR. This was abandoned in favour of joining the European project in France, where Geoff led the UK safety side in the design organisations. However, the FBR did not survive the downturn in the nuclear industry in the 1980s so Geoff joined the UK's regulatory body, then called the Nuclear Installations Inspectorate (NII), but now called the Office for Nuclear Regulation (ONR). Geoff undertook a range of work in NII: assessment of fault studies, PSA, management for safety, site inspection, project manager of the safety assessment principles and was involved in international work including latterly, chairing the IAEA's Nuclear Safety Standards Committee. He retired from ONR in 2011, and took on a lectureship at the University of Central Lancashire in Nuclear Safety and Regulation, finally retiring in 2014. However, he is still active as a consultant both in the UK and other countries, providing training and advice on regulatory issues.



Secretary: Mr Andrew Quinn CPhys MInstP

Andrew is a Thermo-Fluids Engineer doing Performance work at Rolls-Royce based in Derby. Andrew has worked at Rolls-Royce for just over 6 years with previous roles involving Project Management and 3 years' experience doing Probabilistic Safety Assessment. Andrew has recently achieved Chartered Physicist and has qualifications in Risk and Safety Assessment and has an MSc from Birmingham University in the Physics and Technology of Nuclear Reactors.



Treasurer: Chris O'Leary

Chris's background (PhD and post-doctoral fellowships at the Universities of Liverpool and York) is in experimental nuclear structure physics, focussing on gamma-ray spectroscopy of high-spin states in medium-mass nuclei near the N=Z line.

Chris joined Rolls-Royce Submarines in Derby in 2007. Here, he held technical roles in LOCA performance, reactor physics and (currently) as team leader for core thermal hydraulics and rigs. Most of this work has supported the design for the Successor class submarine reactor plant; for example, leading on the design and analysis of a V&V programme using an experimental test reactor.



Chris's personal LinkedIn page is at:

<http://www.linkedin.com/pub/chris-o-leary/29/64b/950>

**Lucy Bailey CPhys MInstP**

Lucy is responsible for developing the long-term safety case to support the implementation of a geological disposal facility for higher activity radioactive waste in the UK. She leads the Post-closure Safety Case Group of Radioactive Waste Management Limited (RWM), a subsidiary of the UK's Nuclear Decommissioning Authority (NDA). Lucy works on a number of EC projects and is co-chairing an IAEA safety case project. She has been an expert reviewer of a number of international safety cases and has many publications in the safety case field. In her spare time, Lucy enjoys campanology, entertaining friends and travelling (almost) anywhere.

**Heather Beaumont CPhys MInstP**

Heather is Head of Profession for Physics, and Team Leader for Physics and Licensing, in Amecs's Existing Nuclear Business based in Knutsford, Cheshire. Heather has been in the nuclear industry with AMEC and its predecessor organisation NNC for 20 years. Her technical background is in reactor physics and she has worked on many physics based projects for a number of reactor types. She now leads a team working on Amecs's portfolio of UK and international nuclear projects covering a range of physics based technical disciplines.

**Dr Michael Gifford CPhys MInstP**

Michael has worked across a wide range of sectors including defence, security, communications, law and software. Much of this was associated with elements of the nuclear industry. Currently he is the Managing Director of Mountain Hare Consulting and Pangaea Agrochemicals and is finding new challenges every day. Prior to working he spent longer than is usual studying and is a graduate of Exeter and Cambridge universities in the UK and HEC in Paris. In addition to work, Michael is a keen sailor during the summer months and enjoys skiing in the winter.

**Dr Ian Holloway CPhys MInstP**

Ian is a graduate of Birmingham and Surrey Universities. His career began as an oil reservoir physicist for BP Exploration at Sunbury on Thames. Thereafter he relocated to Ipswich to work for University College Suffolk. Ian joined Royal Naval College Greenwich in 1997 as Principal Lecturer and now has the role of Nuclear Physics Group Manager in the Nuclear Department DCMT in Gosport. Ian has research interests in radiation detection, shielding and nuclear accident response.

**Dr Steven Judge CPhys FInstP**

Having spent much of my working life at the National Physical Laboratory, I'd describe myself as radiation metrologist, leading research projects for radiation protection, environmental monitoring and radioactive waste measurement. I've also worked in the commercial world, supporting the manufacture of radiopharmaceuticals for imaging and cancer therapy, and marketing products for radiation measurement. I'm currently working for Magnox Ltd at Dungeness, where I've set up a new laboratory for waste clearance and site characterisation. In my spare time, when I'm not trying to repair an old yacht, I'm Managing Partner of Radiation Science Services (a technical writing and training company).

**Mr Zahid Riaz CPhys MInstP**

Zahid received his BSc Physics from Leicester University and an MSc Nuclear Science & Technology from Liverpool University. As well as being a member of the IOP he is also a member of the Nuclear Institute.

He has spent 14 years working within the nuclear industry in various roles on a variety of projects. These ranged from remediation of radioactively contaminated land at Harwell, assessing explosive threat detection systems which utilised nuclear technology to working as a reactor and fuel route operator at Dungeness B.

Currently he works as a scientist at the National Nuclear Laboratory (NNL) within the Nuclear & Reactor Physics Team (N&RPT), where he performs radiation shielding, criticality and reactor physics calculations.

**Dr John Roberts CPhys MInstP**

John is the Nuclear Fellow at the School of Physics and Astronomy at The University of Manchester. He has previously worked at the Universities of Sheffield and Leeds and the Rutherford Appleton Laboratory since obtaining his PhD in Nuclear Physics from the University of Liverpool. As well as being a member of the IOP, he is a member of the Nuclear Institute, Chair of the Nuclear Academic Industry Liaison Society and Board Member of the European Nuclear Education Network. He is very active in promoting nuclear outreach initiatives and is also a Technical Expert for the IAEA on Nuclear Knowledge Management, Education and Training.



Dr David Tattam CPhys MInstP

David is Head of Physics Group at GE Healthcare based on The Grove Centre site (at Amersham). He is also the Head of the Dosimetry Services and Radioactive Water Advisor for the UK sites. The Physics Group operates the Dosimetry services, environmental assessment services, the UKAS accredited calibration laboratory, Solid Waste assessment and Radiation Protection Instrumentation services.



Neil Thompson

Neil Thomson is presently Head of R&D in the Generation Business of EDF-Energy. He is a Fellow of the Institute of Physics and the Institute of Mechanical Engineers, and has spent 35 years carrying out scientific, engineering, and senior management roles in the electricity generating industry.

After starting as a Research Officer in the CEGB covering plant inspection development, he recently held the position of Head of Engineering in EDF-Energy, Nuclear Generation for five years and, prior to that, five years as Chief Engineer for Scottish Power.

Results of our Members Survey

Andrew Quinn

Towards the end of last year we sent out a survey to get an idea of the views of members in the NIG, where they are located, what they want from the NIG and other information that would help us focus on providing a better range of events for the members. Around the time of the survey we had 512 members in the NIG, of which 37 people responded to the survey (7%). Of those 37 people:

- 76% are full Members, 16% are either Associate Members or Student Members and the remaining 8% are Fellows/Honorary Fellows.
- 49% work either in a Civil Nuclear Power Plant or in the Civil Fuel Cycle, 14% in Defence, 8% in Academia, 8% in other Civil roles, and 21% in other related areas.
- 46.5% expressed a preference for a regular newsletter/evening lectures, 26.5% for Industry Visits, 24% for Half Day Seminars/Short Conferences, 3% Other Responses.
- There was an even split in terms of event lengths, with 33% in favour of evening meeting, 33% for half day meetings and 34% for full day meetings.
- There was some interest also in the possibility of providing recorded lectures or webinars, with 80% in total in favour for one of these two means of internet based lectures.
- 49% are already chartered, and about 9% responded that they weren't interested in becoming chartered.

In terms of location, from those who responded, the majority are situated in the North West or nearby, Liverpool, Cumbria, Lancashire areas. There are several members located around London and in both the South West and South East, with a smaller number of respondents in the Midlands and Wales. We even have a member over in the US!

The main reason for people joining the NIG seems to be information purposes and keeping up to date with new developments in the industry, including awareness of talks and conferences that are of interest. The remainder (approximately a third of respondents) said that their main driver was for networking or CPD.

There was a wide variety of topics suggested of interest for future events covering a nearly all aspects of the nuclear industry. The most popular topics included New Nuclear, Waste Disposal, Reactor Physics (with a more technical details), Decommissioning, Government Policy/GDA Assessment Process and how the IOP can influence it and Metrology. There was also interest in how to get started in the industry, PhD opportunities, Shielding and the possibility of overseas talks.

Additional comments included:

- A better survey relating to location of events/willingness to travel

- Encouragement for people to submit their own articles for the newsletter (If interested please get in touch!)

- A larger presence on social media sites – YouTube, Facebook, Twitter with a view to spread a more positive image of the nuclear industry

Overall, despite the low number of responses, there was a lot of useful information provided by the survey, and I would like to thank everyone who spent some time responding to the survey.

We will take these comments on board and hope to deliver events based on these suggestions, and may do a follow up survey for additional information that was not captured in the first survey.

As always, if you have any suggestions for ideas, or wish to get involved in some way we are always looking for ideas so please do get in touch if there is something specific you would like to see.

Andrew Quinn is the Honorary Secretary for the Nuclear Industry Group. A brief pen-portrait can be found within the “Meet the Committee” Section of this Newsletter

Maintaining your CPD for Chartership

Vishal Shethwood

For those of you obtained your chartership from 2012 onwards, you may be aware that in order to maintain your chartership accreditation you will need to present evidence of your ongoing CPD record, as well as an up to date CV, to the IOP membership committee every 3 years. The aim is to raise the standards expected of all IOP members and give employers, public and members increased confidence in the quality of those who are Chartered.

This is IOP policy and therefore it is important for you to understand what is required from you and ensure you are aware of the tips and guidance available which can provide support to help meet this. Below is some information to help clarify what CPD is, as well as guidance on what is expected to maintain your Chartership.

What is CPD?

CPD stands for Continuous Professional Development and is a term used to define the undertaking of learning and development by professionals. The IOP defines it as a systematic maintenance, improvement and broadening of knowledge and skill. Simply put it is a a life-long learning approach to plan, manage and benefit from development activities. Members of the IOP are required to undertake CPD and to encourage others to do the same.

Many become confused in trying to classify what actually constitutes CPD and focus activities such as formal training only. However a huge variety of activities undertaken in your profession (and perhaps outside of it) can qualify towards CPD if the learning event is

recorded and reflected upon correctly. The outcome of any learning event is more important than the type of event or time taken however it may only count towards your official CPD record if you reflect upon the learning gained and how that learning can be applied.

CPD can take many forms including work based learning, professional activity, formal or educational training, self-directed learning or something entirely different such as public service or voluntary work. Specifically, the activities can be as wide ranging as work shadowing, presentations, secondments, teaching, coaching/mentoring, involvement in professional bodies, attendance to training courses, writing papers or articles, delivering training courses, reading specific books or journals and reflective practice. The key point is to identify what activities you have undertaken, what you have learnt from them and how you can apply this to enhance your knowledge, skill and capability.



The benefits of CPD won't just be felt when going for a promotion or applying for (and maintaining) your Chartership, many employers now value 'learning agility' as a core competency. It can help build confidence and credibility as you see your progression by

tracking your learning. It can be prove to be handy during appraisals as a means of highlighting systematic personal development and it can also help to achieve your career goals by focussing on your training and development.

Capturing your efforts

There are many ways of recording CPD activities and its easy to find templates on the internet if your company or organisation does not already have something. The important thing is to record the key elements including dates, what you did, why you did it, what you learnt from that activity and how you will use (or have already used) this learning.

The IOP offers it members with a free online tool called MyCareerPath specifically desgined to help capture the key points from CPD activities. It actually is a combination of both a planning and recording tool by allowing you to record your career goals, plan activities that will help you reach them and give you a chance to reflect on your progress and the specific activities.

The requirement is that every three years, those that are Chartered should provide details to the IOP of at least 5 development activities undertaken in the last three years which includes a complete 'reflective analysis' record for each activity showing what has been learnt and how it contributes to ongoing professional competence. You can use MyCareerPath to capture this or another document template however it must capture and detail the key information.

The principles of recording CPD are the same as those required for Chartership which is that the details should be outcome based and members needing to articulate the benefits gained from the experience.

The important point to remember is that the IOP are open to accepting a wide variety of activities as demonstrating learning and development which is relevant to your career to qualify as CPD as long as the reflective analysis has been undertaken.

The IOP website provides a wealth of further information to members to support them in maintaining and recording their CPD activities.

On a final note the NIG committee would like to remind everyone that attending and learning at one of our speaker events is a great way of gaining CPD. Details of our forthcoming events can be found later in this news letter.

Vishal Shethwood is a Chartered Physicist and currently works as a Licensing Engineer in AMEC's Clean Energy Europe Business based in Knutsford, Cheshire. Vishal has been in the nuclear industry with AMEC for over 5 years and in addition to technical experience has also worked in team leadership and bid management roles.

Mentoring and the IOP

Vishal Shethwood

Have you ever wondered what mentoring is all about or wanted become involved in mentoring? This article sets out what the IOP can offer in terms of mentoring and how the IOP can help you if you need mentoring.

Before we talk about IOP activities and resources to support mentoring, it's useful to understand what we mean by mentoring and why it is considered to be so important for continuous professional development.

Why mentoring?

Mentoring has been described as "one of the best methods to enhance individuals "learning and development". It is a relationship between two people, based on mutual trust and respect, with a focus on goals and objectives for professional development. Typically the mentor is someone experienced who can share knowledge, experience and offer advice to the less experienced person and in doing so, support and encourage their mentee to increase their skills and capability.

Increasingly professionals are actively pursuing mentoring to support their professional development and advance their careers. It is seen to be hugely beneficial for both the mentor and the mentee which can help both to recognise their abilities and limitations and therefore highlighting areas for future development. Also many others can benefit including line managers, colleagues, customers and suppliers in an almost ripple effect from the mentor's and mentee's increased confidence, motivation, greater insights and knowledge and enhanced skill levels.

The IOP recognises the benefits of mentoring and is committed to promoting and facilitating the mentoring process as a key tool for professional development and has found it to be of significant benefit to those working towards their chartership.

Making it happen

Whether you are a potential mentee looking for some support in professional development or a potential mentor with a desire to impart your skill/knowledge to help others, the first thing to

do is be clear with yourself exactly why you want to participate in mentoring and what you hope to get out of it. This forms the foundation of the relationship and allows both parties to be open and honest upfront about expectations.

In terms of the mentee, the next step is to choose a mentor. Some organisations offer established mentoring programmes and/or allocate mentors to mentees as part of an induction programme or graduate training scheme. If that isn't available, the best approach is to identify a potential mentor and simply ask them. Many people would be happy to be a mentor and would likely feel privileged to be asked but the mentee must be very clear as to what they are asking for and what they hope to get out of the mentoring relationship. This could be objectives such as wanting to apply for a certain job role to helping guide you through your professional accreditation.

The IOP offers an online mentoring service for registered IOP members to help mentees search and identify mentors with the relevant professional experience within the IOP network. The searchable database can link mentees with suitable mentor. It is currently in the final stages of being upgraded with an expected go live date of 8th September 2014.



Having identified a suitable and willing mentor, it is important to ensure that the relationship starts off on the right foot. Have a clear agenda for the first meeting and use it to not only build rapport and get to know one another better but to also set out and agree clear goals and

objectives. This will provide context for the mentoring relationship and inform how future meetings will be structured and focussed. Agree on when and how regularly the goals and objectives should be reviewed and ensure timescales are linked to actions such that progress can be measured more effectively. Plus it is a good idea to define the duration of the partnership so that each party is clear what

they hope to achieve and by when. By planning ahead and setting targets, both the mentee and mentor have something to strive for, and a sense of satisfaction can be felt by both when these are achieved.

At some point close to the defined duration, both the mentor and mentee will need to review whether the relationship has come to an end. This will require a meeting to look at what has been achieved, and in some cases what may not have been achieved and why. This is not a point to cut off all further contact between the mentor and mentee but more a moment to review if the mentoring relationship needs to formally be dissolved and if so make sure it is done in a way that brings about adequate closure to both the mentor and mentee. Typically these moments lead onto new mentoring relationships being formed as a result of new goals and objectives being set.

Further details

Mentoring partnerships can be mutually beneficial and rewarding – on both professional

and personal levels. Mentors can develop leadership skills and gain a personal sense of satisfaction from knowing that they've helped someone. Mentees can expand their knowledge and skills, gain valuable advice from a more experienced person, and build their professional networks. Both partners can improve their communication skills, learn new ways of thinking, and, ultimately, advance their careers.

The IOP website has plenty more detail on mentoring and further guidance on how to make the most of a mentoring relationship for your professional development.

Vishal Shethwood is a Chartered Physicist and currently works as a Licensing Engineer in AMEC's Clean Energy Europe Business based in Knutsford, Cheshire. Vishal has been in the nuclear industry with AMEC for over 5 years and in addition to technical experience has also worked in team leadership and bid management roles.

Regulating New Build – Progress and Lessons

A lecture by Alan McGoff of the Environment Agency on 30th September 2014: at Horizon Nuclear Power, Gloucester, UK

Geoff Vaughan

Alan began by saying the basic UK policy on nuclear power plants now was “anyone with the money should go ahead and build”. The regulators, the Office for Nuclear Regulation (ONR) and the environment agencies in England (EA) and Wales (NRW), were working together, through the Generic Design Assessment (GDA) process, to assist in meeting this aim. Alan claimed that the regulators now see themselves as “enablers not blockers” and the thrust of his lecture was to explain how this was being realised in practice.

To set the scene Alan quoted from the DECC website that predicted that by 2050 30-60% of heating would be by electrical means and 80% of car journeys would be in electric cars. Whilst there would be improvements in insulation and the use of Carbon Capture and Storage for fossil fuel plants, there was a need for roughly one Hinkley Point C sized plant to be built each year from about 2020. As these plants were likely to be of different designs getting a smooth process for assessing the safety of them and

demonstrating to the satisfaction of the regulators that operation would be safe was important.

The GDA process was intended to speed up the process so that designers/vendors (known as Requesting Parties – RP) could have their designs assessed, based on a generic site, before a formal request for a licence from an operator was made. This process had been developed and applied to four different designs in the late 2000s, although only two designs (Areva's EPR and Westinghouse's AP1000) were taken through to completion. Completion would mean that ONR issued a Design Acceptance Confirmation (DAC) and EA a Statement of Design Acceptance (SoDA) which both had a validity of ten years and could be used in support of a licence application. During the process there was a great amount of transparency using a joint website so that the public could see how the assessment developed. The regulators, for instance, published their Regulatory Issues (which

indicated areas where the design was not adequate) and monthly progress reports as well as assessment reports. At the end of what had been initially expected to be a four year process, but was extended by 6 months due to the requirement to consider the effects of the Fukushima-Daiichi accident on the design, it was determined there were still outstanding issues so only interim DACs and SoDAs were issued. As there had been changes that meant it was unlikely the AP1000 would be built in the UK, Westinghouse decided not to resolve the issues on their plant, but Areva provided further information and a DAC and SoDA for the EPR was issued a year later in December 2012.

Alan noted that for EPR over 7000 documents had been reviewed, involving 50,000 days of regulatory effort and the cost had been about £33million (he estimated that the vendor had probably spent about three times this amount). GDA had resulted in 82 design changes to the design as submitted. He noted that the assessment had involved liaison with regulators in other countries who were considering the designs and this had been particularly useful when a letter signed by several of them had been sent to the designers pointing out fundamental issues that needed to be resolved: on EPR this involved the digital C&I.

The GDA process had developed during this period and was being revised and new guidance was about to be published along with a "Lessons Learnt" document. Among the changes were: the use of dedicated technical and project staff by the regulators; better communications which related to language,

culture and technical understanding; publication of Regulatory Observations (where there was a need for further information) and their resolution rather than a plethora of Topic Reports; improved dissemination of information on the UK regulatory approach for RP; earlier fixing of the reference design during GDA; better quality and delivery on time of RP documents and a master list of submissions. This improved GDA would be used in assessing the Hitachi-GE ABWR, which was no doubt of interest to our hosts HORIZON!

Alan then discussed some of the issues that needed resolving in choosing and agreeing to a site, such as a Development Consent Order which had to fit with the National Policy Statement. Several sites had now been determined as well as Hinkley Point, for which a Nuclear Site Licence had been issued: EDF-NNB was also intending to build at Sizewell; HORIZON had sites at Wylfa and Oldbury; NuGen at Moorside near Sellafield. He noted that other sites such as Heysham, Bradwell and Hartlepool were also available

Alan finished by saying the only thing which seemed to be missing was money!

There was a lively question session after the talk, which was attended by about 90 people. The NIG wishes to thank HORIZON for their hospitality in hosting the event.

Geoff Vaughan is the chairman of the IOP NIG committee. A brief pen-portrait can be found within the "Meet the Committee" Section of this Newsletter

The Jules Horowitz Reactor

A report on the talk given by David Farrant, National Nuclear Laboratory

David Tattam

On the evening of 6 March 2014, following the AGM, the Nuclear Industry Group was pleased to welcome David Farrant from NNL. David presented the UK contribution to the Jules Horowitz Reactor (JHR).

Access to facilities that will provide fuel and materials test data under irradiation is an essential part of any country's nuclear reactor programme. It is acknowledged, however, that most current Materials Test Reactors (MTRs) around the world are ageing and many are scheduled to close over the coming years. With that in mind, a new materials test facility, the

Jules Horowitz Reactor (JHR), is currently under construction at the CEA's Cadarache site in the south of France. The JHR will underpin the international community's test reactor requirements well into the future. It is being built, and will be operated, within the context of an international consortium. Construction is expected to be completed in 2018.

On 12 March 2013 the UK government announced a significant funding commitment to the JHR. This commitment will allow UK-based academics, national laboratories and the nuclear industry guaranteed access to the

reactor, and enable collaboration on safety and innovation. At the same time, the government announced that UK participation in the JHR programme would be led by the UK's National Nuclear Laboratory (NNL). NNL currently leads the UK involvement in the existing international fuel and materials experimental programme at the Halden Test Reactor (HTR) in Norway. NNL, the government's Department of Energy and Climate Change (DECC) and the CEA believe that a similar approach should be adopted regarding the UK's interactions with JHR.



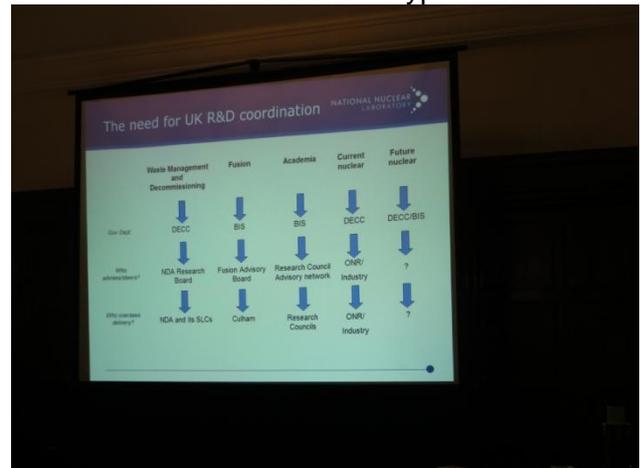
JHR will be a 100 MWth light water MTR optimised for fuel and material testing. In summary, the capabilities of the JHR will include the following:

- Fuel testing under nominal, off-nominal and accident (eg Loss of Coolant Accident or LOCA) conditions.
- Material testing under high 'displacements per atom' (dpa) and controlled thermal gradients.
- Pressure vessel steel testing.
- Corrosion and stress corrosion cracking testing.
- High temperature materials testing.
- Gen II, III, III+ and IV fuel and material types.
- Supply of medical isotopes.

NNL will set up a UK consortium of interested parties who, together, could make use of JHR's capabilities and realise the benefits of UK membership. The first step in this process was the organisation of a one-day seminar on 22

May, when a wide cross-section of organisations in the UK who could potentially have an interest in the project (including government, industry, national laboratories and academia) were invited to hear about the project. At this seminar, an overview was provided of the UK R&D infrastructure and Government drivers for JHR membership, in addition to background on the Halden project for comparison purposes. The main part of the meeting was a presentation by CEA on JHR's capabilities, the potential for sending secondees now to work at the reactor site, plus a Q&A session with the audience.

The current expectation is that first criticality of JHR will happen at the end of 2016, with the first tests starting in 2018. The initial experimental capability will focus on normal and off-normal LWR tests. This will eventually be expanded to cover accident conditions and other high temperature materials testing capability, and eventually testing under Generation IV reactor type conditions.



If anyone would like any further information about the JHR project and the UK's involvement in it, please contact the speaker, David Farrant at NNL (david.farrant@nnl.co.uk).

Acknowledgements

The images in this article are courtesy of CEA, which is the French Atomic Energy Commission.

David Tattam is a member of the IOP NIG committee. A brief pen-portrait can be found within the "Meet the Committee" Section of this Newsletter

Small Modular Reactors (SMRs)

A report on the talk given by Tom Courtney, Lloyds Register (Energy)

Zahid Riaz

Small Modular Reactors (SMRs) have come to the fore recently with international interest in their design, economics and deployment. The IOP NIG recently submitted a response to questions raised by the Department of Energy Climate Change (DECC) select committee inquiry into small nuclear power i.e. SMRs.

In addition the IOP NIG organised a presentation on SMRs to further inform its members and the public on this promising technology. This was held at 'The Centre' Birchwood Park in May. The presenter was Mr Tim Courtney, a principal consultant in nuclear risk at Lloyds Register Energy. The audience turnout was very good and ranged from a gentleman who had worked on the Windscale Piles during the 1950's to new graduate scientists working at the various nuclear companies on the Birchwood Park site. The presentation was very well received by the audience, the general consensus being that it was well presented, interesting and informative. A brief outline of the main points covered in Tim's presentation is given below.

The International Atomic Energy Agency (IAEA) defines a 'small' nuclear power reactor as one which produces under 300MWe. Most reactor designs in this power range are referred to as SMRs. They are designed to be manufactured in a factory and transported to an installation site fully constructed via road, rail or barge.

There are many different SMR concepts (over ~50), some of these are described on the World Nuclear Association (WNA) website. There are four main types of SMR, these being, Light Water Reactors (LWR), Gas Cooled Reactors (GCR), Fast Spectrum Reactors (FSR) and Molten Salt Reactors (MSR).

The attributes of modern SMRs are:

- they are simplified in design and quicker to build relative to large Generation II/III+ PWRs currently in service (e.g. Sizewell B) and proposed Generation III PWRs (e.g. EPR);
- have economy of manufacture per reactor unit, i.e. multiple units can be

manufactured to the same design and specification at a factory

- some have the ability to provide process heat e.g. for chemical processes, water desalination or as well as electricity production.

The most likely type of SMR to be built in the UK in the near future will be based on large current Pressurised Water Reactor (PWR) technology, a LWR type. It is referred to as 'Integral SM PWR'. The 'Integral' refers to the fact that the primary system components such as the reactor core, steam generator, pumps and pressuriser or a combination of the components are incorporated into a single vessel. Two promising integral SM PWRs are described below.

NuScale: Is a US based 45MWe multi-application scalable small PWR design for which Rolls Royce is providing support. The passively cooled reactor core has nominally enriched PWR fuel assemblies 1.8m long and is contained in the same vessel as the steam generator.

mPower: Is a US based 180MWe scalable small PWR design. The reactor core uses standard PWR fuel assemblies and is contained together with the steam generator and pumps within a single vessel emplaced below ground.

SMRs are becoming increasingly attractive to potential operators around the world, for the following reasons.

- They are ideal for some countries e.g. Canada which have population concentrations spread over a large territory but do not have an electricity grid covering the entire country. In this instance an SMR could be built close to the population concentration to supply electricity.
- A single SMR (~300MWe) has lower capital costs than a large conventional PWR (~1000MWe), this allows countries with limited finances an entry route to nuclear power. e.g. An EPR would cost

~£6 billion, whilst an SMR would cost ~£1 to 2 billion. In addition an SMR would be quicker to build and start generating electricity to provide revenue to fund further SMR builds and scale up MWe generation. However it must be noted that several SMRs providing the same MWe as a single large conventional PWR will likely cost more per MWe and have a larger footprint.

From a safety point of view SMRs could be viewed to be safer than large conventional PWRs. They have a smaller power output which means that in some designs passive cooling of the core is being considered, thus allowing for reduced operator intervention in the event of an accident. In the event of a catastrophic accident because the core is smaller less radioactive material is released to the environment. In addition the smaller power output of an SMR may have a smaller emergency planning zone and cooling demand which means that it can be sited at a much greater range of sites than a large conventional nuclear reactor. Near term SMRs are based on current PWR technology and so have the same proliferation issues. Future SMRs may provide greater proliferation resistance due to having different fuel cycles.

Some of the licensing challenges that a potential UK, SM PWR would face are:

- testing and proving of the integral SM PWR design i.e. core, steam generator, and pumps etc being in a single vessel.

- testing and proving of designs with passive cooling.
- multiple SMR reactor maintenance & safety e.g. number of reactor desk operators required for multiple SM PWRs at one site.

Some SMRs designs are already well advanced and are due to be built or are being built, these are:

- ACP100: a Chinese designed 100MWe integral SM PWR emplaced below ground which is due to start operation in 2018.
- HTR-PM: a Chinese designed high temperature gas cooled reactor currently under construction. The reactor uses a technology similar to South African Pebble Bed Modular Reactor (PBMR). Two HTR-PM units will supply steam to a single turbine to produce 210MWe. It is due to start operation in 2017-2018.

There is considerable interest in SMR technology in the UK and the rest of the world. The UK nuclear industry is well placed to support SMR research and development e.g. Rolls Royce supporting NuScale in the US. The increased experience we gain from this will in turn enable us to become intelligent customers and licensers of this technology. This could lead to SMRs being built in the UK!?

Zahid Riaz is a member of the IOP NIG committee. A brief pen-portrait can be found within the "Meet the Committee" Section of this Newsletter.

Future Events

The NIG is pleased to announce the next few events in our calendar:

17 September 2014 - 'Innovative approaches to optimise the management of higher activity radioactive wastes' by Ciara Walsh at EDF-Energy, Barnwood.

This talk will describe a range of innovative approaches to optimise the management of higher activity radioactive wastes and will provide an update on the work of Radioactive Waste Management Limited (RWM). The Upstream Optioneering project was created in the Nuclear Decommissioning Authority (NDA) to support the development and implementation of significant opportunities to optimise activities across all the phases of the higher activity waste management lifecycle (i.e. retrieval, characterisation, conditioning, packaging, storage, transport and disposal). The objective of the Upstream Optioneering project is to work in conjunction with other functions within NDA and the waste producers to identify and deliver solutions to optimise the management of higher activity waste.

Registration

This event is free to attend however you must register in advance as space is limited to 30 people. You can register online at <https://www.eventsforce.net/iop/611/home>. Registration closes on Monday 8 September. Please note that attendees will need to bring photographic ID (e.g. a passport) with them to gain access to the site.

15 October 2014 – ‘Space application of nuclear technology’, Tim Tinsley (NNL) at Department of Physics, University of Birmingham.

The talk will discuss the needs for nuclear technology in space applications, the history of developments, the challenges of applying the technology, and the role the UK may provide for future space missions. Tim will talk on the work being carried out at NNL to develop Am-241 based space batteries

30 October 2014 – ‘Seminar on Nuclear Data’ 1 Day Workshop on Nuclear Data: Current Measurements, Uncertainties, Applications and Needs at National Physical Laboratory in Teddington. Directions to NPL can be found via the following link

<http://www.npl.co.uk/contact-us/location/> Registration: 09:00 hrs - 17:30 hrs

The recent [STFC Nuclear Physics Showcase Event](#) in September 2013 highlighted the contribution that nuclear physics makes to the UK and also the challenges in resourcing and co-ordination that the field faces.

Following on from this event, you are cordially invited to a workshop to debate one of the topics raised - the need to maintain and improve nuclear databases. The aims are to discuss the present status and future requirements.

Presentations will include:

- *Nuclear databases (national and international perspectives)*
- *Nuclear data needs for nuclear medicine, NORM, the nuclear industry and test-ban treaty verification*
- *Total decay heat measurements*
- *Decay data for exotic radionuclides*

The event is jointly Sponsored by the IOP Nuclear Physics Group, The IOP Nuclear Industry Group and the National Nuclear Laboratory.

Speakers include representatives from academia, the National Nuclear Laboratory (NNL), the National Physical Laboratory (NPL), Argonne National Laboratory, AWE plc., the IAEA and the UK nuclear industry.

Registration

The meeting is free to attend but participants are kindly requested to register in advance using the online portal below:

<http://www.npl.co.uk/events/30-oct-2014-nuclear-data>

20 November 2014– ‘From Fission to Fuel Gone – the CONSORT reactor’ by Trevor Chambers at Franklin Theatre: IOP, London: 6.30 for 7.00

CONSORT, the last civil research reactor in the UK, shutdown for the final time in December 2012. The reactor, owned and operated by Imperial College London, had for nearly fifty years been used for teaching and research in many fields of nuclear science and

technology such as reactor physics, reactor engineering, neutron physics, solid state physics, radiochemistry and activation analysis.

*But now the neutrons have ceased their toil, what's left for the reactor?
This talk will discuss the first significant stage in the decommissioning of the reactor – defueling. It will cover the design, installation and commissioning of the defueling equipment, the regulator interactions and the successful outcome of the project.*

Registration

This event is free to attend and registration details will be advertised in due course.

24 March 2015 'The behaviour of graphite in reactors based on PhD studies at Leeds'. Helen Freeman at Birchwood, Warrington

October 2015

In addition to the above we are planning a joint half-day seminar with the History of Physics Group to celebrate the successful use of magnox reactors in the UK for over fifty years. The last of the type will close at Wylfa in 2015 and it is intended the seminar will take place in October, hopefully in the Wylfa Visitor Centre. More information will be available when the details have been finalised

Items for the next newsletter – Submit an Article

We'd like to hear what you're doing, what you think of the Nuclear Industry Group, any ideas you may have for networking opportunities or anything else you think would be of interest to the rest of the group. We plan to publish our next Newsletter in early of 2014.

Please submit any articles and accompanying photographs or pictures to either Heather Beaumont (mailto:heather.beaumont@amec.com) or Geoff Vaughan (mailto:gvaughan@uclan.ac.uk) .

This newsletter is also available on the web and in larger print sizes.

The contents of this newsletter do not necessarily represent the views or policies of the Institute of Physics, except where explicitly stated.

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