Universal Business Case for Participation in External Opportunities

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Introduction

Nuclear Criticality Safety (NCS) is a vital discipline within the international nuclear industry to ensure that the processing and handling of fissile material is done safely. However, NCS is recognised as a niche discipline which has limited coverage within relevant nuclear physics modules at universities in the UK. As such, expertise is developed primarily through experience within the role. In recent years, the aging population of suitably qualified and experienced personnel in NCS has become a common issue identified across the whole nuclear industry. Accelerated and continued development of early-careers NCS practitioners will ensure capability is strengthened and maintained.

Many conferences, training courses, forums and working groups have been established in NCS for sharing knowledge on a wide array of topics including novel methods, good practices, and learning from experience (LFE). While such events are conventionally attended by leading experts from companies within the UK nuclear industry, there are many compelling reasons that members of the early-careers NCS community should attend such events.

The purpose of this universal business case is to outline the types of opportunities that members of the Early Careers Criticality Safety Network (ECSN) could get involved with and provide a succinct summary of the benefits to their attendance, both to their own development and to their companies. This document is endorsed by industry experts within the UK Working Party for Criticality (WPC) and therefore serves as a reputable guide to support the creation of an individual's business case, increasing the confidence of business management that such activities provide sufficient benefits against the costs of attendance.

Types of Opportunities

The table below summarises the types of opportunities that early-career NCS practitioners can get involved with. Beyond basic attendance, a minimum expectation of participation is the capturing and sharing of knowledge attained from attending these events. ECSN members should be prepared to articulate within their business case how they will share LFE gained within their company's NCS division (or more widely). The below table suggests additional activities that extend beyond passive attendance that may enhance one's business case by maximising both personal development and value brought back to the business.

Note that the examples given are illustrative and not an exhaustive list of opportunities that the ECSN endorses or recommends. However, all examples given are well established within the NCS discipline and have proven to be highly beneficial for the development of early-career members.

Type	Activities/ Participation Beyond Minimum Expectations	Examples
Conferences	• Attendance at associated workshops • Presentation of papers • Chairing sessions • Contribution to organising committee • Contribution to associated workshops	• ANS criticality topical conference (NCSD) • International Conference on Nuclear Criticality Safety (ICNC) • ANS general conferences
Training Courses	• Revision of prerequisite material • Deployment of improvements to current practices within company	• UK-NNL/UNM NCS • US Hands-on Experiments • Introduction/Advanced MONK • MCNP / SCALE / Serpent / OpenMC Training Courses
Workshops and Seminars	• Delivering presentations • Contribution to organising committee • Chairing sessions	• ANSWERS Seminar • WPC Workshops • ECSN Workshops
Sub-Groups	• Contribution to sub-groups, e.g. writing guidance, undertaking calculations, comparison of results. • Input to Good Practice Guides to be used across industry • Deployment of improvements to current practices within company	• WPC, e.g. Emergency Planning, Competency Framework, Random Geometries, Sensitivity/Uncertainty, etc. • ANS • WPNCS • NEA
Standards	• Contribution to Standards sub-groups, e.g. writing standards, reviewing standards, collating feedback from UK. • Representing company to evidence engagement with regulators	• ISO • ANS
Site Visits	• Hosting/coordinating site visit.	• UK licensees

Benefits

The following sub-sections will discuss the business benefits associated with participation in the types of opportunities listed in the table above. These benefits cover a wide range of aspects from direct business improvements, LFE, and development of trainees from a technical, behavioural, and business perspective.

Conferences, Workshops & Seminars

Conferences, workshops, and seminars provide an extremely condensed, in-depth course of curated presentations delivered by adept members of the NCS community on topics at the leading edge of the discipline. As such, they serve as a great opportunity to accelerate one's learning about NCS, especially when in the early stages of their career. This learning can be developed both by attending the presentations and through engaging with subject matter experts. Direct interaction with experts in the field often provides more effective and insightful learning than can be attained from literature alone. This is doubly beneficial in cases where the attendee will be contributing to the event. For example, a presentation given by the attendee will attract feedback from many of these experts.

Conferences also provide an opportunity to network with other professionals across the discipline who may be able to advise or collaborate on future challenges. With the ongoing importance of shared LFE in the nuclear industry, it cannot be understated how important it is for early-career professionals to garner a wide and diverse network from which LFE can be pooled together to improve the collective safety of the

international nuclear industry. Should there be a novel technical problem that is proving challenging, connections made at these events could serve as an invaluable resource if they've encountered a similar issue. A network that spans beyond your company's boundary of expertise encourages collaboration and reduces repeated mistakes and overall effort expenditure.

Such events also provide early-career professionals with an invaluable opportunity to boost their own career development by utilising their newly gained knowledge and richer network of NCS professionals to guide their own future development. The immediate and future development of the individual will allow them to better deliver against tasks on their return by having an increased awareness of good practices and new methods of working within NCS which they otherwise may not encounter, improving quality and resource efficiency.

Training Opportunities

Since NCS is a highly specialised discipline, the number of NCS-specific training opportunities available is very limited. However, those offered both domestically and internationally are well-regarded within the NCS community for the development of NCS professionals. Notably, "hands-on" training opportunities are available outside the UK where trainees can gain an appreciation for how the behaviour of a neutron multiplying system changes when varying key parameters such as geometry, interaction, and moderation. This course is a compulsory aspect of the competency framework to become a qualified NCS practitioner in the USA. Those who have attended the hands-on course hosted by the US DOE routinely say how it reinforces learning and greatly improves their understanding of criticality safety.

External training opportunities provide early-careers professionals in NCS with both depth and breadth of knowledge within the discipline which would otherwise take several packages of work to accrue. This can reduce the amount of time required to become suitably qualified, which is of huge benefit in the current scarce resource climate within the NCS community. Formal training delivered by industry experts also allows individuals to develop a stronger fundamental understanding of theories and methods. Improved theoretical knowledge, coupled with a deeper understanding of good practices and techniques, will improve the quality of work produced, reduce the time taken to produce work and will allow individuals to better adapt to new tasks.

Sub-Groups and Development of Standards

It is often assumed that input into these subjects is reserved for senior professionals. However, participation in technical sub-groups and standards development areas exposes early-career NCS professional to real, complex issues earlier than would be expected in their day-today roles. This practical application helps bridge the gap between academic knowledge and criticality safety practice. It also promotes a stronger understanding of the standards themselves, as well as the regulatory intent behind them and gives confidence in the application of relevant good practice. Furthermore, it builds professional skills such as technical communication, provides a constructive challenge but ultimately provides early establishment of professional credibility – a great way to accelerate an early-career individual to being fully qualified.

A recent example of this was a request for volunteers to lead the coordination of workstreams regarding key skills raised by the UK-WPC. The work was to drive a UK deliverable forward and provided exposure to a wide group of NCS personnel from many organisations which supported development of management as well as behavioural skills (by holding people to account, overseeing delivery, providing resilience etc.). This type of activity would be expected to support the individual in future endeavours where they may need to use internal or external resources and feedback on progress and challenges to a committee or leadership function. In this specific example, mentors were provided to support the lead and help to develop these skills.

Site Visits

The ECSN offers several opportunities to visit UK licensed sites each year. In addition, opportunities to go on site visits are offered by other early-career groups such as the Nuclear Institute's Young Generation Network (YGN) and the Society for Radiological Protection (SRP). Often, conferences also include opportunities to go on tours before or after the main proceedings. Visits can be valuable opportunities to gain a broader understanding of the nuclear industry, and the co-dependencies within the UK fuel cycle. Through visits, early-career criticality practitioners can also gain an insight into how different examples of hazard management strategies are implemented at UK facilities. The opportunity should be taken to reflect on similarities and differences between the sites visited and the trainee's own site, with a view to identifying improvements or LFE that can be brought back.

An excellent example of the benefits of site visits would be the ECSN visits to the Office for Nuclear Regulation (ONR). These are professional meetings held in a non-representative capacity and are a great opportunity to meet with the regulator and have general topics of discussion around criticality. As these visits involve many criticality specialists from around the UK, there are plenty of opportunities to learn from others and discuss open issues that are broadly relevant to the criticality safety community. These are also a good opportunity to learn of any opinions, methodologies, or the general direction of UK regulation from both the regulator and other criticality professionals in attendance.

Guidance for Using the Universal Business Case

The sections above describe the general benefits of sending early-career NCS professionals to various external events and opportunities. This document should be used to bolster an individual's business case, which may re-use some of the content but should be case-specific to highlight the benefits of attending a given event.

Tips

- Be sure to detail how the event will support any work you are undertaking, or any areas where your development would benefit your company.
- Try to tie the identified benefits to any individual professional development goals you have (e.g. chartership competencies, internal skills plans/frameworks).
- Associated costs should be estimated and presented to allow stakeholders to weigh up the costs and benefits, including potential cost-savings from your development.
- Specify the expectations of your involvement including submitting and presenting papers or producing a summary of findings upon your return.
- Detail how it may be more challenging to achieve this (i.e., development) another way in terms of time, cost and opportunity (e.g. timing relating to upcoming work in the organisation).

The endorsements below should communicate to your stakeholders that attending such events is a vital part of developing NCS professionals which is recognised by industry leading experts within the UK-WPC.

This document has been produced by the ECSN and has been formally endorsed by the following members of the UK-WPC:

Organisation	**Principal Member**	**Job Title**
AWE	Mark Roydhouse (Vice Chair)	Criticality Safety Authority
Cerberus Nuclear	Stewart Hay	Director, Criticality Safety and Radiation Shielding
Nuclear Waste Services	Liam Payne (Chair)	Safety Case Lead (Criticality Safety, Dose & Shielding)
Galson Sciences	Tim Hicks	Technical Director
NRS (Dounreay)	Roksana Grzelak	Criticality Specialist
NRS (Magnox)	Ed Cracknell	Section Head – Assay, Shielding, Criticality
NNL	Deborah Hill	Senior Fellow in Criticality Safety & Head of Fellowship
NTS	Michelle Nuttall	Criticality Safety Capability Specialist
Sellafield Ltd	Fred Winstanley	Senior Criticality Safety Assessor
ETC Ltd	Barry McGuirk	Nuclear and Process Safety Specialist
Urenco UK	Karandeep Giddha	Criticality Assessor
Amentum	Simon Richards	Principal Physicist | MONK Design Authority
Stantec	Stuart Watson	Principal Criticality Safety Consultant
TUV SUD Nuclear Technologies	Peter Roocroft	Senior Lead Consultant
EDF	Mark Henderson	Reactor Physicist
Rolls-Royce Submarines (Product)	Paul Walmsley	Criticality Section Lead
Rolls-Royce Submarines (Operations)	James Anderson	Nuclear Safety Lead
Rolls-Royce SMR	James Lam	Criticality Engineer
Springfields Fuel	Andrew Brown	ONR Regulatory Liaison & Principal Assessor – Criticality
ECSN – Chair	Harry Lester	Engineer – Reactor Physics