**Technical Support – Work Order Specification**

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| **Title: Development and delivery of a software analysis training course for ONR inspectors** |
| 1. Background to the project

ONR C&I inspectors are increasingly encountering regulatory challenges in the area of software based systems, particularly in the new reactor assessment and build projects, due to increasing use of components containing software, coupled with strong economic pressures. This is a trend that inspectors for many operational nuclear facilities are also facing. It is anticipated that software based systems will take a greater role in small modular reactors (SMRs) and Advanced Modular Reactors (AMRs) that ONR is likely to be requested to assess in the near future.Whilst ONR has robust and well-developed high-level guidance in this area, this does not provide the detail necessary for inspectors to determine what is reasonably practicable in the application of existing and new software tools and techniques in this developing field. Relevant good practice (RGP) has also been superseded by technological developments in some areas. ONR uses technical support contractors (TSC) extensively to provide guidance and regulatory support, and this has proved to be generally adequate to date. However, there are very few TSCs with sufficiently detailed knowledge of both UK nuclear regulatory approaches for software based systems and the application of specific software techniques that are reasonably practicable for these systems. In the past this has resulted in there being conflicts between ONR's resource requirements and those available from the TSC, resulting in assessment delays. In addition, the number of projects involving software and requiring detailed regulatory knowledge has increased, as has the level of knowledge required by inspectors to make effective regulatory decisions, even with TSC input.To service this increased demand the ONR E, C&I professional lead has identified a need to increase the number of inspectors able to regulate effectively where components containing software are encountered. This is intended to reduce pressure on TSC resources and to reduce the potential for conflicts between projects caused by limitations on TSC resource. Also to increase the size of the pool of inspectors who will be able to undertake assessments of software based systems, and to increase the knowledge of existing inspectors able to assess software based systems.Therefore the ONR C&I specialism needs to provide additional training to inspectors in the area of software analysis. This is will increase the competence of inspectors, so that they are better able to make effective regulatory decisions in a wider range of circumstances, and to work in an enabling manner.There is no commercial training course that is suitable to provide inspectors with the required knowledge. This is because commercial training courses are often targeted at specific software types whilst inspectors may be presented with a range of different potential approaches, and need to be able to understand the suitability of each.What is required is a specialist training course in software analysis techniques that will increase the competence of inspectors by providing them with knowledge of the current practices in software analysis across a range of industrial sectors, including nuclear safety engineering. |
| 1. SCOPE OF THE SERVICES REQUIRED

A training course will be developed by the TSC for the purposes of training ONR inspectors in software analysis techniques, recognising the needs of inspectors, including:* Inspectors will have attended a pre-requisite course on the causes of failures of software based systems, so inspectors will understand how software can contribute to failures, but not what can be done to efficiently identify and eliminate the causes of failures. This course should fill this gap.
* Inspectors will not be able to undertake significant pre-reading due to operational demands, so the training course should be stand-alone.
* Inspectors will have a range of previous levels of understanding and experience of software analysis techniques, from very limited to significant knowledge in a specific technique. The course should be sufficiently detailed to allow inspectors less experienced in software analysis to learn, whilst giving the more experienced inspectors the information they need.
* Inspectors are likely to be presented with a wide range of proposals from licensees or requesting parties regarding how software analysis techniques will be used, and claims of their efficacy. After attending the course inspectors should be better able to understand the benefits and disbenefits of a number of commonly used techniques, and the reasonable practicability of different techniques for risk control, allowing them to make informed regulatory judgements.
* The training course should be formatted so that the material can be used as a reference source by inspectors in future assessment work. For this reason the material should be available in a suitable electronic format and machine searchable to allow inspectors to quickly access the information in it.
* Inspectors should be provided with material for making notes during the training course.

To be effective for the purposes of inspectors, this training course should be developed by practitioners who are expert and up-to-date in the practical application of software analysis in a wide range of industrial fields, including nuclear safety.The training course should be presented by experienced trainers in a way that engages and encourages inspectors to participate and to maximise learning potential using a range of learning techniques. Interactive sessions should be included, and the material should be presented at an acceptable rate. Trainers should be flexible to answer questions and respond to challenges. Trainers may need to produce responses off-line to avoid disrupting the training course for the majority.The training course should be delivered once over 2 days at ONR’s Bootle offices. The training course material will remain the property of ONR, and in a format suitable for ONR to repeat the training course at a future date using ONR resources. |
| 1. OBJECTIVES

The objective of developing this training course is to improve the regulatory capability within ONR in the area of software analysis. This will allow inspectors to:* Understand proposals from licensees and requesting parties regarding the use of software analysis techniques.
* Understand how each software analysis technique works, and what it does and does not do.
* Understand the relative strengths and weaknesses of the different software techniques and their reasonable practicability.
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| 1. CONSTRAINTS

This training course must be developed and delivered by individuals with considerable experience in the practical application of software analysis techniques for safety critical systems in a wide range of industrial sectors, including the nuclear sector. The course developers and deliverers must be aware of any recent developments that may be relevant to practical regulation in the area of safety critical systems.The course delivery must have a sufficient level of interaction to enable inspectors to fully explore and understand the potential benefits and drawbacks of different software analysis techniques, and to compare the efficacy of different techniques.The training material must be self-explanatory and be delivered to ONR in an electronic form and remain the property of ONR.The training material should not contain any confidential information or information that presents a security risk. It should not be security classified. |
| 1. CONTRACT MANAGEMENT

ONR will attend a start-up meeting at the Altran offices in Bath to reduce costs, as several Altran employees will need to be present. ONR will receive weekly updates of the progress of the work, and review the developing material to ensure it meets ONR’s expectations. ONR will provide comments on it in sufficient time to ensure efficient and effective use of resources.ONR will ensure that resources are made available to enable the course to be run, including the booking of rooms, the use of personal laptops, and the booking of inspectors onto the course. |
| **TECHNICAL RESPONSE** |
| 1. Response

The Technical Response proposal from TUV SUD is provided in a separate document at CM9 2019/332041 |