**Technical Support – Work Order Specification**

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| **Title: Provision of Technical Review/Technical Assessment of the Adequacy of Shielding Design and Approach taken to Assess Direct Dose to the Public in support of the GDA Reference Design for the UK HPR1000** |
| 1. Background to the project

In January 2017 the UK Government formally asked ONR and EA to begin the Generic Design Assessment (GDA) of the UK HPR1000. The UK HPR1000 is a reactor design proposed for deployment at Bradwell-on-Sea, Essex. General Nuclear System LTD (GNS) is a UK-registered company that was established as the Requesting Party (RP) to implement the GDA of the UK HPR1000 reactor on behalf of three joint requesting parties, i.e. China General Nuclear Power Corporation (CGN), EDF and General Nuclear International (GNI).The GDA process calls for a step-wise assessment of the RP’s safety and security submissions with the assessments increasing in detail as the project progresses. Step 1 of the UK HPR1000 GDA commenced in January 2017 and Step 2 finished in November 2018. Step 3 commenced on 15 November 2018 and is expected to complete at the end of February 2020. The ONR Radiological Protection Assessment Report for Step 2 of the UK HPR1000 GDA is available at: <http://www.onr.org.uk/new-reactors/uk-hpr1000/reports.htm> In undertaking assessment activities, ONR often calls upon technical support contractors (TSCs) to provide expert, independent advice in specialised areas, in support of its overall judgements regarding the acceptability of the design or supporting safety case presented by an RP during GDA. ONR have identified that such support is required for Step 4 of GDA in the radiological protection topic, to support our assessment of the radiation shielding provisions of the UK HPR1000 design. More detail on the exact nature of the scope of the services required is provided in Section 2 below. However, there are two distinct purposes to this contract:* To undertake an independent review/assessment of a sample of the RP’s safety case submissions which identify and justify the radiation shielding provisions for the UK HPR1000 design. This may involve undertaking independent radiation shielding modelling.
* To advise ONR on the adequacy of the radiation shielding design proposed for UK HPR1000 and more generally, to advise ONR on the adequacy of the RP’s radiological protection arrangements , with regard to restricting radiation exposures of workers and the public ,so far as is reasonably practicable (SFAIRP).

These activities/purposes will input into the basis of ONR’s Step 4 radiological protection assessment of the UK HPR1000 design. ONR will therefore use the outputs of this contract to:* judge if the claims and arguments are adequate (i.e. complete) and to judge whether suitable and sufficient evidence has been provided by the RP to substantiate them;
* determine if the RP have identified the most safety significant aspects concerned with making the “radiological protection safety case” for UK HPR1000;
* be satisfied the RP’s approach to making the “radiological protection safety case” for UK HPR1000 meets relevant good practice when judged against comparable reactor technologies and the expectations of ONR’s relevant Technical Assessment Guides (TAGs), Safety Assessment Principles (SAPs) and other relevant standards;
* ensure ONR’s regulatory decision making remains demonstrably robust.
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| 1. SCOPE OF THE SERVICES REQUIRED

To be able to deliver the scope of services required for this contract, the successful TSC will need to develop an adequate understanding of the UK HPR1000 generic design and safety case. This will involve the TSC reviewing a sample of the RP’s submissions which provide general UK HPR1000 design information and information most pertinent to the “radiological protection safety case”. ONR will advise the successful TSC which documents to review to gain design familiarisation. However, the TSC should be aware a public version of the UK HPR1000 Safety Security and Environmental Report (SSER) is available on the RP’s website (below). ONR would not expect the TSC to plan for a significant amount of time to be spent on this part of the work.  <http://www.ukhpr1000.co.uk/documents-library/step-3/>The successful TSC will then be expected to undertake direct review/assessment of a sample of the RP’s radiological protection submissions. The RP’s submissions the TSC will be asked to review/assess, from a radiological protection perspective, are:General Shielding Methodology Reports* Radiation Shielding Topic Report (16 pages).
* PCSR Chapter 22 - Primary Shielding Calculations Report (34 pages).
* Penetrations Shielding Design Report (20 pages).
* Radiation Protection Design Principles of Labyrinth and Shielding Doors (in production – assume ~30 pages).

Shielding Design Summary Reports* Reactor Building Shielding Design Report (77 pages).
* Fuel Building Shielding Design Report (92 pages).
* Safeguard Building Shielding Design Report (52 pages).
* Nuclear Auxiliary Building Shielding Design Report (93 pages).

Detailed Shielding Assessments (in production – assume all reports are ~40 pages)* Reactor Building Fuel Pool Shielding Design Report
* Reactor Building Fuel Transfer Canal Shielding Design Report
* Reactor Building Reactor Pressure Vessel Closure Head Storage Area Shielding Design Report
* Calculation Report of Minimum Allowable Water Depths during Fuel Handling
* Fuel Building Fuel Pool Sluice Gate Shielding Design Report

In undertaking the review/assessment of the RP’s submissions, the key themes ONR would expect the TSC to examine/consider are:* High level review of the plant locations and/or work activities where shielding is being claimed, by the RP (during both normal operations and fault/accident conditions), to understand the general basis of the design of this shielding (including dimensions, materials and performance requirements).
* The adequacy of the methodologies utilised to underpin the design of that shielding (i.e. shielding codes/calculation tools). ONR will be expecting the TSC to draw upon their own expert knowledge in the field to undertake an independent assessment of the RP’s calculation tools, methodologies and assumptions. Based on ONR’s experience of commissioning similar work, this aspect of the contract is likely to require the TSC to undertake, on a sampling basis, some of their own independent modelling using appropriate codes/tools etc. to confirm the adequacy, or otherwise, of the RP’s radiation shielding design.
* The adequacy and use of the shielding code SuperMC in undertaking shielding assessments. ONR will require the TSC to review the verification and validation of SuperMC and how the code compares to other industry standard codes/methods typically used within the UK. This may involve the TSC undertaking sample calculations using UK recognised codes and comparing the results with those of the RPs undertaken with SuperMC to provide additional confidence.
* Advice to ONR on whether the RP has provided shielding to all aspects of the design where it is reasonably practicable to do so. This should include the key consideration of whether, in the TSC’s opinion, the shielding provisions are suitable and sufficient with regard to restricting radiation exposures so far as is reasonably practicable (SFAIRP).
* Advice to ONR on the adequacy of the RP’s radiological protection arrangements with regard to restricting the exposure of the public to ionising radiations. ONR expect the RP’s generic safety case to include a demonstration that annual doses received by members of the public as a result of UK HPR1000 operations, will be controlled at levels which are ALARP, under all conditions.

To achieve the above objectives the contactor will be expected to consider appropriate sources of what ONR considers to be relevant good practice (RGP) – including relevant parts of ONR’s Safety Assessment Principles (SAPs) and the relevant ONR Technical Assessment Guides (TAGs). ONR will advise the successful TSC which SAPs and TAGs are most relevant. ONR will also be expecting the TSC to draw upon their own expert knowledge, skills and experience in the field, to form the benchmark of what constitutes good practice in radiation shielding design and inform the judgement of whether the RP has met the standard or not. The overall objective of Step 4 of a GDA is to undertake an in-depth assessment of the RP’s safety case evidence. The TSC should therefore plan on the basis that their review of the RP’s submissions pertinent to this contract, should be sufficiently detailed when reporting against the adequacy of the RP’s approach to radiation shielding as compared against the expectations in ONR’s SAPs/TAGs, and other sources of standards/guidance judged to represent good practice. Whilst ONR has listed the primary submissions the TSC will be expected to review as part of this work, the TSC should also plan on the basis that there may possibly be other documentation referenced by these submissions which may subsequently form part of the scope of the assessment. This should be discussed and agreed with ONR as the work proceeds. Importantly, regulatory decisions on the adequacy of the submissions will ultimately be made by ONR. The main outcome of the TSC’s assessment/review should be to make recommendations to ONR where the RP’s approach may not satisfy RGP and/or where further justification may be required by the RP.The contractor will be expected to document the outcome of their review/assessment of the submissions in an appropriate format. The output should be produced in a format that can be directly referenced from ONR’s formal Step 4 Assessment Report (which will be published on ONR’s website) and must include a clear rationale for the conclusions reached and advice/recommendations provided to ONR. It will be at the TSC’s discretion, with prior agreement from ONR, as to how they decide to report the outcome of the review i.e. one or a series of reports. The TSC should also plan to receive and address ONR’s comments on the report(s) before they are finalised.To be able to deliver the various parts of this work package, the scope of the work should also include, where appropriate:* The identification of any necessary UKHPR1000 information required from the RP. ONR will formally submit these to the RP as Regulatory Queries (RQs), but the contractor is expected to identify the information required and be involved in drafting the RQs.
* Review of part, or all, of any responses provided by the RP in answer to any RQs raised in conjunction with completing the work package. The response time to the questions is at the discretion of the RP and will depend upon the complexity and number of queries. However, the successful TSC should plan on a minimum response time of 6 weeks for planning purposes.
* Support to ONR during some technical meetings with the RP. This might include, for example, discussions on information required to undertake the review. ONR would expect the TSC to be present when the final results of the work are discussed with the RP. This may involve attending video/teleconferences or face-to-face meetings in the UK . For planning purposes, the TSC should assume six meetings in London and one trip the RP’s office in China will be required during the course of the contract.
* Provide monthly progress reports, either via meetings or teleconference, for the duration of the contract.

**WORK BREAKDOWN AND DELIVERABLES**In summary, the contractor is required to:* Attend an initial kick-off meeting at ONR’s offices in Redgrave Court, Bootle, Liverpool, to discuss and agree the final scope of work to be undertaken.
* Produce a detailed work place including: full details of the proposed approach to both parts of the work, timescales, invoice schedule and staff details for approval.
* Become familiar with the UK HPR1000 design and undertake an assessment of a sample of the RP’s safety case submissions which justify the radiation shielding design for UK HPR1000.
* Undertake independent radiation shielding modelling using appropriate tools/codes/techniques, especially as this may be required to support validation and verification of SuperMC.
* Assist ONR in engaging with the RP at key Level 4 technical exchange meetings. Expected to be six meetings in London and one trip to the RP’s offices in China over the course of contract.
* Raise requests for additional information (RQs) from the RP (via ONR), and review their responses. In some cases, this may require the contractor to attend meetings with the RP to discuss and clarify questions and responses. Such requests for information would be aimed at establishing the quality and relevance of the RP’s radiation shielding proposals and information.
* Routine engagement and progress updates with ONR *via* meetings or by telephone, particularly in the event that significant omissions or shortfalls are identified in the RP’s approach, should also be planned for.
* Produce report(s) and submit to ONR to formally capture the outcome of the TSC’s independent assessment of the RP’s radiation shielding design and methods/tools etc. for UK HPR1000. The deliverable(s) should capture the TSC’s expert advice to ONR and contain recommendations to ONR where the RP’s approach may not satisfy RGP and/or where further justification may be required. The TSC is expected to use their discretion, with prior ONR agreement, to decide how best to formally report the basis and outcome of their assessment.
* A close-out meeting will be held upon completion of the contract. This meeting will take place either at the ONR offices in Bootle, or the contractor offices. Videoconference facilities are also available if necessary.

**TIMESCALES**The following timescales can be assumed, noting that progress meetings and updates should be provided concurrently:* March 2020 - Start of contract expected middle to end of March 2020.
* July 2020 - Completion of high level shielding review. TSC is expected to have completed intial review of key documents and raised any requests for additional information.
* December 2020 – Completed reviews of samples and additional information. Completion of SuperMC validation and verification review.
* February 2021 - Issue draft assessment report to ONR for review and comment.
* April 2021 - Issue final assessment report to ONR.
* July 2021 - End of contract.
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| 1. OBJECTIVES

In summary, the required outcomes of this work are for the contractor to:* Provide an independent technical review of the claims, arguments and evidence presented by the RP in relation to the shielding design in UK HPR1000 during both normal operations and fault/accident conditions;
* Ultimately the contractor should provide their view on whether any assumptions made by the RP are appropriate, are significant in terms of the design or operation of UK HPR1000 or could increase the external doses to workers or the public from direct radiation shine.
* Make recommendations to ONR where the RP’s approach may not satisfy RGP and/or where further justification may be required by the RP.
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| 1. CONSTRAINTS

Provide details of anything that may constrain the ability of potential suppliers to meet the requirement such as:* The work is expected to start and conclude in accordance with the overall timescales given above, and a project programme will be agreed with the contractor upon contract award.
* ONR will provide the latest versions of relevant documentation submitted by the RP. Further information will need to be identified and requested by the contractor through regulatory queries (via ONR). The timescales for both of these processes are largely outside of ONR’s direct control and therefore delays to the receipt of information may occur. The TSC should also be aware that in some limited cases, the information requested may only be available in Chinese and translation into English (undertaken by the RP) may be required. Similarly, the quality of any response cannot be guaranteed. A pragmatic and flexible approach will need to be adopted by the contractor to deal with these circumstances, both technically and contractually, should they arise.
* It is expected that the successful contractor will also draw upon their experience, resources and publicly available information to perform this work. The TSCs undertaking the work will be expected to have demonstrable experience in relation to the scope of this contract.
* All information received from the RP will need to be treated in accordance with the ONR Technical Support Contact Framework agreement and non-disclosure agreement. The information or a certificate of destruction will need to be returned to ONR at the end of the contract.
* Information in this contract will contain protectively marked information and if so, will need to be handled accordingly. Most information will contain proprietary markings.
* Information in this contract may contain Sensitive Nuclear Information (SNI). No information with a security marking above UK OFFICAL - SENSITIVE is anticipated as part of this contract.
* The contractor will need to provide assurances that it has all necessary export control licences to exchange information with ONR.
* The transmittal of all documents between ONR and the contractor will be through ONR's Joint Programme Office (JPO). This will use the egress system, regardless of the security marking (unless the documents are publicly available on the internet).
* The contractor may be asked to sign Export Control End User Undertakings (EUU) to receive controlled technology.
* The contractor will be required to work in accordance with ONR’s Export Control Instruction in order to facilitate engagement with the GDA RP.
* The contractor shall not utilise any additional third party support not named in the bid documentation without ONR’s prior written consent.
* Any conflict of interest should be declared. Where a potential conflict exists, the contractor should describe how this will be managed.
* The aim of this work package is to inform and advise ONR. However, it is ONR’s intention to brief the RP on the conclusions of the work. The RP will be provided with copies of any reports produced for information and will be invited to comment on their factual accuracy.
* It is not ONR’s intention to publish the reports produced through this contract. However, it is likely they will be referenced in publicly available reports and therefore subject to freedom of information requests. This should not constrain or limit the produced reports but should be taken into account with the style and format.
* The contractor shall ensure they have the relevant permissions for all codes, standards, technology, software and/or information required to deliver the scope of work.
* The contractor should identify any constraints that may impact delivery of the intended scope of work.
* The contractor is responsible for making all arrangements required to support meetings in China. However, ONR will facilitate the provision of Invitation letters.
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| 1. CONTRACT MANAGEMENT

The Procurement Unit will provide contractors with details of:* who in ONR will be responsible for managing delivery and certifying completion of the required work; and
* ONR'S expectations in terms of being kept updated about delivery of the required work including review meetings, interim/final reporting arrangements, and management information requirements
* ONR will require to be kept updated about progress and delivery of the required work via monthly meetings, to include a contract start-up meeting at ONR’s offices at Bootle. Subsequent progress meeting should be arranged with the ONR Project Office and can be held at ONR’s office in Bootle, or the contractor’s premises.
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| **TECHNICAL RESPONSE** |
| 1. Response

The Technical Response should demonstrate a clear understanding of the work required and Please provide: * a description of how you will deliver the scope of work (methodology) and the proposed delivery team you will use, clearly signposting to relevant sections within your Capability Prospectus where appropriate/relevant;
* a demonstration of up-to-date knowledge of relevant national and international benchmarks, approaches, standards etc. and research programmes etc. in radiation shielding design and assessment;
* a description of the proposed teams’ expertise and experience in radiation shielding design and associated radiological protection issues for nuclear facilities (especially for PWRs);
* an overview of any prior experience with the HPR1000 design and/or undertaking similar pieces of work to that requested in this contract, for other PWRs;
* a description of proposed deliverables and/or outputs;
* an outline of anticipated engagement (project meetings & management);
* details of proposed cost and associated effort assumptions;
* a project delivery plan showing activities and milestones;
* a planned invoice schedule; and
* details of any assumptions or constraints.
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