**Integration Group for the Safety Case (IGSC) Symposium 2024***MOVING TOWARDS THE CONSTRUCTION OF A SAFE DGR – GETTING REAL*

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| **Abstract Title:**  **An Integrated Approach to Environment, Safety, Security and Safeguards (E3S) and the Role of Requirements in Safety Led Design** | |
| **Abstract (300-500 words):**  To successfully realise a Deep Geological Repository (DGR), developers must consider the construct of the post-closure safety case and also how suitable conditions for closure can be achieved through the execution of prior lifecycle stages. Site characterisation, design, construction, operations, and closure must *all* satisfy the expectations and constraints of multiple stakeholders over *all* lifecycle stages. Managing these interconnected lifecycle requirements is essential to coping with complexity and uncertainty, and mitigating the risk that requirements turn out to be conflicting or unimplementable.  Systems engineering is a proven approach to realising complex systems and optimising their performance across the lifecycle. Measures of performance are defined in the form of requirements that must be verified and validated through the lifecycle stages. These requirements are initially established at stakeholder level, and progressively developed at system, sub-system and component levels, with the aim of identifying requirements that are bounding and implementable across all lifecycle stages. Conflicting requirements and implementation risks are addressed before committing to design decisions and optimisation is achieved through an iterative and recursive process in which options are evaluated against requirements. The eventual demonstration of post-closure safety must include verifying that the closure configuration of a DGR conforms to requirements that have been validated as evidential to the safety arguments. Accordingly, verification and validation of requirements must be managed throughout the lifecycle and planned in conjunction with characterisation, research and development, monitoring and the control of the DGR’s configuration.  In pursuing such an approach to the design of the UK’s Geological Disposal Facility (GDF), NWS proposes to develop a single integrated Environment, Safety, Security and Safeguards (E3S) Case. The E3S Case will present, for all lifecycle stages, the justification that people and the environment are protected from waste both at the time of disposal and in the future. The intent is to drive consistency between the constituent elements of the E3S Case, and the maturity of the associated requirements. Crucially, E3S Case argumentation emerges in conjunction with, and not separately from, overall system maturity. This approach also provides a consistent basis for interdisciplinary working as all disciplines must interact with a common process, lifecycle understanding and system definition. | |