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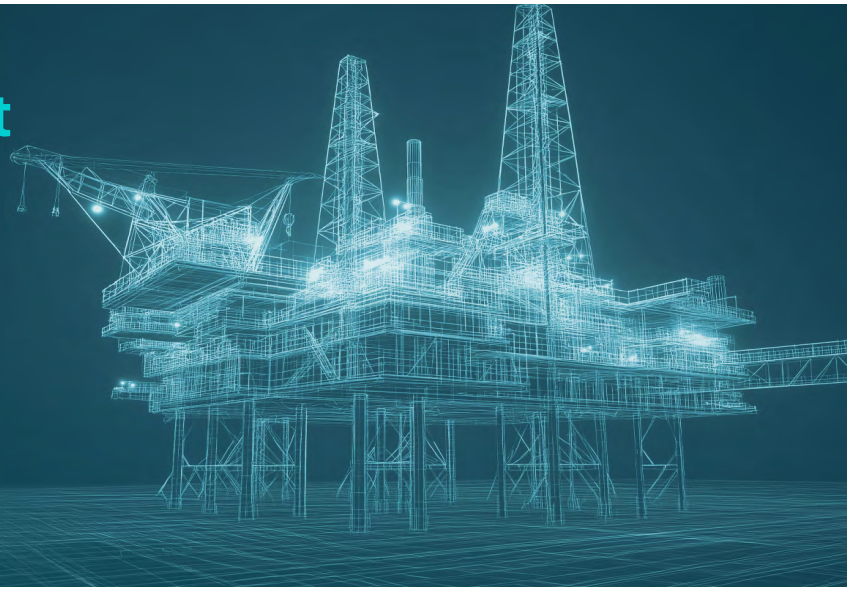
Net Zero Technology Centre
Technology Driving Transition

Requirements Help Sheet



This is a supporting document for the report: Well P&A Technology Qualification Framework Guidance – Issue 1

Why requirements are needed

Before an alternative well barrier is designed or manufactured it is essential to understand the requirements both from a well operator perspective and from a technology deployment perspective. Lessons from the past indicate that much effort and resourcing can be wasted if this is not done. The identified requirements provide the essential criteria against which design, production and testing activities can be assessed and appropriate development decisions made.

Types and examples of requirements

There are many different types of requirements that will often need to be met for a new technology to be acceptable to well owners. For example, requirements related to certification, required functions, installation performance, expected performance, product life, as well as operator specific requirements. The main aspects to consider include:

- What does the barrier technology have to do and how well does it have to do it (function/performance requirements)?
- What is the expected barrier operational life based on normal conditions?
- How long before failure of the barrier is acceptable?
- Can the well barrier be removed? Are there any specific disposal concerns?
- Can the barrier be repaired?
- Are there any health and safety risks during barrier production, (factory) testing, storage, and delivery?
- Are there any health and safety risks from the installation, verification, or failure, of the well barrier?
- How carefully should the barrier / barrier material be stored and delivered? What loads, temperatures, environments could it see?
- Are there any installation constraints or limitations that need to be addressed to successfully install the barrier?
- What environment might the barrier be exposed to once installed? What is normal and what is extreme?
- Does the barrier design or production process need to conform to an existing code, standard or regulation?
- What testing, verification and monitoring is required? Does a 3rd party need to be involved?
- Who is able to provide certificates of compliance with specified codes, standards and regulations, if required?

How do I find out what the requirements are?

It is important to start by identifying the potential users of the well barrier technology. Early discussions with operators and well owners can be very beneficial to understanding their needs. In addition, online searches for competing/comparable technologies may indicate required testing, codes and certification. Standards organisations such as BSI and ISO, or industry organisations such as OEUK and NORSOK, also have searchable databases to help find relevant codes, standards, guidelines, and regulations. However, reading through and understanding these documents can be time consuming and hence it is recommended that a discussion and/or small workshop is held with technical experts, well operators, deployment specialists and champions with detailed knowledge of the application and relevant regulations.

Once the key requirements for the well barrier technology have been identified, these may need to be considered further in the context of specific well barrier elements and interfaces, e.g. material or component specifications. For well barrier technologies that interface with other equipment and other downhole well barriers elements (e.g. casing), there may also be a need to understand and align with the wider system requirements.

It is essential to understand the requirements early in the development of the device to ensure that it can achieve operator acceptance. However, as the well barrier technology is developed, more detailed specifications may evolve from these initial requirements so that detailed design and production specifications can be developed as well as testing procedures, installation and training guides, etc.

Writing requirements well

It is important that requirements:

- Are traceable, to identify where they have come from and to be able to reference in the future
- Use concise language that is easy to understand
- Focus on what is essential and necessary, and hence use words such as “must” and “shall”
- Are measurable and objective, not vague or open to interpretation. If and when possible, requirements should be quantified. Where this isn’t possible they can be qualitative / semi-qualitative, but still as unambiguous as possible.

Using the requirements worksheet

At the top of the Requirements worksheet, the “Requirements Sheet Completion Status” will initially be set to “Not started”. Use the dropdown list to change this to “In progress”, “Completed” or “Updated” as appropriate. The Requirements Proforma worksheet is divided into a number of sub-sections, worksheet with space to add further specific requirements. For each row, it is important to describe what the requirement or specification is, quantify it and explain the basis for this, including evidence and references. If previous Technology Qualification Process have been undertaken for the technology, this can be added and elaborated on in the additional notes for the Regulators, Codes and Standards section. While the requirements proforma can be used by operators to describe the well conditions to which they need to deploy a well barrier technology, it is anticipated that it will more often be used by the technology developer to describe the capability of their technology for an expected application or range of applications. In this case, the Operator would review the claims to ascertain the suitability and maturity of the technology for their intended use.

Whether technology developer or operator led, the requirements proforma sheet should be populated in the context of the proposed technology and application, adding further requirements within each section as required.

General functions and functional requirements

The general functions need to identify everything that the well barrier has to do at every stage of its use. This might include requirements for it to be transported (e.g. transportable by air), for it to be installed (to be installable in various scenarios), for it to be stored (to remain ready for use), for it to be able to provide any number of operational functions (e.g. to displace well bore fluids, to contain fluid, etc), for it to be able to provide safety functions (to protect user from harm), for it to be repaired / removable (e.g. able to be re-set or drill-out, etc).

The functional requirements then need to identify how each of the general functions need to be delivered (e.g. maximum duration for installation, minimum acceptable leak rate, life expectancy, downhole fluids and conditions to be compatible with, etc). Where these functions and functional requirements are driven by codes, standards and regulations, these need to be referenced.

Operator specific requirements

The operator and well specific requirements will normally be in addition to the general functional requirements. They will likely relate to the well application or range of well applications where the well barrier will be deployed, e.g. type of barrier (casing, annulus, etc), well dimensions, downhole conditions. Some of these requirements will be essential, but some may initially be less essential, although may still represent the difference between success and failure. Different requirements may need to be addressed including storage, transport, installation, testing, verification, monitoring, through-life, etc. The worksheet enables multiple requirements to be identified.

Modified technology requirments

When dealing with a new version of a previously qualified technology, the first step is to update the requirements proforma. This document should be revised to reflect the specific needs and operational context for the modified technology, whether it's a change in size, material, or application. This is a critical step because it establishes the new baseline against which the technology readiness and qualification gap assessment will be undertaken.

Once the requirements are clearly defined, the Technology Readiness Level (TRL) assessment can be conducted. In addition to documenting the evidence for the completed application relevant qualification activities, this assessment can then focus specifically on the qualification gaps created by the changes. By identifying these gaps, the technology developer and operator end user can develop a clear plan to validate the new version/application of the technology, avoiding the need to re-qualify aspects of the technology that remain unchanged. This streamlined approach ensures that the modified technology meets all necessary standards efficiently and effectively.

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