Astrimar
Reliability by Design

Technology Qualification Framework for Well P&A Technologies

SPE Well Decommissioning

11 June 2025

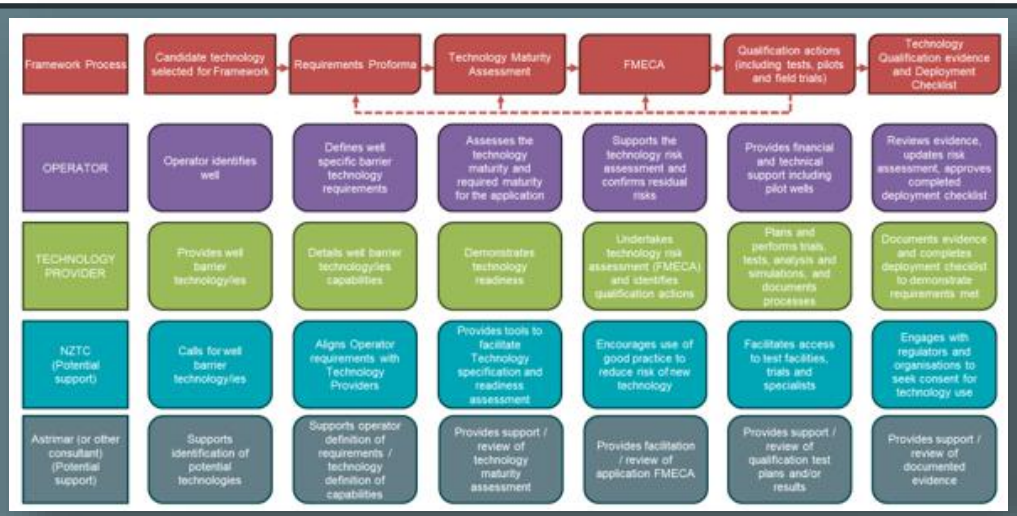
Net Zero Technology Centre
Technology Driving Transition

6 Wdc
The Wells Decommissioning Collaboration
2022

Technology Qualification Framework for Well P&A Technologies

- Developed in collaboration with operators, technology developers and regulators
- Intended to streamline the acceptance process
- Supports adoption of alternative materials for use in permanent P&A of oil and gas wells
- Technology Qualification Framework Roadmap
  - Provides qualification process for alternative well plugging materials
  - Based on industry accepted TQ Processes
  - Addresses requirements from regulations and standards
- Intended to be applicable across multiple operators and regions, materials and barrier types

Framework - Alignment with Industry Requirements



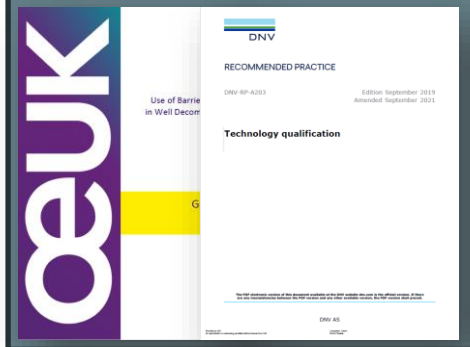
Appendix 1.1. United Kingdom Regulations

The following regulations are expected to be applicable in the United Kingdom, The Offshore Installations and Wells (Design and Construction, etc.) Regulations 1996, Part IV (GOV, 1996).

General duty (GOV, 1996)
Regulation 13. "(1) The well-operator shall ensure that a well is so designed, modified, commissioned, constructed, equipped, operated, maintained, suspended and abandoned that— (a) so far as is reasonably practicable, there can be no unplanned escape of fluids from the well; and (b) risks to the health and safety of persons from it or anything in it, or in strata to which it is connected, are as low as is reasonably practicable. (2) The provisions of regulations 14 to 19 and 21 are without prejudice to the generality of the requirements of paragraph (1) save that, where regulation 17(2) places a duty on the duty holder for an installation, the well-operator is not under the same duty."
Interpretation The well should be abandoned such that there is no leak from the well, so far as is reasonably practical (i.e. ALARP) i.e. residual risks are acceptable. The ALARP principle implies that the risks should be as low as practical, as long as the cost and effort to reduce the risk are not disproportionate to the risk reduction achieved. Note that no lifetime is prescribed, therefore it can be assumed that this regulation applies in perpetuity.
Framework Demonstration For a novel well barrier technology and well abandonment design, it is necessary to demonstrate that risks associated with the technology are ALARP. This will be assessed by a FMECA, and, if required a Quantitative Risk/ALARP Assessment of the well barrier envelope and abandonment design on a case-by-case basis. Qualification actions and risk mitigations arising from the FMECA assessed failure modes and mechanisms will support the appropriate management of risk.

Alignment with qualification guidance

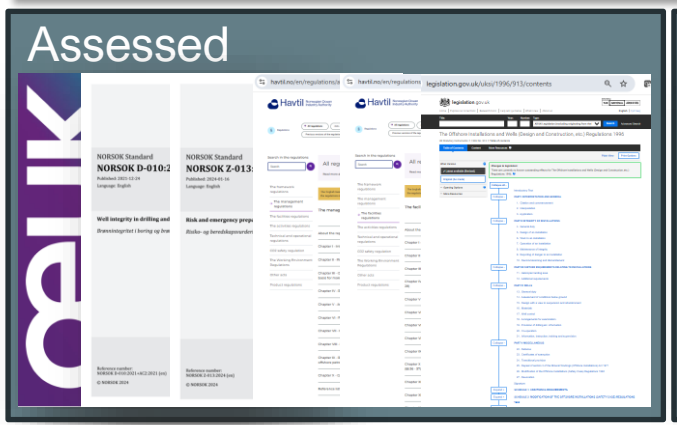
Assessed



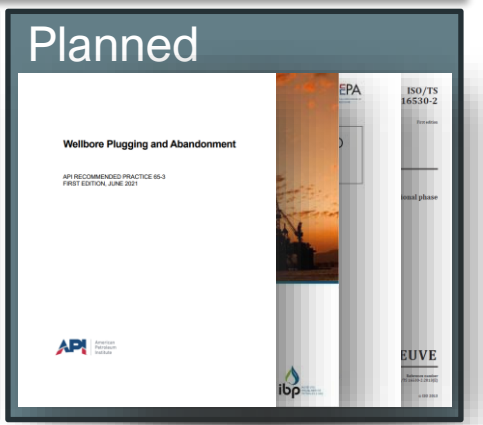
By implication

Well decommissioning guideline requirements

Assessed

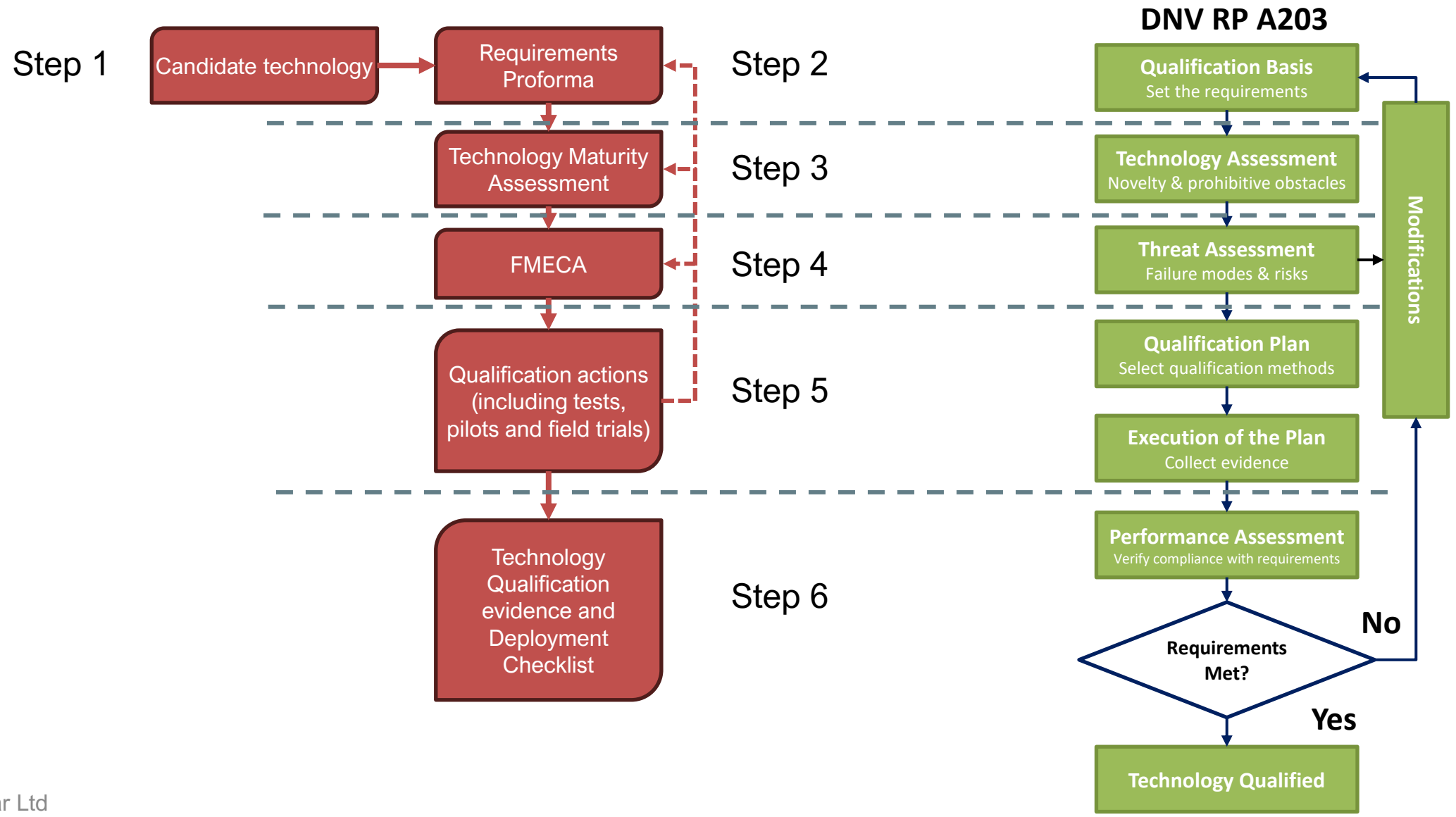


Planned



Aligned Countries

Framework Process - Alignment with DNV RP A203

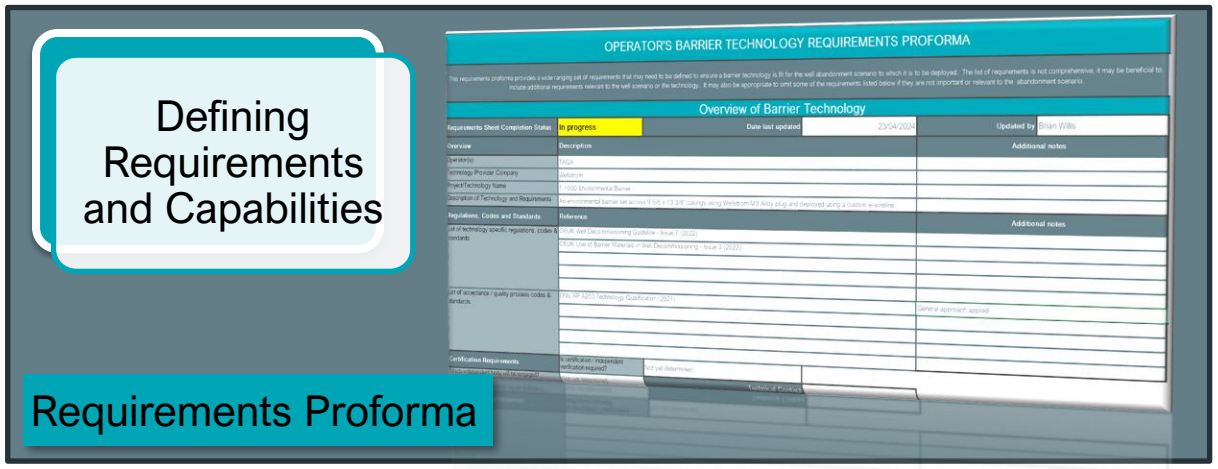


Step 1: Candidate Technology Identification

Organisation	Activity
Operator	Operator identifies well(s) where alternative barrier technology is of interest
Technology Providers	Technology provider(s) communicate capabilities and maturity of their well barrier technology/ies for the application(s). Understanding operator needs, helps refine their offering.
Tool	No specific tool is needed for this step. Requirements proforma could start to capture relevant information.

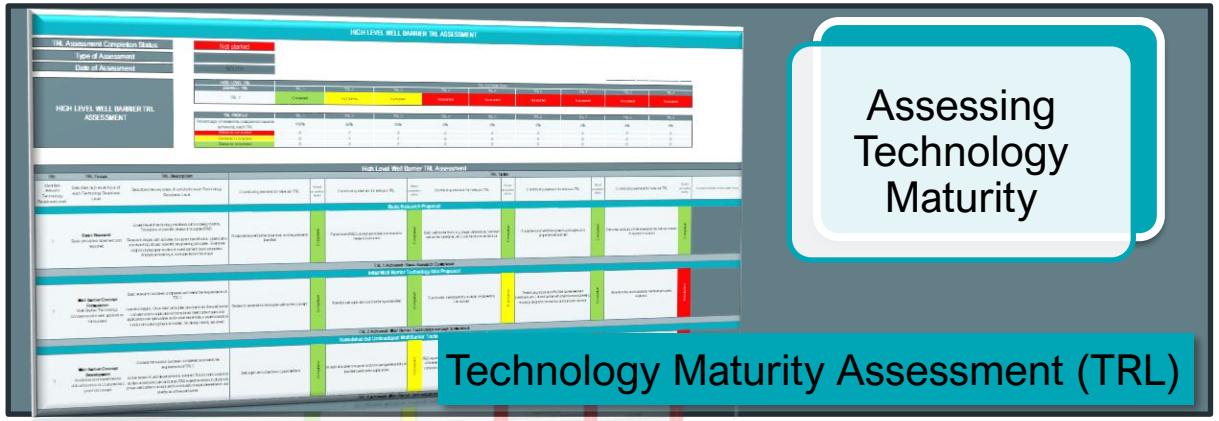
Step 2: Requirements and Technology Specification

Organisation	Activity
Operator	Operator provides well specific requirements the barrier technology is required to meet
Technology Providers	Technology providers should compare their technology's capabilities with Operator's requirements to ensure compliance
Tool	The Requirements proforma should be used to capture both current capabilities and operator requirements



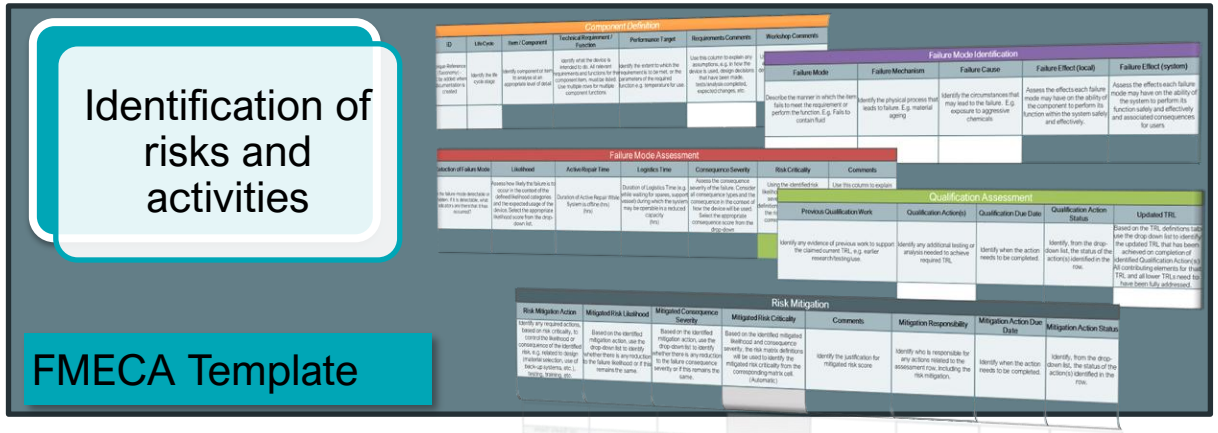
Step 3: Assessment of Technology Maturity (TRL)

Organisation	Activity
Technology Providers	Technology Provider uses TRL tool to assess TRL of their relevant technology for the specific application. This facilitates communication with operators on the technology readiness for the application.
Operator	Operator reviews TRL assessment for the application, to understand technology risk and qualification gaps to be addressed.
Tool	The Framework's Technology Maturity Assessment tool should be used.



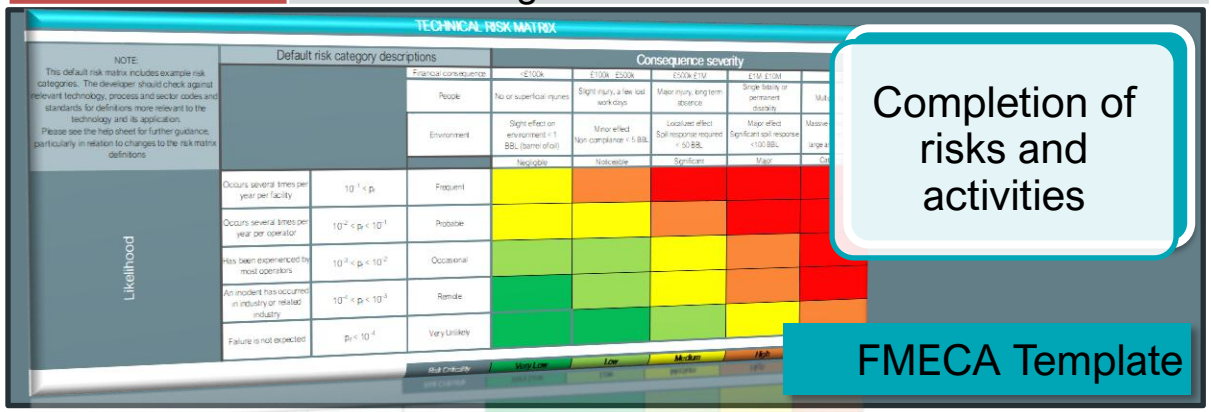
Step 4: Assessment of Failure Modes and Effects (FMECA)

Organisation	Activity
Technology Providers	Technology Provider undertakes detailed FMECA to evaluate potential Failure Modes, Mechanisms and Effects, for of each stage of the proposed application. Design, Qualification and Procedural mitigations may be identified.
Operator	Operator should participate in, or review and feedback on FMECA and proposed mitigations.
Tool	The Framework's FMECA template provides a consistent basis of scope and extent.



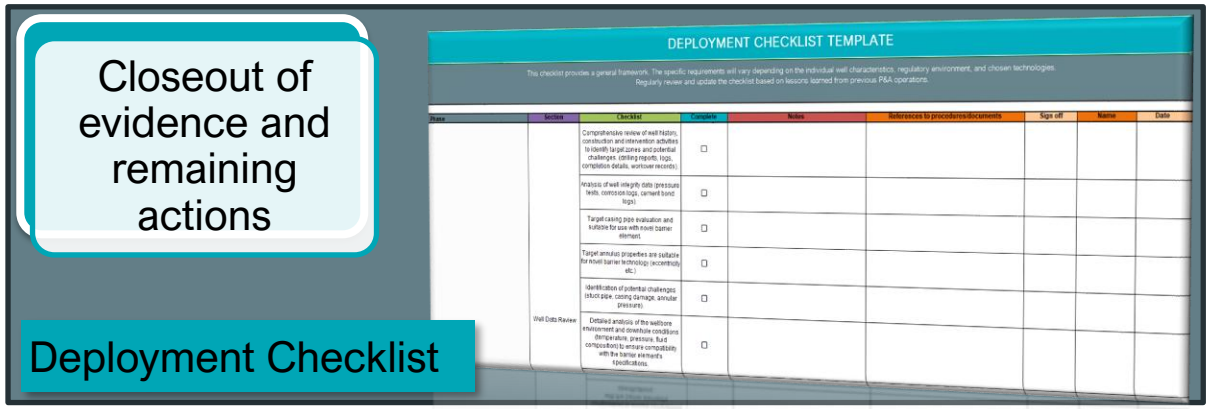
Step 5: Identification Qualification and Risk Mitigation Actions

Organisation	Activity
Technology Providers	Technology Provider plans and performs identified trials/tests/analyses to address qualification gaps and risks to advance their technology's TRL to the required level.
Operator	Operator provides support to the further qualification, This may include technical, financial and access to pilot well(s).
Tool	The FMECA template facilitates the documentation and management of qualification and risk mitigation actions.



Step 6: Qualification evidence and Deployment Checklist

Organisation	Activity
Operator	Operator reviews the evidence of completed qualification and risk mitigation actions from technology provider, updates risk assessment and completes deployment checklist
Technology Providers	Technology Provider submits TRL compliance documents to operator as evidence of fulfilling all requirements and creates deployment checklist for technology deployment and verification.
Tool	The Deployment Checklist tool is used to confirm all risk mitigations, procedures, and compliance checks are in place before installation



Pilots/case studies

- Aspects of the NZTC TQ Framework have so far been used to provide support / feedback to a number of technology developers including:
  - Wellstrom T1000
  - Resolute Assure ® EPG
  - Isol8 Fusion Alloy
  - Peer-review of DNV-RP-A203 document qualifying the Local Casing Expander tool with Shell
- NZTC TQ Framework to be used to support further 2025/2026 pilot deployments
  - Multiple pilots being planned

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A Problem Shared is a Problem Solved.

Sponsored by:

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Discover more

Multi-Operator collaboration accelerating the rate in which technology is developed, tested and piloted for well decommissioning.

Alternative Barrier Materials

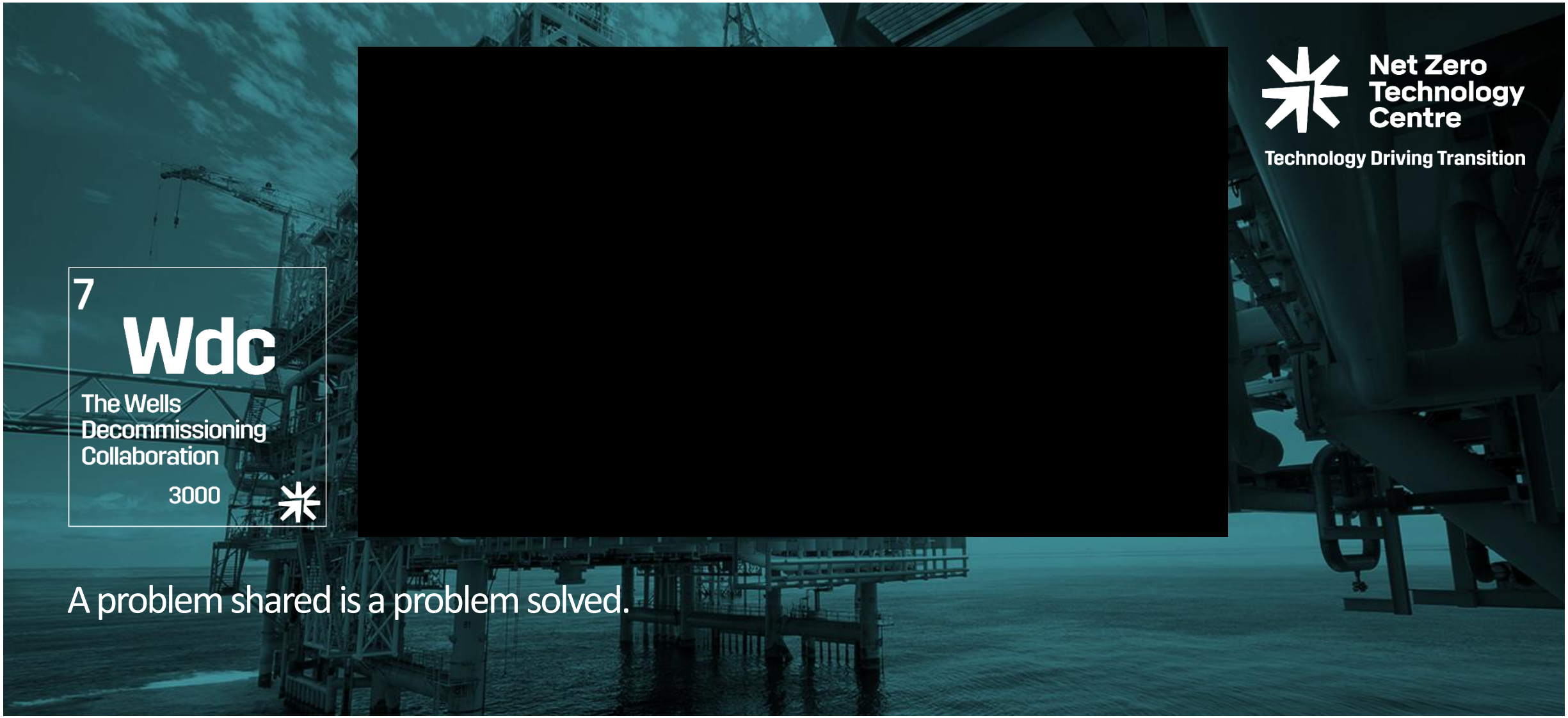
Alternative materials used solely or in composite barriers have potential to provide more reliable and resistant isolation compared to cement.

Inspection and Verification

Reliable barrier design and construction relies on assessment of the integrity through existing well construction. Through tubing evaluation allows for this to be completed in advance of the abandonment programme.

Enabling Technology

Enabling technologies provides through tubing services to perform a wide range of task to support barrier placement.



Lewis Harper
Programme Manager - Collaborations
lewis.harper@netzerotc.com

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What's happening next

- NZTC TQ Framework will be available on the NZTC website from the end of June for developers and operators wanting to use it.
- Second Party Peer-Review by DNV
- Ongoing collaboration with NSTA, Havtil, GRaPA to support wider adoption
  - Review of guidelines and regulations from additional regions (e.g. Brazil, Australia, Malaysia etc)
- Incorporation of feedback and continuous improvement
- Potential extension of framework for enabling technologies

Register your interest in the Framework

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Thank you

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brian.willis@astrimar.com
caroline.roberts@astrimar.com
lewis.harper@netzerotc.com

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