

# GO RADICAL P&A

“Challenging the Status Quo to Radically Reduce Rig-Time for P&A”

**Accelerating the Qualification of new P&A Technical Solutions**

**Havtil Fagdag May 7<sup>th</sup> 2026**

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## AGENDA

- GRaPA's original mandate
- The industry challenge of qualifying new technology
- Specific issues behind the challenge – issues shared with the UK
- The Solution - Introducing the NZTC / Astrimar Technology Qualification Framework
- Key Learnings to Date



The GRaPA project team

GRaPA is sponsored by:



## Primary Goal

Deliver radically new technical solutions,  
to perform the plugging and abandonment of oil and gas wells,  
enabling a step change reduction (>50%) in the environmental footprint and cost,  
while ensuring the prevention of long-term leakage from abandoned wells.

Implement new radical solutions designed to  
drastically reduce rig-time, with the ultimate  
long-term ambition of rig-less P&A.

## Long-Term Deliverable

**Qualified** radical new solutions for oil and gas well P&A,  
supported by a portfolio of **necessary processes**

~~Never~~

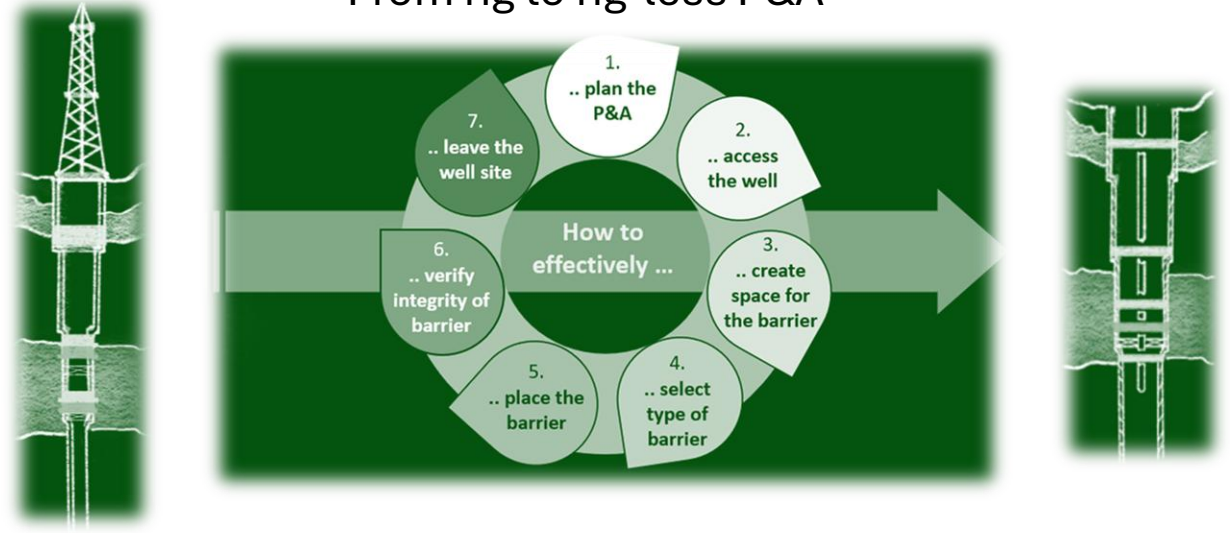
~~Impossible~~

# Fundamentals to achieve the goal

However, many suppliers fail to mature their solutions to the necessary degree to achieve qualification and commerciality

- New Complementary Industry Standards:**
- Risk-based P&A design process
  - **Solution Qualification Best Practice**

## From rig to rig-less P&A



Success is totally reliant on active support and cooperation between the majority of operators and Havtil



**GRaPA** has the expertise, experience, network and motivation to facilitate delivery of the ambitious goals set by the industry

# The Technology Qualification Challenge

**The qualification and delivery of new technology is taking too long, costing too much and in many cases new technology is not reaching the field.**

*Specific issues driving the challenge*

- No common simple/practical industry process for solution qualification (ref DNV RP-A203)
- Operators and Suppliers adopting different internal qualification “processes”
- Evidence of no consistency when suppliers describe the “maturity” of their technology
- Opportunity for improved cooperation between Operators around the qualification of similar solutions
- Lack of collaboration has resulted in;
  - Lack of common acceptance criteria
  - Lack of common risk management principles
  - Duplication of testing / qualification initiatives
- Many suppliers and operators misunderstand Havtil’s role in technology development and qualification

# The Technology Qualification Solution

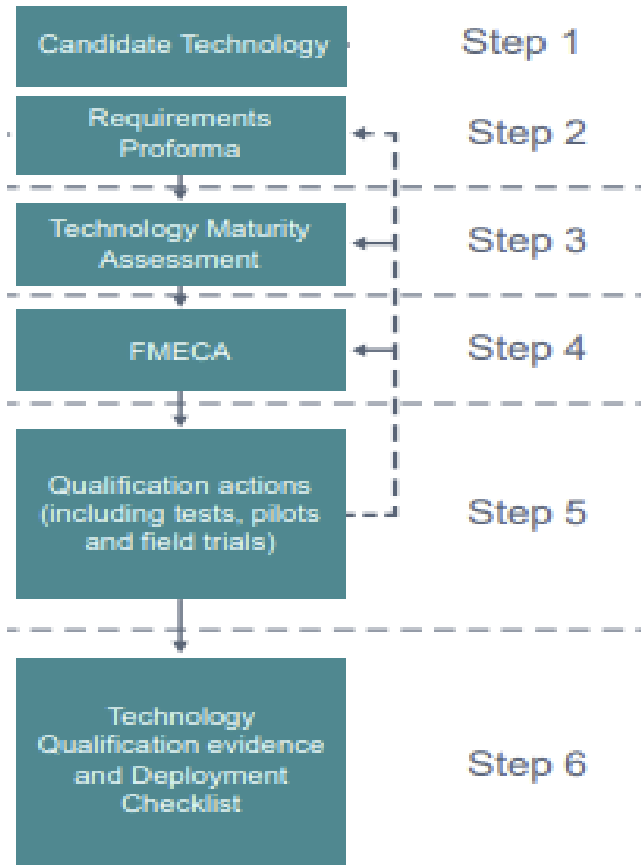
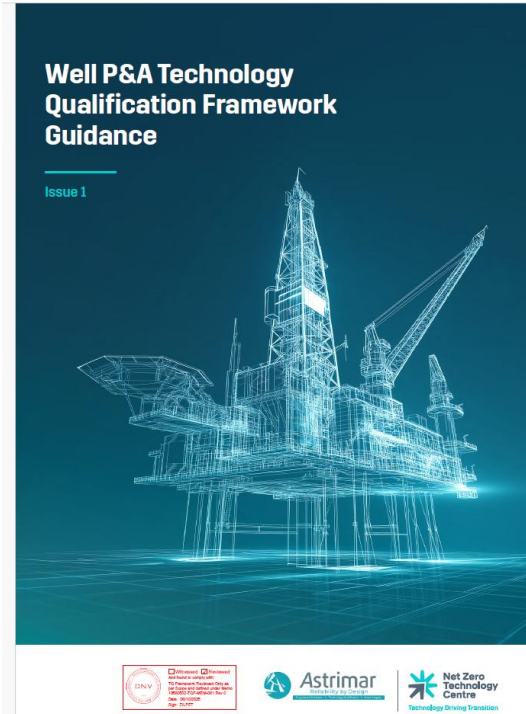
## Deliver an Effective Industry Standard Process to Drive the Acceleration of P&A Solution Qualification

*The NZTC / Astrimar Solution Qualification Framework enables and offers;*

- A **highly structured/practical** process for solution qualification (based on DNV RP-A203)
- Operators and Suppliers collaborate around a common standard process – **disciplined approach**
- Requires Operators to clearly define the application case including technical and operational risk acceptance criteria
- Requires Suppliers to follow detailed standard definition of solution maturity
- Facilitates the development of:
  - Common acceptance criteria
  - Common risk management principles
  - Avoids duplication of testing / qualification initiatives
- Clearly incentivizes Operators to cooperate around qualifying similar solutions and sharing experience/data
- Provides Havtil a consistent and credible platform to evaluate Operator's conclusions in qualifying new technology

1. *Using the NZTC Technology Qualification Framework, draft a NCS adjusted generic qualification framework / process for any new P&A solutions.* 
2. *Apply the generic qualification process to accelerate the qualification plan for a specific P&A technology*
  - ***Measure / check framework / process with Havtil and report feedback in the final report.*** 
3. *Develop:*
  1. *An execution plan for a Risk-Based P&A design process*
  2. *A draft specification for a Risk-Based P&A design process*
  3. *A draft of common risk acceptance criteria for permanent well plugging* 

# NZTC Qualification Framework 6 steps process / roles

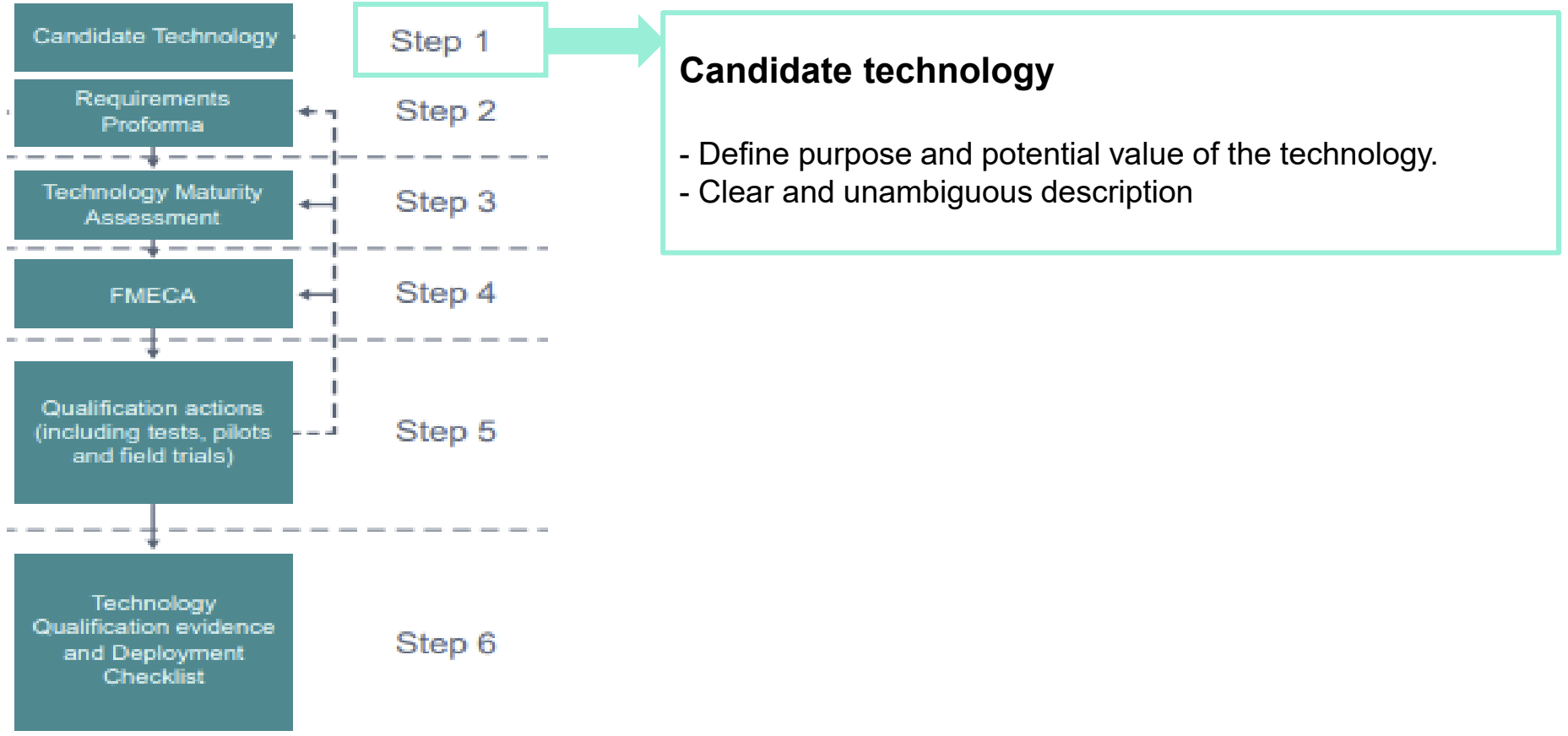
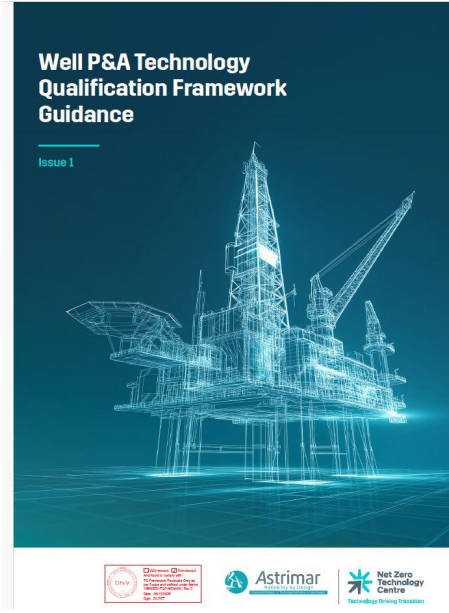


## The stakeholder community

Framework process	1. Candidate technology selected for Framework	2. Requirements Proforma	3. Technology Maturity Assessment	4. FMECA	5. Qualifying actions (incl. tests, pilots, field trials, etc)	6. Technology Qualification evidence and Deployment Checklist
<b>Operator</b>	Operator identifies well	Defines well specific barrier technology requirements	Assesses the technology maturity and required maturity for the application	Supports the technology risk assessment and confirms residual risks	Provides financial and technical support including pilot wells	Reviews evidence, updates risk assessment, approves completed deployment checklist
<b>Technology provider</b>	Provides well barrier technology	Details well barrier technology capabilities	Demonstrates technology	Undertakes technology risk assessment (FMECA) and identifies qualification actions	Plans and performs trials, tests, analysis and simulations, and documents processes	Documents evidence and completes deployment checklist to demonstrate requirements met
<b>GRaPA</b>	Calls for well barrier technology	Aligns Operator requirements with Technology Providers	Provides tools to facilitate Technology specifications and readiness assessment	Encourages use of good practice to reduce risk of new technology	Facilitates access to test facilities, trials and specialists	Engages with regulators and organisations to seek consent for technology use
<b>Other consultant support</b>	Supports identification of potential technologies	Supports operator definition of requirements / technology definition of capabilities	Provides support / Review of technology maturity assessment	Provides facilitation / Review of application FMECA	Provides support / Review of qualification test plans and results	Provides support / Review of documented evidence
<b>Regulators</b>	Encourage opportunities for new technologies	Confer expectations on suitability and use of new technologies	Informed of technology readiness for a specific applications, on request	Provided details of identified risks	Provided assurance of risk mitigation	Provided evidence of completed deployment checks and completion of qualifying actions

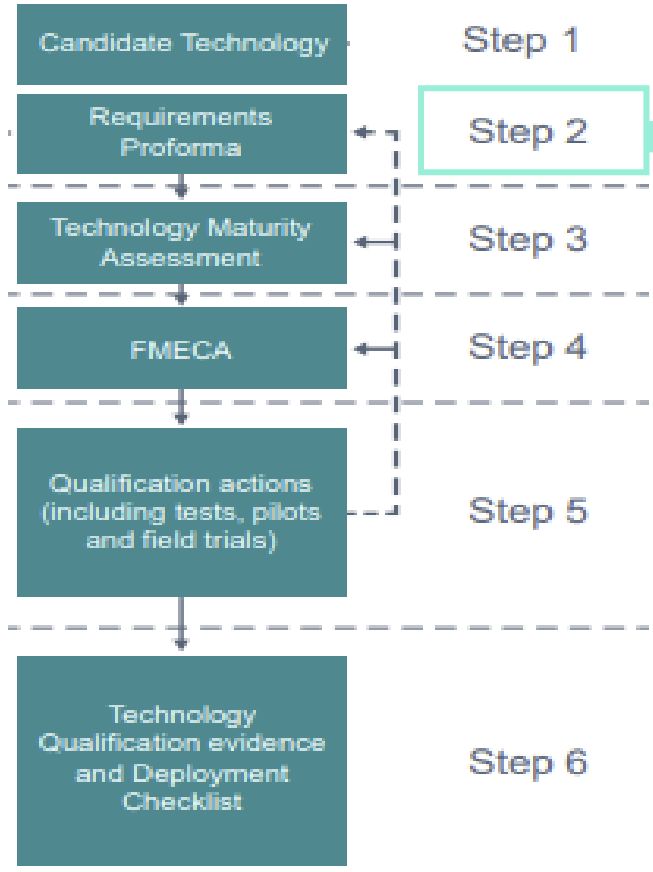
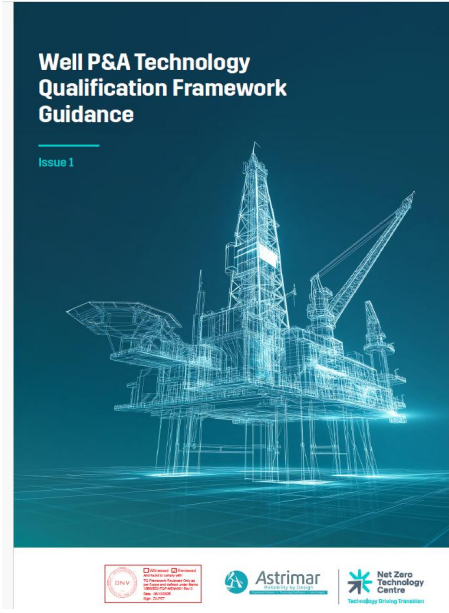
# NZTC Qualification Framework Process, Step 1

## Technology Description



# NZTC Qualification Framework Process, Step 2

## Requirements Proforma



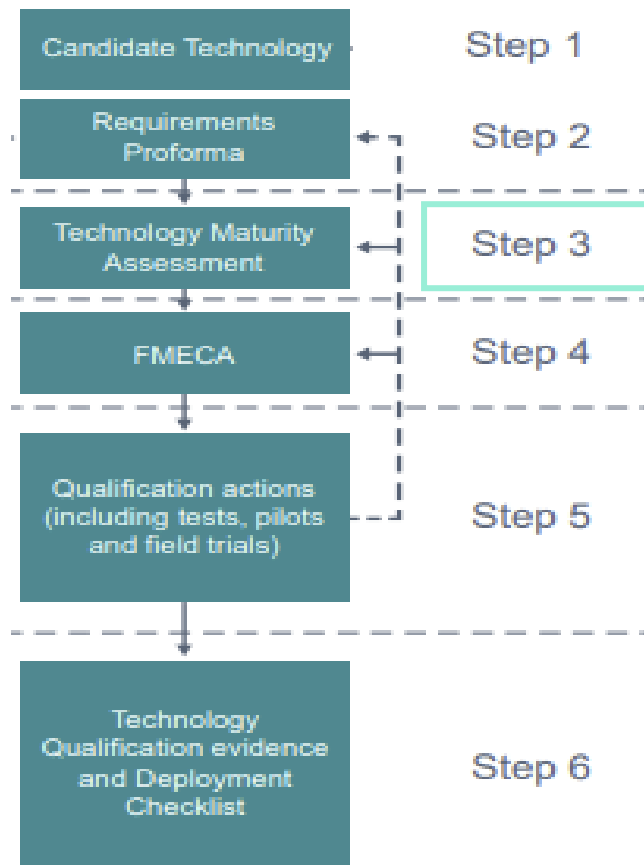
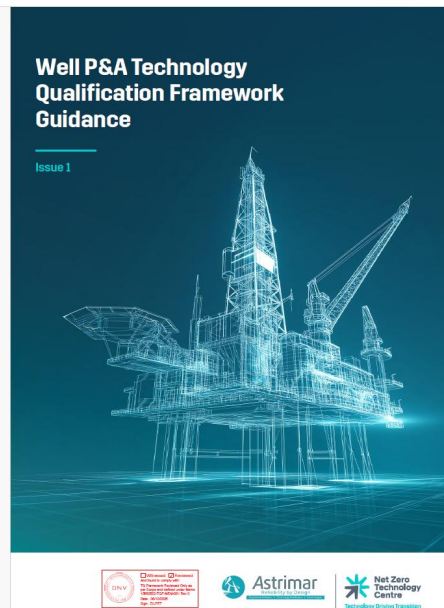
### Requirements Proforma

- The Framework is based on qualifying technology for **specific applications**
- The first step in the process is to define technology goals and requirements.

This is to define the qualification basis which will underpin all the other technology qualification activities.

# NZTC Qualification Framework Process, Step 3

## Technology Maturity Assessment



### Technology Maturity Assessment (TRL)

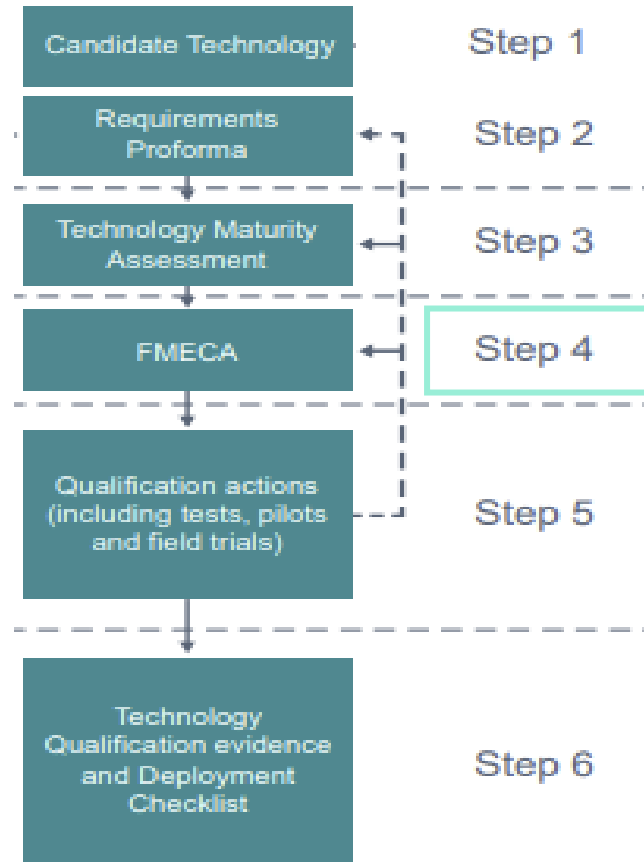
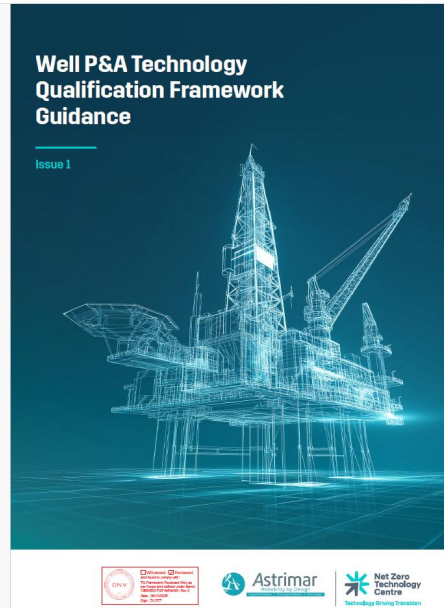
- Follows a 1-9 step TRL scale (based on NASA scale)
- More detailed than industry generic TRL ladder

The first version of the NZTC / Astrimar Framework was developed to qualify barrier material solutions.

Qualifying barrier material must follow a stricter qualification process than other non-barrier technologies.

# NZTC Qualification Framework Process, Step 4

## Failure Mode, Effects, and Criticality Analysis (FMECA)



### FMECA, a rigorous threat assessment

(Failure Mode, Effect and Criticality Assessment)

- Considered essential in Qualification process
- All Qualification activities traced back to FMECA

NZTC Framework provides examples / guidance on how to use FMECA

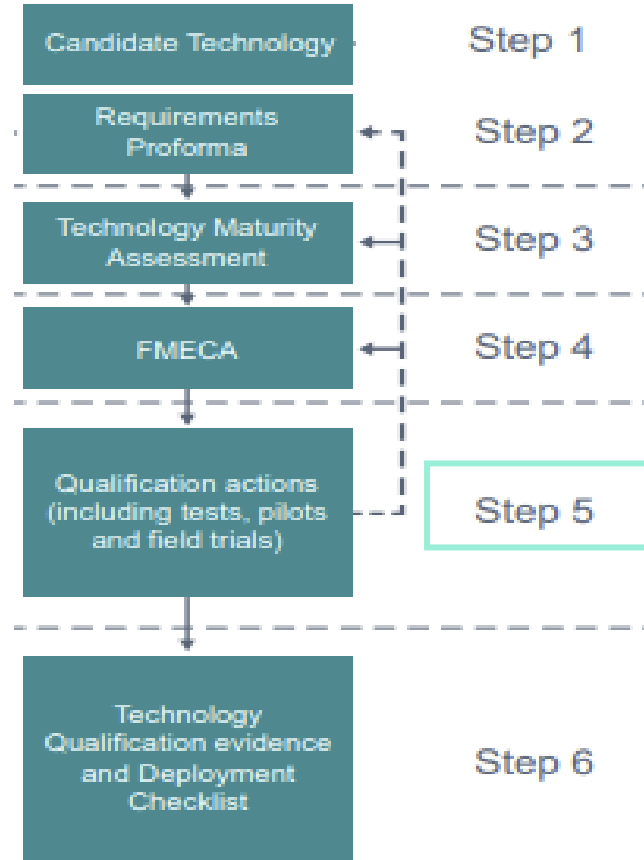
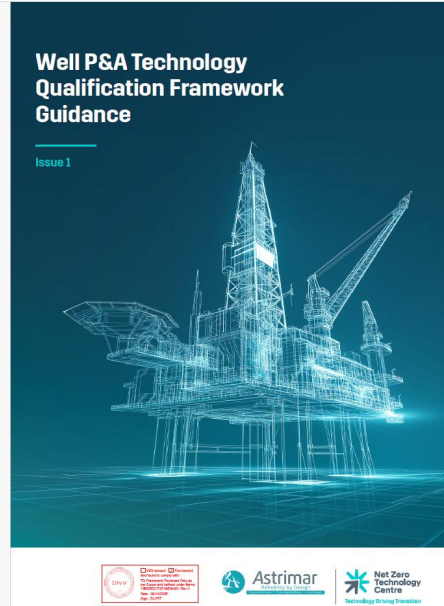
(Details missing in many general industry practices)

FMECA process has 5 major focus areas

- Component definition
- Failure mode identification
- Risk assessment
- Qualification assessment
- Risk mitigation actions

# NZTC Qualification Framework Process, Step 5

## Qualification Actions



### Qualification plan (actions)

- The heart of the Technology Qualification (TQ) process
- A key output from earlier steps.

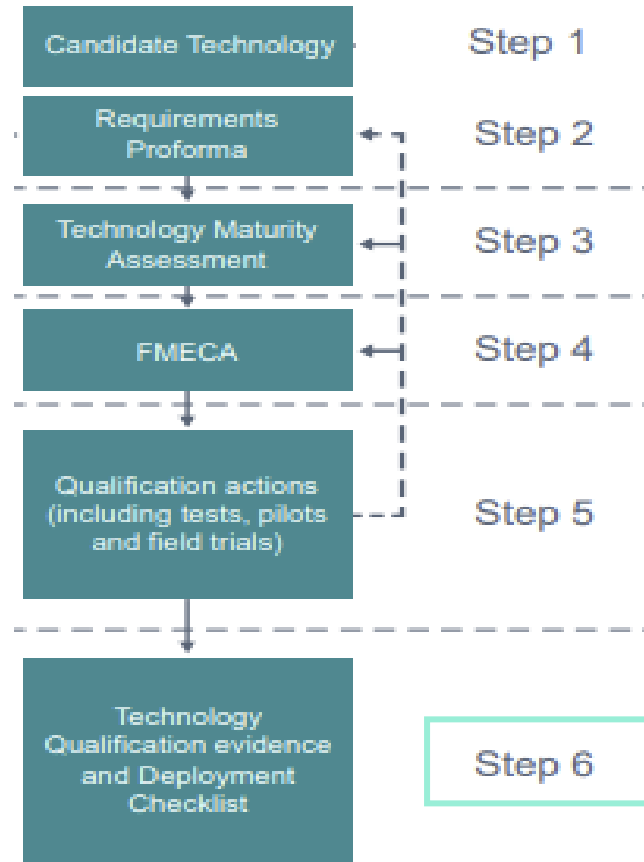
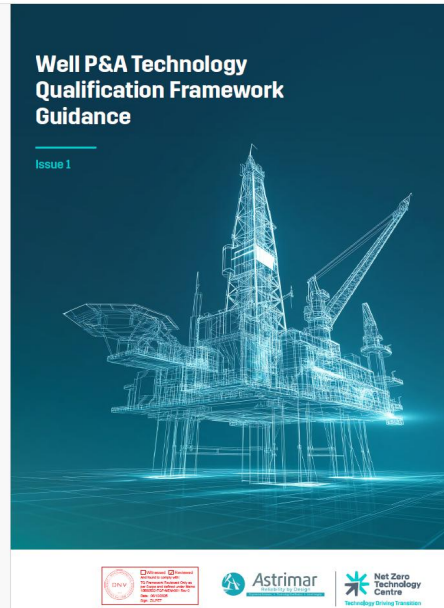
All industry TQ guidance documents recommend the creation of a qualification plan.

#### Key output of the FMECA:

- Identification of qualification actions e.g.
  - Physical testing of materials and components
  - Analysis and simulations
  - Process development
  - Documentation
  - And more ....

# NZTC Qualification Framework Process, Step 6

## Qualification Evidence and Deployment Checklist



### Qualification Evidence and Deployment Checklist

There is a need to –

- Assess and evaluate results of all qualification activities
- Compare results against requirements
- Ensure all mitigations have been put in place
- To be reported in a formal document.

A formal Technology Qualification (TQ) report, provides evidence that the new technology is fit for service in the specific application

Primary purpose –

- Present and document, in a complete and traceable manner
- A review of the qualification evidence
- Demonstrates the risks with deploying novel technology are acceptable.

By presenting all supporting evidence and data –

- The report concludes the technology ready for deployment
- Includes a final statement on its performance capabilities
- Reliability
- Any operational limitations.



# GRaPA / NZTC Qualification Framework Templates



TECHNOLOGY QUALIFICATION FRAMEWORK FOR WELL P&A TECHNOLOGIES					
OPERATORS BARRIER TECHNOLOGY REQUIREMENTS PROFORMA					
<b>Overview of Barrier Technology</b>					
Requirements that Completion Status	Not started	Not started	Not started	Not started	Not started
Operator's Acceptance Dashboard	Not started	Not started	Not started	Not started	Not started
Percentage	100%	0%	0%	0%	100%
Number of items	100	0	0	0	100

Detailed templates for each process step are provided, enabling;

- consistent approach
- comparable results
- reusable data
- structured output

A highly collaborative step-by-step process is assured across the Stakeholder Community

HIGH LEVEL WELL BARRIER TRL ASSESSMENT									
TRL Assessment Completion Status									
Type of Assessment									
Date of Assessment									
HIGH LEVEL WELL BARRIER TRL ASSESSMENT									
OVERALL TRL	TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
TRL PROFILE	TRL 1	TRL 2	TRL 3	TRL 4	TRL 5	TRL 6	TRL 7	TRL 8	TRL 9
Percentage of elements completed	85%	85%	85%	85%	85%	85%	85%	85%	85%
Elements completed	8	8	8	8	8	8	8	8	8
Elements not completed	1	1	1	1	1	1	1	1	1

TRL	TRL Focus	TRL Description	High Level W
1	Basic Research	Level 1 of technology readiness with no design barriers. Transition of concepts through to application.	TRL 1 Achieved

Component Definition				Failure Mode Identification				Risk Assessment					
ID	Item Name	Item Component	Function	Requirement	Failure Mode	Failure Mechanism	Failure Cause	Failure Effect	Detection of Failure Risk	Likelihood	Consequence Severity	Risk Criticality	Risk Criticality Comments

CRITICALITY ANALYSIS (IF MECA)									
Qualification Assessment									
Previous Qualification Work	Current TRL	Qualification activities	Qualification Date	Qualification Status	Risk Mitigation Action	Mitigated Risk	Mitigation Effectiveness	Mitigated Risk Criticality	Risk Mitigation

TECHNOLOGY QUALIFICATION FRAMEWORK FOR WELL P&A TECHNOLOGIES									
DEPLOYMENT CHECKLIST TEMPLATE									
This checklist offers a structured set of example items intended to guide the development of a tailored Deployment Checklist for specific technologies and applications. Actual requirements will vary depending on well characteristics, regulatory frameworks, and selected technologies and applications. It is essential to regularly review and update the checklist based on insights and lessons learned from previous Plug and Abandonment (P&A) operations. The checklist is designed to be editable, allowing customization for specific technologies and applications. Additional blank rows are included at the bottom of the list to accommodate new items as needed.									
Phase	Section	Checklist	Complete	Notes	Reference to procedures/documents	Sign off	Name	Date	
Well Data Review		Comprehensive review of well construction and intervention activities (logging reports, logs, completion details, workover records) to identify suitable zones for deployment.	<input type="checkbox"/>						
		Identification and suitability of well barrier elements (e.g. casings, annuli and cement) at target depths, if remaining in place.	<input type="checkbox"/>						
		Analysis of well history and well integrity data (pressure tests, annuli pressure, cement logs, cement bond logs).	<input type="checkbox"/>						

## Key Learnings to Date:

- The NZTC / Astrimar Qualification Framework has the potential to become the **“New Language for Technology Qualification”** ..... **A true industry game-changer!**
- The Framework documents have the potential to become industry standards for the credible and clear communication of:
  - Supplier technology maturity
  - Operator application specifications (including acceptance criteria)
  - Risk/QAQC/HSE Management Requirements
- The Framework has already successfully identified deviations in technology maturity, thereby precluding a solution as qualifiable (for the Operator’s required timeframe)
- GRaPA is very confident that **the Framework is fully compliant for use in Norway**
  - Has the potential to deliver **Reduced Time and Cost of Qualifying New Technology**