Havtil Norwegian Ocean Industry Authority

Plugging and Abandonment

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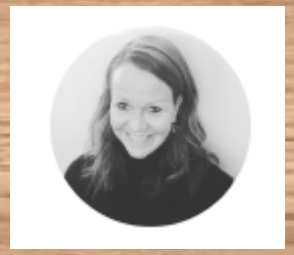
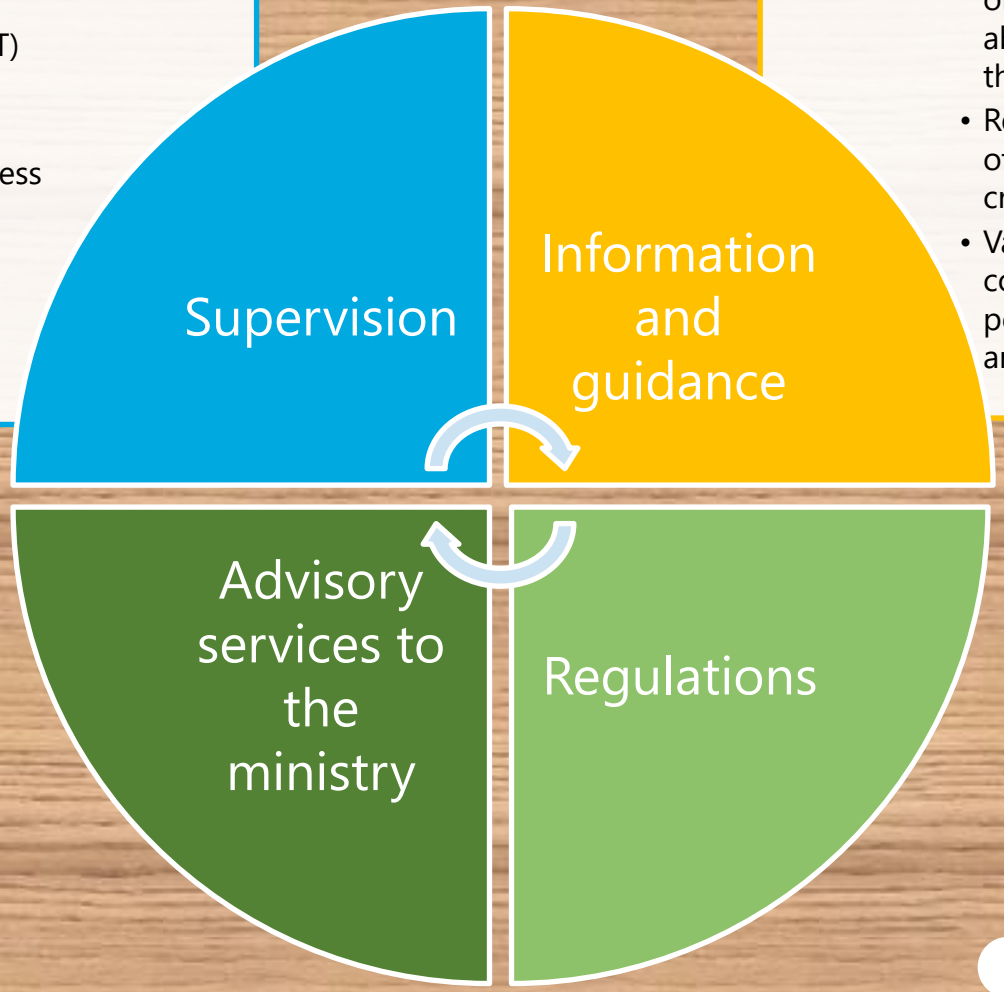
The Havtil P&A-group





- Statutory duties and case processing
  - AoC (norsk: SUT)
  - Application for consent
  - Request for access (norsk: innsyn)
  - PDO/PIO
- Supervision
  - Revisions
  - Investigations



- Biennial data collection on temporarily abandoned wells and their status.
- Report on qualification of PWC, qualification of creeping shales etc.
- Various forums and collaboration platforms, podcasts, conferences, and seminars

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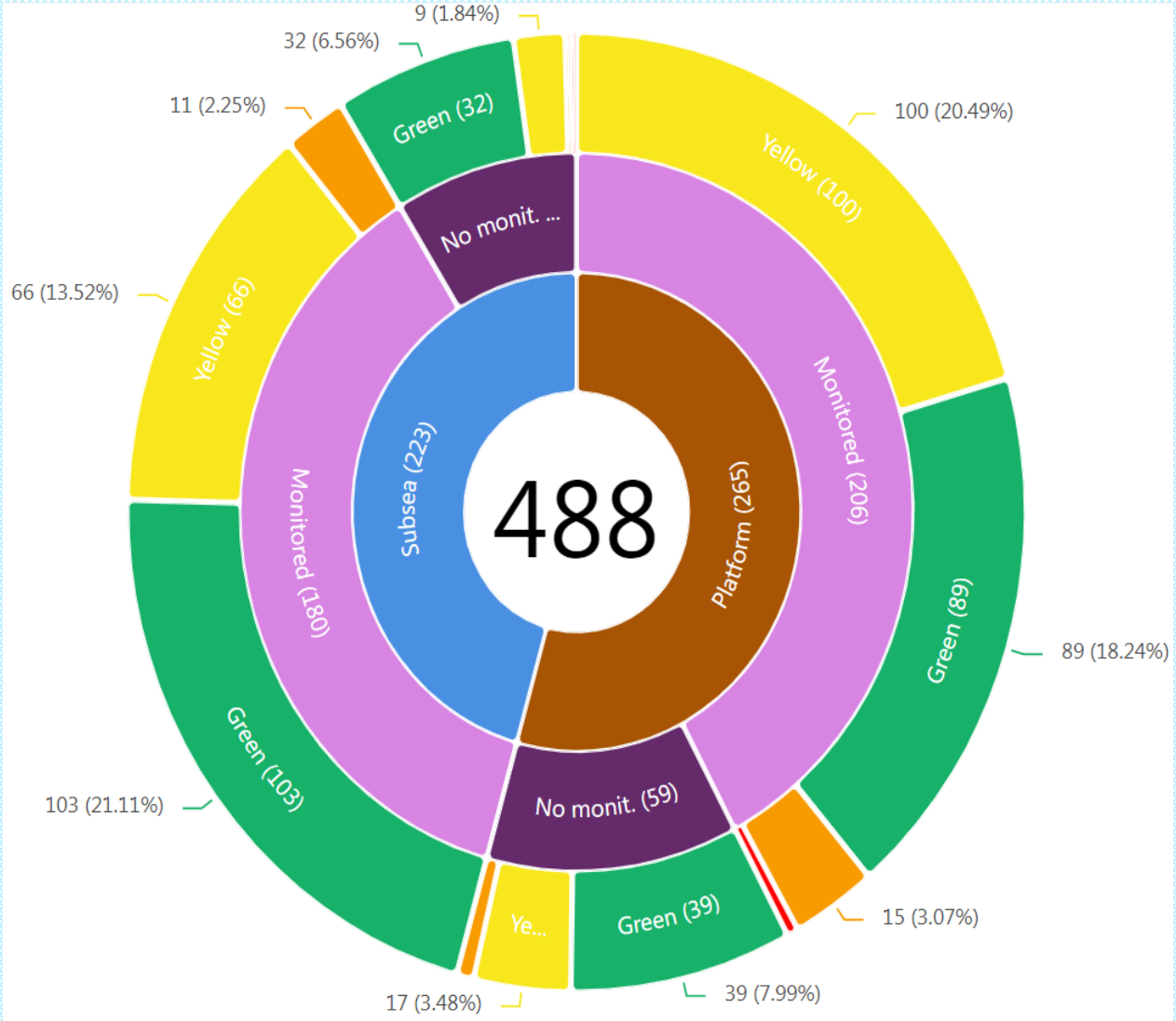
Status temporary abandoned wells 2024

All temporary plugged wells, with or without monitoring, including wells that have been shut in/inactive for the last 12 months

NOROG 117 for categorization (green, yellow, orange, red)

Category	Principle
Red	One barrier failure and the other is degraded/not verified, or leak to surface
Orange	One barrier failure and the other is intact, or a single failure may lead to leak to surface
Yellow	One barrier degraded, the other is intact
Green	Healthy well – no or minor issue



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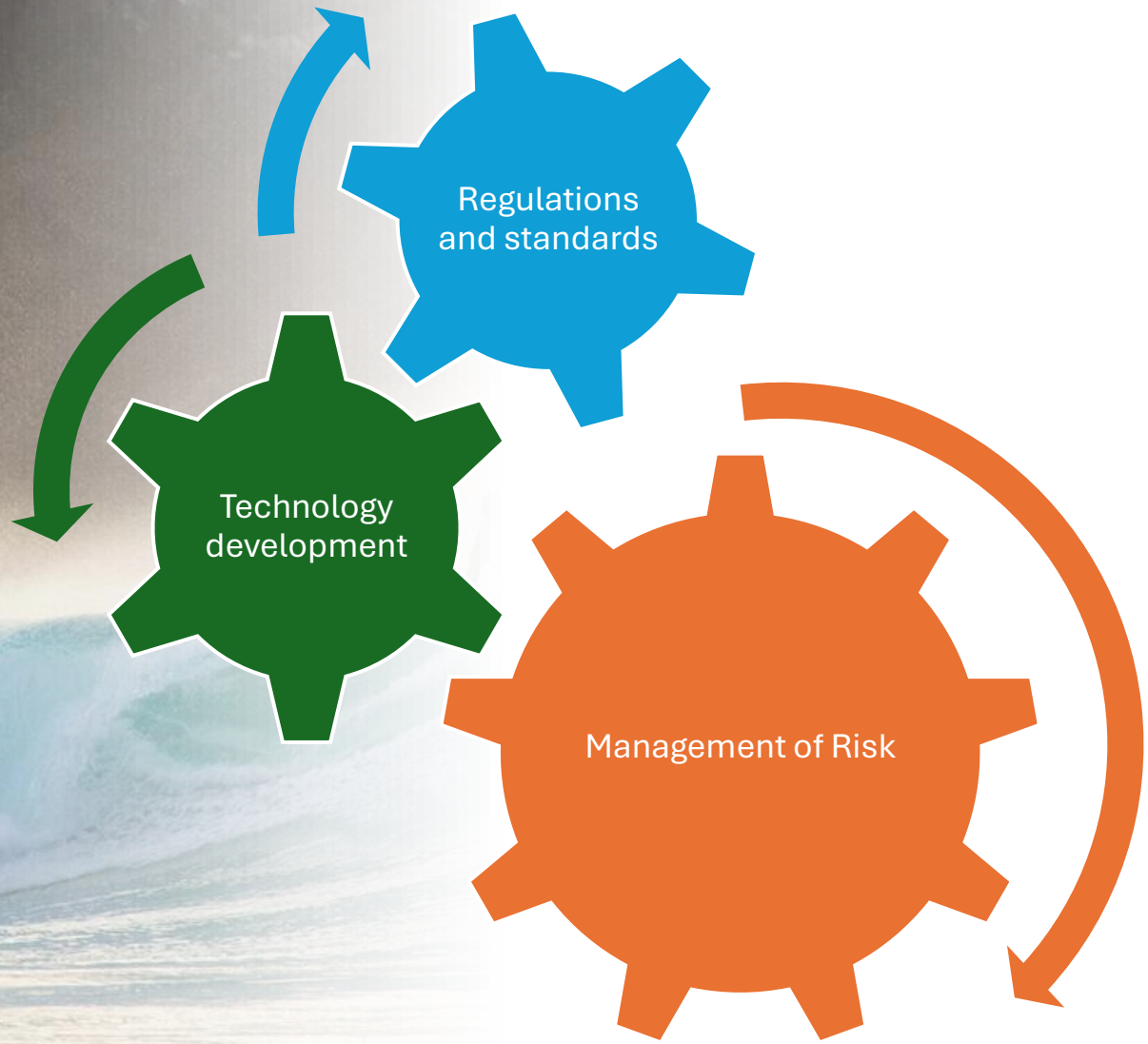
PPA outlook from 2025 - 2050

Several fields in production will have a decline in production rate from 2030…

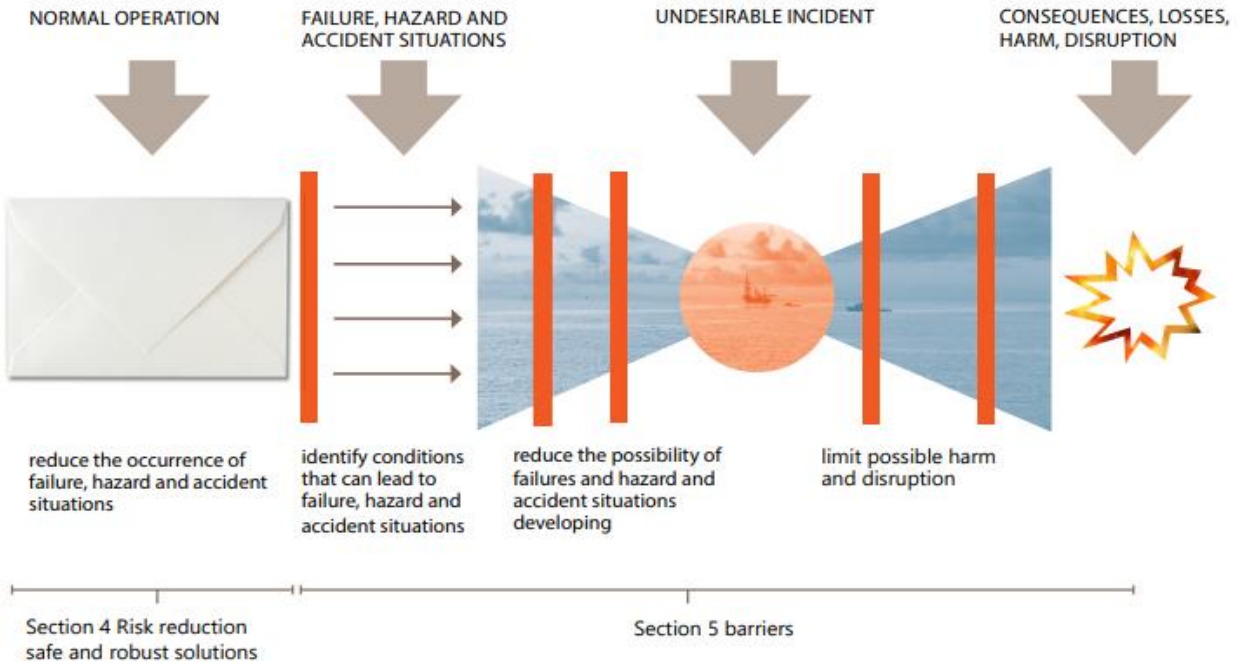
More than 2000 wells expected to be permanent plugged between 2025 – 2050-2070.

Wild Well Control reports an increase in well control incidents related to “suspended wells” globally

Are we prepared ?



Context and perception



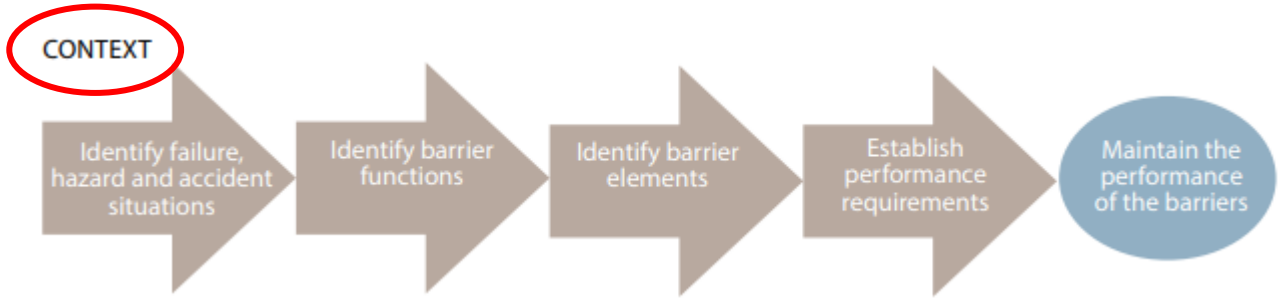


Table 1 — Minimum number of well barrier envelopes

Pore-pressure	Source of inflow	Minimum number of well barrier envelopes: Drilling, Completion & P&A Phase	Minimum number of well barrier envelopes: Production[9] / Injection/ Disposal Operations	Minimum number of well barrier envelopes: After Permanent P&A
Normal pressure Note that local over-pressured shallow hazards may occur in this interval	a) Interval with no hydrocarbon and no flow potential	One[1,2]	Not relevant[3]	Not relevant[4]
	b) Interval with hydrocarbon and flow potential (included depleted reservoir)	Two[2]	Two	Two[5]
	c) Shallow water flow potential	Two[2,6]	Two[6]	One
Over pressure	d) Interval with no flow potential (with or without HC)	Two	One[7]	One[8]
	e) Interval with limited flow potential (with or without HC)	Two	Two[8]	Two[8]
	f) Interval with flow potential (including reservoir)	Two	Two	Two

NOTE 1 This interval may be drilled with seawater providing a risk evaluation finds this acceptable

NOTE 2 A pilot hole is considered an acceptable method of de-risking potential shallow hazards, see 6.7.2.2.

NOTE 3 Surface casing should be cemented to surface during construction

NOTE 4 An open hole to surface plug is required

NOTE 5 A pilot hole with confirmed shallow gas should be cemented back to surface

NOTE 6 One barrier may be acceptable based upon a specific risk evaluation considering well/template/installation stability

NOTE 7 Casing and seal assembly. A specific risk evaluation of sustained casing pressure shall be performed, and mitigations incorporated in the well design or operating guidelines

NOTE 8 For overburden formations, with limited or no flow potential, the required number of barriers may be reduced by one providing a risk assessment demonstrates an acceptable risk level. The risk assessment shall cover all plausible load scenarios (including sustained casing pressure) and account for operational limitations and uncertainties in fluid type, pore-pressure, barrier conditions, etc.

NOTE 9 Gas-lift gas require two barrier envelopes

Principles, processes and context

§ 11 Risk reduction principles

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Harm or danger of harm to people, the environment or material assets shall be prevented or limited in accordance with the health, safety and environment legislation, including internal requirements and acceptance criteria that are of significance for complying with requirements in this legislation. In addition, the risk shall be further reduced to the extent po

In reducing the risk, the responsible party operational or organisational solutions that, evaluation of the potential harm and present provided the costs are not significantly dispr achieved.

If there is insufficient knowledge concern technical, operational or organisational solut environment, solutions that will reduce this u

Factors that could cause harm or disadva material assets in the petroleum activities, s overall assessment, have less potential for h

Assessments as mentioned in this sectio phases of the petroleum activities.

This provision does not apply to the onsh external environment.

§ 4 Risk reduction

In reducing risk as mentioned in **Section 11 of t** responsible party shall select technical, operationa that reduce the likelihood that harm, errors and haz occur.

Furthermore, barriers as mentioned in **Section 5**

The solutions and barriers that have the greates chosen based on an individual as well as an overall protective measures shall be preferred over protect individuals.

Last changed: 01 January 2011

§ 5 Barriers

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Barriers shall be established that at all times can

a) identify conditions that can lead to failures, hazard and accident situations,
b) reduce the possibility of failures, hazard and accident situations occurring and developing,
c) limit possible harm and inconveniences.

Where more than one barrier is necessary, there shall be sufficient independence between barriers.

The operator or the party responsible for operation of an offshore or onshore facility, shall stipulate the strategies and principles that form the basis for design, use and maintenance of barriers, so that the barriers' function is safeguarded throughout the offshore or onshore facility's life.

Personnel shall be aware of what barriers have been established and which function they are intended to fulfil, as well as what performance requirements have been defined in respect of the concrete technical, operational or organisational barrier elements necessary for the individual barrier to be effective.

Personnel shall be aware of which barriers and barrier elements are not functioning or have been impaired.

Necessary measures shall be implemented to remedy or compensate for missing or impaired barriers.

Last changed: 01 January 2015

Technology Development

Barrier materials and barrier verification

7	**Field Proven** Production system field proven
6	**System Installed** Production system installed and tested
5	**System Tested** Production system interface tested
4	**Environment Tested** Pre-production system environment tested
3	**Prototype Tested** System function, performance and reliability tested
2	**Validated Concept** Experimental proof of concept using physical model tests
1	**Proven Concept** Proof of concept as a paper study or R&D experiments
0	**Unproven Concept** Basic R&D, paper concept

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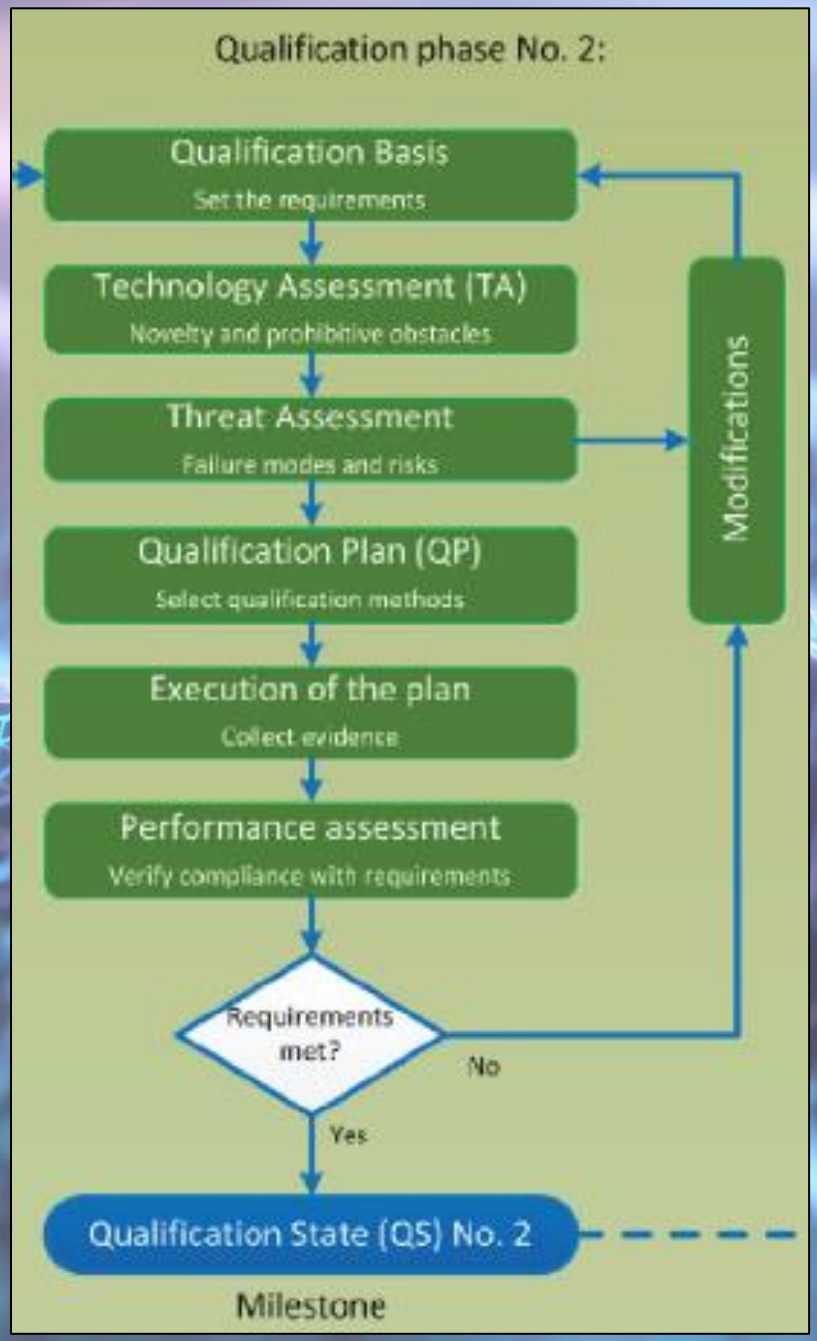

Take Away

Context, as opposed to perception, is everything!

Structured technology qualification is crucial

Investment in the Norwegian continental shelf comes at a cost!

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