Technology qualification

The energy industry is actively developing new technologies to improve efficiency, facilitate energy transition and to reduce both hardware and operating costs. However, operators are reluctant to deploy these technologies without robust qualification assurance evidence. Furthermore, for the industry to move into more challenging operating environments, and adopt novel net zero technologies outside existing industry experience, additional technical risk and uncertain reliability performance is introduced that needs to be managed through appropriate technology qualification; this applies as equally to the introduction of new technology, new materials and new manufacturing methods, as it does to 'stretching the envelope' of existing hardware in a new environment.

Qualification and technology readiness

When introducing new technology, it is critically important to understand when the technology is ready for deployment and the level of risk that the deployment entails. Astrimar is able to assist both technology developers and system operators in the management of risk through qualification testing and analysis. In particular, we can help companies to:

- Understand the level of technical risk and uncertainty
- Determine maturity and initial technology readiness level (TRL)
- Identify and plan qualification tests to raise the TRL to the required level of readiness including application of FMECA
- Identify reliability requirements and forecast expected reliability

	TRL		
	1-9	0-7	
Basic Research	1	0	Research World
Concept Formulation	2	1	
Concept Development	3		
Concept Demonstration	4	2	
Prototype Development	5	3	Simulated World
Product Validation	6	4	
System Integration Testing	7	5	Real World
System Installation and Commissioning	8	6	
System Operation	9	7	

Our track record

For more than fifteen years our consultants have been developing practices, procedures and tools for the assessment and management of technical risk and reliability, enabling us to support technology developers and users of technology to demonstrate the achievement of reliability and technology readiness prior to application.

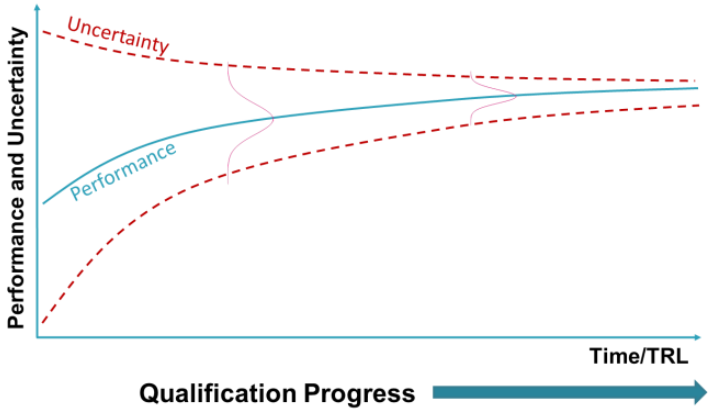
Astrimar consultants were the lead technical authors for the 1st and 2nd editions of API RP 17N on subsea reliability, integrity and technical risk management and supported a completely revised 2nd edition of API RP 17Q on technology qualification, requested by the industry and published in 2018; this includes alignment between the TRL approach and DNV RP A203 in addition to more detail on the qualification process and supporting reliability testing. Astrimar also support the NZTC on technology qualification best practice, including TechX mentoring.

Our consultants have written technical practices on the qualification of technology for a number of client companies; each sought to align their procedures with the API RP 17N/Q approach and its TRL 0 - 7 ladder. We also assist companies working with alternative, more common, TRL 1 - 9 ladders, such as those defined by NZTC, NASA, US DoD, EMEC and ISO, and used by funding bodies including Innovate UK.

Qualification methodology

The basis of the Astrimar technology qualification approach is the attainment of a required TRL from an initial TRL, through application of a robust qualification process to provide traceable assurance evidence from a combination of R&D, testing, simulation and analyses.

The aim of the qualification programme is to reduce the level of technical risk and uncertainty in reliability and performance to an acceptable level, prior to deployment.



In practice many qualification programmes start at TRL 3 (1 - 9 ladder) and then progress through to 6 and then to 8 in conjunction with an operator.

Different types of testing and analysis are undertaken at different stages in the ladder. For example, the use of testing and analysis of a prototype to create a robust and reliable product is undertaken as part of TRL 5. Whereas realistic environmental testing e.g. in a deep water test site, is undertaken to achieve TRL 6. For TRL 7, tests and analyses are undertaken to ensure that the device will function reliably when interfaced to the wider system and overall system reliability requirements are not compromised.

Different types of equipment will involve different types of testing and analysis. For example, qualification of a PCB may benefit from a HALT programme to achieve TRL 5, whereas for a large structural item which cannot be physically tested until installed, greater focus will be placed on analysis and modelling. For example, stress-strength interference could be used to support achievement of TRL 5 with a stronger programme of testing between TRL 6 and TRL 8.

The identification of potential failure modes (as outlined in DNV RP A203) is a key input in the identification of tests and analyses to be undertaken especially between TRL 5 and TRL 8.

Independent verification and validation

In addition to being able to carry out a range of risk, reliability and qualification analyses, Astrimar has wide experience of providing verification and validation of analysis and tests carried out by others to ensure the most appropriate tools, data and data analyses are employed in execution of a qualification programme.

Find out more

We run regular free lunch and learn webinars providing an introduction to TRLs and the qualification process. In addition we are able to provide a two day interactive classroom course. Details about upcoming webinar sessions are provided on the Training pages of our website together with booking and contact information.