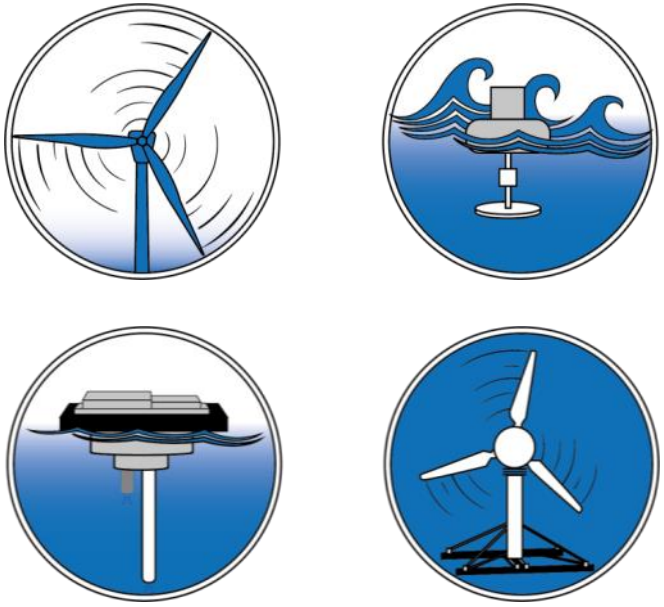
Certification schemes
For Marine Renewable Energy



BUREAU VERITAS
Marine & Offshore Division

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Offshore Wind Market Leader
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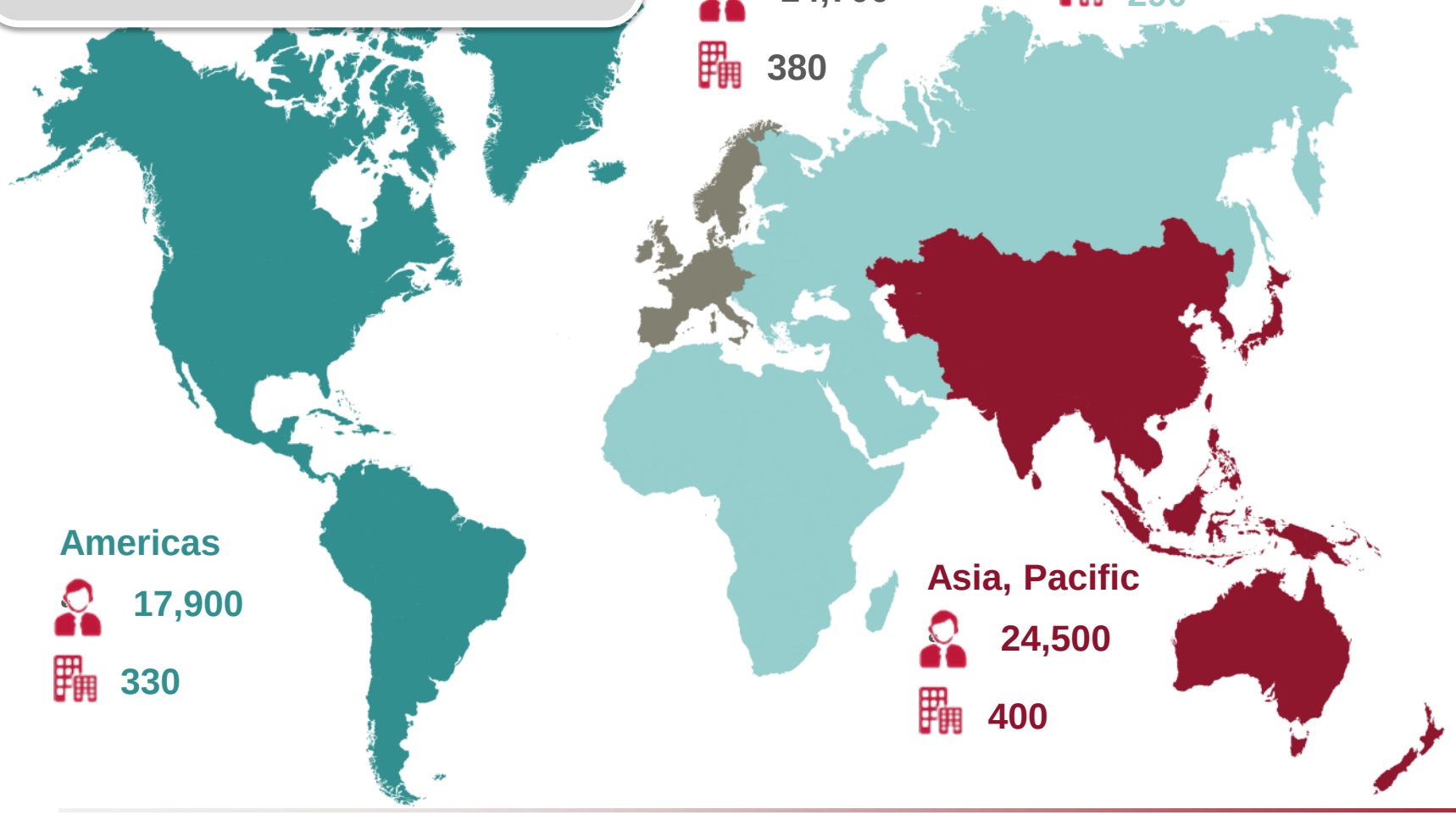
Bureau Veritas presentation

What we do?

An extensive geographic footprint

72,000 employees

1,400 offices and laboratories in **140** countries



A large portfolio of businesses

2016 Revenue: € 4.6 billion

9%

Marine & Offshore

17%

Commodities

14%

Consumer Products

5%

Government Services & International Trade

22%

Industry

13%

In-Service Inspection & Verification

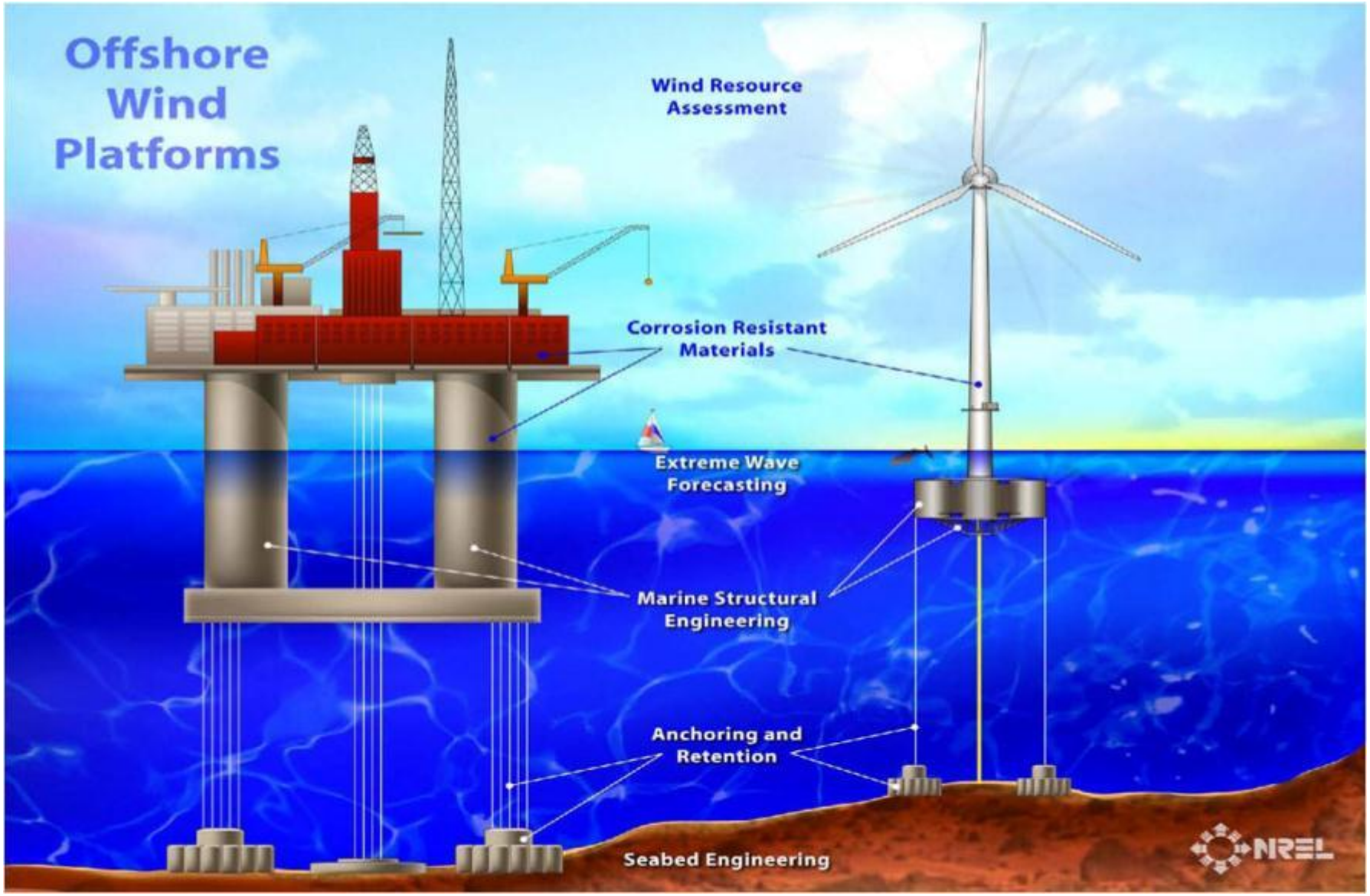
12%

Construction

8%

Certification

BV Experience - similarities



BV Certification schemes for Marine Renewable Energy

Introduction to the Certification: What?

[IEC 61400-22]

***Certification**:*

“procedure by which a third party gives written assurance that a product, process or service conforms to specified requirements, also known as conformity assessment”.

Who asks for / benefits from Certification/Classification ?

- Bankers
- Investors
- Insurers
- Nat. authorities
- Technology & project developers
- End users
- etc.

When ?

All project phases !

- Feasibility studies
- Design
- Manufacturing & assembly
- Transportation
- Installation
- Commissioning
- Operation & Maintenance
- Decommissioning

General MRE certification procedure

Type certification

A series of standard commercial MEC of common design and manufacture

Prototype certification

The first MEC of a new generation

Project certification

A farm of type-certified MEC installed on a specific site

Component certification

A standard commercial component used in multiple projects

Approval In Principle

Technical feasibility of a concept

Approval In Principle (AIP)

► Objectives

1. To establish the **design code** to comply with

2. To verify that **the design is feasible**, **achievable**, and contains **no technological "show-stoppers"** that may prevent the design from being matured

3. To verify that the design is deemed to be **suitable for use in the metocean conditions** that the unit facility will be located in

4. To verify that the design is deemed to be **suitable for use in all phases of operation** including in-transit to field, installation, hook-up, commissioning, start-up, operations and offloading

5. To provide **recommendations** to fulfil through the following phases of the project

► INPUT

❖ **List of design documents to be reviewed**

► *Ex: metocean analysis, stability analysis, structural analysis, hydrodynamic analysis, CFD calculation, preliminary anchoring system, model tests, preliminary steel drawings etc.*

❖ **Codes and standards**

► *Ex: NR445, API codes, etc.*

► OUTPUT

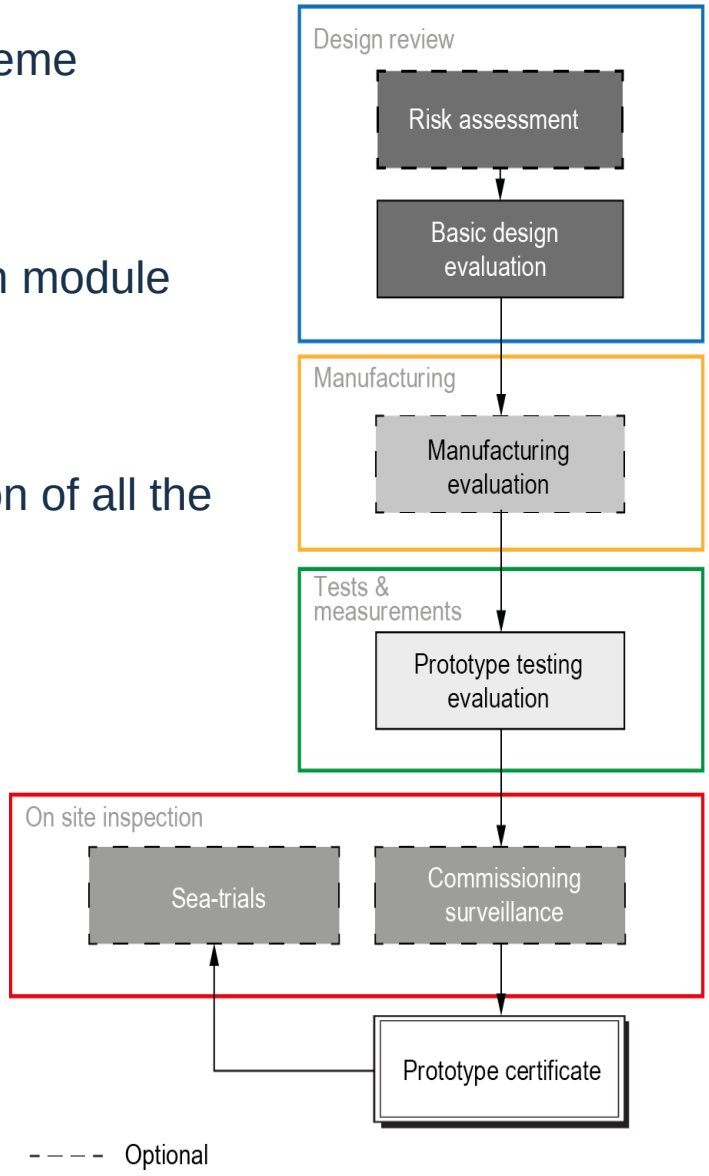
❖ Submitted documents are **stamped**

❖ A **certificate** is issued

❖ **Comments and recommendations** for the following phases of the project are issued

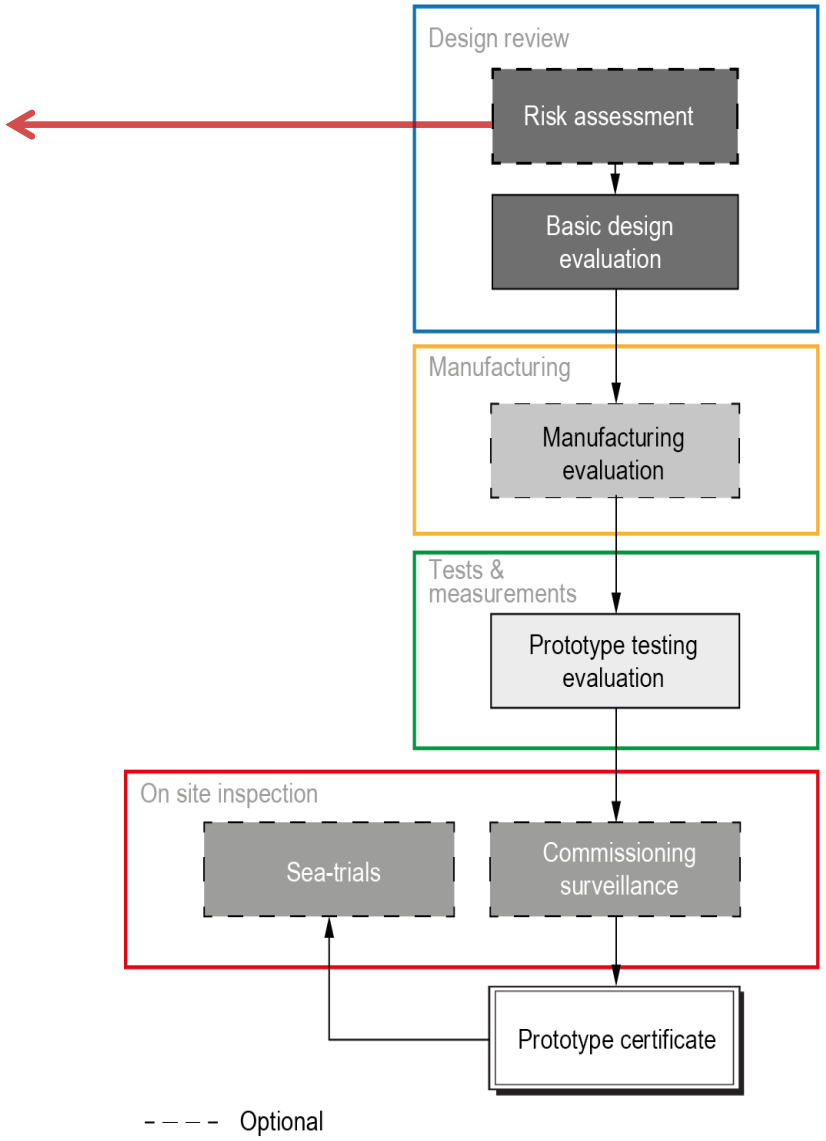
Prototype Certification

- No internationally recognized MRE certification scheme
- BV proposal, iterations possible
- Evaluation report and conformity statement for each module
- Delivery of the certificate subjected to the completion of all the mandatory modules
- Maximum validity period of **3 years**.



Prototype Certification

- Systematic hazard identification:
  - **Causes**
  - **Effects**
  - **Prevention and mitigation measures**
- Review of risk assessment conducted by the Client.
- *Is the selected methodology correctly implemented ? Are there any major hazards remaining unaddressed ?*

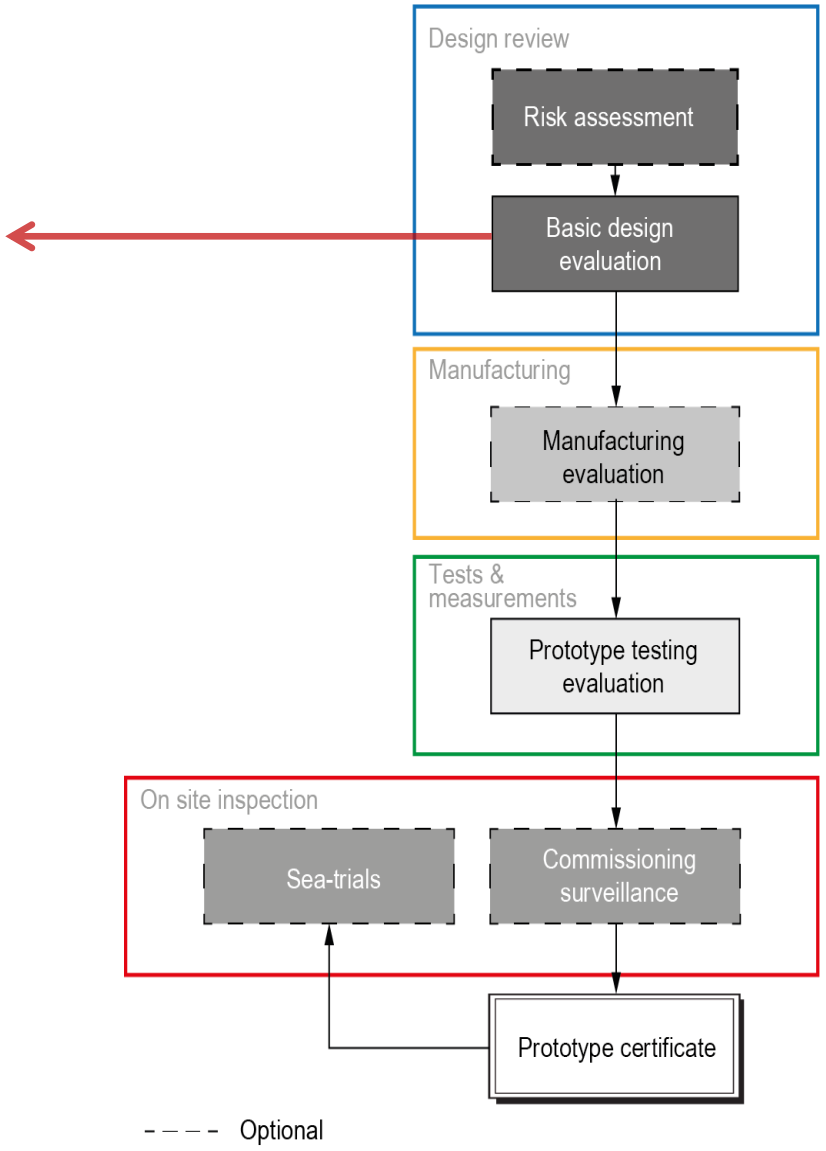


Prototype Certification

► **Verify** :

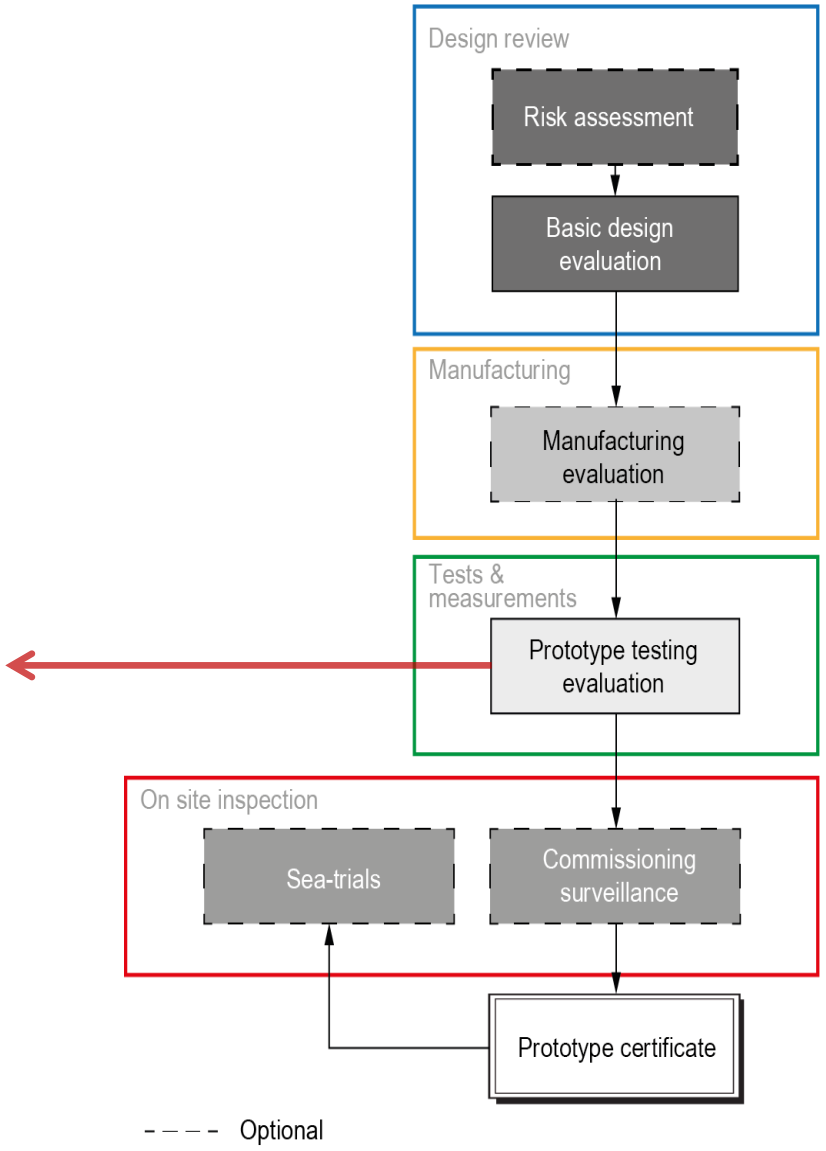
- ❖ Load assumptions
- ❖ Load cases (including transportation and installation)
- ❖ Design of main components
- ❖ …

► Only documentation review



Prototype Certification

- **Review of the sea trials programme and specifications**
- If applicable, review of previous tests:
  - tank tests
  - small-scale sea trials
- *What are the components to be tested ? What are the parameters to be monitored during the tests ?*



Prototype Certification

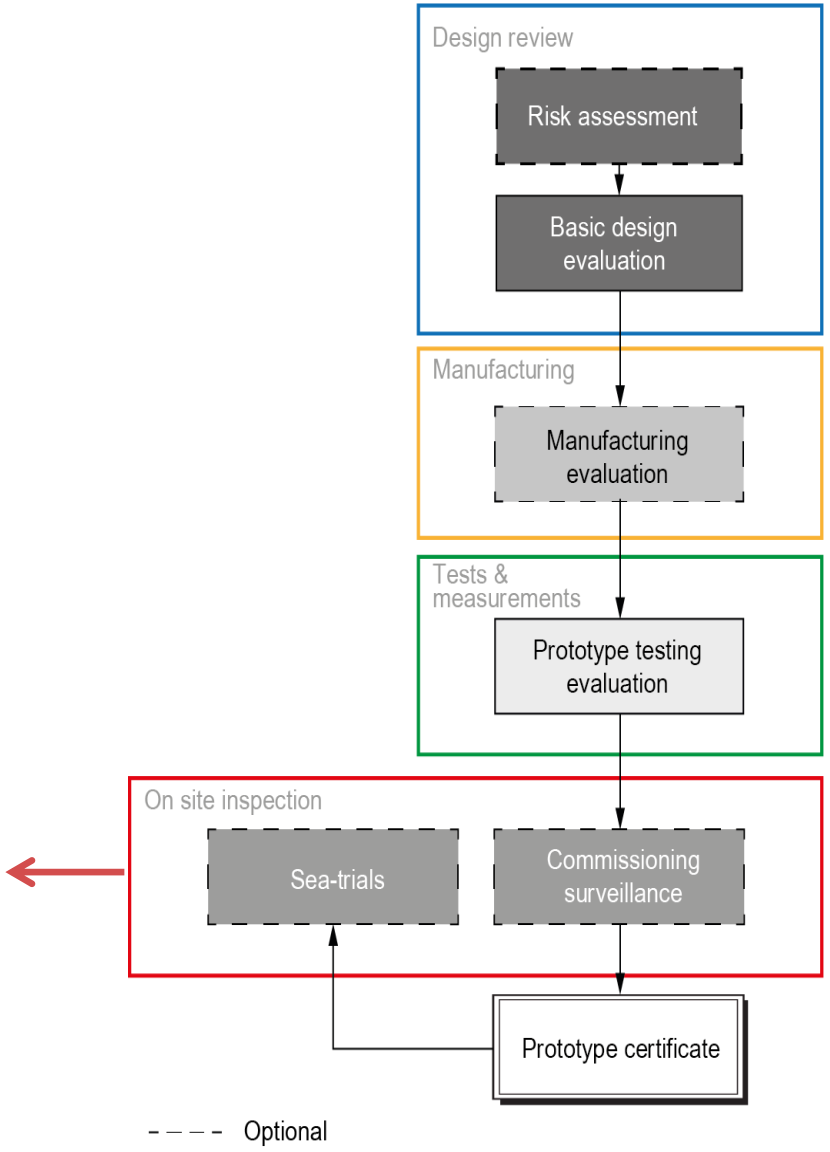
- Commissioning surveillance

  - Is the operation in conformity with the commissioning **manual and procedure** ?

  - Is the operation compliant with relevant **safety standards** ?

- Sea-trials

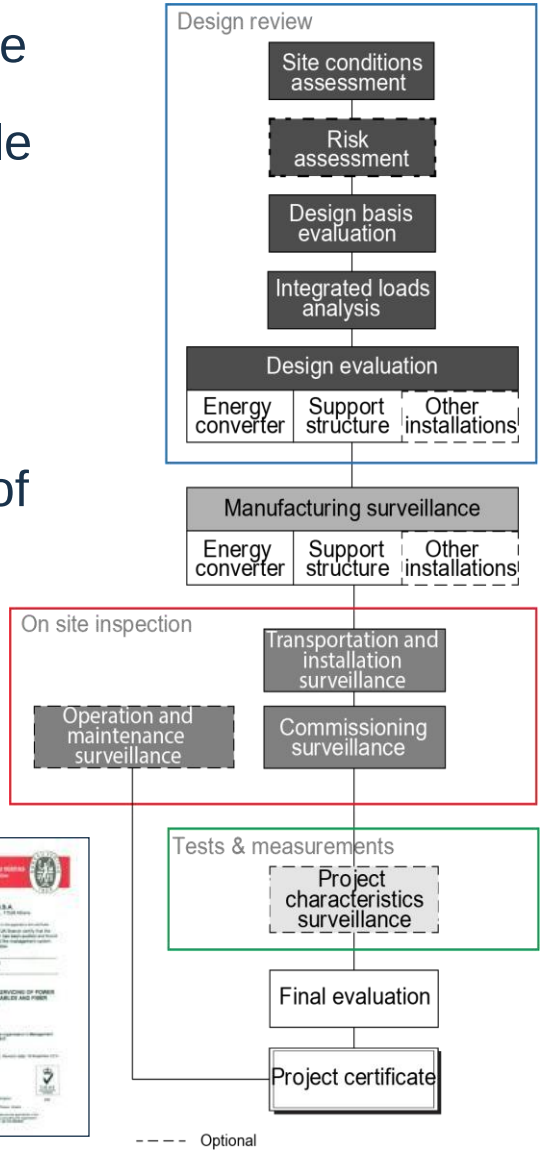
  - Are the sea trials in conformity with the **prototype test specification** ?



Project Certification

- So far, no dedicated IEC/ISO MRE certification scheme
- BV proposal based on IEC61400-22, iterations possible
- Evaluation report and conformity statement for each module

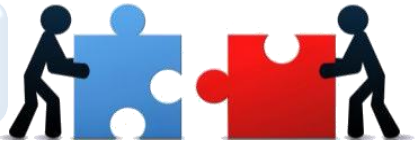
- Delivery of the certificate subjected to the completion of all the mandatory modules
- Validity period on a case by case basis, aiming at covering the lifetime of the MRE project.
- Validity of the certificate is subject to:
  - the periodic inspections outcomes
  - the annual review of monitoring, operation, maintenance and repair reports.



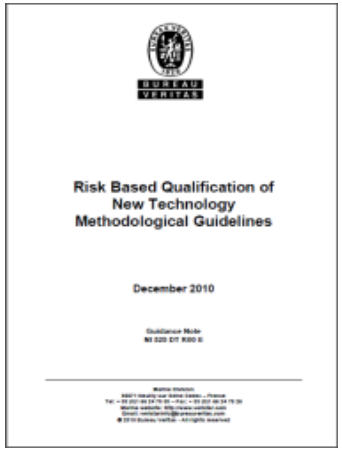
Risk-Based Qualification of New Technology

Certification requirements

Existing codes and standards



Risk based approach Qualification of New Technology

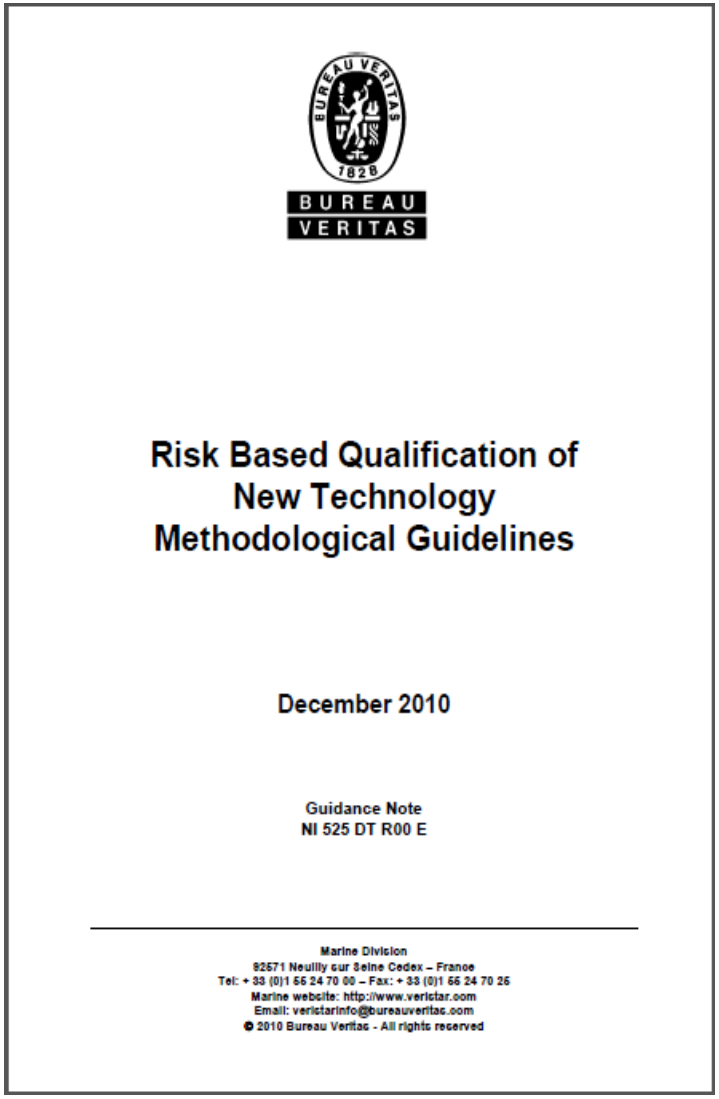


Risk-Based Qualification of New Technology

*"**Qualification** is a process by which a **novel technology** (a new technology or an existing technology used in a new context) is **validated**."*

- theoretical analytical modelling
- physical tests,
  either at reduced scale or at full scale when possible

Technology maturity	Application conditions	
	Similar	Different
Proven	0	1
Limited references	1	2
Extrapolated from proven	2	3
New	3	3

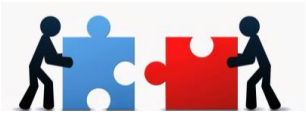


Conclusion

- **Ongoing normalization developments** for MRE converters

- **Innovative certification procedure** developed for MRE converters addressing prototype, component, type and project certification

- Combination of **existing standards** with a **risk-based approach**



- Generic methodology to address **various concepts of MRE devices**

Thank you for your attention!

Move Forward with Confidence