



# IEA-OES Evaluation and Guidance Framework

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IEA-OES Performance Metrics Task

**Technology Collaboration Programme**

by **iea**

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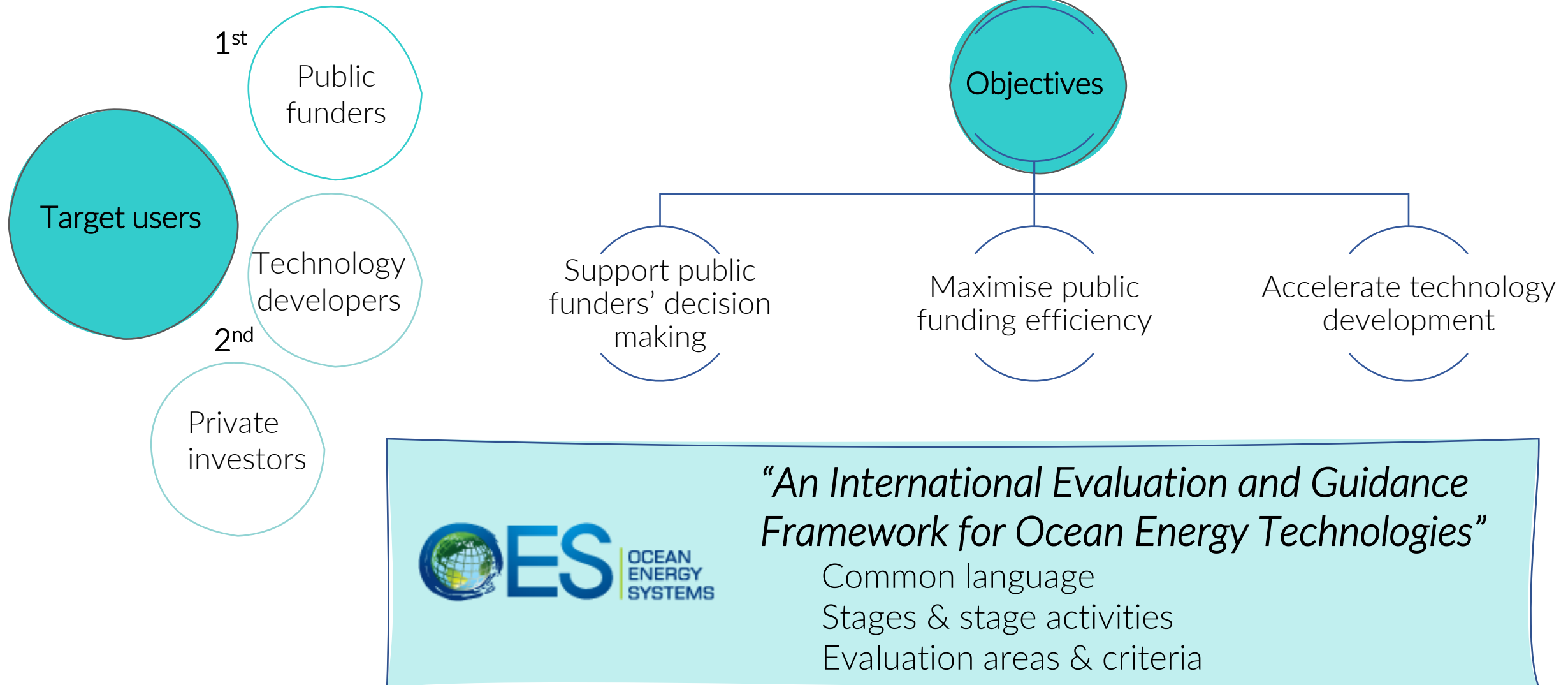
- Stage Gate Metrics and IEA-OES
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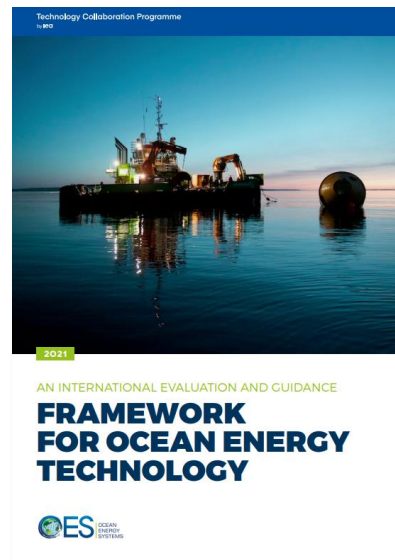
THE UNIVERSITY  
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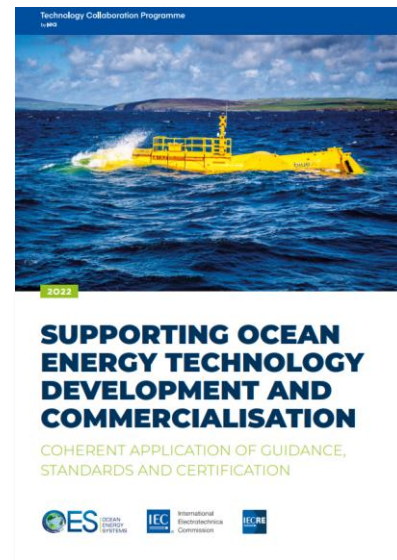
# Stage Gate Metrics and IEA-OES



# Publications



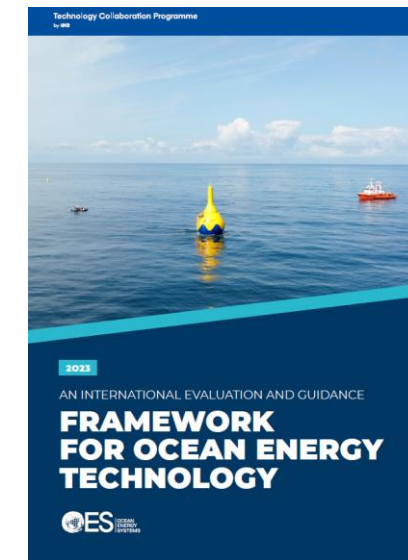
1<sup>st</sup> Edition –  
Published  
January 2021



Complements  
other guidance  
(IEC, IECRE etc.)

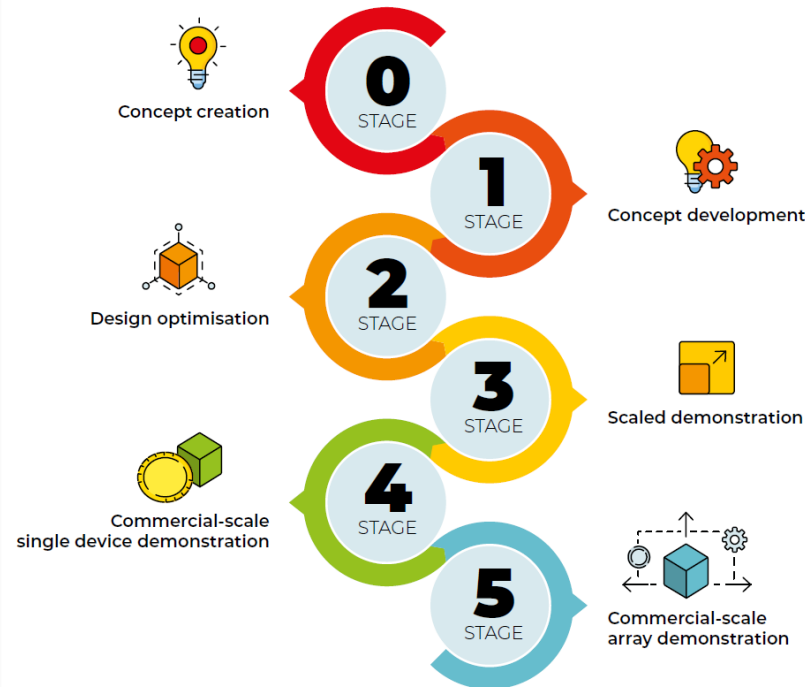
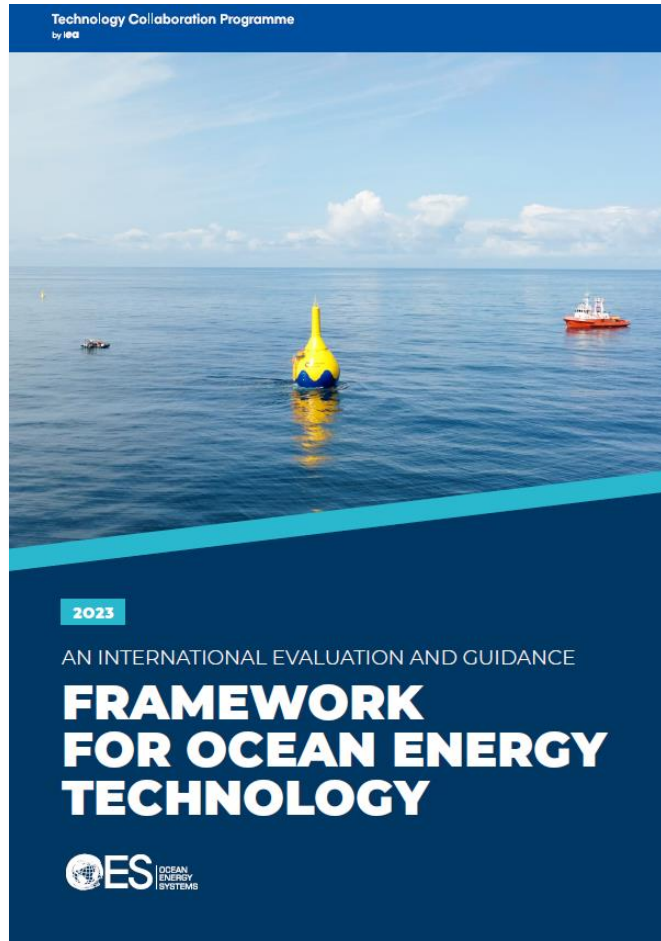


Promoted  
internationally  
–English, Chinese,  
Spanish, French



2<sup>nd</sup> Edition –  
Published  
October 2023

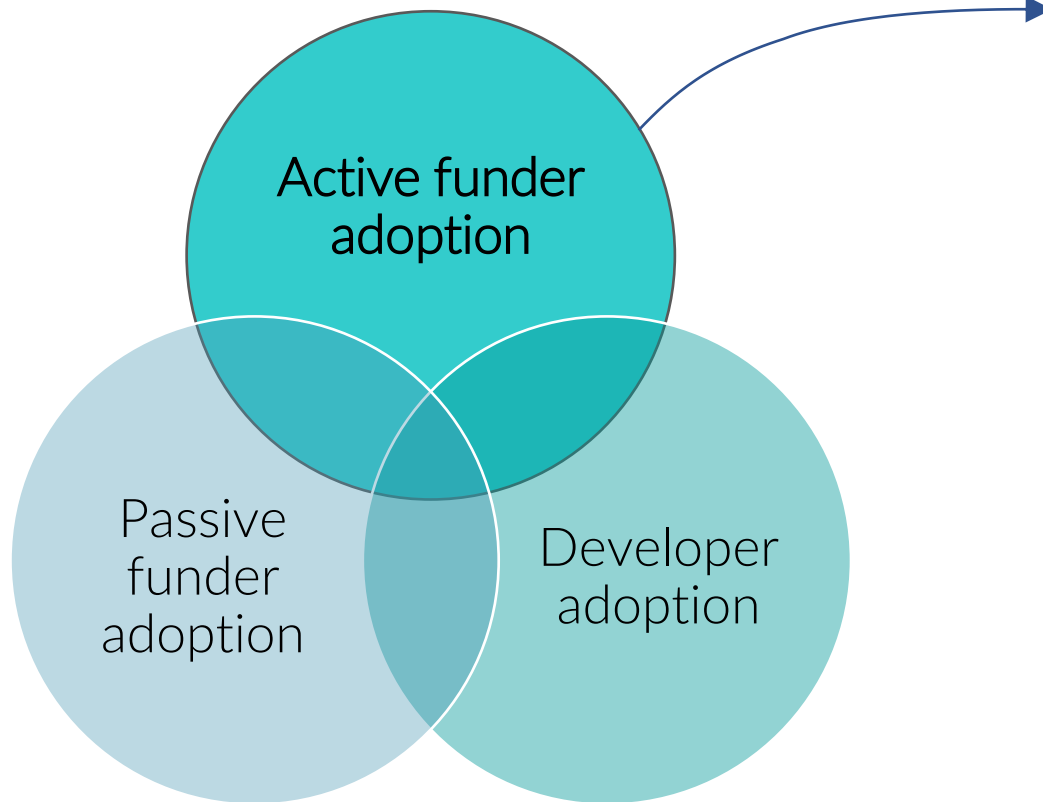
# OES Framework 2<sup>nd</sup> Edition



- + Stage Activities & Evaluation Criteria
- + Alignment with complementary guidance, e.g. IEC standards
- + *Social Readiness coming soon*

# Adoption and benefits

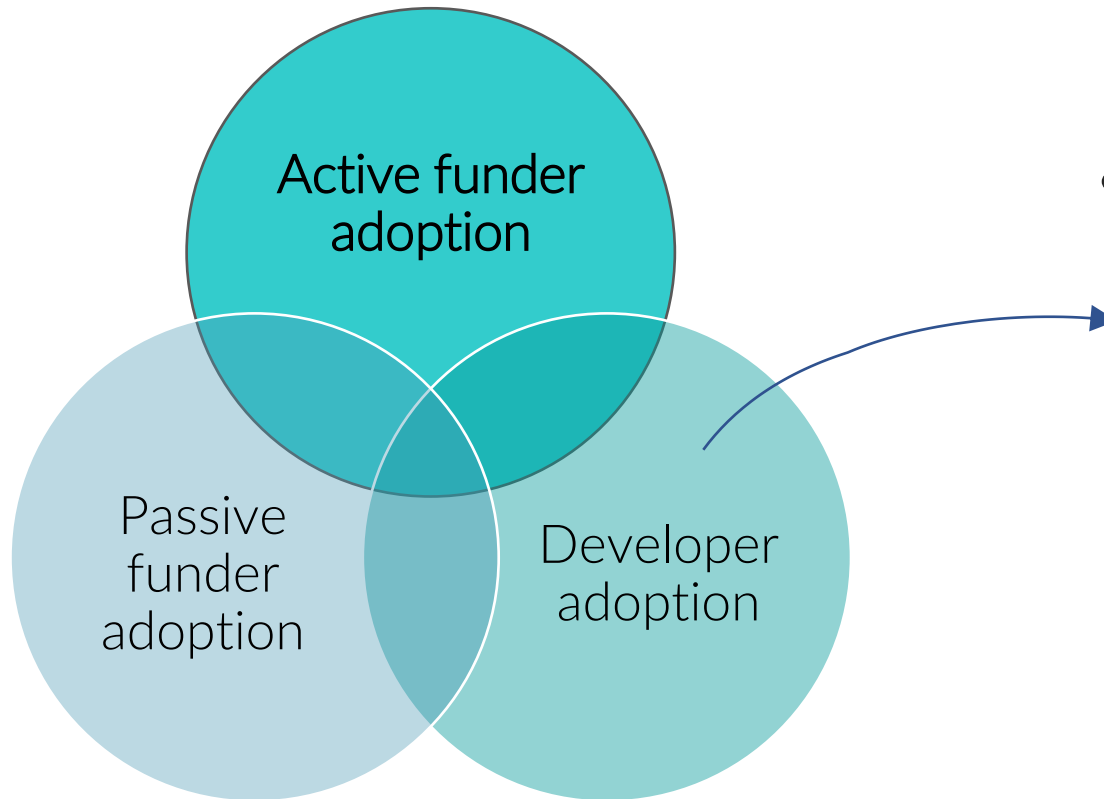
- Types of adoption



- Benefits shared by funders:
  - Design a funding programme
  - Provide clear expectations to applicants
    - Prerequisite technology development
    - Expectation of data and outcomes
    - Key areas of technology attractiveness
    - Definitions and common language
  - Evaluate and compare technology using a consistent dataset
  - Monitor and report progress, risks and impacts

# Adoption and benefits







- Types of adoption





- Benefits shared by developers
  - Understand funder expectations
  - Build a clear narrative
  - Demonstrate technology performance
  - Common language and data
  - Easy to adopt


# Explicit implications for applicants



- What stage of development/maturity is expected by the funder?
  - Funders use the OES Framework to specify what activities should have already been completed for a technology developer to be eligible for a funding call
  - Some funders specify entry and exit TRLs, other refer to the Stages of technology development
  - Action for applicants:
    - Use Stage Activities to check prerequisites and demonstrate your compliance against them

Stage	Description	TRL
 <b>Stage 0</b>	Concept creation	1
 <b>Stage 1</b>	Concept development	2 3
 <b>Stage 2</b>	Design optimisation	4
 <b>Stage 3</b>	Scaled demonstration	5 6
 <b>Stage 4</b>	Commercial-scale single device demonstration	7 8
 <b>Stage 5</b>	Commercial-scale array demonstration	9

 **Early (1-3)**  
Analytical and numerical models

 **Mid (3-6)**  
Experimental tests in controlled environment

 **Late (6-9)**  
Experimental tests in representative environment

 <b>Stage 4</b> Commercial-scale single device demonstration	<ul style="list-style-type: none"> <li>• Further development and refinement of a detailed numerical model with integrated subsystems to cover full operational envelope</li> <li>• Open-water testing (uncontrolled environment) of a single device at commercial scale in a commercially representative site, with fully functional commercial-standard subsystems</li> <li>• Open-water test campaign should be of sufficient duration, with no significant periods of operational interruption, to thoroughly evaluate the device power capture performance. For wave and tidal stream devices, this is expected to be at least 12 months in order to experience the full range of expected operating conditions, taking account of seasonal variations and providing the opportunity to evaluate different system and subsystem settings</li> <li>• Validation of the numerical model using all available appropriate data.</li> </ul>
 <b>Stage 5</b> Commercial-scale array demonstration	<ul style="list-style-type: none"> <li>• Additional numerical modelling and analysis to assess array-related hydrodynamic interaction between devices to reflect the installed array configuration and future array deployments</li> <li>• Selection of array layout based on hydrodynamic modelling and array interaction analysis</li> <li>• Open-water testing (uncontrolled environment) of an array of at least 2 commercial-scale devices<sup>1</sup>, in a commercially representative site, with fully functional commercial-standard subsystems</li> <li>• Open-water test campaign should be of sufficient duration, with no significant periods of operational interruption, to evaluate the array power capture performance to a high degree of confidence. For wave and tidal stream devices, this is expected to be at least 2 years in order to experience the full range of operating conditions and build statistical significance of performance characteristics</li> <li>• Ongoing validation of a detailed numerical model with integrated subsystems, to cover the full operational envelope</li> <li>• Validation and ongoing optimisation of any algorithms to vary controllable parameters, such as PTO settings (damping, force or speed restrictions) or device geometry.</li> </ul>

Done in previous project

Planned for this project

# Explicit implications for applicants

- What technology characteristics does the funder want to demonstrate or improve?
  - Funders use the OES Framework to show the definition of success
  - Actions:
    - Use Evaluation Areas to plan your design, development and demonstration activities
    - Use the Definitions to speak the same language as the funder and show a coherent vision of success

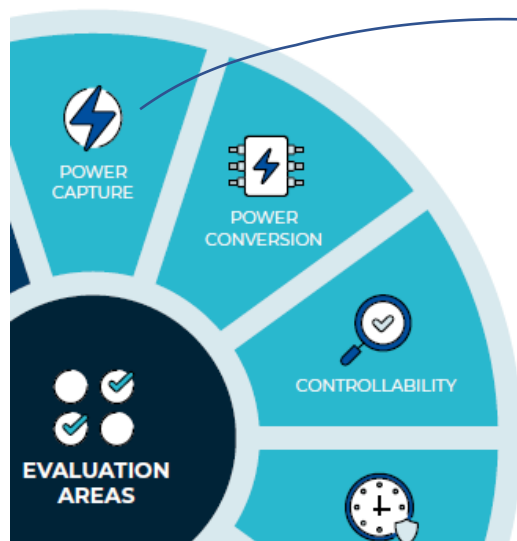


## 3.4.1 DEFINITION

Reliability is defined as the “probability that an item can perform a necessary function under given conditions for a given time interval” <sup>(16)</sup>

# Explicit implications for applicants

- What data/parameters will the funder use to select the best technologies?
  - Funders use the OES Framework to demonstrate international consensus on what parameters are important and, therefore, how technologies will be assessed by the evaluators at selection and completion
  - Actions:
    - Use Evaluation Criteria to plan your evaluation methodologies and data outputs, adding more parameters as appropriate
    - Where appropriate, show how more detailed methods will be used to achieve data outputs e.g. IEC Technical Specifications




e.g.

Evaluation Criteria	Units	Format
<b>Power Capture</b> (hydrodynamic to mechanical PTO input)	kW	Matrix of average power capture in each sea state. Sea states are defined by combinations of significant wave height ( $H_{mo}$ ) and energy period ( $T_e$ ), each split into bins (or intervals) along the matrix axes. Example shown in Figure 7.
<b>Capture length</b>	m	Matrix of average capture length in bins (or intervals) of $H_{mo}$ and $T_e$ . Example shown in Figure 8. Capture length is defined as: $\text{Capture Length (m)} = \frac{\text{Power Capture (kW)}}{\text{Available Power (kW/m)}}$

Table 4 Evaluation Criteria for Power Capture (wave energy)

IEC. TS 62600-100:2012:  
Power performance  
assessment of electricity  
producing wave energy  
converters.

# Adoption and benefits - Reminder

- Benefits shared by **funders**:
    - Design a funding programme
    - Provide clear expectations to applicants
      - Prerequisite technology development
      - Expectation of data and outcomes
      - Key areas of technology attractiveness
      - Definitions and common language
    - Evaluate and compare technology using a consistent dataset
    - Monitor and report progress, risks and impacts
  - Benefits shared by **developers**
    - Understand funder expectations
    - Build a clear narrative
    - Demonstrate technology performance
    - Common language and data
    - Easy to adopt
- 
- A blue double-headed arrow pointing left and right, positioned between the two columns of bullet points, indicating a relationship or exchange between the funders' and developers' perspectives.

# Thank you

**Technology Collaboration Programme**

by **iea**