BLUE SPRING
BE GREEN GO BLUE

Online course

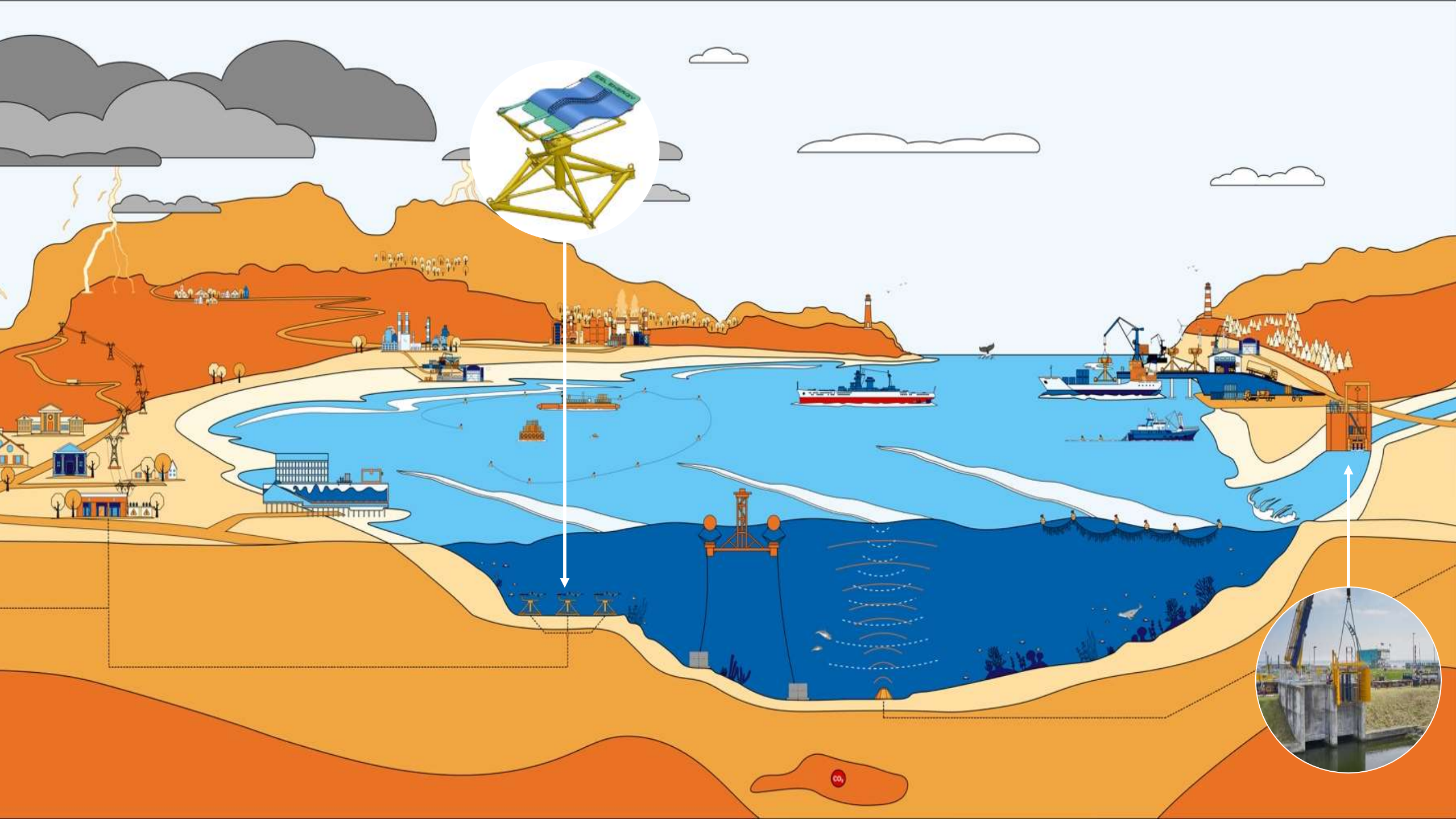
Offshore Renewable Energy Essentials

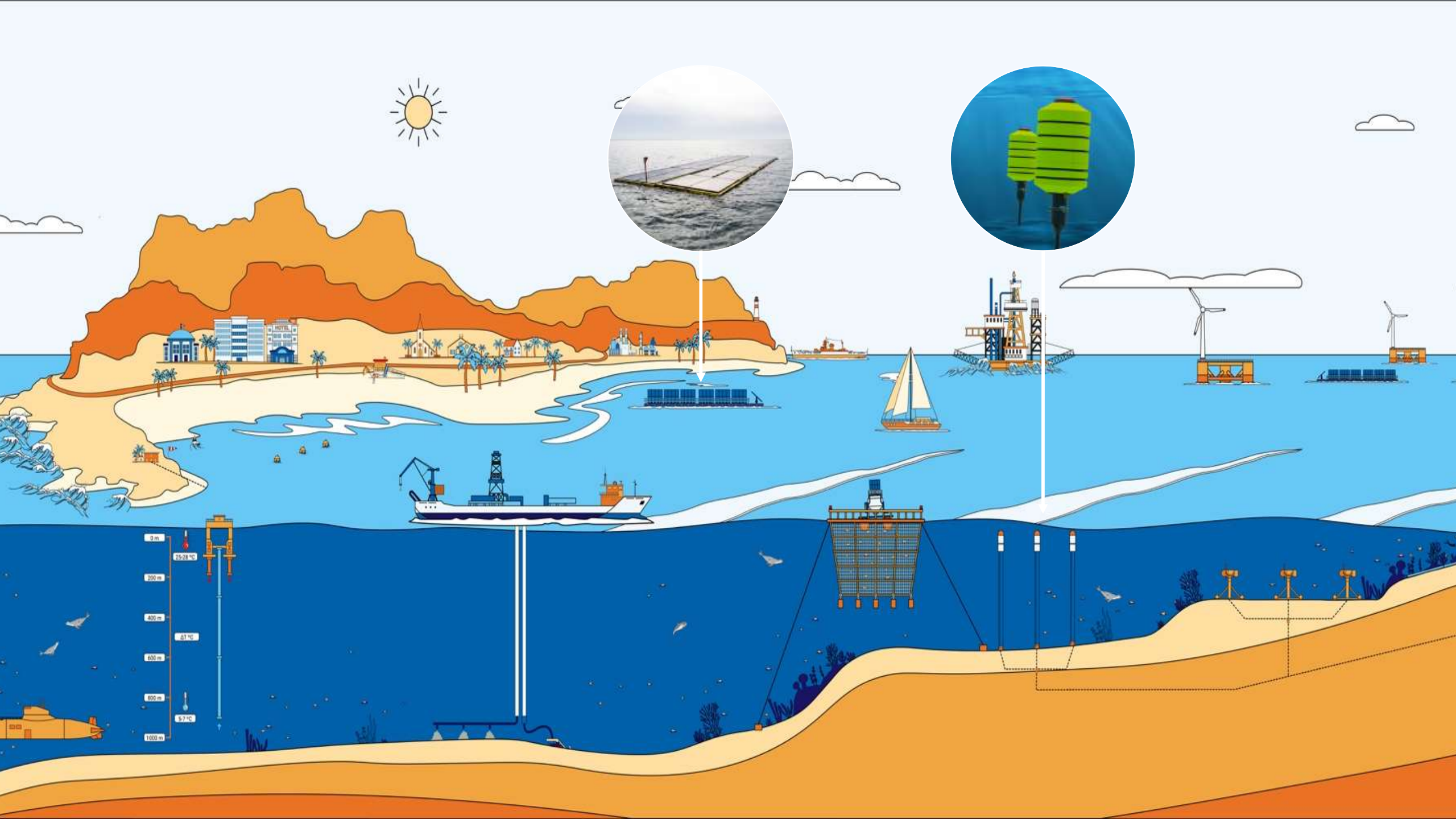
31 CPD Points

CPD CERTIFIED
The CPD Certification Service

Part 1 (M1) = €100,-
Part 2 (M2-M8) = €100,-

>10 users custom pricing



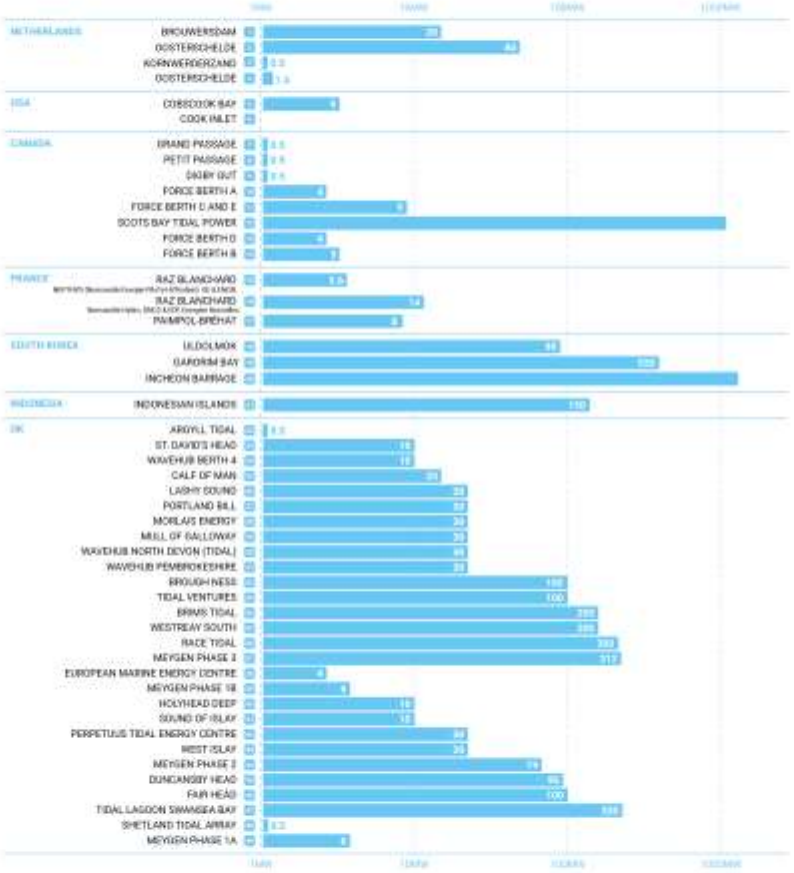

HOTEL
0 m
25-28 °C
200 m
400 m
ΔT °C
600 m
800 m
5-7 °C
1000 m

"Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change"

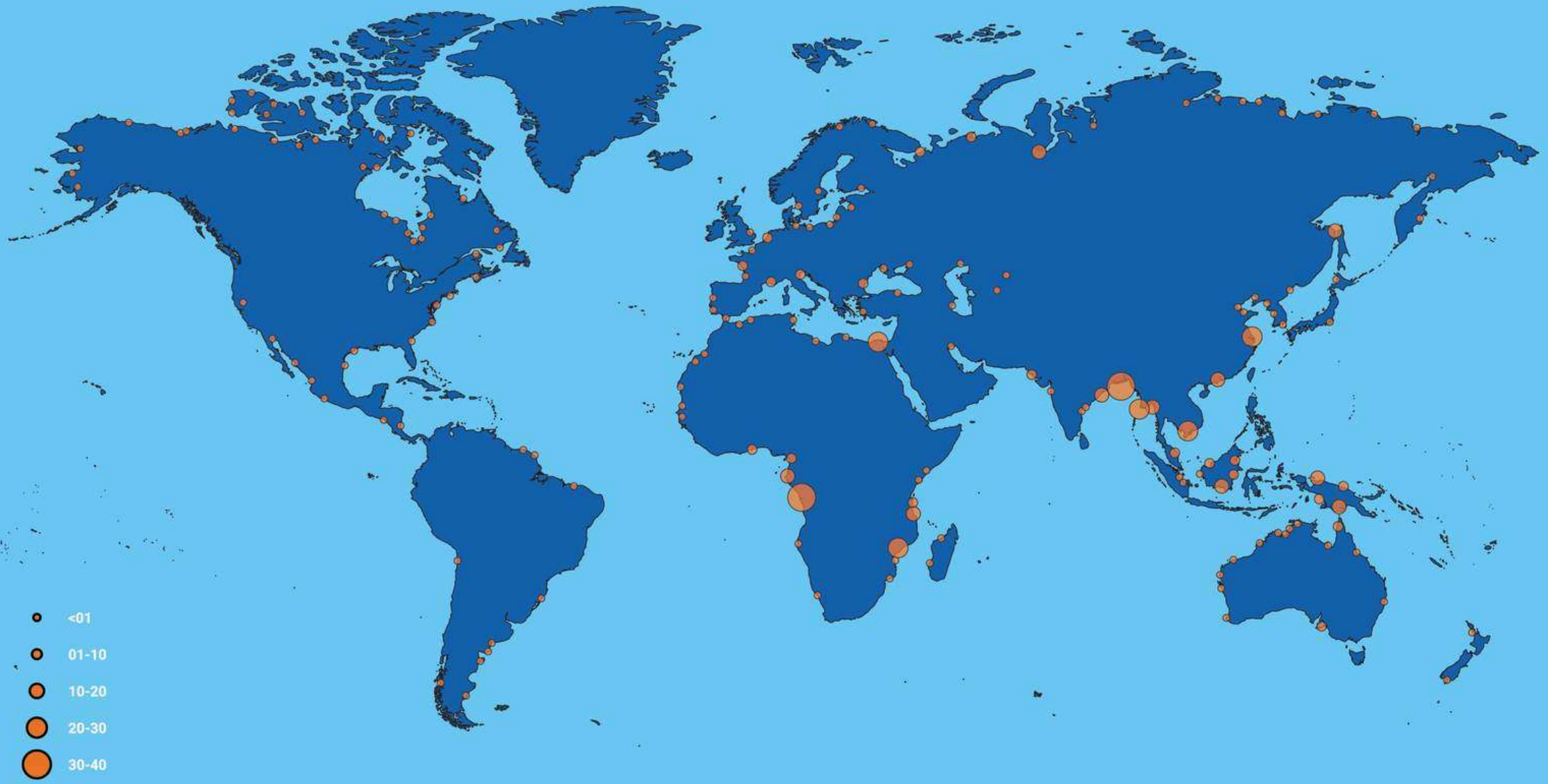
- The Paris Agreement


1 NO POVERTY
2 ZERO HUNGER
3 GOOD HEALTH AND WELL-BEING
4 QUALITY EDUCATION
5 GENDER EQUALITY
6 CLEAN WATER AND SANITATION
7 AFFORDABLE AND CLEAN ENERGY
8 DECENT WORK AND ECONOMIC GROWTH
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE
10 REDUCED INEQUALITIES
11 SUSTAINABLE CITIES AND COMMUNITIES
12 RESPONSIBLE CONSUMPTION AND PRODUCTION
13 CLIMATE ACTION
14 LIFE BELOW WATER
15 LIFE ON LAND
16 PEACE, JUSTICE AND STRONG INSTITUTIONS
17 PARTNERSHIPS FOR THE GOALS
SUSTAINABLE DEVELOPMENT GOALS

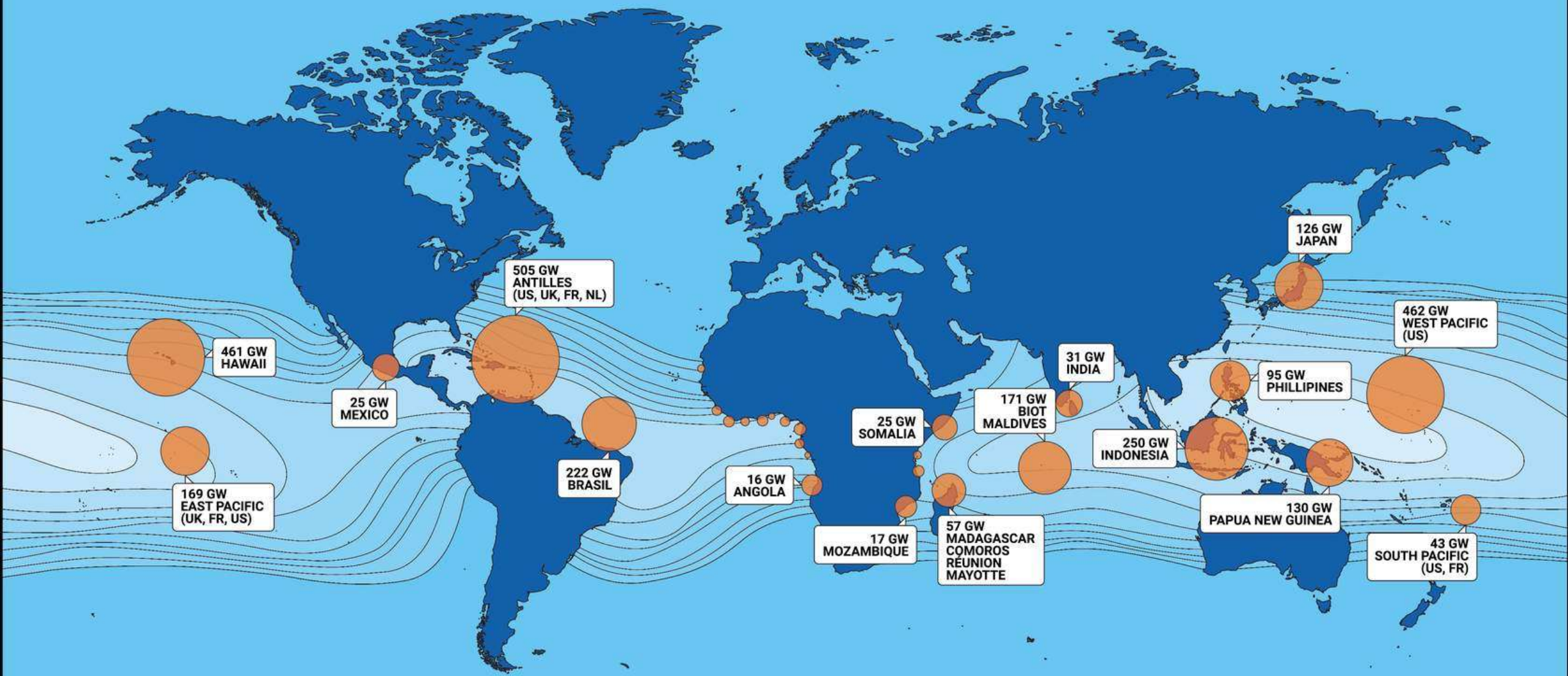
TIDAL WORLDWIDE ENERGY OPPORTUNITIES



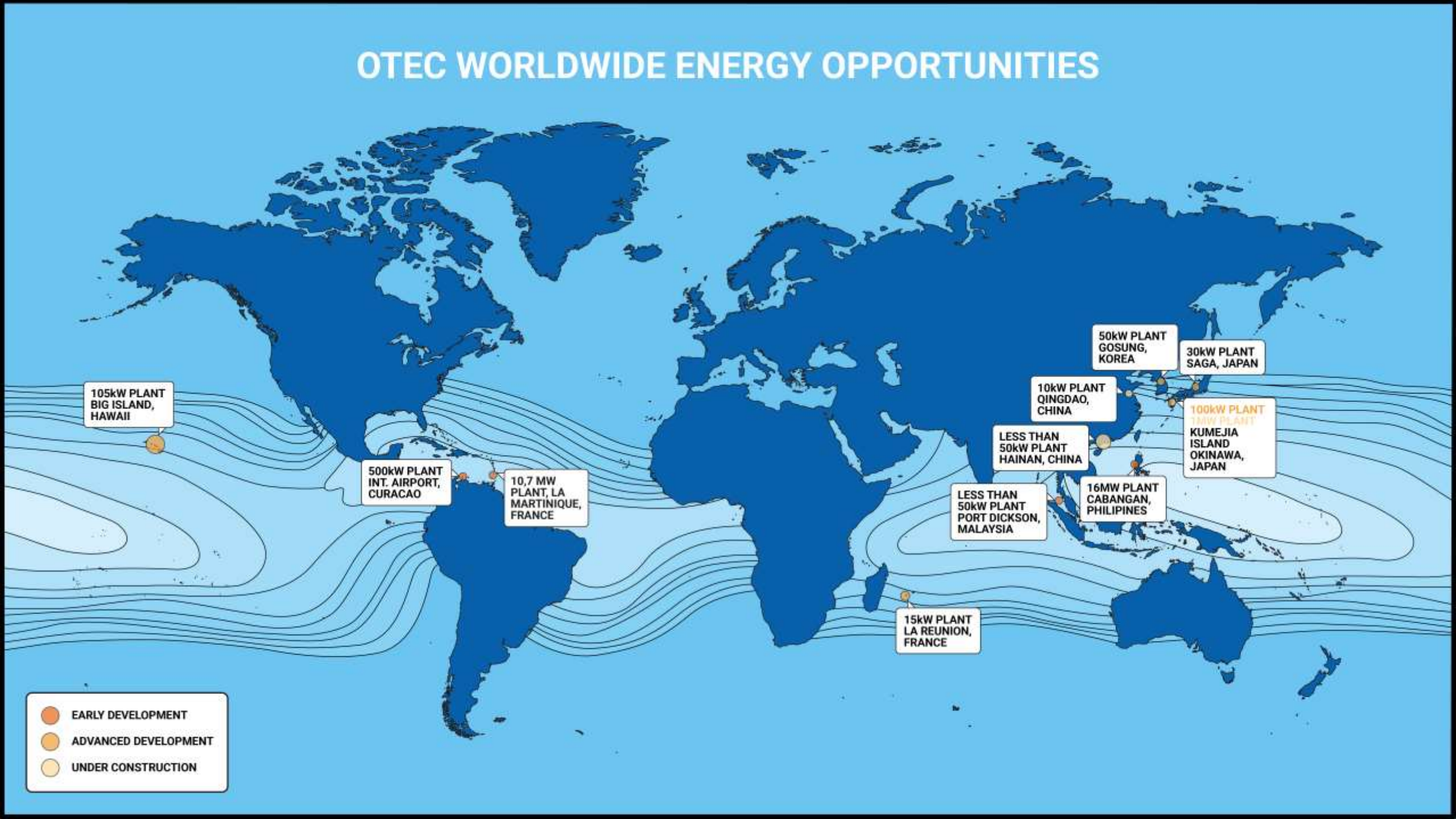
SALINITY GRADIENT ENERGY WORLDWIDE POTENTIAL (1TW)

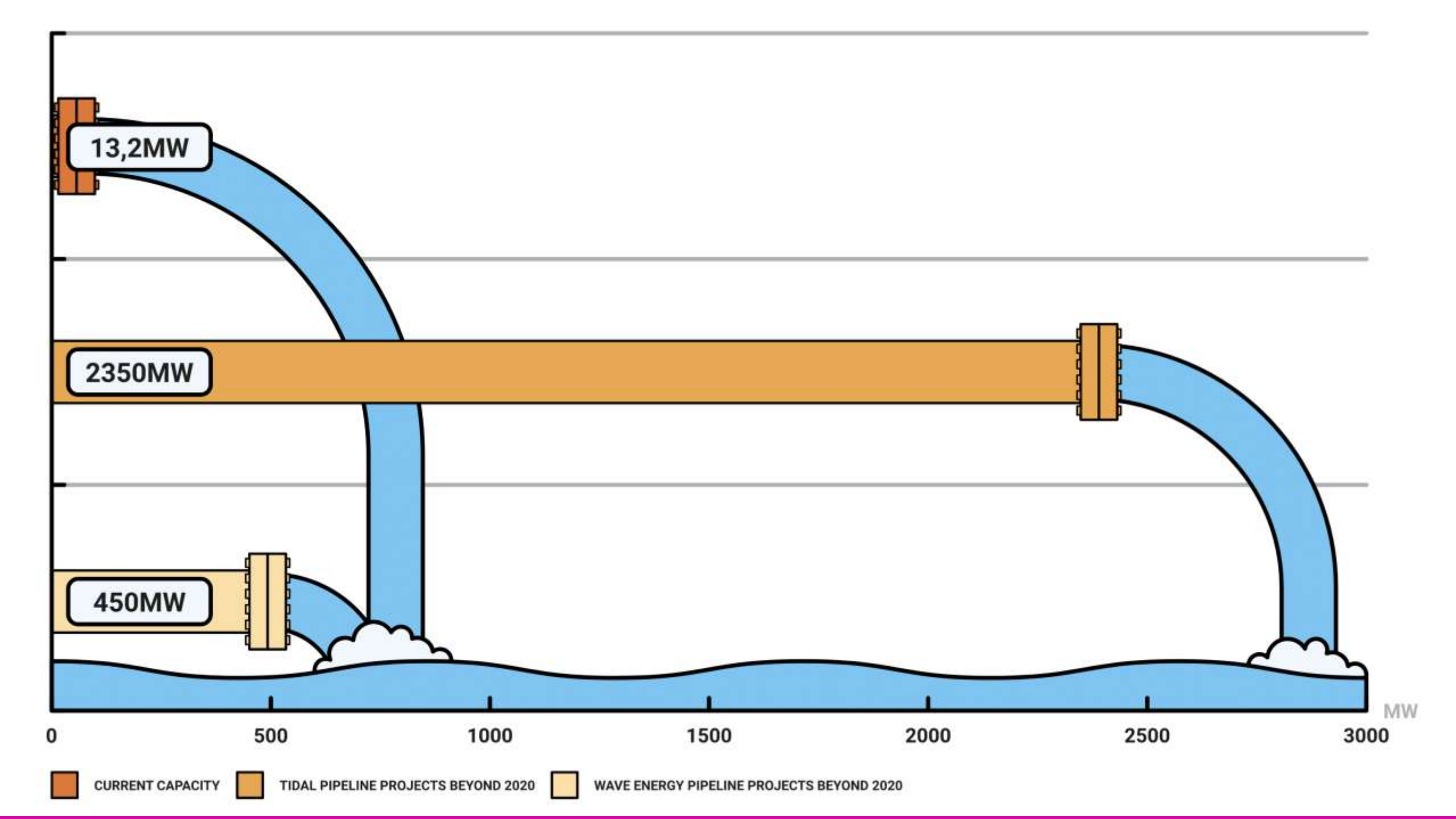


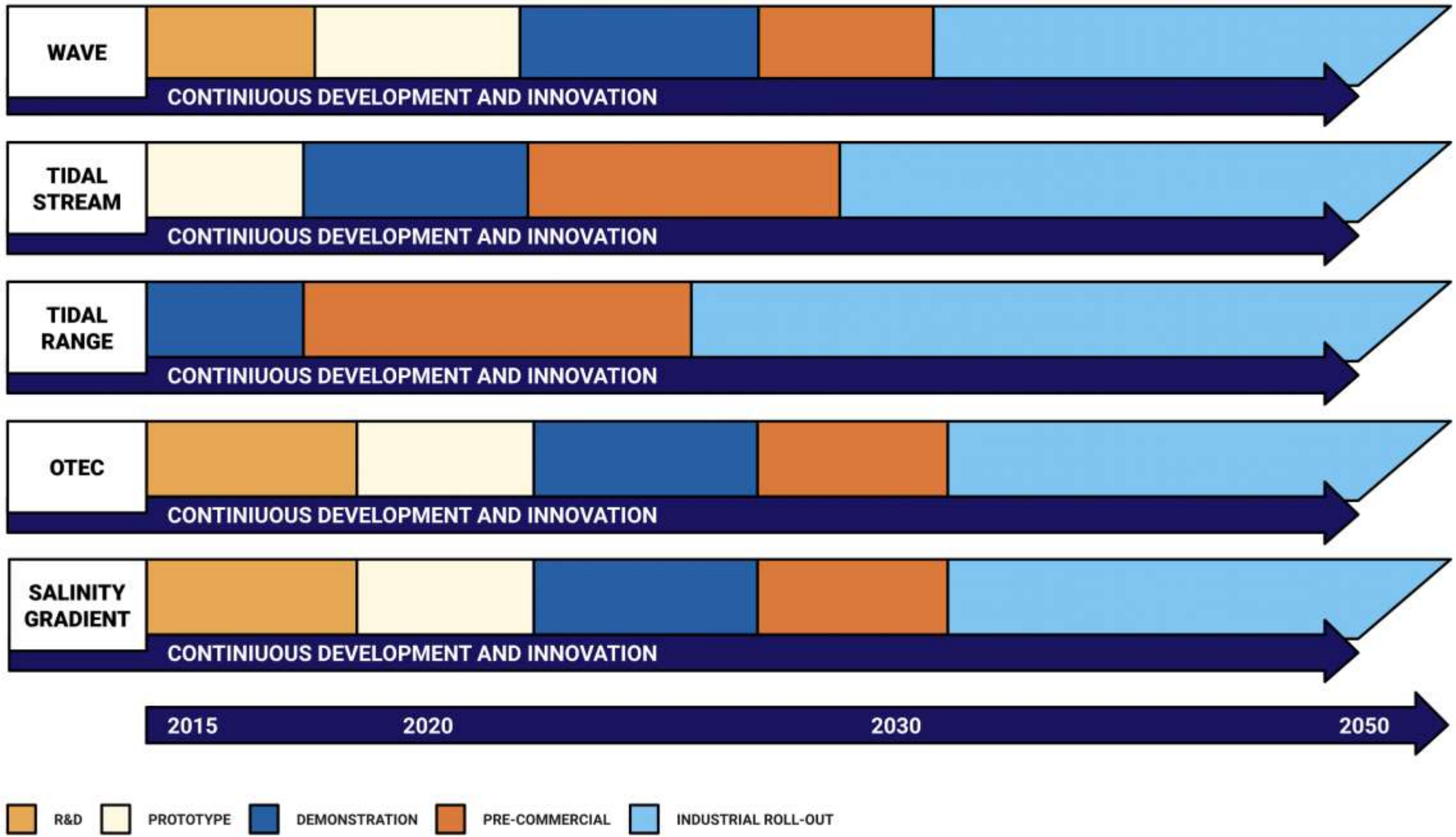
OTEC WORLDWIDE POTENTIAL (7TW)

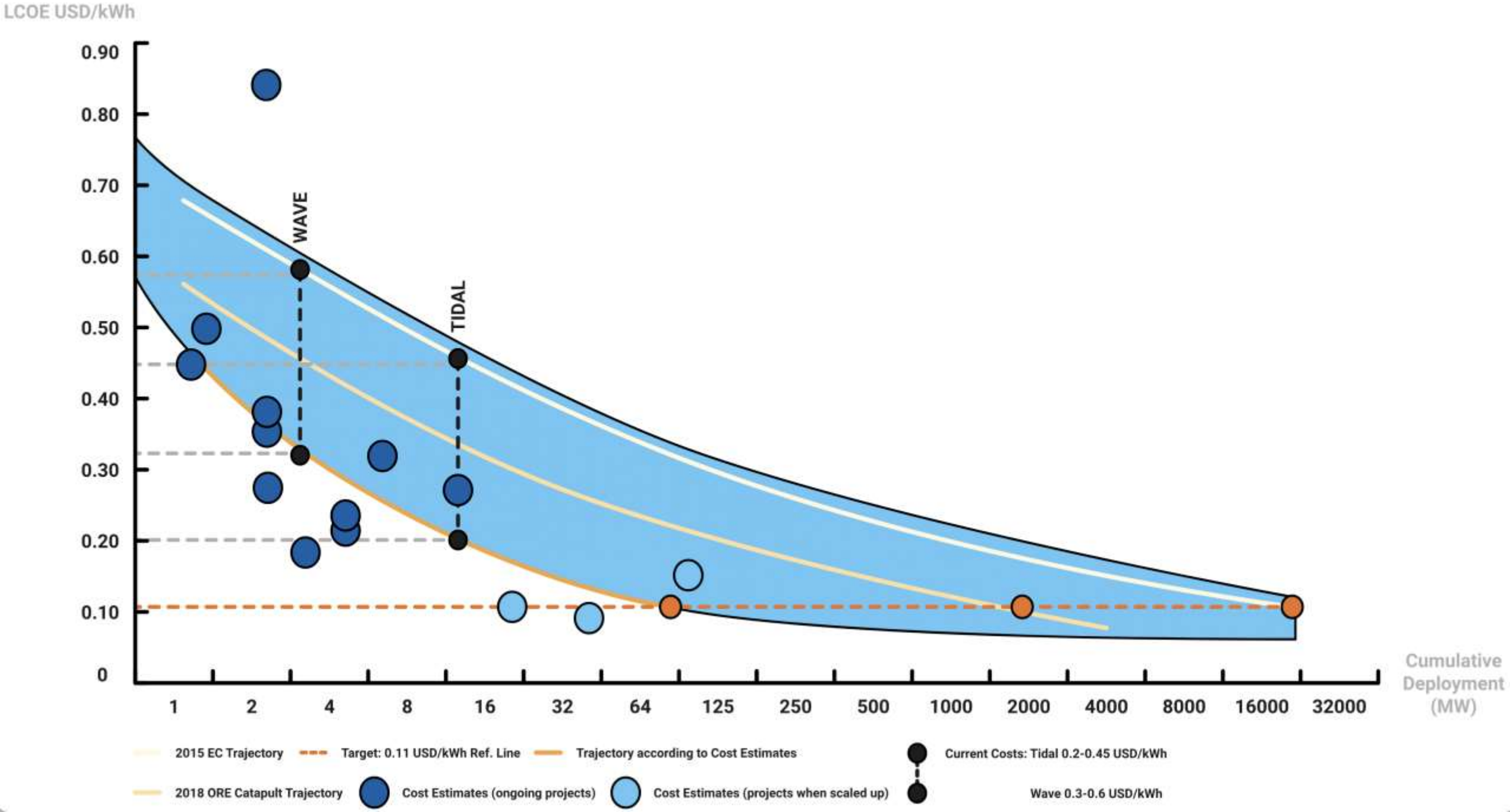


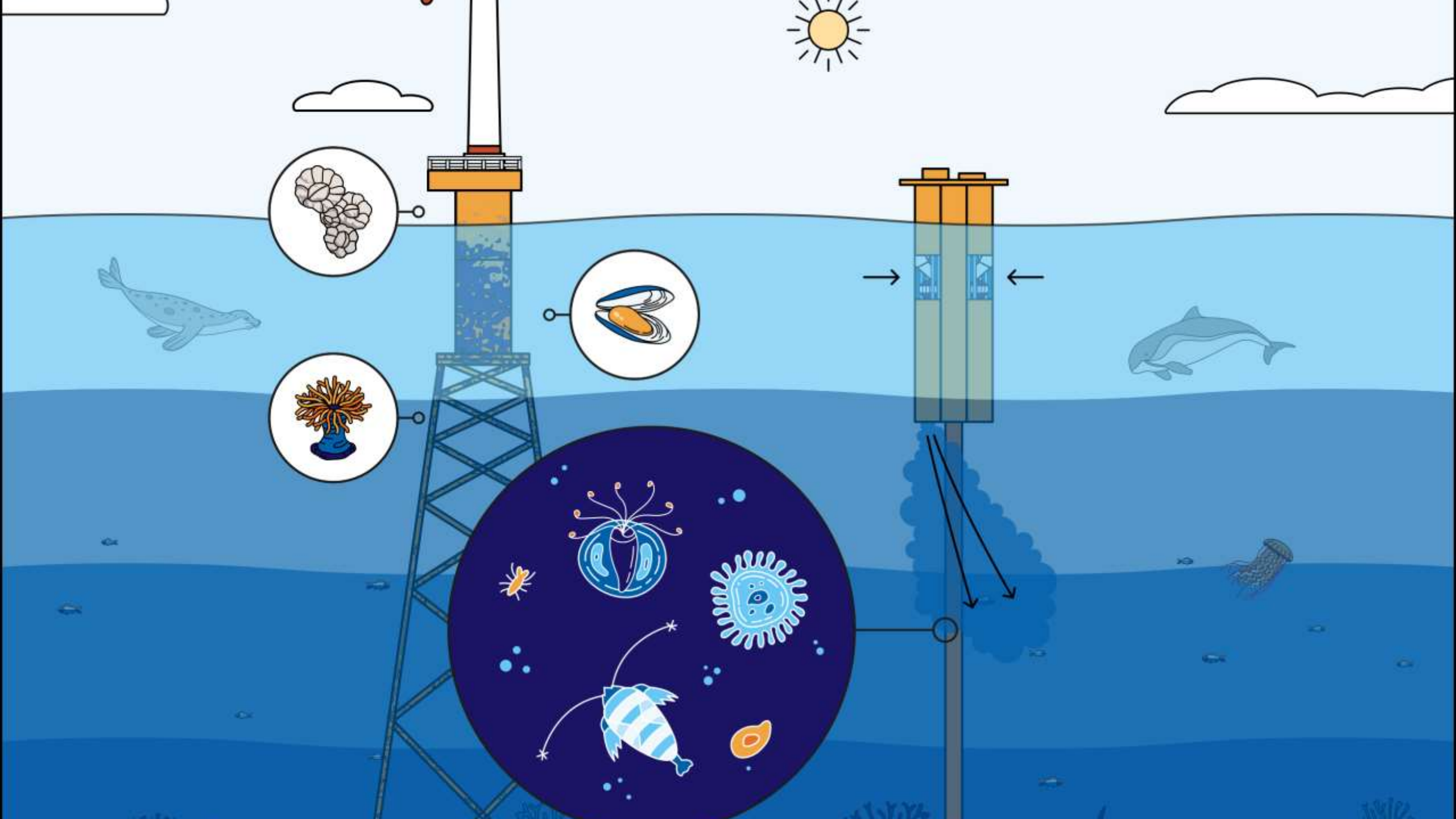
OTEC WORLDWIDE ENERGY OPPORTUNITIES




13,2MW
2350MW
450MW
0
500
1000
1500
2000
2500
3000
MW
CURRENT CAPACITY
TIDAL PIPELINE PROJECTS BEYOND 2020
WAVE ENERGY PIPELINE PROJECTS BEYOND 2020


WAVE
CONTINIUOUS DEVELOPMENT AND INNOVATION
TIDAL STREAM
CONTINIUOUS DEVELOPMENT AND INNOVATION
TIDAL RANGE
CONTINIUOUS DEVELOPMENT AND INNOVATION
OTEC
CONTINIUOUS DEVELOPMENT AND INNOVATION
SALINITY GRADIENT
CONTINIUOUS DEVELOPMENT AND INNOVATION
2015
2020
2030
2050
R&D
PROTOTYPE
DEMONSTRATION
PRE-COMMERCIAL
INDUSTRIAL ROLL-OUT


LCOE USD/kWh
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0
WAVE
TIDAL
1
2
4
8
16
32
64
125
250
500
1000
2000
4000
8000
16000
32000
Cumulative Deployment (MW)
2015 EC Trajectory
Target: 0.11 USD/kWh Ref. Line
Trajectory according to Cost Estimates
Current Costs: Tidal 0.2-0.45 USD/kWh
2018 ORE Catapult Trajectory
Cost Estimates (ongoing projects)
Cost Estimates (projects when scaled up)
Wave 0.3-0.6 USD/kWh



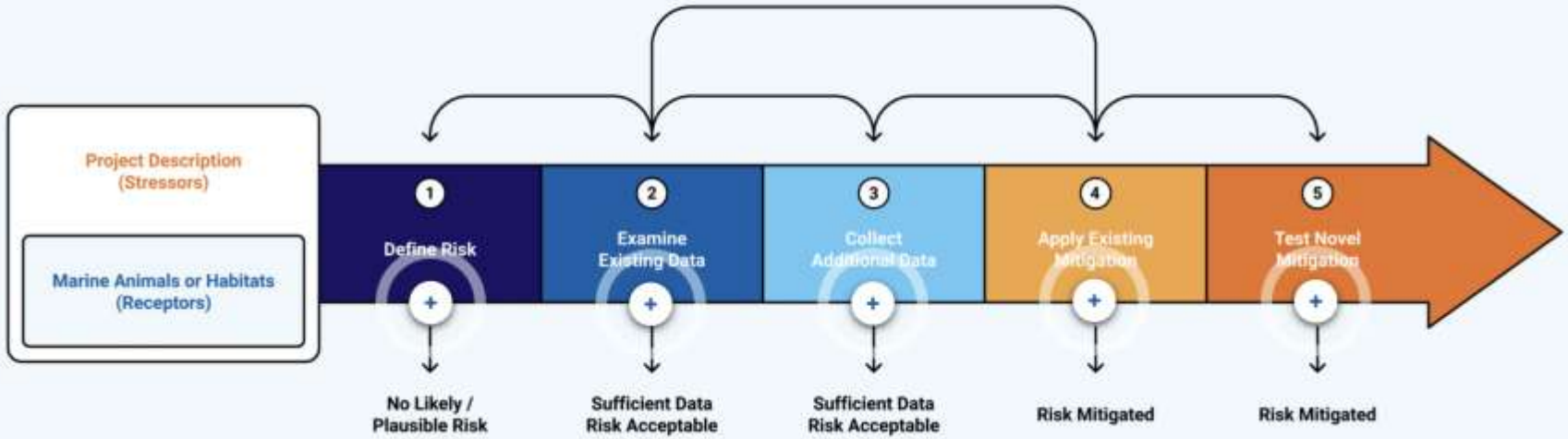
Receptors and stressors

	Static physical presence of device	Dynamic effects of device	Energy removal effects	Chemical effects	Acoustics	Electromagnetic fields
Physical environment	Structures where there was no structure before	Change in water streams, sometimes even tidal changes	Changing water flows	Leakage of chemical fluids could be harmful for the environment		
Pelagic habitat	Artificial reef-effect	Change of organism-location due to water movement	Changing water flow might cause alterations in water quality, relocating of microorganisms and therewith influencing the whole marine food chain	OTEC relocating water could cause changes in chemical conditions in surface water		
Benthic habitat	Scouring, artificial reef effect foundation/mooring	Sediment movement	Scouring around foundations/anchors, mixing/moving sediment	Leakage of chemical fluids could be harmful		Might have effect on certain sensitive animals
Fish and fisheries	Collision risk / artificial reef-effect	Collisions (in case of OTEC: other distribution of species/predators)	Relocation of planktons will affect the marine food chain	Leakage of chemical fluids could be harmful	Fish might avoid or be attracted by certain noisy areas	Might have effect on certain sensitive animals
Marine birds & mammals	Collision risk / artificial reef effect / boundaries for surface dwellers	Collisions	Relocation of planktons will affect the marine food chain	Leakage of chemical fluids could be harmful	Might interfere with frequencies used by fish	Might have effect on certain sensitive animals

Risk retirement

Risk retirement process by OES-Environmental

The International Energy Agency task on Ocean Energy Systems (IEA-OES), developed a process for risk retirement. This helps determine which interactions between stressors and receptors may be 'retired' and not require further data collection or risk mitigation. *The steps in the risk retirement pathway presented by OES-Environmental are the following:*



EIA process

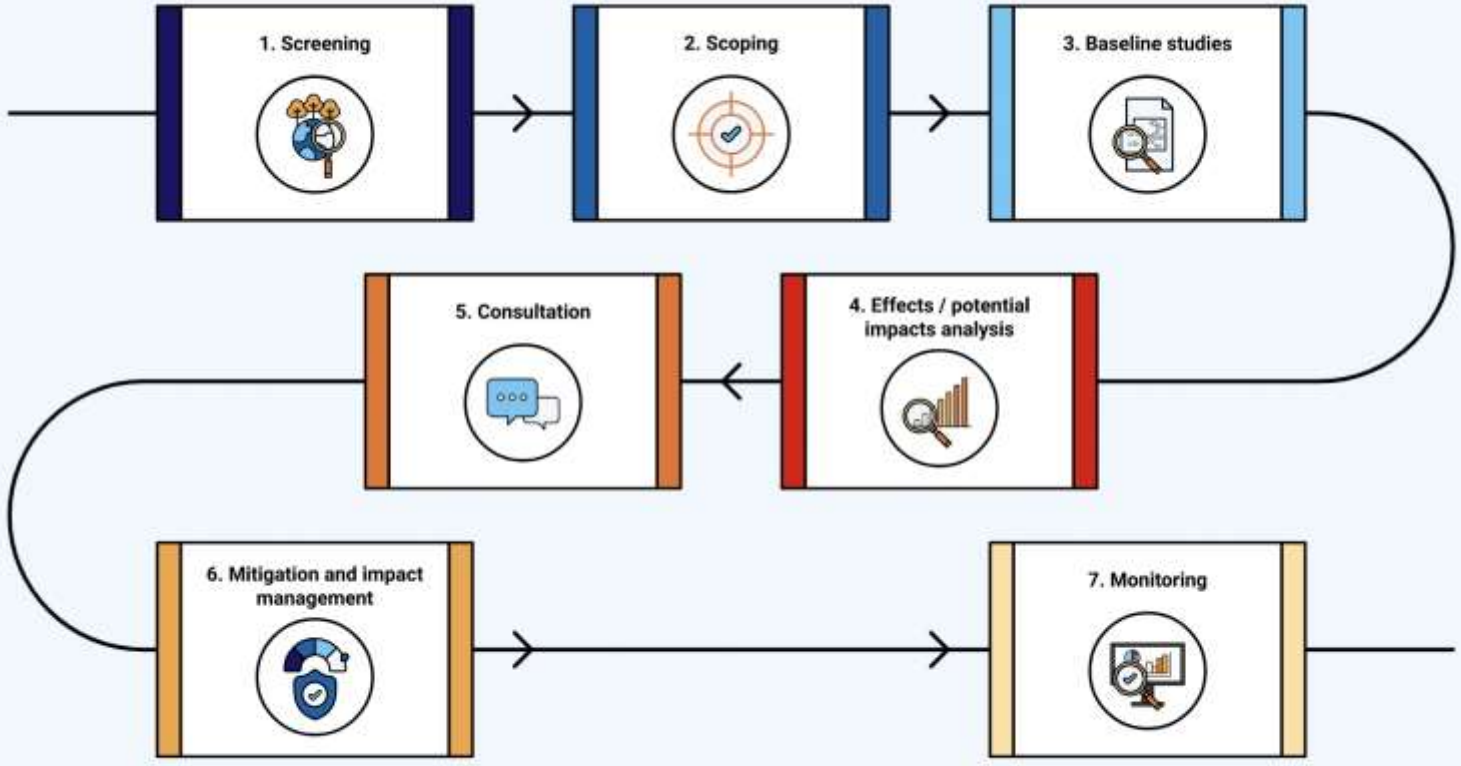


Figure 3.2.1: EIA process

Study & monitoring methods

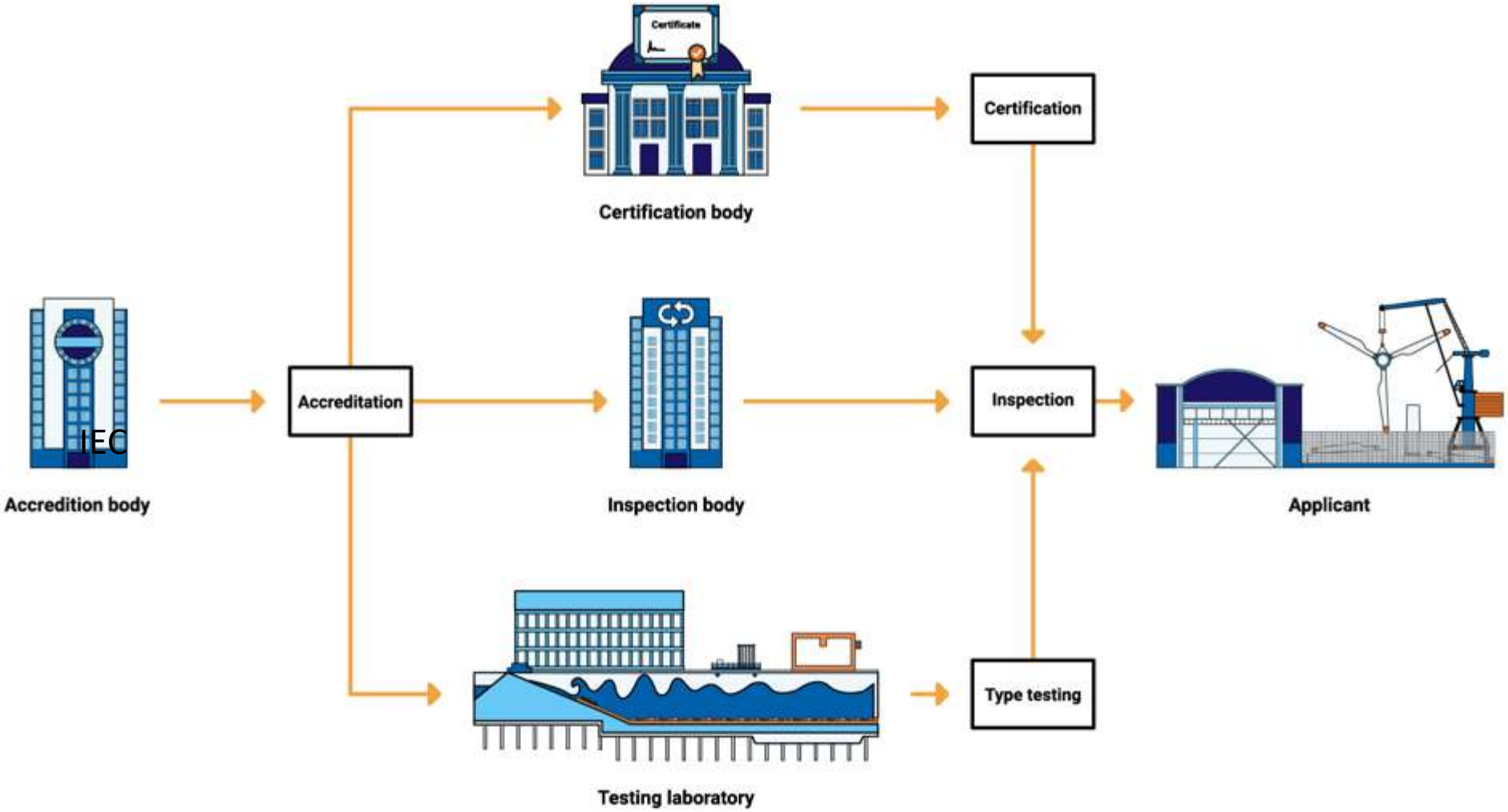
PacWave South test site baseline studies		
Receptor	**Study description**	**Monitoring design & method**
Marine mammals	Whale distribution	Vessel based surveys
Marine mammals	Marine mammal distribution	Aerial surveys
Fish	Fish distribution	Review of species status
Birds	Seabird distribution	Aerial surveys
Invertebrate organisms	Crab distribution	Crab pot sampling
Reptiles	Literature review on sea turtles	Literature review
Physical environment	Benthic fauna distribution	Benthic sampling and research
Sediment transport	Suspended sediment risk calculations	Suspended sediment risk calculations
Physical environment	Benthic footprint	Calculations
Sediment transport	Sediment classification	Sediment classification
Physical environment	Geophysical surveys of the cable path	Electrical Resistivity (ER) in 2D and Seismic Refraction Microtremor (ReMi) in 2D
Human dimensions	Cumulative effects	Review/synthesis

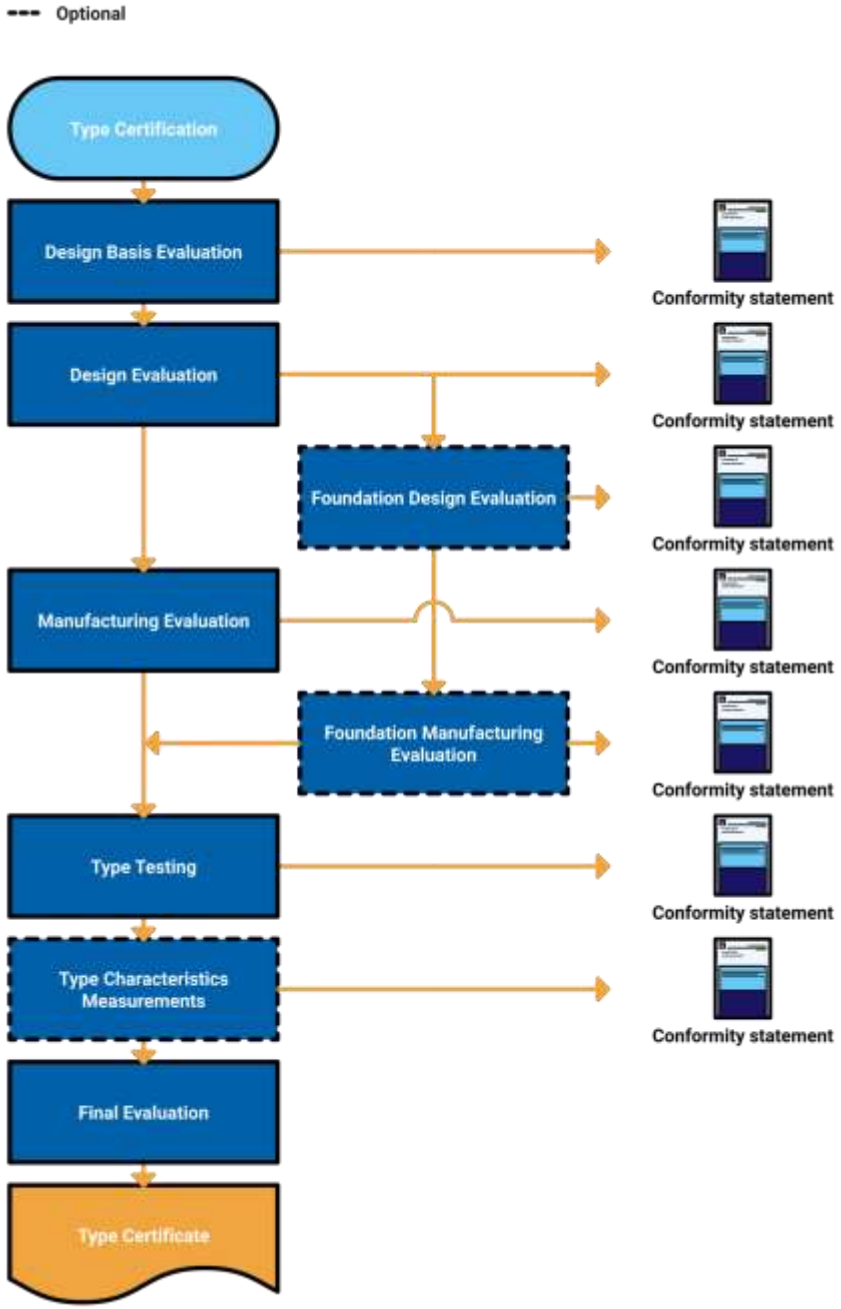
Impact significance

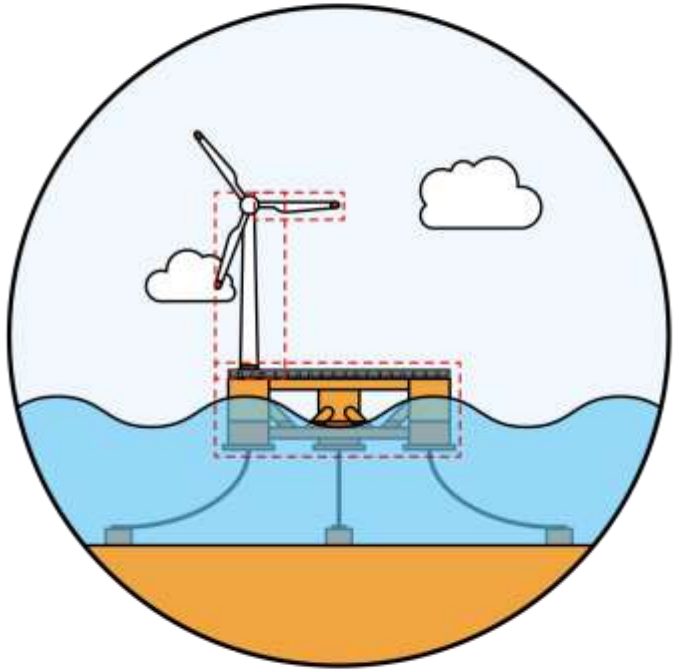
		Impacts	
		Ecological effects	Economical effects
Significance	Major	Loss of quality or availability of habitat with a recovery period of over two years.	Negative effect on commercial activity leading to a loss of income or opportunity.
	Moderate	Changes in habitats or species beyond natural variability with a potential recovery within two years.	Change to commercial activity leading to a loss of income or opportunity within normal business variability.
	Minor	Adaptations to habitats or species which are at the same scale as natural variability.	Minor influence on income or opportunity.
	Negligible	Changes in the habitats or species within the scope of existing variability that are difficult to measure or observe.	Noticed influence, but of no effect upon the incomes, opportunities, health and well-being of the public.
	No interaction	None.	None.
	Positive	Enhancement of ecosystem or receptor.	Benefits to the local communities, commerce and infrastructure.

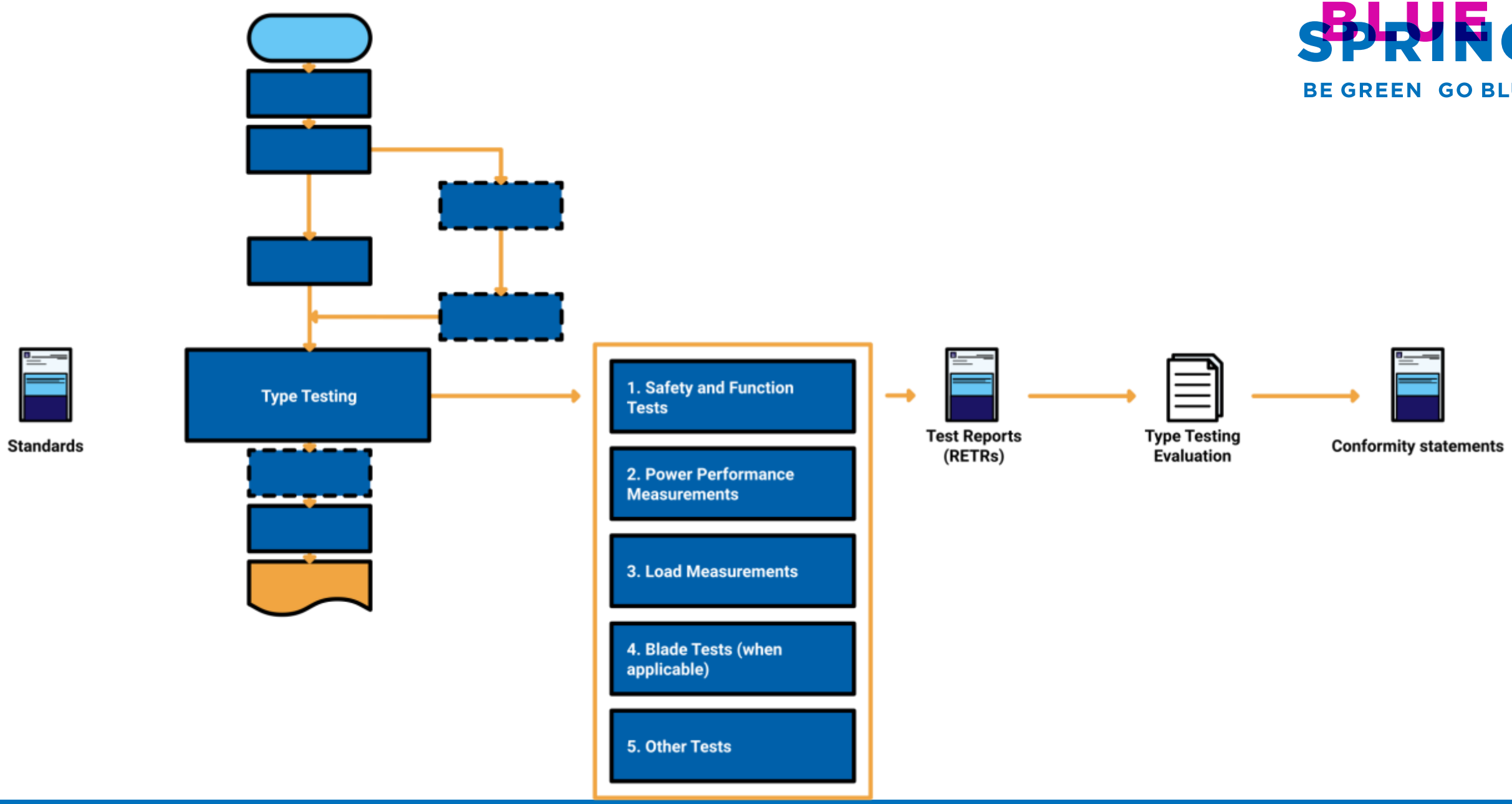
Post-installation monitoring

Overview of post-installation monitoring		
Stressor	Receptor	Monitoring design & method
 Acoustics	 Marine mammals	Acoustic monitoring using moored underwater hydrophones and drifting hydrophones. These will characterize the level and signature of WEC and components sounds. With these, a comparison can be established to see if these acoustics exceed the thresholds.
 Electromagnetic fields	 Fish	Modelling based on existing approaches to calculate the expected EMF output of the WEC will be undertaken.
 Change of physical environment	 Fish	A remotely operated vehicle (ROV), equipped with a multibeam imaging sonar will track changes to the pelagic habitat.
 Change of physical environment	 Invertebrates	An ROV will be used to conduct transect surveys to track changes on the seafloor and the organisms that live there.
 Change of physical environment	 Invertebrates	Benthic sediments monitoring by use of analyzing samples.


Certificate
Certification body
Certification
IEC
Accreditation
Inspection body
Inspection
Applicant
Accredition body
Testing laboratory
Type testing


Optional
Type Certification
Design Basis Evaluation
Design Evaluation
Foundation Design Evaluation
Manufacturing Evaluation
Foundation Manufacturing Evaluation
Type Testing
Type Characteristics Measurements
Final Evaluation
Type Certificate
Conformity statement
Conformity statement
Conformity statement
Conformity statement
Conformity statement
Conformity statement
Conformity statement




Standards
Type Testing
1. Safety and Function Tests
2. Power Performance Measurements
3. Load Measurements
4. Blade Tests (when applicable)
5. Other Tests
Test Reports (RETRs)
Type Testing Evaluation
Conformity statements

Sign up for Pilot

- 50 Spanish speaking users for English course

- 50 users for Spanish Course

FLORES
Offhore Renewable energies partnership in the Pact for Skills
Co-funded by the European Union

Thank you for your attention

BLUE SPRING
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