

Marine Test Sites, strengthening the links between Research, Innovation and Industry for a Sustainable Blue Economy

September 26, 2023 | 15:00- 16:00 CEST | Webex

TALKING BLUE SUSTAINABILITY





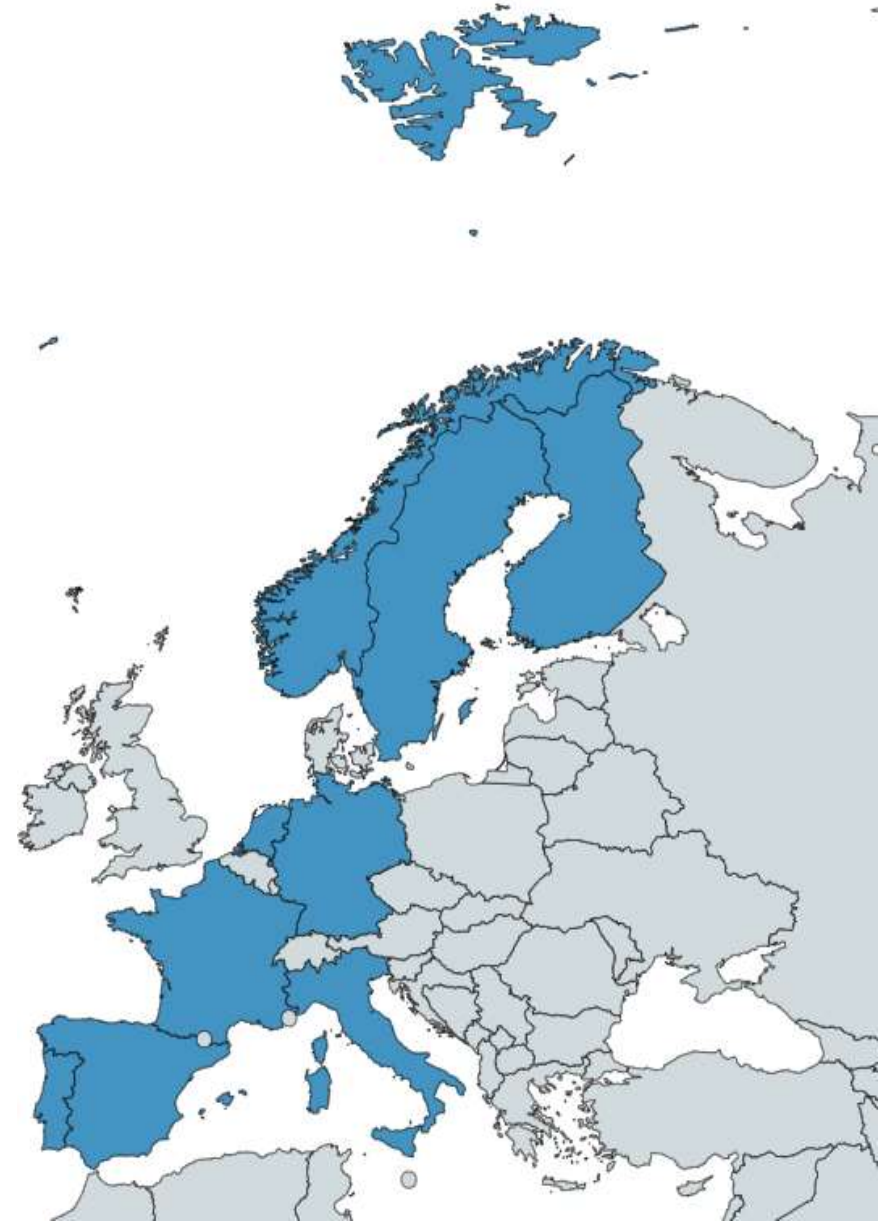
- 15:00** Welcome and introduction by Jean-Marc Daniel
Director of the Carnot MERS Institute and of the Scientific Department “Physical Resources and Deep-sea Ecosystem”, IFREMER (FR)
- 15:05** Setting the scene by Jutta Paulus
Patron of the webinar, Member of the European Parliament
- 15h15** Expert presentations
Martin Träsch, Engineer, Head of the Brest Bay Test Site, IFREMER (FR)
Raphaël Coquet, Deputy Director, Hydroquest (FR)
Chiara Lombardi, PhD, Laboratory of Biodiversity and Ecosystem Services, ENEA (IT)
Peter Scheijgrond , on behalf of Campus@Sea and TNO partner (NL)
- 15h45** Questions and Answers
- 16:00** End of event

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Jean-Marc DANIEL

Director of the Carnot MERS Institute
and of the Scientific Department
“Physical Resources and Deep-sea
Ecosystem”
IFREMER (FR)



Science, expertise for public policies and innovation to:

- **Protect and restore the ocean**
- **Sustainably use marine resources to benefit society**
- **Create and share ocean data, information & knowledge.**





- **What ?** Open-sea test centres are open and safe areas offshore
 - to innovate with high-level scientists
 - to experiment and develop solutions for our the societies.
- **Where ?** Worldwide. Often part of networks and infrastructures – MARINERG-I, International WaTERS network, etc.

MTS are key tools for achieving the Green Deal and for sustainable blue economy

Transnational access Horizon Europe calls are crucial for their long-term development.

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Jutta Paulus
Member of the European
Parliament

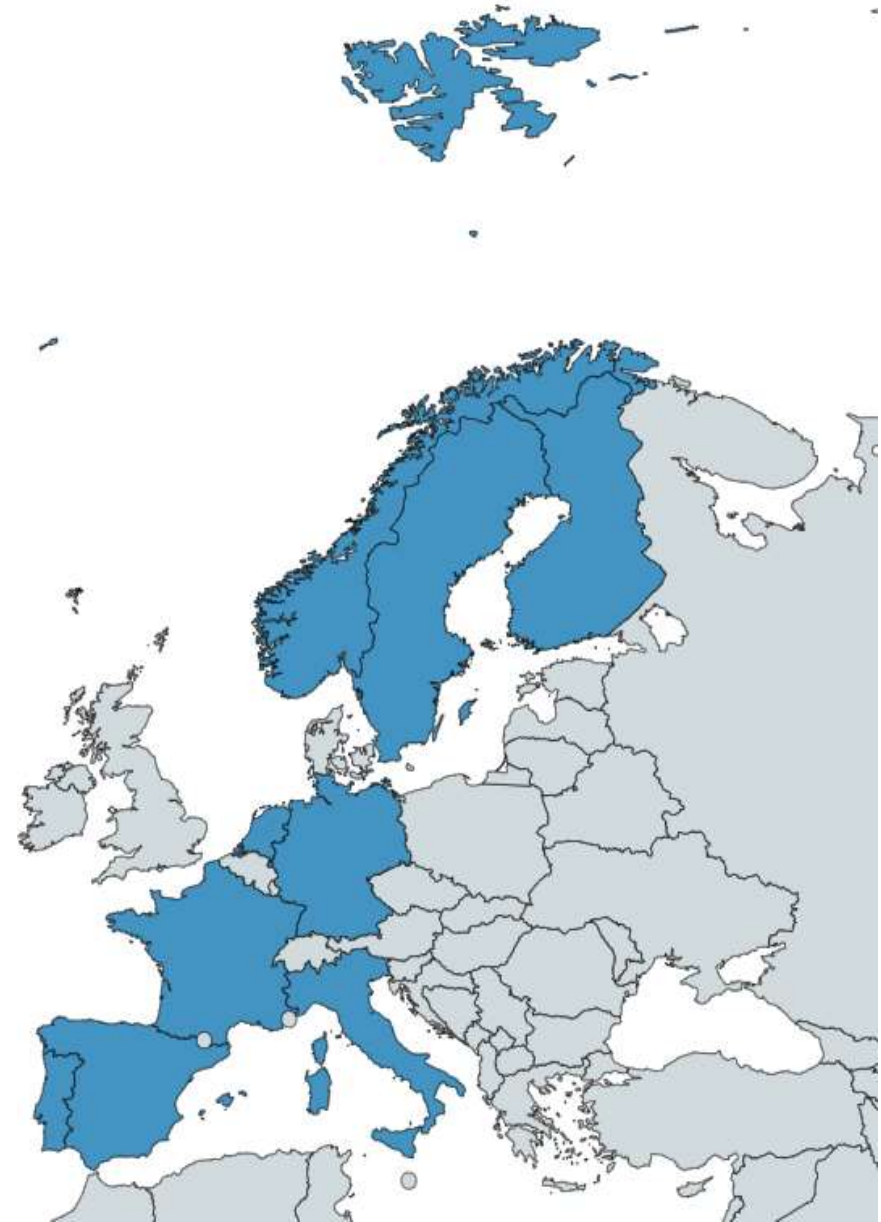


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Martin Träsch

Engineer, Head of the Brest Bay Test Site, IFREMER (FR)



Ifremer & Open-C test site , from prototype to industry

Martin Träsch, Head of the Brest Bay Test Site, IFREMER (FR)

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Technology Readiness Level (TRL) & development steps for MRE systems



**From the applied research ...
.. to the system validation**

-
- | | |
|---------|--|
| TRL 1-3 | <ul style="list-style-type: none">• Concept validation.• Prove the basic concept from tank tests in small scale |
| TRL 4 | <ul style="list-style-type: none">• Design validation.• Subsystem testing at intermediate scale (tank tests scale 1:10)• Numerical analysis;• Engineering Design (Prototype); Feasibility and costing; Survivability; |
| TRL 5-6 | <ul style="list-style-type: none">• Testing operational scaled models at sea• Subsystem testing at large scale |
| TRL 7-8 | <ul style="list-style-type: none">• Full scale prototype tested at sea |
| TRL 9 | <ul style="list-style-type: none">• Economic validation;• Several units of pre-commercial machines tested at sea for an extended period of time. |
-

Eolink: an example of successful FOWT development



TRL 7



Real scale test at the SEM REV test site (2024)

TRL 5-6



Intermediate scale sea tests in the Brest Bay test site (2018)

TRL 3



Small-scale tests in the deep wave tank (2016)

Brest Bay test site: The essential step from the lab to the deployment



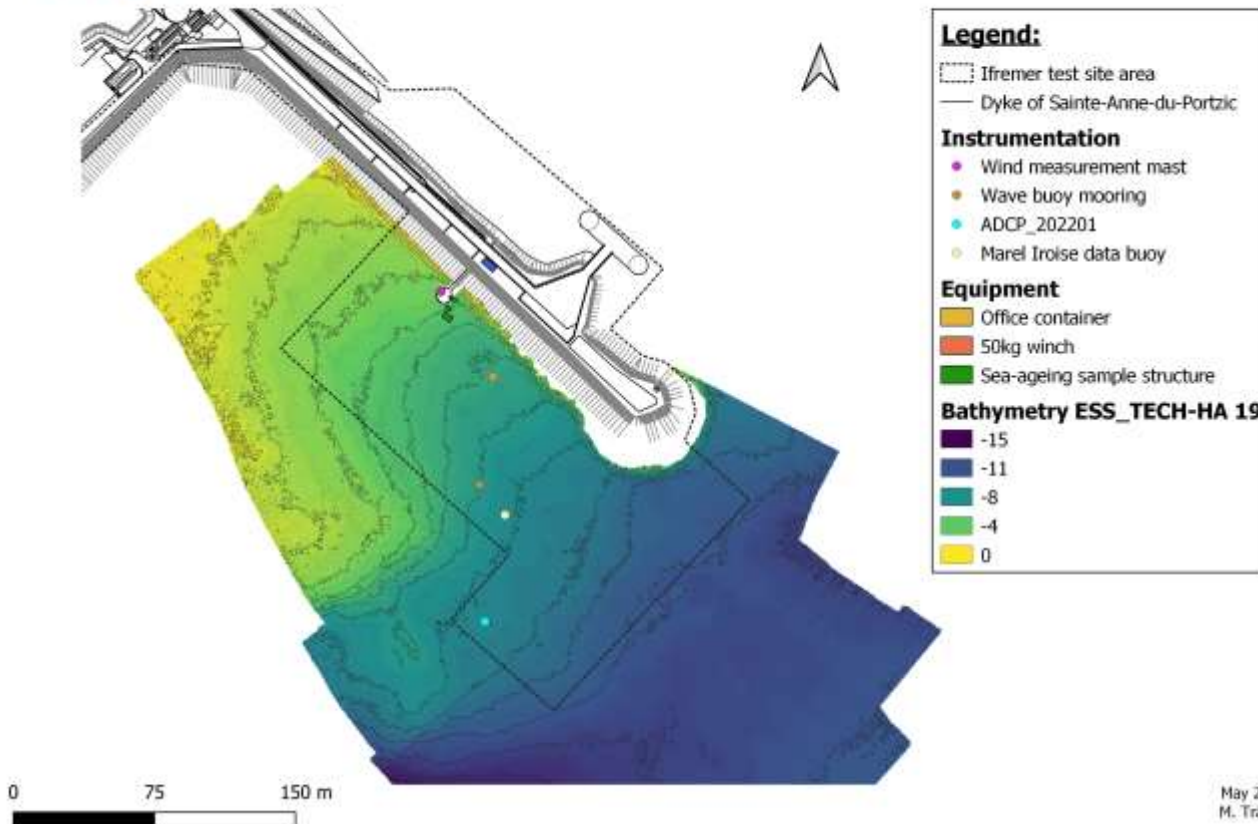
- Real marine environment
- Relatively sheltered, easy access from the dyke or nearby Brest harbor
- History of continuous metocean data
- Long-term physical, chemical and biological monitoring of the sea water in the Brest bay
- Oceanographic sensors test & development
- Ageing of materials in sea water, corrosion & biofouling.



Brest Bay test site: The essential step from the lab to the deployment



Map of the Ifremer in situ test site of Brest



- Area covered: 250m x 150m
- Mainly sand, 2 to 12m deep at L.A.T
- Tide range up to 7.7m

Facilities :

- Secured area
- Ethernet connexion
- 220-400V
- Diving team & service boat
- Real-time wave & wind data
- Instrumentation : ADCP, wave buoy, anemometer, submarine load cell, GNSS RTK position, multiparameter sensor, ...

Examples of tested MRE prototypes



2000

2013

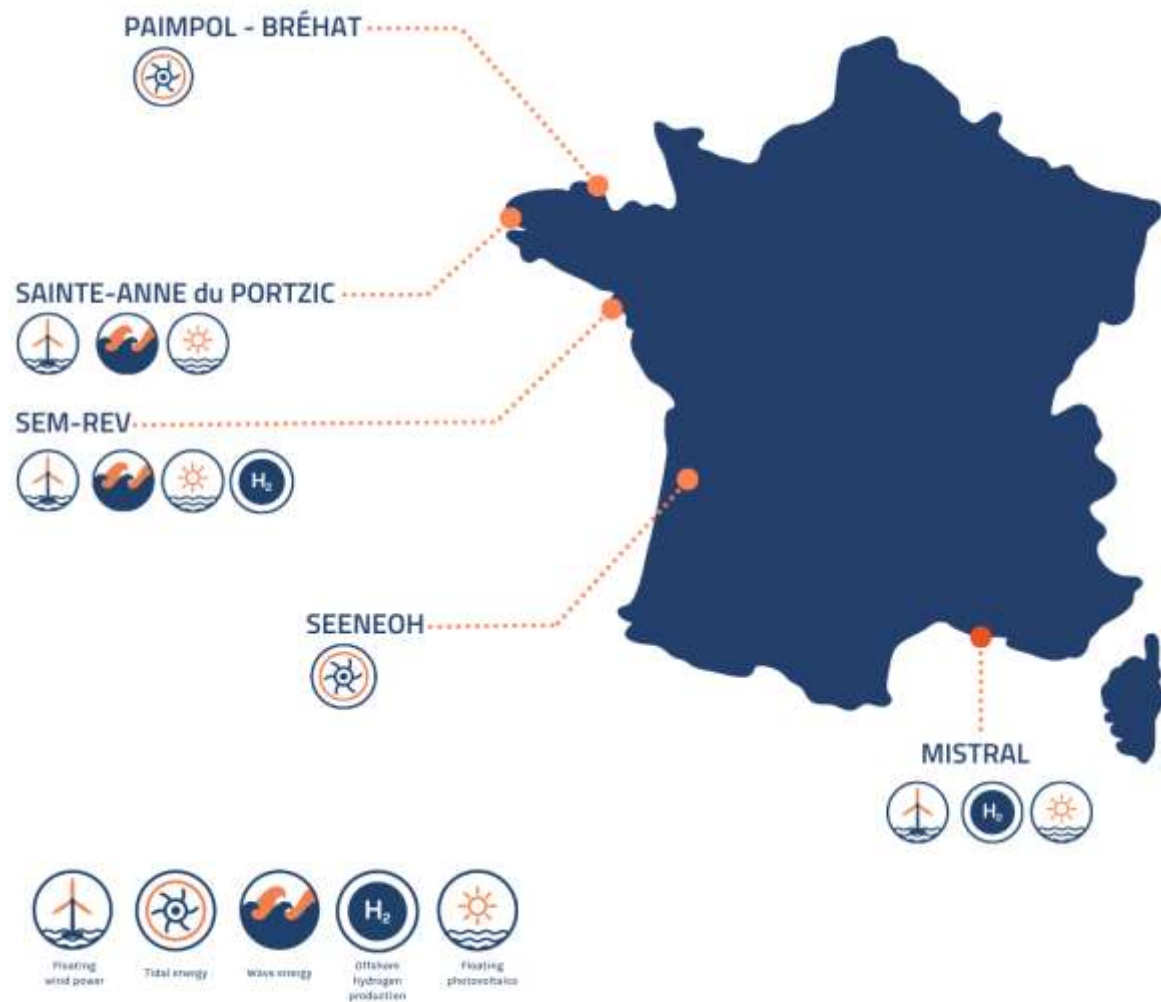
2015

2018

2021

2022





Today
35MW
 of power

•
52km
 of cables

•
5 to 75m
 of depth

•
12
 prototypes that can be hosted

Tomorrow
95MW
 of power

•
152km
 of cables

•
5 to 195m
 of depth

•
16
 prototypes that can be hosted



FLOATGEN (BW Ideol) ©Centrale Nantes



WAVEGEM (GEPS Techno) ©Centrale Nantes



Eolink (1-10ème)© Dugornay Olivier (2018) Sainte-Anne du Portzic Ifremer



DIKWE © Lesbats Stéphane Sainte-Anne du Portzic Ifremer



Design Pro @Seeneoh



Hydroquest ©SENEOH



HPGS @Seeneoh



Hydroquest_Installation à Paimpol-Bréhat @Philippe Gosselin

WindQuest
Hydroquest
@ Ste Anne du
Portzic Ifremer



PH4S/Geps Techno @ Ste Anne du Portzic Ifremer

Conclusion



Brest Bay test site:

- Relatively sheltered test site, easy access from dyke or nearby Brest harbor
- 30 years of experience for offshore testing of technical concepts
- Well-suited for MRE intermediate scale prototype, from 1:20 to 1:4, or sub-components at TRL 5-6, at transition from laboratory to real environment

The Open-C foundation:

- coordinates, develops and manages offshore test sites in France
- for floating offshore wind, tidal power, wave energy, offshore hydrogen and floating photovoltaics
- making it Europe's largest offshore testing centre

Thank you for your attention!



For more information:

E-Mail: martin.trasch@ifremer.fr

Website: [The Open-C Foundation test sites](#)



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Raphaël Coquet
Deputy Director
Hydroquest (FR)





26/09/2023

Raphaël Coquet
Deputy director / Project director

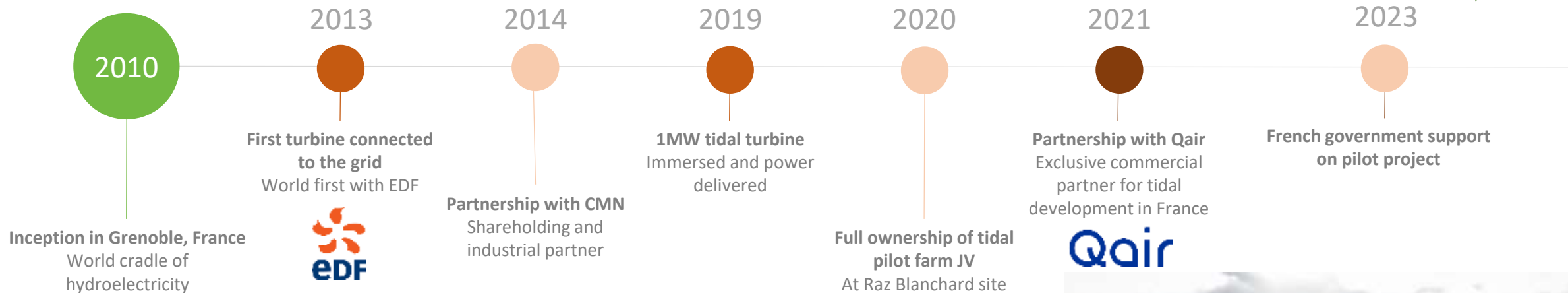
HydroQuest Technology

About us

Full scale river turbines

First full scale tidal turbine

Next generation & commercial development



Inception in Grenoble, France
World cradle of hydroelectricity

First turbine connected to the grid
World first with EDF



Partnership with CMN
Shareholding and industrial partner

1MW tidal turbine immersed and power delivered

Full ownership of tidal pilot farm JV
At Raz Blanchard site

Partnership with Qair
Exclusive commercial partner for tidal development in France



French government support on pilot project

9 patents on a unique technology

37 million euros invested for R&D

13 years of development



Hydroquest's main strength: its team

27 people (80% engineers, 5 PhD) experts in :

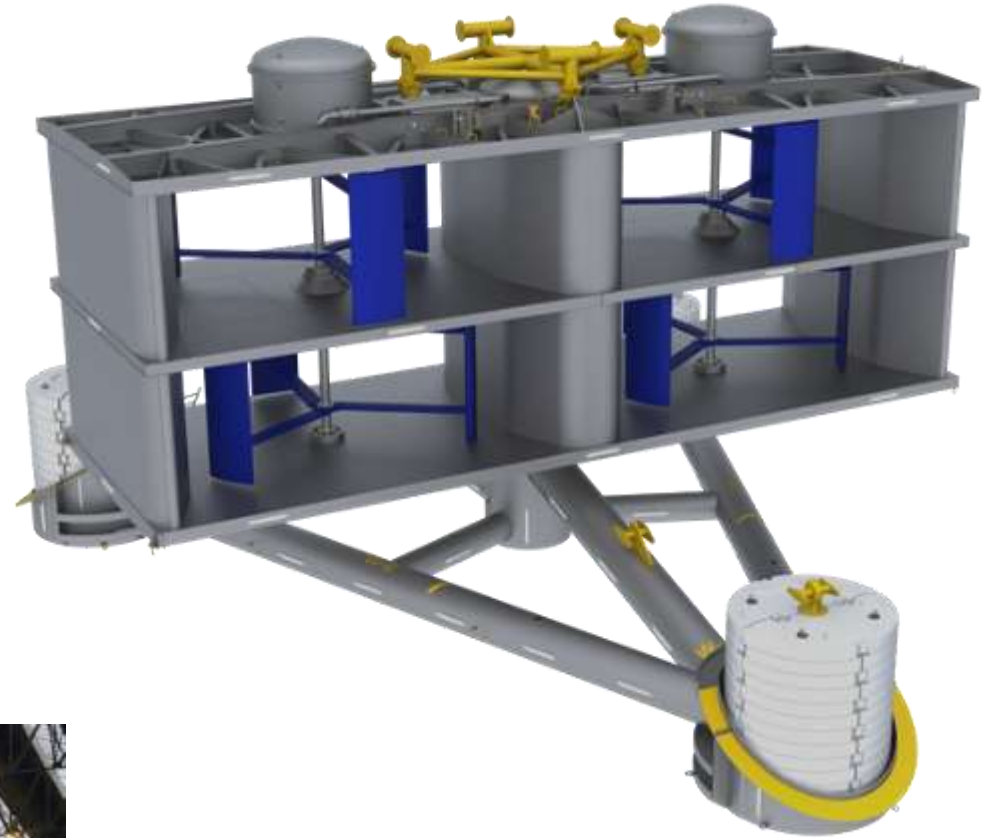
- Hydraulics
- Mechanical & power engineering
- Offshore work
- Project management



Oceanquest turbine

First Hydroquest tidal turbine

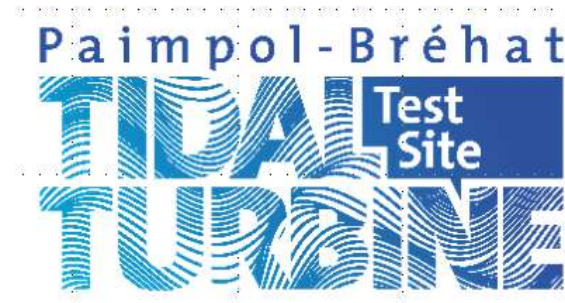
- 1 MW device
- 4 rotors : 8 m diameter x 4 m high
- Ducted structure : 25 m width x 12 m high
- Gravity base foundation
- Manufactured at CMN shipyard (Cherbourg)



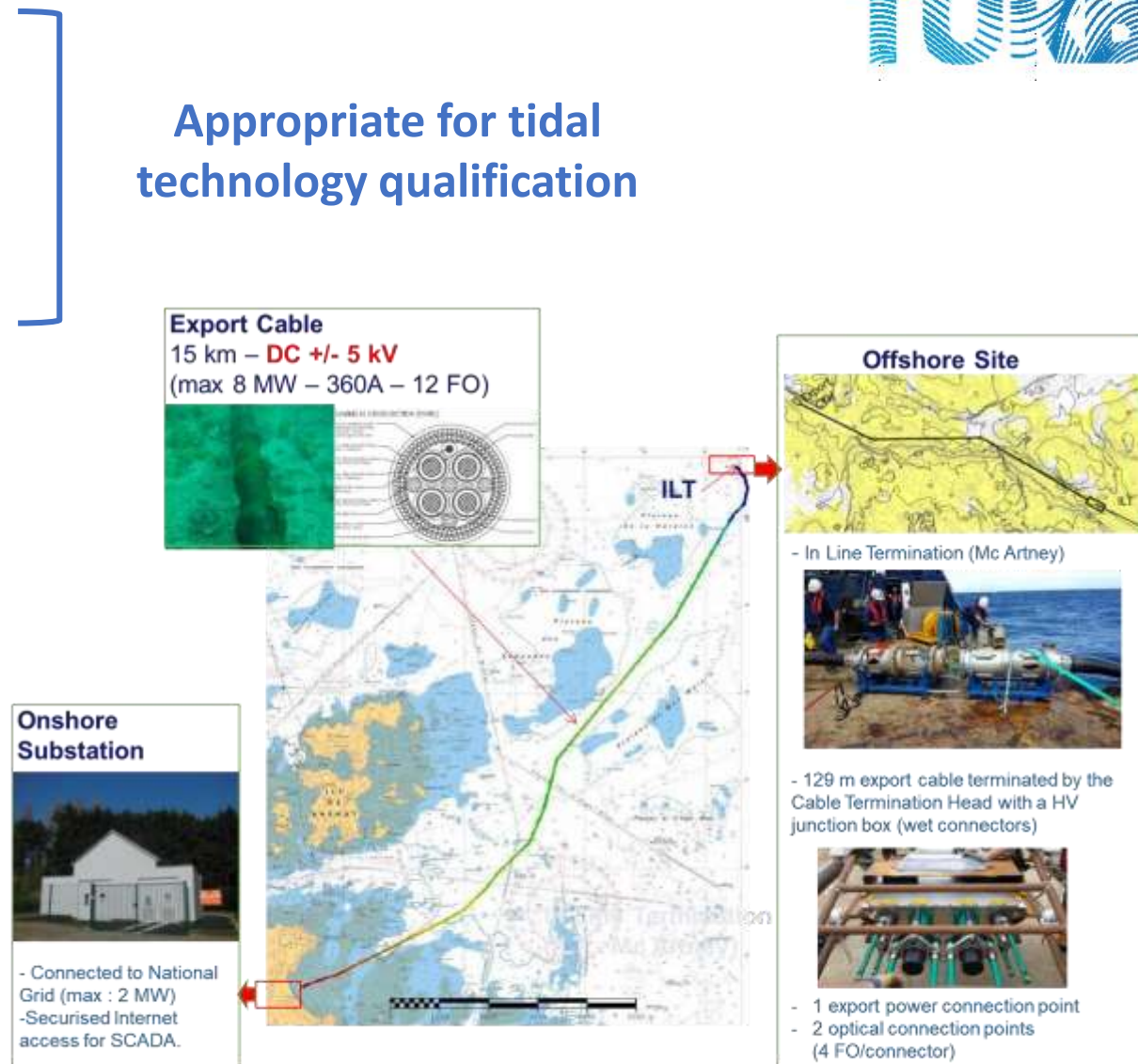
Paimpol Bréhat test site

Perfect tidal test site

- Flow speed range (0 to 3 m/s)
- Severe sea states (Hs up to 7 m)
- Connected to the grid
- 30 to 40 m depth



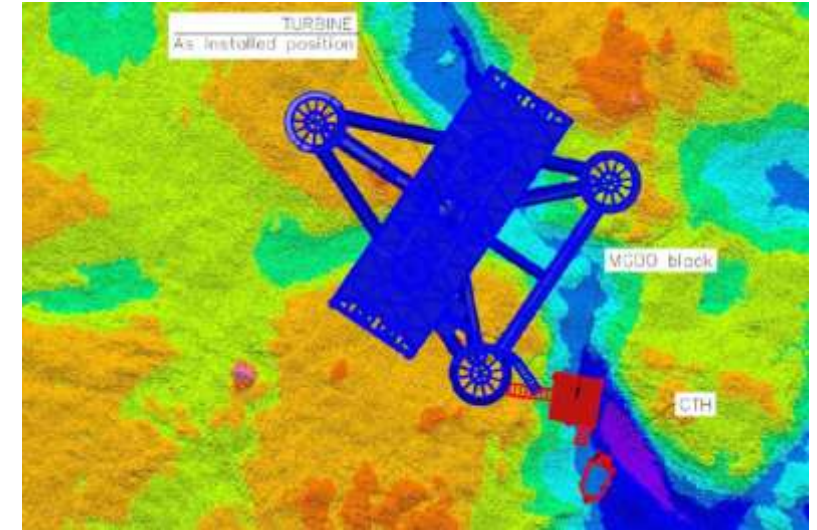
Appropriate for tidal technology qualification



Oceanquest project - Paimpol Bréhat

2 years of operation and testing, a key moment in our development

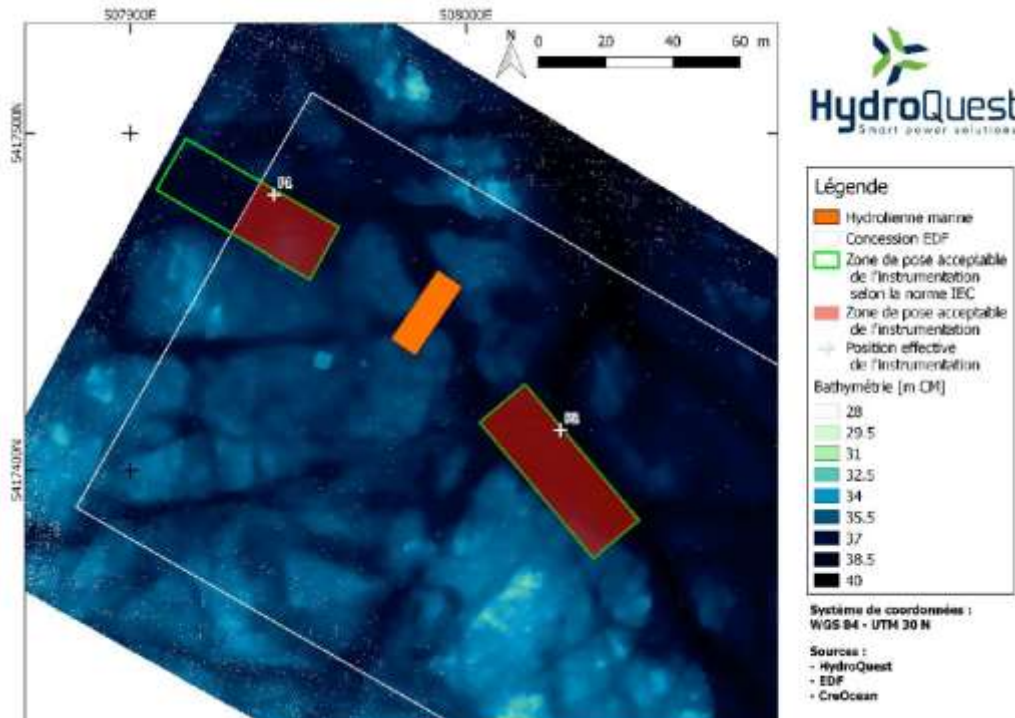
- Manufacture from mid-2017 to March 2019
- Installation : April 2019
- Connection : May 2019
- Commissioning : June 2019
- 2 + years of operations
- Recovery : September 2021



Oceanquest project - Paimpol Bréhat

2 years of operation and testing, a key moment in our development

- Power curve certified by Bureau Veritas & EMEC following IEC (2019 & 2020)
- Control strategy optimization in 2020
- Environmental surveys (acoustic, benthos, fouling)



Oceanquest project - Paimpol Bréhat

2 years of operation and testing : a huge opportunity for collaboration



EUROPEAN UNION
European Regional Development Fund



Set up of long term collaborations:

- Comparison with numerical analysis :



- In situ measurements and data analysis :



- Comparison with tank test model :



- Environmental analysis :

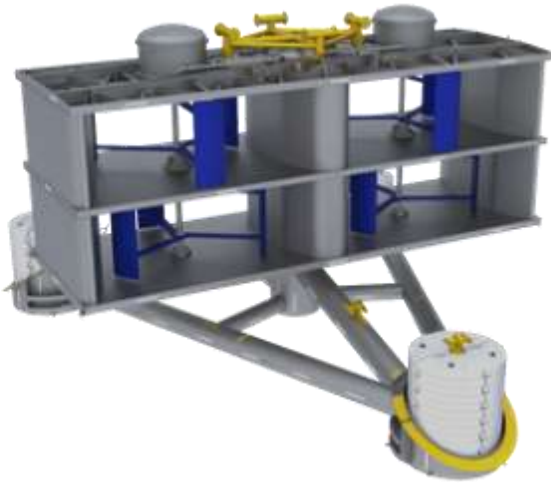


- Tank test model for new generation :



A proven technology

1MW prototype operated for over 2 years off the coast of Paimpol-Bréhat, France



Main results

- 2 years of operation
- Installation and recovery done each in one week
- Operational feedback and environmental monitoring
- Collected data and analysis feed the new generation design

DESIGN
Robust and efficient



INSTALLATION
And connection to the grid



RECOVERY AND DECOMMISSIONING
Learnings and confirmation of design and engineering



2016

2017

2018

2019

2020

2021

MANUFACTURING
In CMN shipyard, France

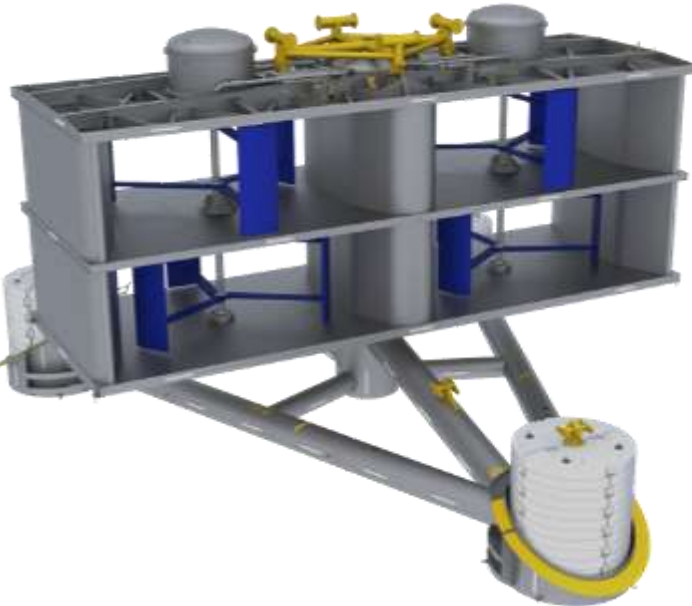


OPERATING OFF FRANCE FOR OVER 2 YEARS
No failure
100% availability rate (turbine)
Power Curve Certified by 



OceanQuest turbine

Learnings and development leading to the next turbine generation



Next generation 2.5

Same concept, better performances

- More **performant**: yield increased by 50%
- More **powerful**: 2.5 MW
- **Lighter**
- Easiest to **manufacture**
- Less **costly**
- **Robust**, designed to last 25 years



Conclusion

- Paimpol Brehat test : an successful step in the way of commercial deployment
- Full size sea qualification steps : key learnings for project development, engineering , construction
- Marine test sites : a huge opportunity for collaboration





**THANK YOU ALL FOR YOUR
ATTENTION**

More information on :
hydroquest.fr
flowatt.fr

TALKING BLUE SUSTAINABILITY



Chiara Lombardi
PhD, Laboratory of
Biodiversity and Ecosystem
Services
ENEA (IT)



SMART BAY SANTA TERESA Marine Test Site



September 26, 2023 | 15:00- 16:00 CEST | Webex

Chiara Lombardi





Cooperativa
Mitilicoltori
Associati



**Detection of ecologic and economic potential
of marine and terrestrial ecosystems**

Transition to **communities regeneration of resources** **nature-based** towards **of natural resources**



Establishment of clusters of local actors to share visions and needs generating the motivation to change

Creation of a cooperation platform for stakeholders both at local, national and international levels, thus developing **'community lead' projects for environment sustainability, resilience and regeneration**

Smart Bay Santa Teresa Underwater Observatory



- Legend:
- Natural Regional Park
 - Shell farming
 - Smart Bay S. Teresa

Big Data Gathering to support Environment & Ecosystems Regeneration

RESEARCH, SMEs, PUBLIC ADM



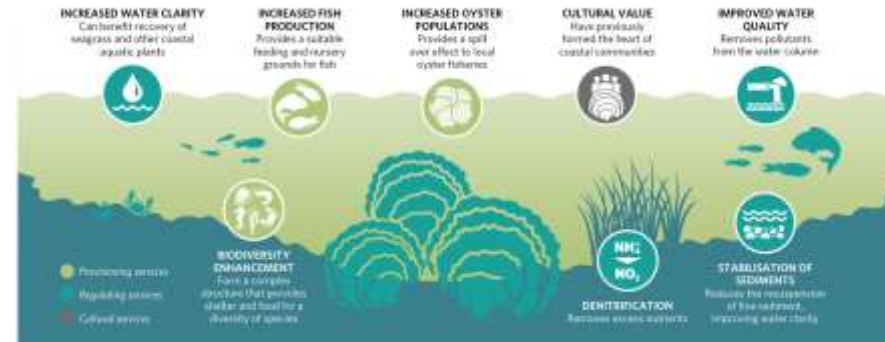
Underwater marine network for acquisition and real time transmission of high resolution physico chemical data (i.e., temperature, oxygen, salinity, current, pCO₂, pH,...) and data correction via AI (artificial intelligence)



Environment Regeneration - Circular approaches for Environment Regeneration using mussel and oyster shell waste for creating substrates for sea-bottom regeneration (<https://smartbaysteresa.com/en/mussel-and-oyster-shells-for-regeneration/>)



Marine Ecosystem Restoration— Restoration of native oyster beds (*Ostrea edulis*) to regenerate the underwater environment, including port areas

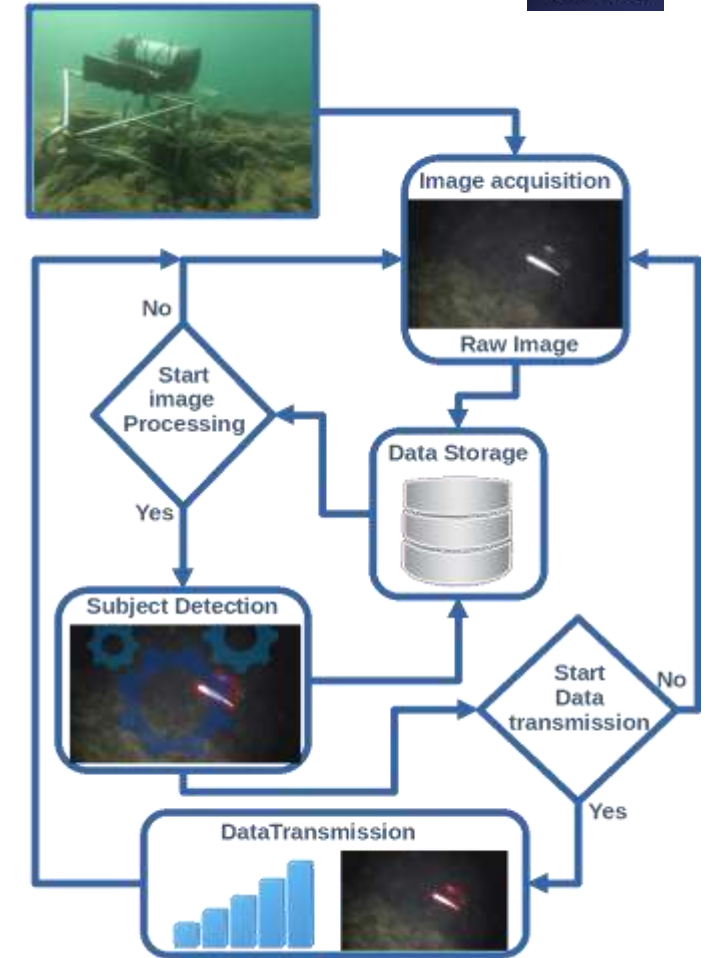


Imaging Device (GUARD-1) For Intelligent Underwater Monitoring



RESEARCH, SMEs

- Stand-alone (not wired) and autonomous (unmanned) programmable device for image acquisition and processing (European Patent EP 2863257)
- The acquired image content is extracted onboard (e.g., fish, gelatinous zooplankton, benthic species recognition/classification)
- The information extracted forms the acquired images is transmitted outside the device (e.g., text, images, image regions).
- Conceived to be deployed on fixed or mobile platforms for autonomous monitoring activities extended in time (> 6months)



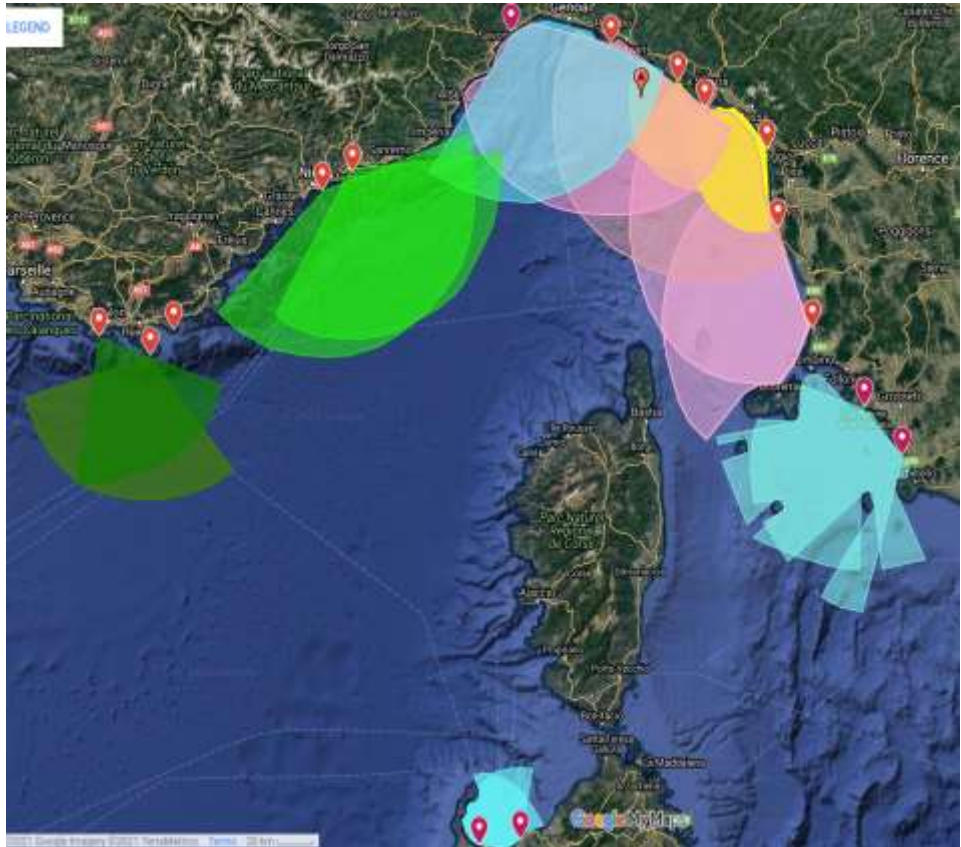
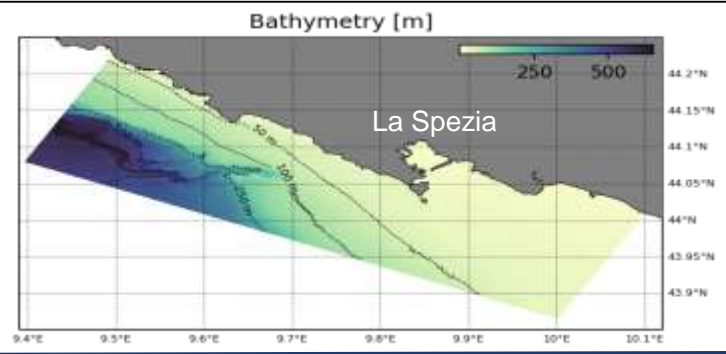
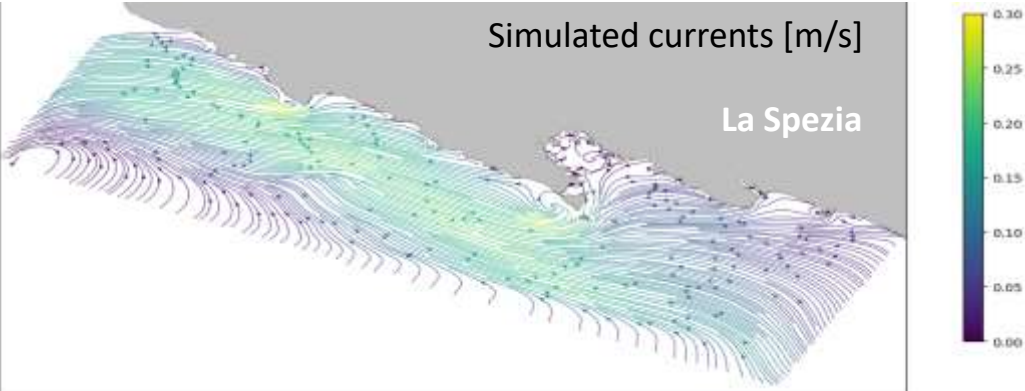
Dynamic Marine Observations and Modelling to Support Marine Spatial Management

RESEARCH, PA, SMEs



HF Radar - measuring the surface marine currents (e.g., assess how pollutants are transported by marine currents), hourly measurements (<http://radarhf.ismar.cnr.it>)

Modelling Tools - Delft-3d model, very-high resolution (50 m), based on a Nested approach



- ✓ Our research is directly connected with SDG#14 monitoring Blue Economy activities (Commercial and tourist port, mussel farming, military Arsenal, shipbuilding) + power plant and urban and industrial discharges;
- ✓ The strive and the strategies for carbon neutrality in the bay is also related to SDG#13;
- ✓ Different marine uses and a lot of data: Smart Bay S. Teresa is a key-pilot site for the National and European Maritime Spatial Planning efforts;
- ✓ "Smarter" and "more automated" marine technologies should be better supported to reach higher TRLs especially when AI is employed;
- ✓ Possibility of funding a new marine Research Infrastructure gathering and integrating all Smart Bays around Europe;
- ✓ Knowledge spread of MTS – even at local level- and involvement to different type of users: researchers, SMIs, PA, citizens,....to promote the development of Local Clusters for Empowering Nature Based Communities (SDG#14).



Thank you for your attention!



For more information:

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Website: <https://smartbaysteresa.com/en/>



TALKING BLUE SUSTAINABILITY



Peter Scheijgrond
On behalf of Campus@Sea
TNO partner (NL)





ISSS Webinar: Marine Test Sites, Peter Scheijgrond

A bit about myself



1.25MW dam-integrated array of 5 turbines
Eastern Scheldt Storm surge barrier



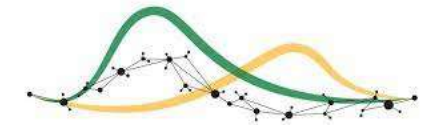
200kW floating platform
Island of Texel



- connect initiatives for sustainable, multiple use of the North Sea.
- meeting place for impact makers & maritime companies
- Stimulate international collaboration

Test bed at the North Sea

- tests & demonstrations at sea (typically 1 day).
- 10 x 10 miles
- Real time data
- Autonomous shipping
- Security at sea



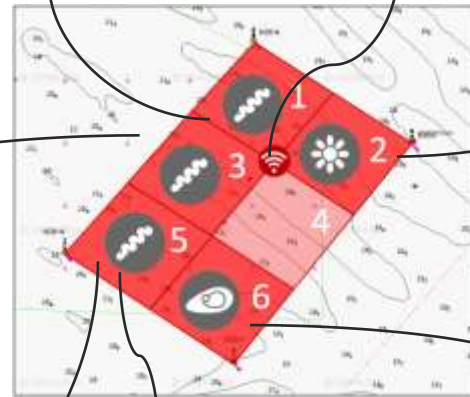
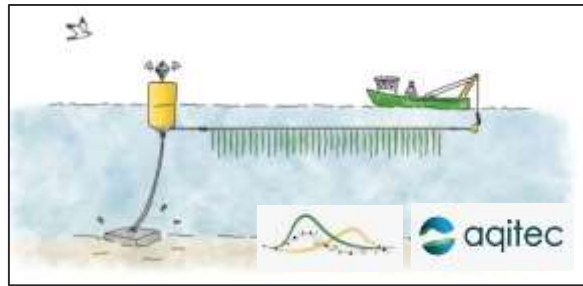
Proeftuin
op de
Noordzee



Offshore Test Site

- Largest Offshore Test Site in Europe: 6 km²
- Long duration testing
- 6 pre-consented plots of 1 km x 1 km for derisking & upscaling nature-inclusive solutions for multiuse at sea.
- Officially demarcated (cardinal buoys & registered in hydrographic cards)





Role of test sites

Accelerate upscaling and shorten the time to market:

- **Derisk** critical aspects at sea (survivability, performance, noise, etc)
- 3rd party validation -> **certification** services
- Catalyse **multi-use** and **nature-inclusive** solutions
- Strengthen **regional value chain**, connecting start-ups, industry, service companies, NGOs, education, research bodies
- Increase societal **acceptance**



Installation data buoy



Plot 1 mussel module



Plot 5 Harvest seaweed



Plot 2 Offshore solar

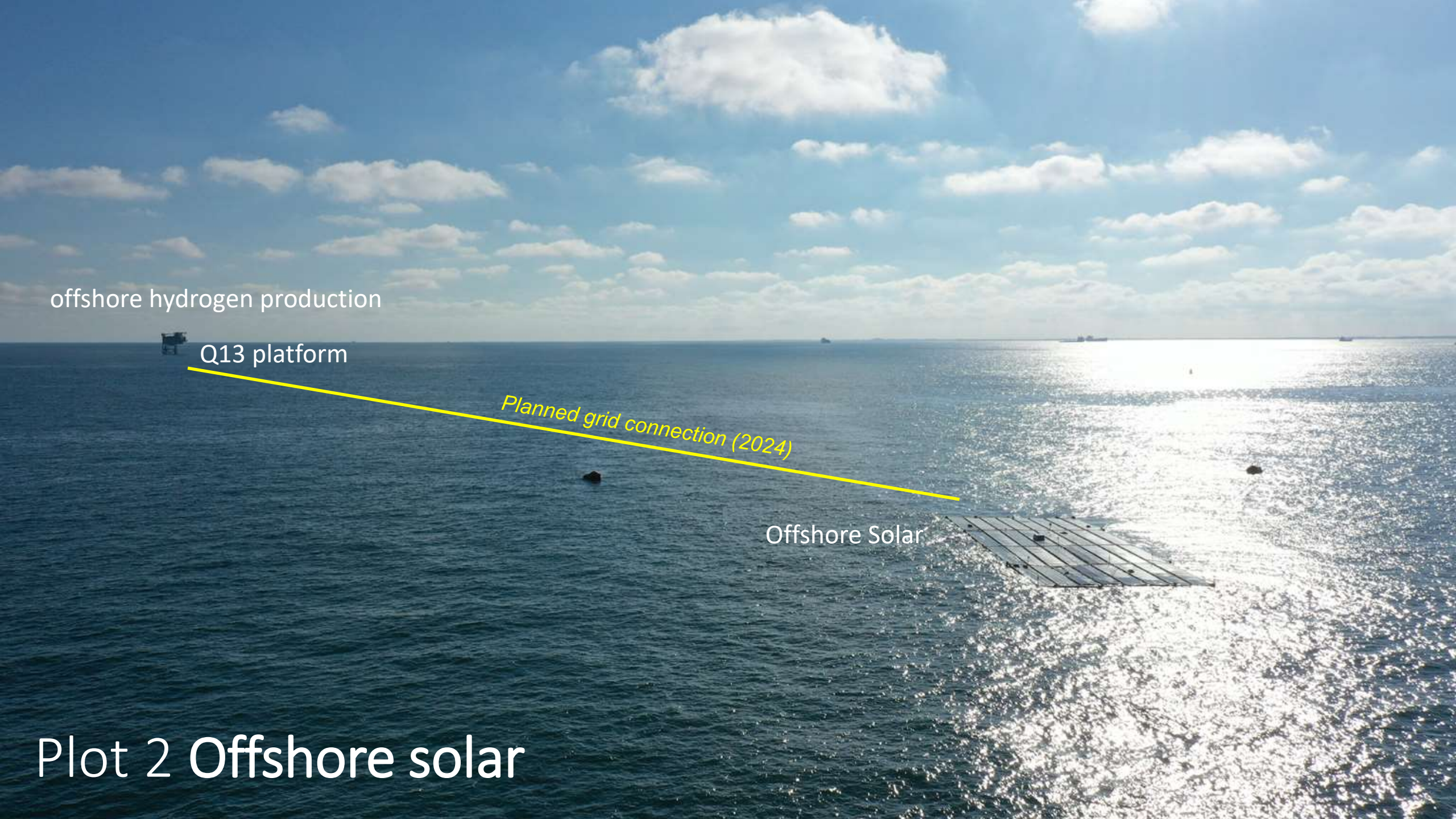
offshore hydrogen production

Q13 platform

Planned grid connection (2024)

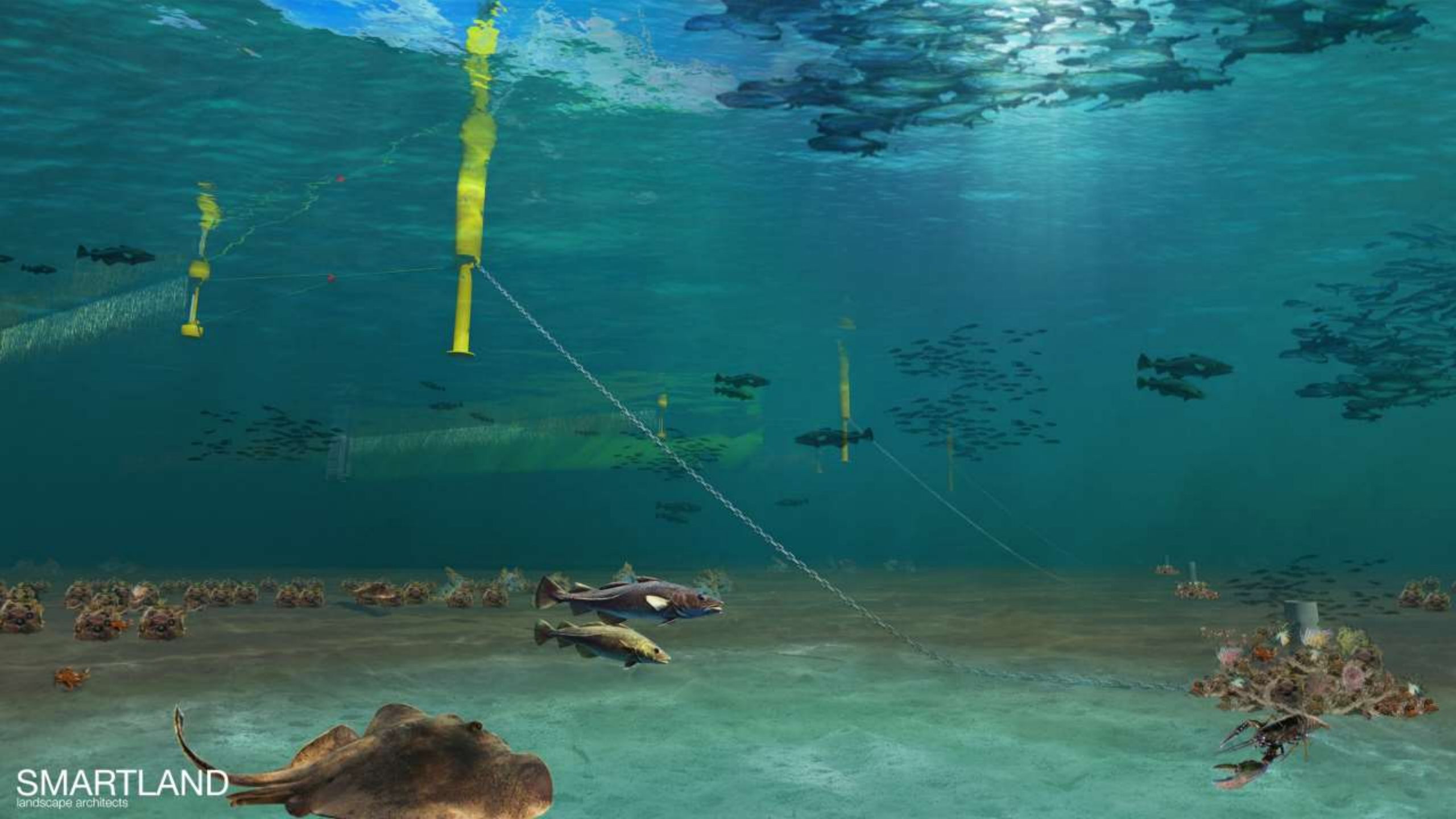
Offshore Solar

Plot 2 Offshore solar





Impression North Sea Farm #1 in Borssele © SMARTLAND



Oceans of Energy



Wide open corridors for wind turbine access

Recommendations

- Attain acceptance under e.g. IECRE to perform specific tests as part of **Type Certification** (e.g. wave, tidal, solar performance, acoustic measurements, loads measurements, etc)
- More international **collaboration** between test sites
- Sharing of resources (online training, instructions etc)
- Develop a **online platform** for users and test facilities to generate high-quality leads, increase visibility of sites, attract new type of clients (offshore wind, ecology, security, shipping etc)

Team



Zinzi Reimert, NSF



Eef Brouwers, NSF



Jan-Hendrik Schretlen, C@S



Peter Scheijgrond, C@S



TALKING BLUE SUSTAINABILITY - Discussion



Thank you for your attention!



For more information:

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[ISSS](#)

