OPIN webinar - Introduction to European Tidal Stream projects

8th June 2020

Interreg North-West Europe OPIN
European Regional Development Fund

Scottish Enterprise

Agenda

14:00 – 14:15	• **Introduction to Ocean Power Innovation Network (OPIN)**	*Lesley Doyle, Scottish Enterprise*
14:15 – 14:40	• **ORE Catapult – TIGER Project**	*Teo van der Kammen – ORE Catapult*
14:40 – 15:05	• **Orbital Marine - The potential of O2 tidal turbines, & opportunities associated with this for companies**	*Andrew Scott – Orbital Marine*
15:05 – 15:30	• **Sabella – Introduction to tidal turbine design and projects**	*Marlène Moutel - Sabella*
15:30 – 15:55	• **EMEC – Tidal energy development projects**	*Erica Mathers – EMEC*

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OPIN Introduction

Lesley Doyle
Lesley.doyle@scotent.co.uk
Project Manager, Scottish Enterprise

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What is OPIN

Ocean Power Innovation Network (OPIN) is a **European collaborative network**

OPIN objectives:

- Gather **Offshore Renewable Energy** SMEs and associate partners (large companies, research organisations, public institutions).
- Develop both **cross-regional** and **cross-sectoral** collaboration
- Support over 100 companies
- Develop a self-sustaining network (>200 members)

3 years from 2019 to 2021

€2.6M total project budget
€1.5M in financial support from Interreg North West Europe

Join the network (free)

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Who are OPIN

7 partners from Ireland, UK, Belgium, France, the Netherlands and Germany

Project Partners	Countries/Regions
Sustainable Energy Authority of Ireland (SEAI)	Ireland
Scottish Enterprise (SE)	Scotland
Offshore Renewable Energy Catapult (OREC)	United Kingdom
Sirris, het collectief centrum van de technologische industrie (SIRRIS)	Belgium
West Atlantic Marine Energy Community, École Centrale de Nantes (WEAMEC)	France Pays de la Loire
Dutch Marine Energy Centre (DMEC)	Netherlands
Fraunhofer-Gesellschaft zur Förderung der angewandten Forschung e.V. (Fraunhofer IEE)	Germany

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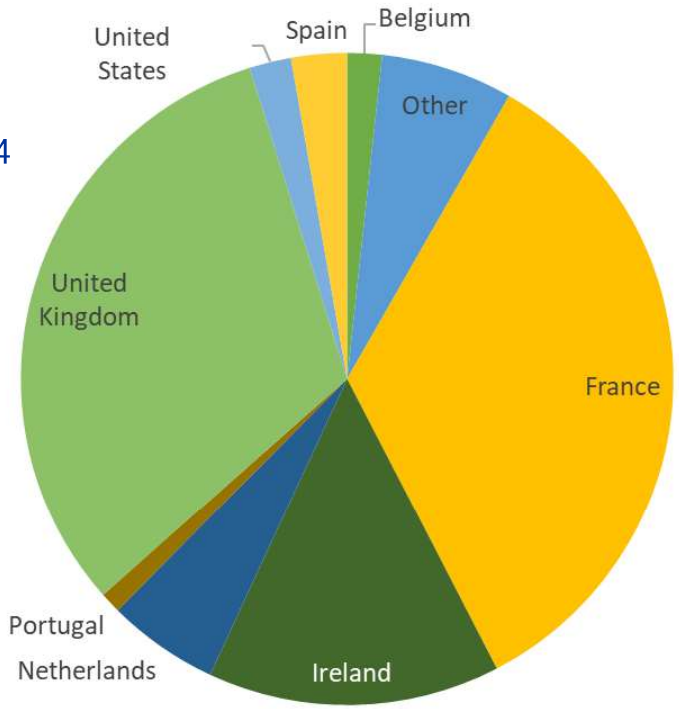
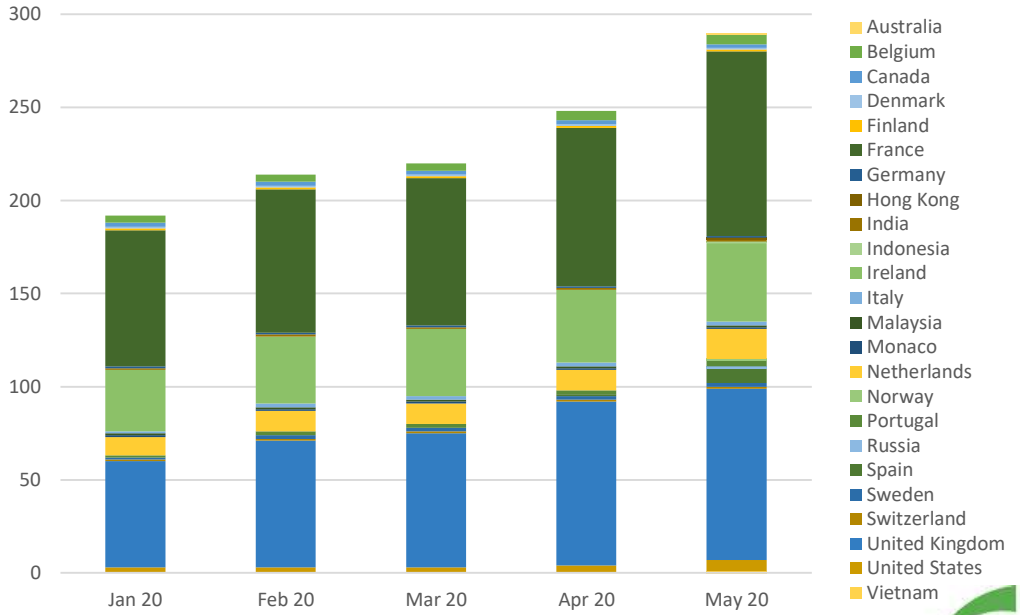
OPIN Membership

290 members from 24 countries (as of May 2020)





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What can OPIN do for you (1/2)

Access **free events**: learning and networking opportunities

- **Webinar: Tidal Supply Chain Opportunities**
  09/07/20, online

- **Workshop: Challenges and Solutions for Improved Durability of Materials**
  22/10/20, Antwerp, Belgium

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What can OPIN do for you (2/2)

Access **expert advice** on your technology (TAPs)

- ✓ Independent expert opinion – e.g. on the route to market, on reducing development risks and costs, etc.
- ✓ Advice on next steps, funding and collaboration opportunities

Support **collaborative projects** (CIGs)

- ✓ Preparatory step to National and EU research calls
- ✓ Find ways to solve technical or financial problems you are facing
- ✓ Expand your network nationally and internationally
- ✓ Benefit from the experience of those in other industries

Receive **travel support**

- ✓ Enabling Irish and Scottish SMEs to travel abroad for OPIN events

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What can OPIN do for you (3/3)

Collaborative Innovation Groups (CIGs) Scoping Sessions

1) Corrosion: Impacts and Solutions
Thursday 11th June, from 13:00 to 14:30 BST (14:00 to 15:30 CEST).
Sign up to this online event Here.

The OPIN Team wants to develop a CIG to create awareness on the impact of corrosion on offshore renewable projects and how to deal with it.

2) Anchoring Lines and Mooring Solutions
Wednesday 17th June, from 10.00 to 11.30 BST (11.00 to 12.30 CEST).
Sign up to this online event Here

The OPIN Team wants to develop a CIG to help members understand the technology challenges and best practice associated with mooring lines and anchoring solutions for floating platforms.

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Other resources

OPIN Members list

OPIN Library:

- Workshops/masterclasses presentations
- Value chain study - summary report
- Ocean energy challenges and recommendations: Desktop analysis of studies and reports

OPIN Twitter and Linkedin groups. Join us for the latest updates!

Email us at: OPIN@seai.ie

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TIGER TIDAL STREAM INDUSTRY ENERGISER

OPIN - Introduction to European Tidal Stream Projects
8th June 2020

Teo van der Kammen – TIGER Technical Manager

EUROPEAN UNION

Interreg France (Channel Manche) England
EUROPEAN UNION
European Regional Development Fund

Content

- What is TIGER?
- What is tidal stream?
- What are the TIGER objectives?
- Who are the Partners?
- TIGER Development sites
- Supply Chain Engagement activities
- Upcoming TIGER Events

What is TIGER?

Tidal Stream **I**ndustry Ener**G**is**ER**

TIGER is a **€45.4m** (€29.9m ERDF), 4-year project, with 18 partners, approved 2 Jul 2019.

Funded through the Interreg France Channel (Manche) England programme, it is a collaborative cross border project

What is TIGER?

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www.interregtiger.com

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EUROPEAN UNION
European Regional Development Fund

What is TIGER?

CORNWALL

ORE Catapult
Chi Gallos
Hayle Marine Renewables Business Park
North Quay
Hayle
Cornwall
TR27 4DD

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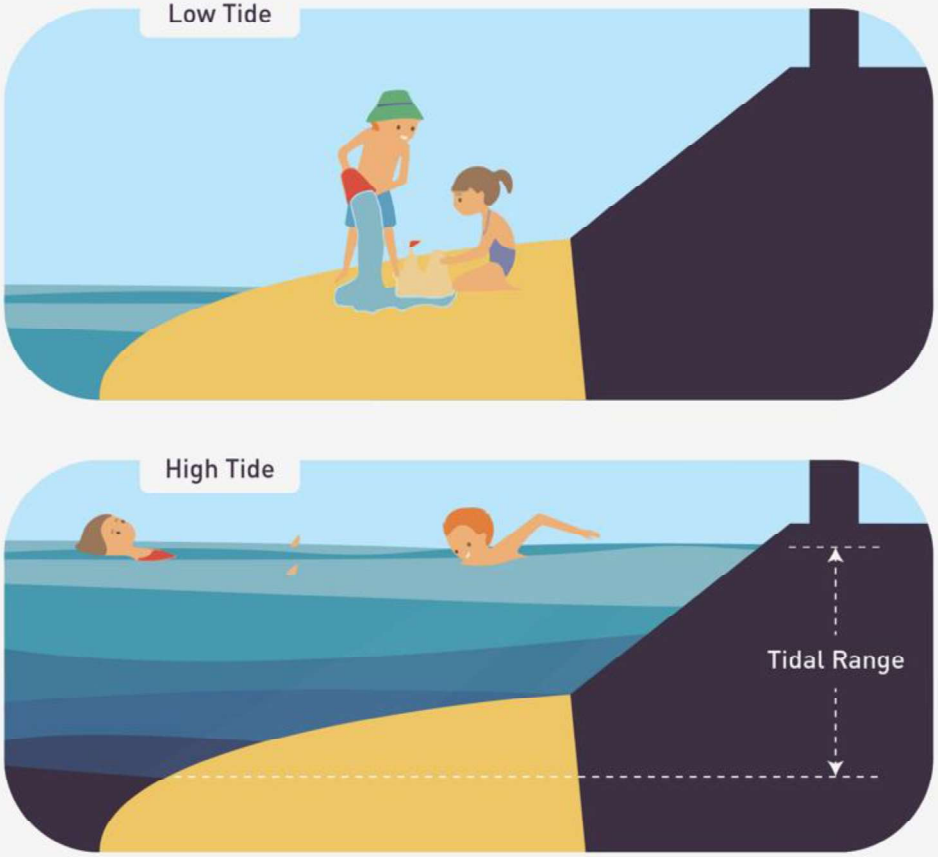
The Tides

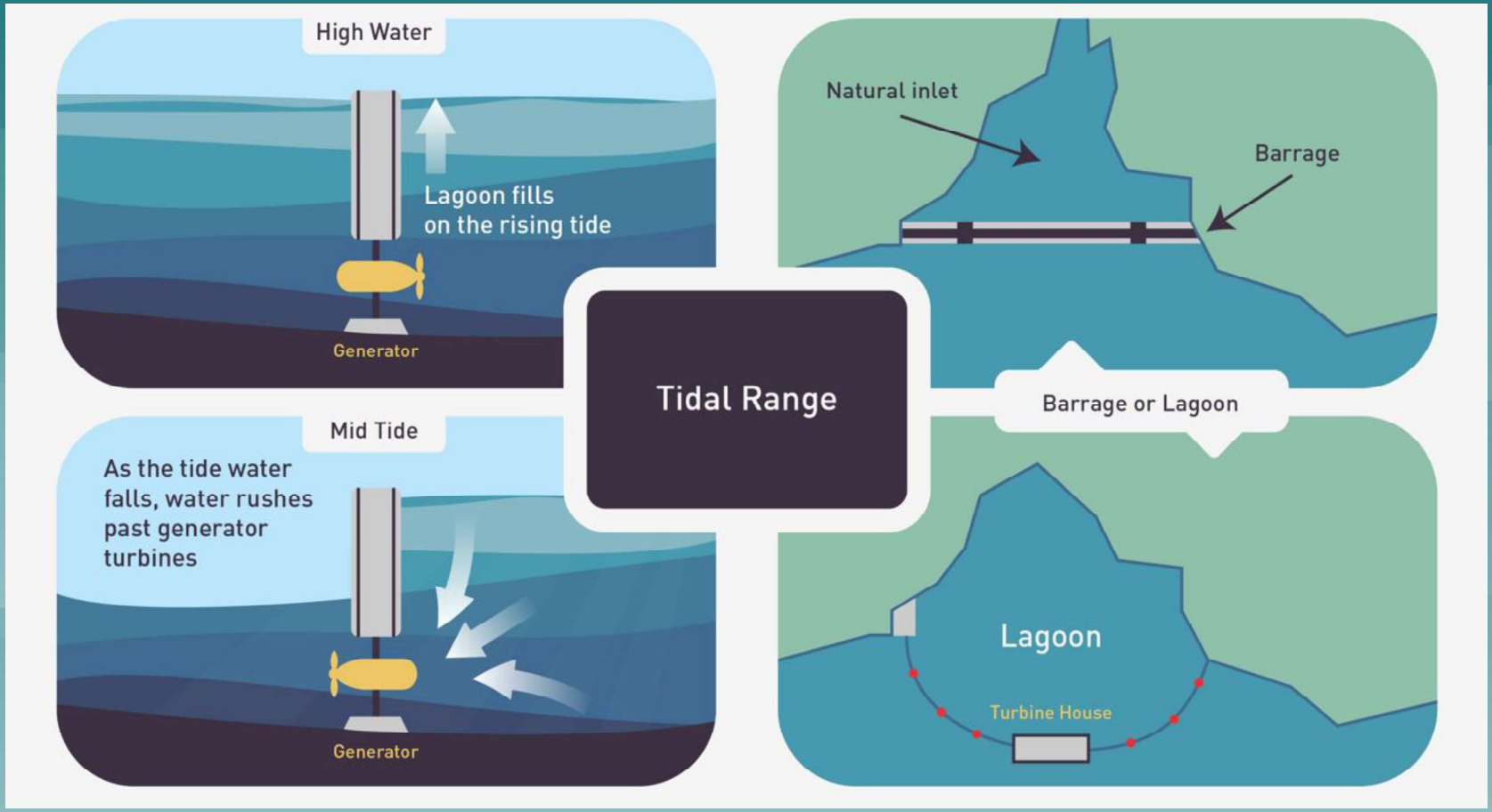
There is a low tide twice a day

There is a high tide twice a day

The difference in height between the low tide and high tide is called the tidal range



Credit: Power of the Ocean PowerPoint - Marine Energy Wales



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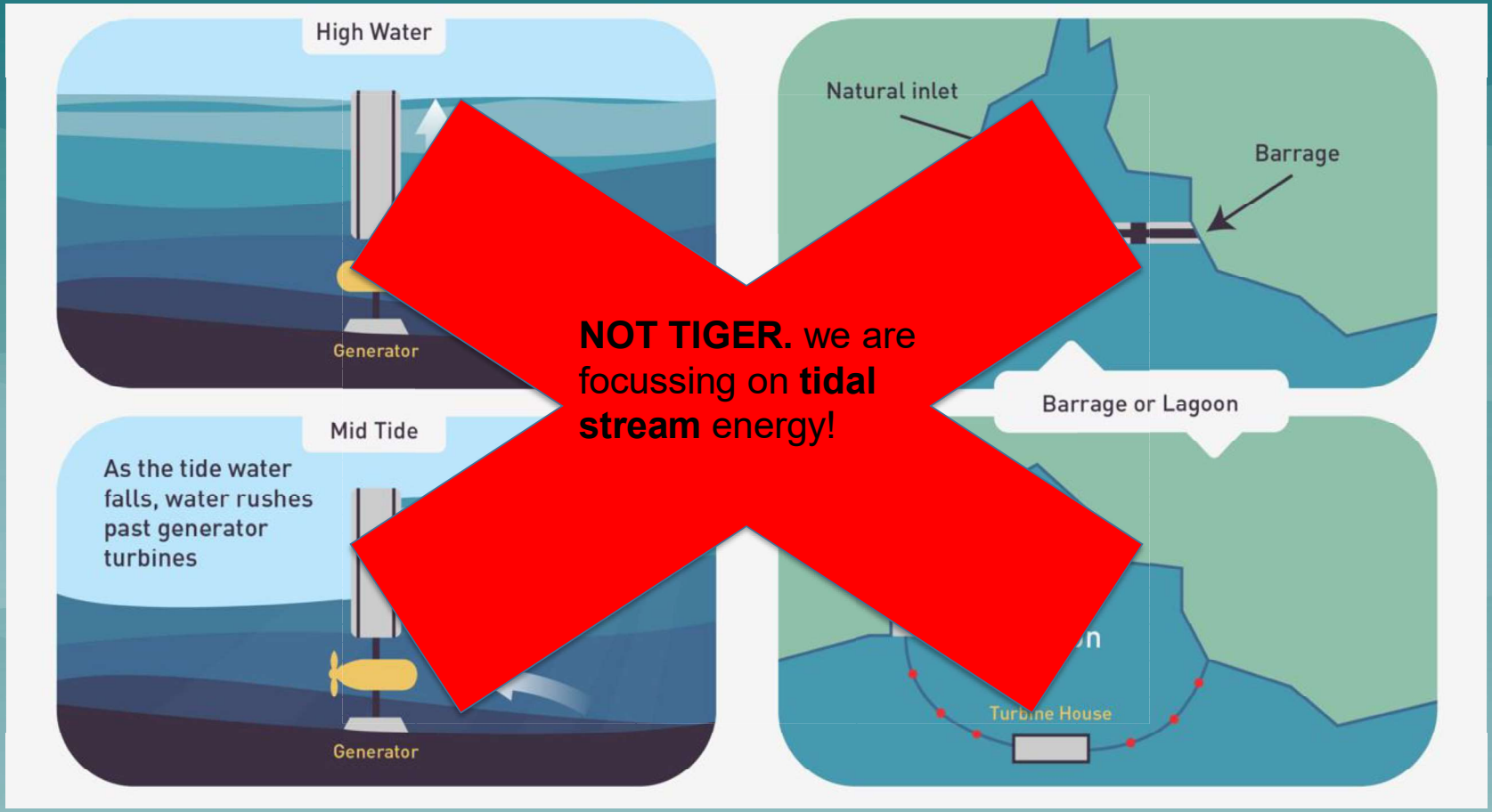

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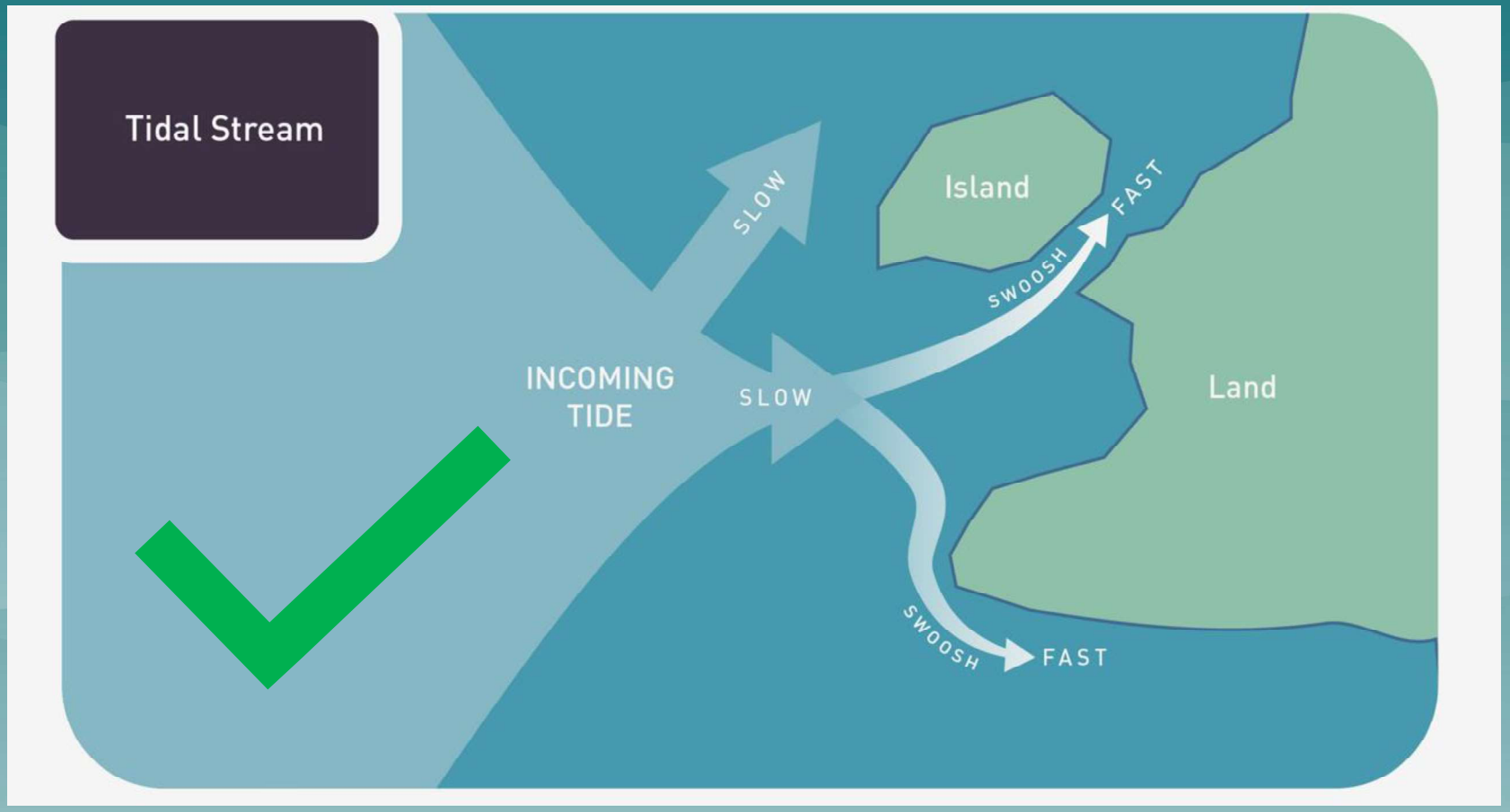

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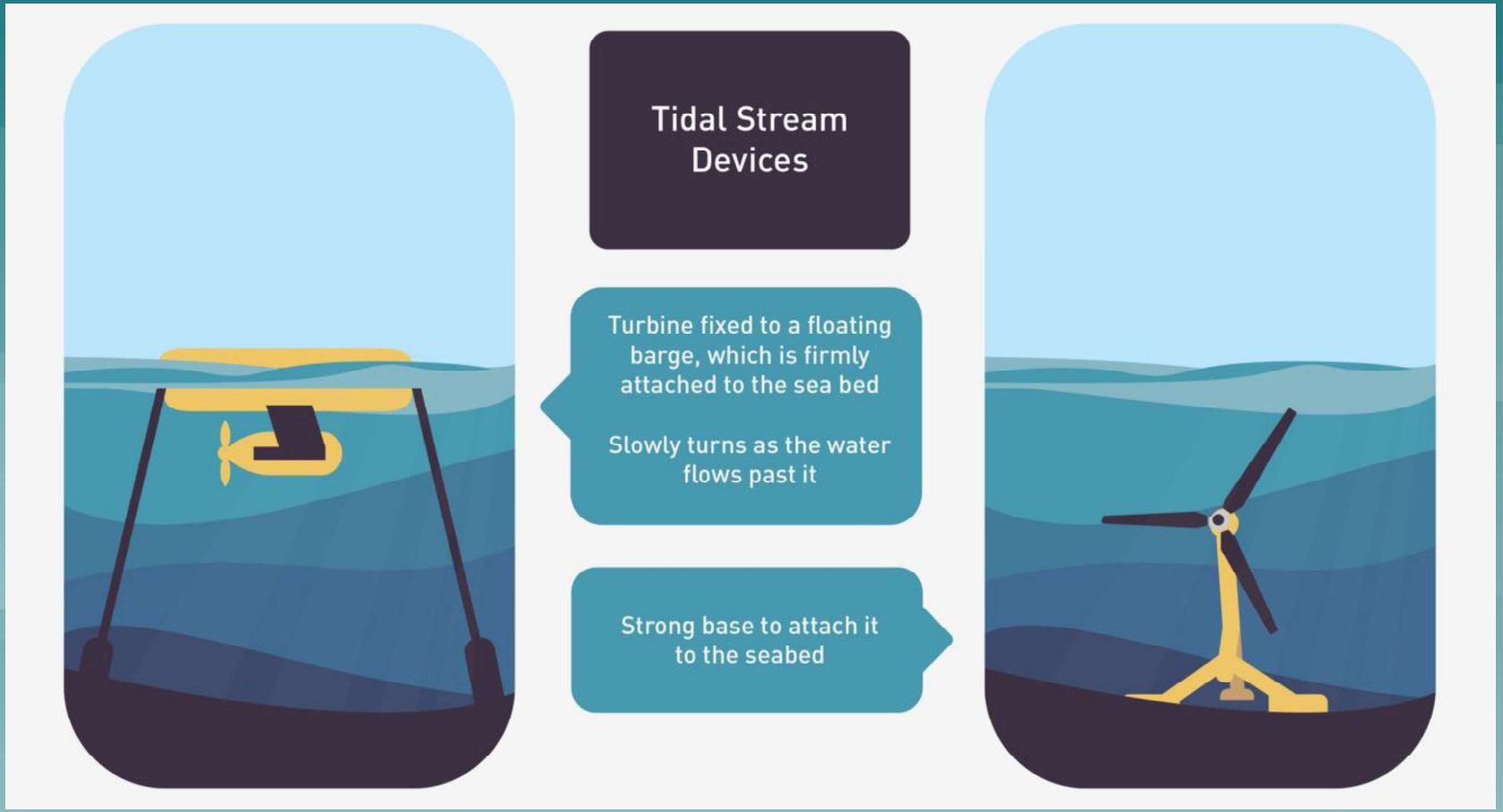

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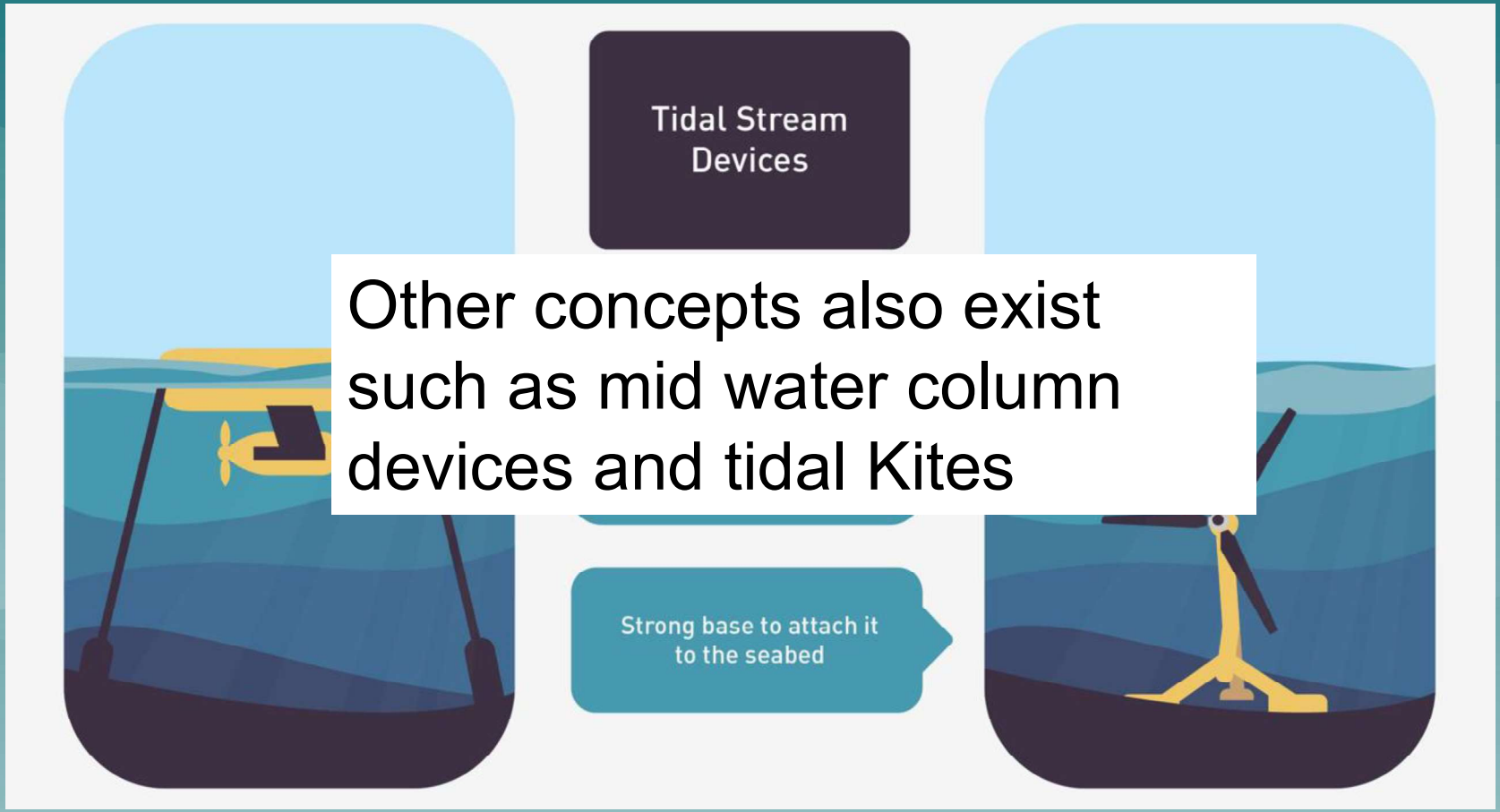
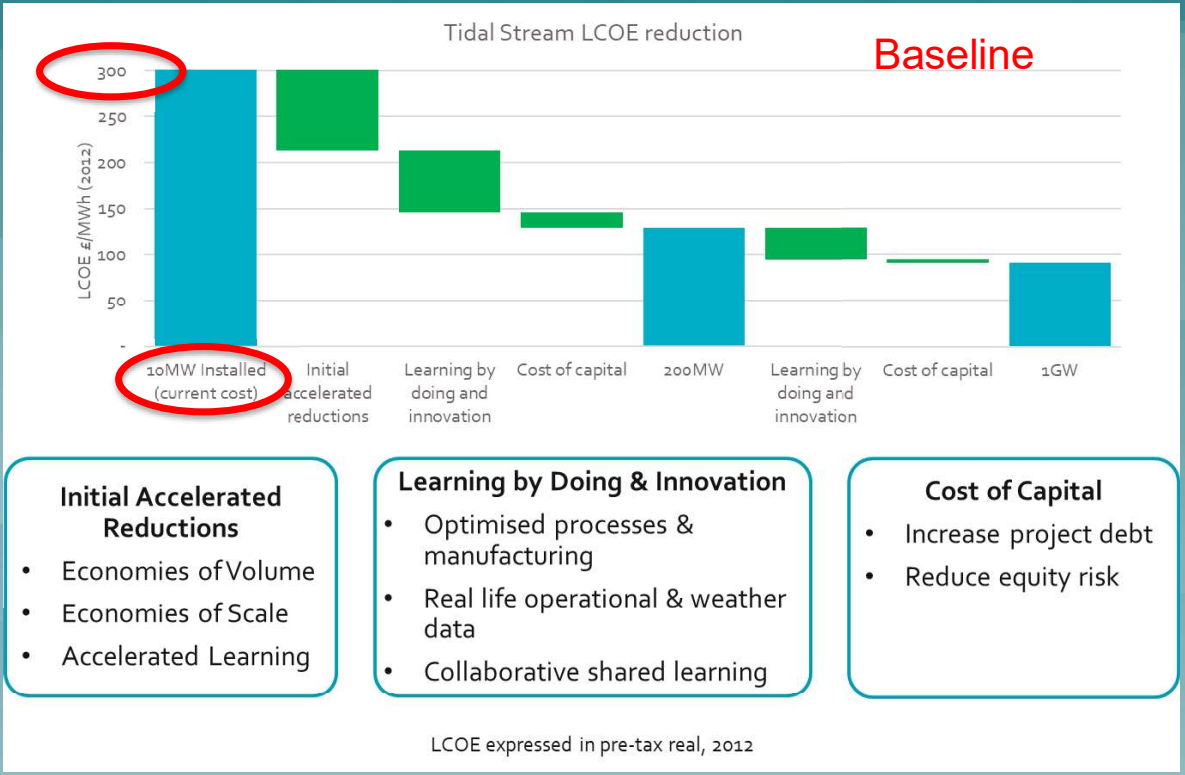


Other concepts also exist such as mid water column devices and tidal Kites

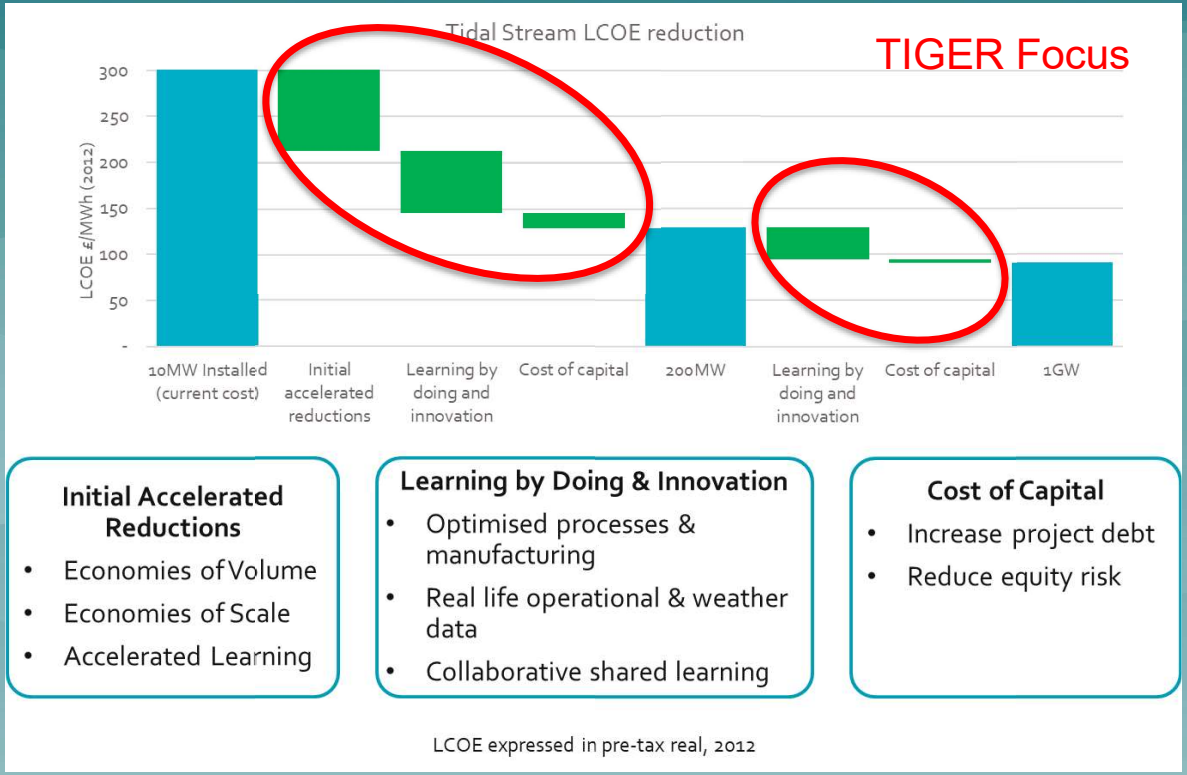
Credit: Power of the Ocean PowerPoint - Marine Energy Wales

What is TIGER about?



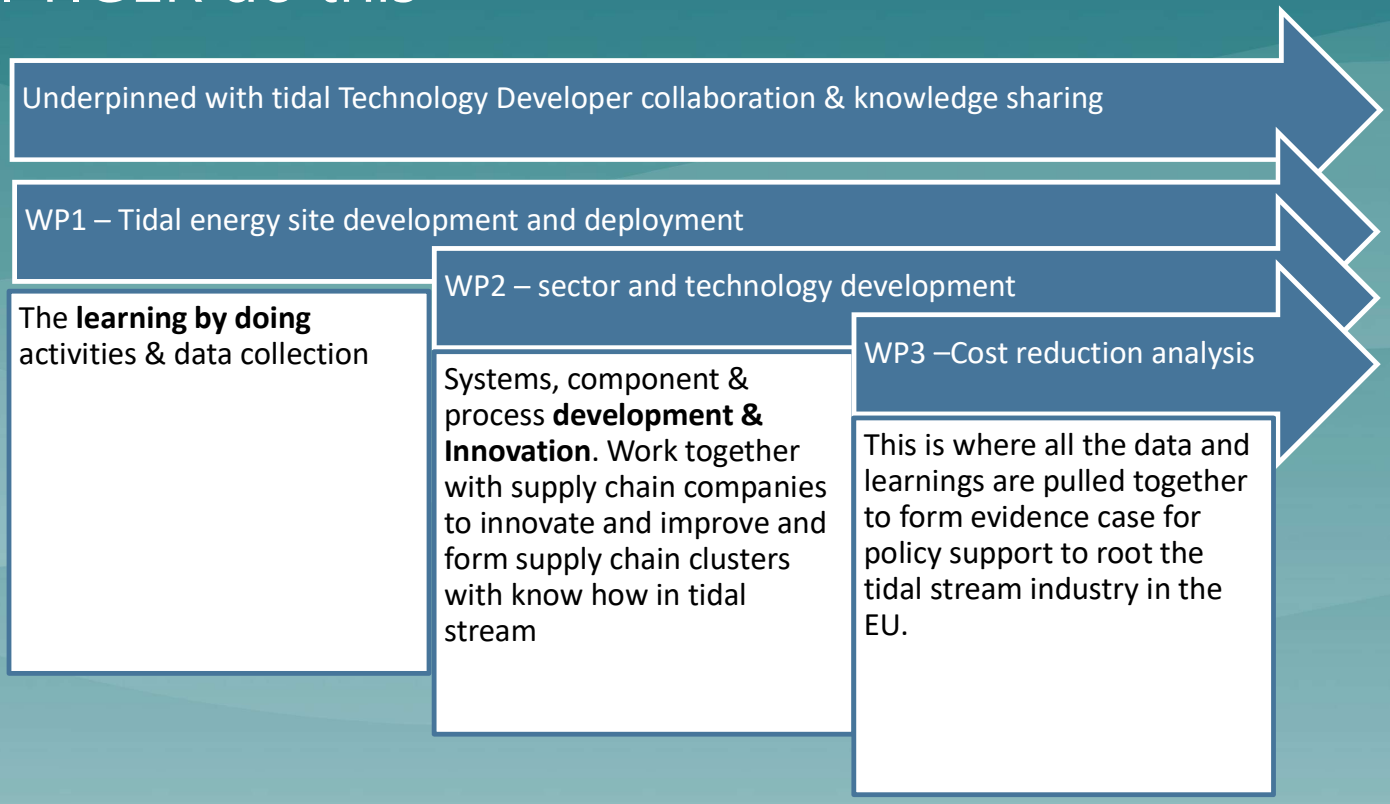
OREC 2018 Wave & Tidal cost reduction pathway report

What is TIGER about?



OREC 2018 Wave & Tidal cost reduction pathway report

How will TIGER do this



Who are the Partners?

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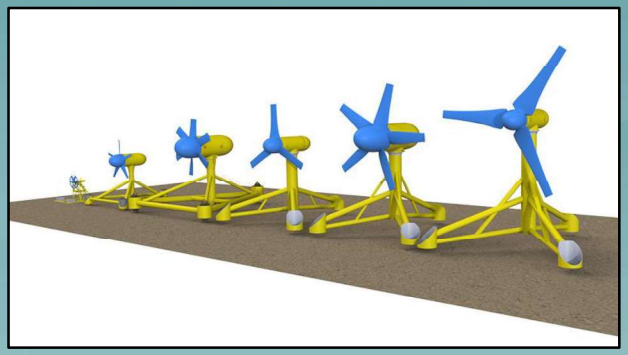
WP1 TIGER Development sites – Morbihan

Sabella & Energies 56 have formed MHE56 to consent and install 2x D08 250kW turbines in the Morbihan Gulf.

sabella ride the tide

56 énergies



WP1 TIGER Development sites – Paimpol Brehat

Minesto will design and install a new variation of their DG100 Tidal kite at the EDF/SEENEOH tidal demonstration site

EDF SEENEOH TIDAL TEST SITE Minesto

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WP1 TIGER Development sites – Ramsey Sound

Cambrian Offshore will repurpose the Ramsey Sound demonstration site and install a different tidal device

CAMBRIAN OFFSHORE
AR Y MÔR CAMBRIAN

WP1 TIGER Development sites – PTEC

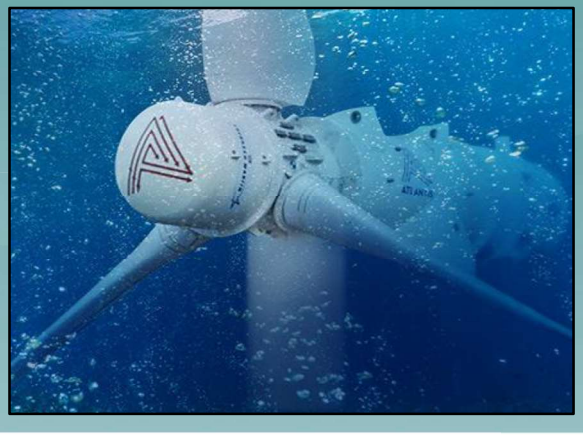
QED Naval will work to bring PTEC back out of hibernation and develop a commercial array off the Isle of Wight.

WP1 TIGER Development sites – Raz Blanchard

SIMEC & AD Normandie have formed Normandie Hydroliennes to consent and develop a commercial array.

SIMEC ATLANTIS ENERGY

NORMANDIE AGENCE DE DÉVELOPPEMENT



WP1 TIGER Development sites – Raz Blanchard

HydroQuest will secure consent and develop a 10MW commercial array.

Orbital Marine Power

LCOE analysis of potential innovations to identify high and medium LCOE impact areas of innovation.

priority areas will be worked into detailed R&D work packages involving identifying suitable partners and external expertise for each.

Feed into a basis of design for future devices

ORBITAL
MARINE POWER

Supply Chain Engagement activities

- TIGER technology developers, in conjunction with **engaging interested supply chains**, will develop a range of at least 46 different equipment design specifications/ front end engineering designs/detailed designs for new optimised turbine components and systems.
- Looking to work with organisation from across sectors
- These designs will maximise cost reduction, performance, modularity and plug and play features to increase standardisation and improve production economies of scale across the sector.

Supply Chain Engagement activities

TIGER will be hosting a series of 6 themed supply chain engagement events over the next 6-9 months. TIGER may be able to facilitate mini collaborative projects in conjunction with it's partners over the next 2-3 years. Follow ups events planned in 2022.

The events will provide unique insight into TIGER industry leading projects and identify opportunities for future supply chain engagement/product development with market opportunities likely in all offshore energy sectors.

Supply Chain Engagement activities

Collaboration & knowledge sharing

TIGER welcomes the opportunity to collaborate with other like-minded projects and associations.

If you would like to discuss possible opportunities, please get in touch.

Thank You

Contact

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ORBITAL

MARINE POWER

Who Are Orbital Marine

ORBITAL MARINE POWER

European Marine Energy Centre

Headquarters: Kirkwall, Orkney

Edinburgh office

Privately held Scottish company with 33 employees who have accumulated over 100 engineering years focused on optimising the world's most advanced tidal turbine technology.

Company founded: 2002

Scotrenewables® Tidal Power Ltd

World's first grid connected floating tidal turbine (250kW): 2011

World's most powerful tidal turbine, SR2000, starts operation: 2016

SR2000 exports more power (3GWh+) in 12 months than entire wave & tidal sector in Scotland over previous 12 years.

ORBITAL MARINE POWER

Company rebrands, 2018

Company raises UK's largest ever crowdfunding bond - £7m in 10 weeks.

Company starts build of first 2MW O2. 2019

What does Orbital Marine want to achieve.

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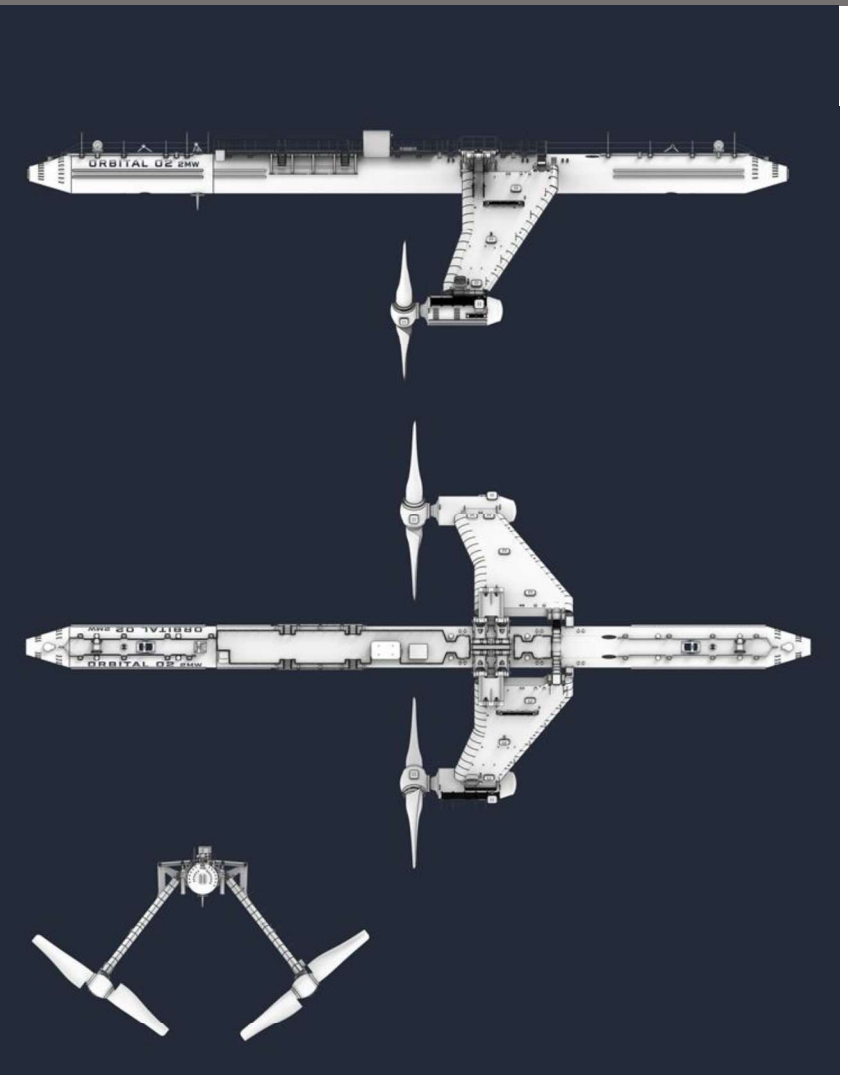
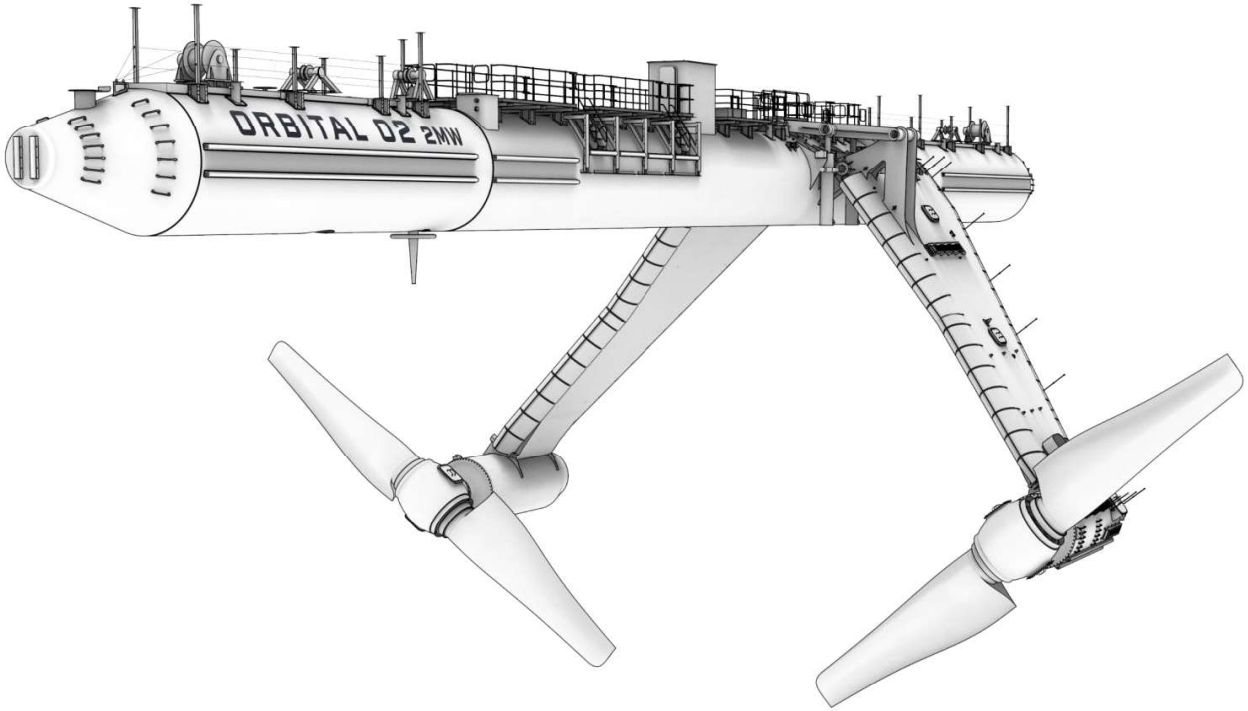


Unlock clean, predictable power for millions of people, homes and businesses around the world through the commercialisation of our proprietary technology and engineering know-how.



Breakthrough Industry Project: SR1-2000

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MARINE POWER

- ✓ **World's most powerful operating tidal turbine – 2MW.**
- ✓ **2 x 1MW nacelles with 16m rotor diameters.**
- ✓ **Stall regulated control.**
- ✓ **500T turbine mass.**

Construction Philosophy

ORBITAL MARINE POWER

Manufacturing process analogous to ship building.

No dependency on high cost specialist construction vessels.

Simplified, standard offshore operations involving moorings and cable installation.

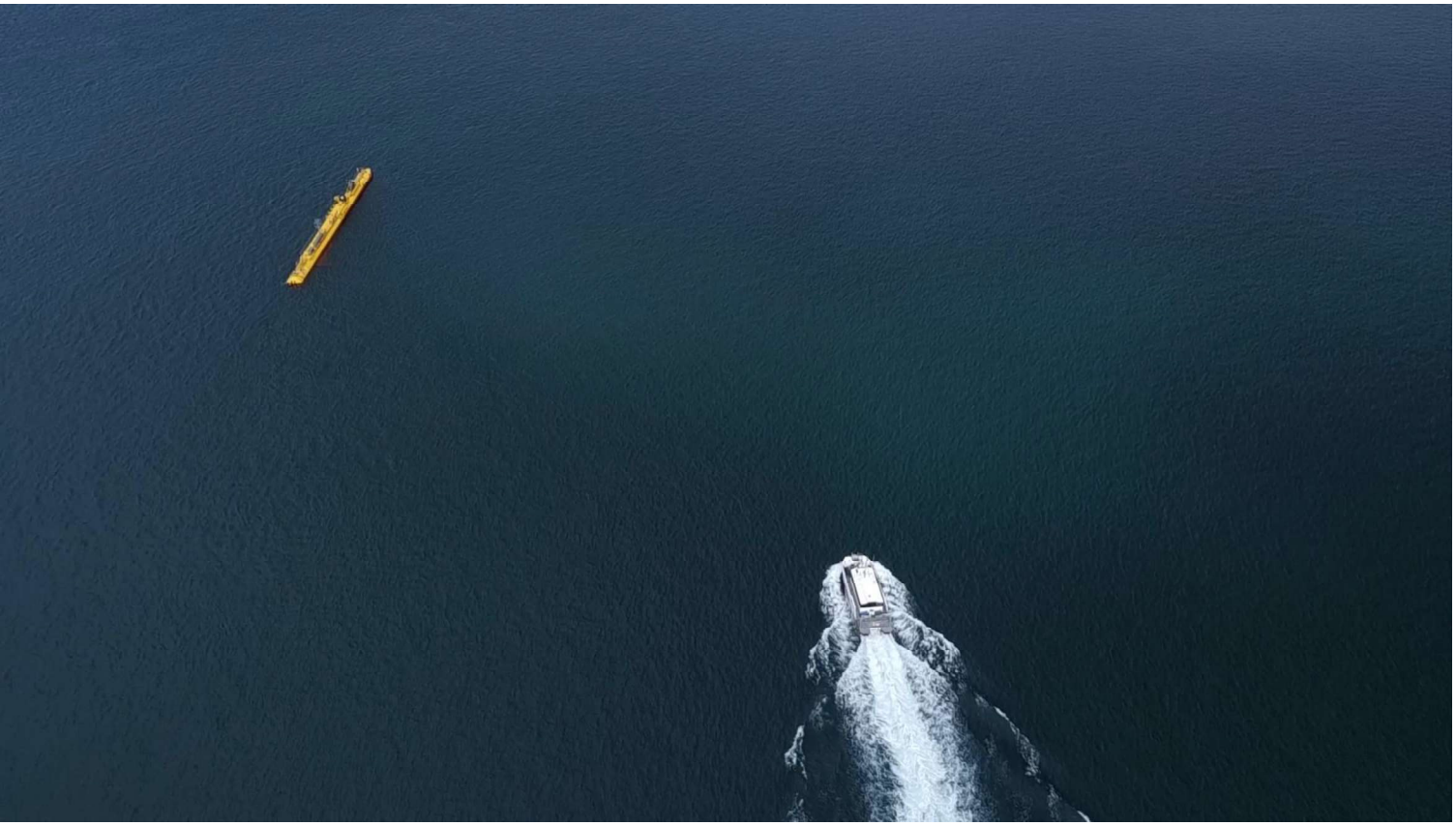
Maintenance Philosophy

ORBITAL MARINE POWER

Maximise generator uptime by enabling fast response maintenance interventions.

Minimise cost of repairs and service vessels via turbine design and marine operations.

Performance



- ✓ 2.2MW peak output.
- ✓ Provided 7%+ of entire Orkney electricity demand over 1 week of continuous generation.
- ✓ Predictable source of generation.
- ✓ 450+ days on moorings and grid connection.
- ✓ Weathered 6m+ storm waves.
- ✓ Maintained generation in 3m+ waves.
- ✓ 6,000hrs generation per nacelle.
- ✓ 3.2GWh+
- ✓ 30+ interventions – no lost time incidents, no expensive vessels.
- ✓ <45mins quickest time to repair.

Orbital O2: Most Advanced Tidal Turbine in the World

ORBITAL MARINE POWER

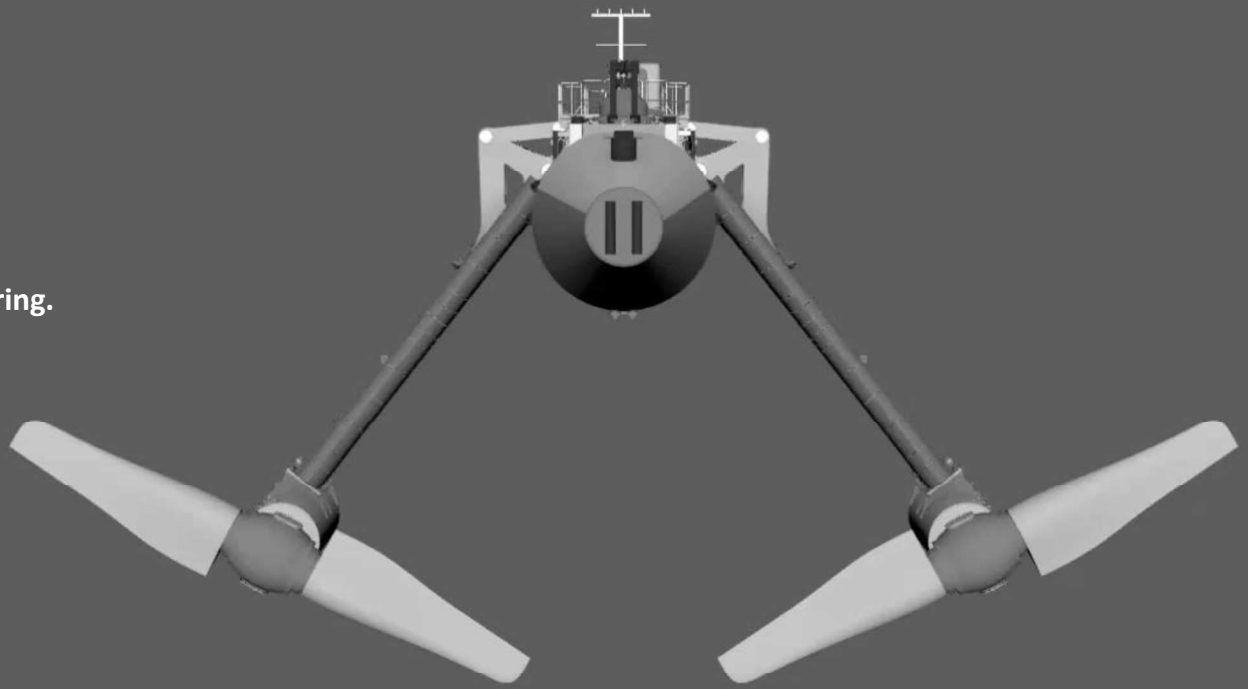
2.5MW of power at rotor shaft.

20m rotor diameter / 628m^2

74m main hull structure.

Pitch controlled rotors.

Forward and aft catenary mooring.



UK Build Story

ORBITAL MARINE POWER

EMEC – THE EUROPEAN MARINE ENERGY CENTRE LTD

Location: Orkney Islands.
Contractor: European Marine Energy Centre.
Activity: Operation of installation site.

ORBITAL MARINE POWER

Location: Kirkwall, Orkney.
Contractor: Orbital Marine Power.
Activity: Electrical systems assembly.

GRAY FABRICATION

Location: Coupar, Fife.
Contractor: Gray Fabrication.
Activity: Heavy steel fabrication.

LIBERTY

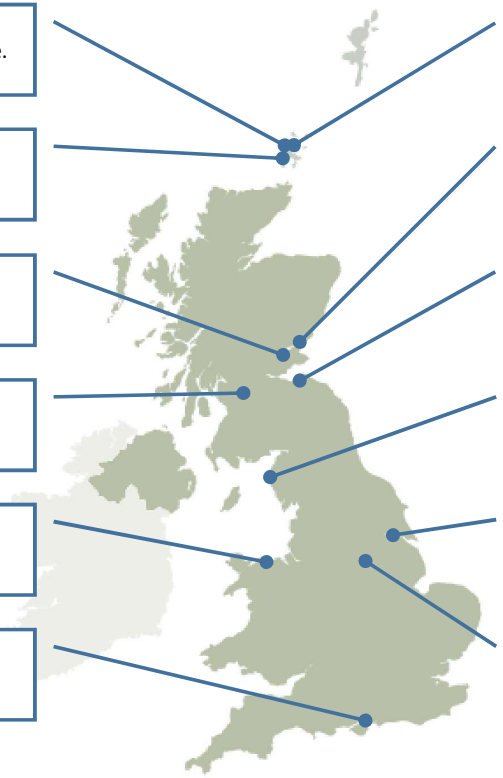
Location: Motherwell.
Contractor: Liberty Steel Dalzell.
Activity: Main plate steel supplier.

FAUN TRACKWAY

Location: Llangefni, North Wales.
Contractor: Faun Trackway.
Activity: Anchor manufacturer.

A C MARINE & COMPOSITES Ltd.

Location: Gosport, Southampton.
Contractor: AC Marine Composites.
Activity: Composite blade manufacture.



Location: Fall of Warness.
Contractor: Leask Marine.
Activity: Mooring and cable installation.

LEASK MARINE

Location: Dundee.
Contractor: TEXO Group.
Activity: Main turbine manufacture.

TEXO GROUP

Location: Edinburgh.
Contractor: Orbital Marine Power.
Activity: Engineering & project management.

ORBITAL MARINE POWER

Location: Workington, Cumbria.
Contractor: TSP Engineering.
Activity: Mooring connection manufacture.

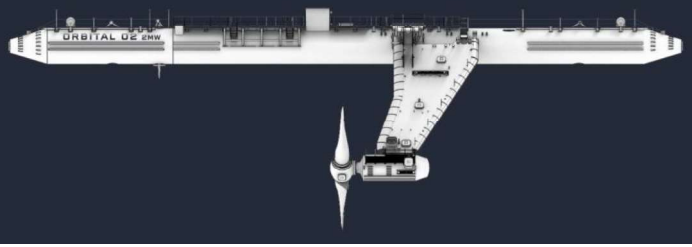
TSP ENGINEERING

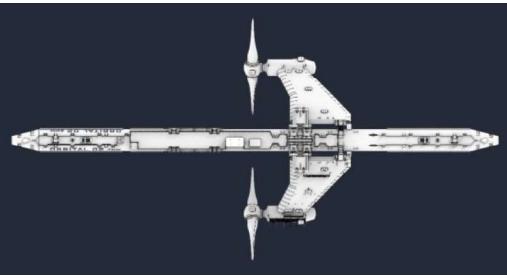
Location: Scunthorpe.
Contractor: Bonds Heavy Castings.
Activity: Load bearing heavy castings.

Bonds

Location: Sheffield.
Contractor: Shepcote Engineering.
Activity: Hydraulic cylinder supply.

SHEPCOTE engineering





O2 in Build

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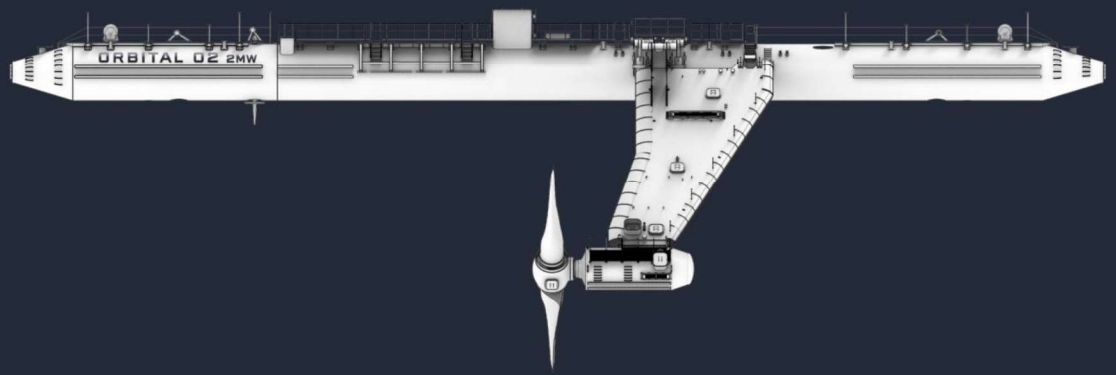

O2 in Build

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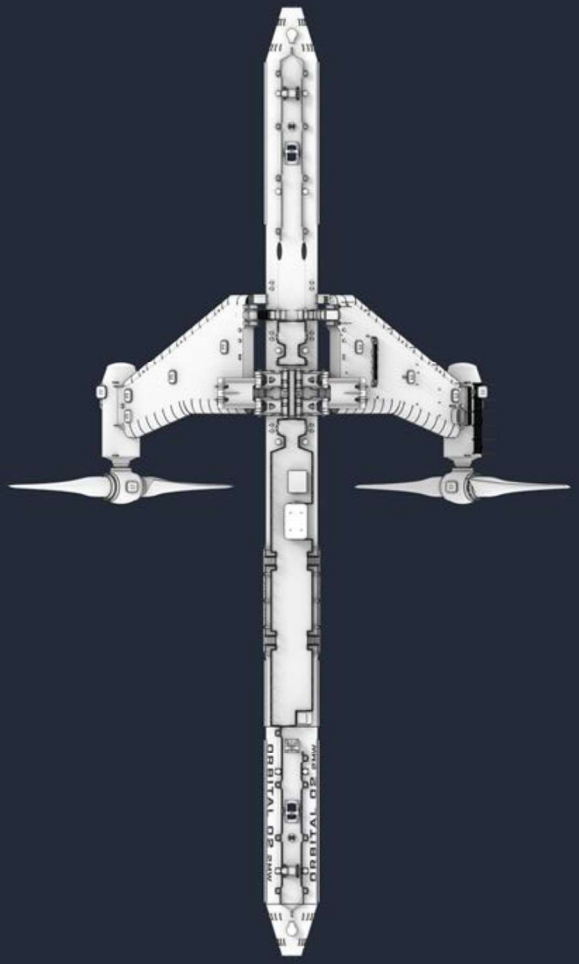

O2 in Build

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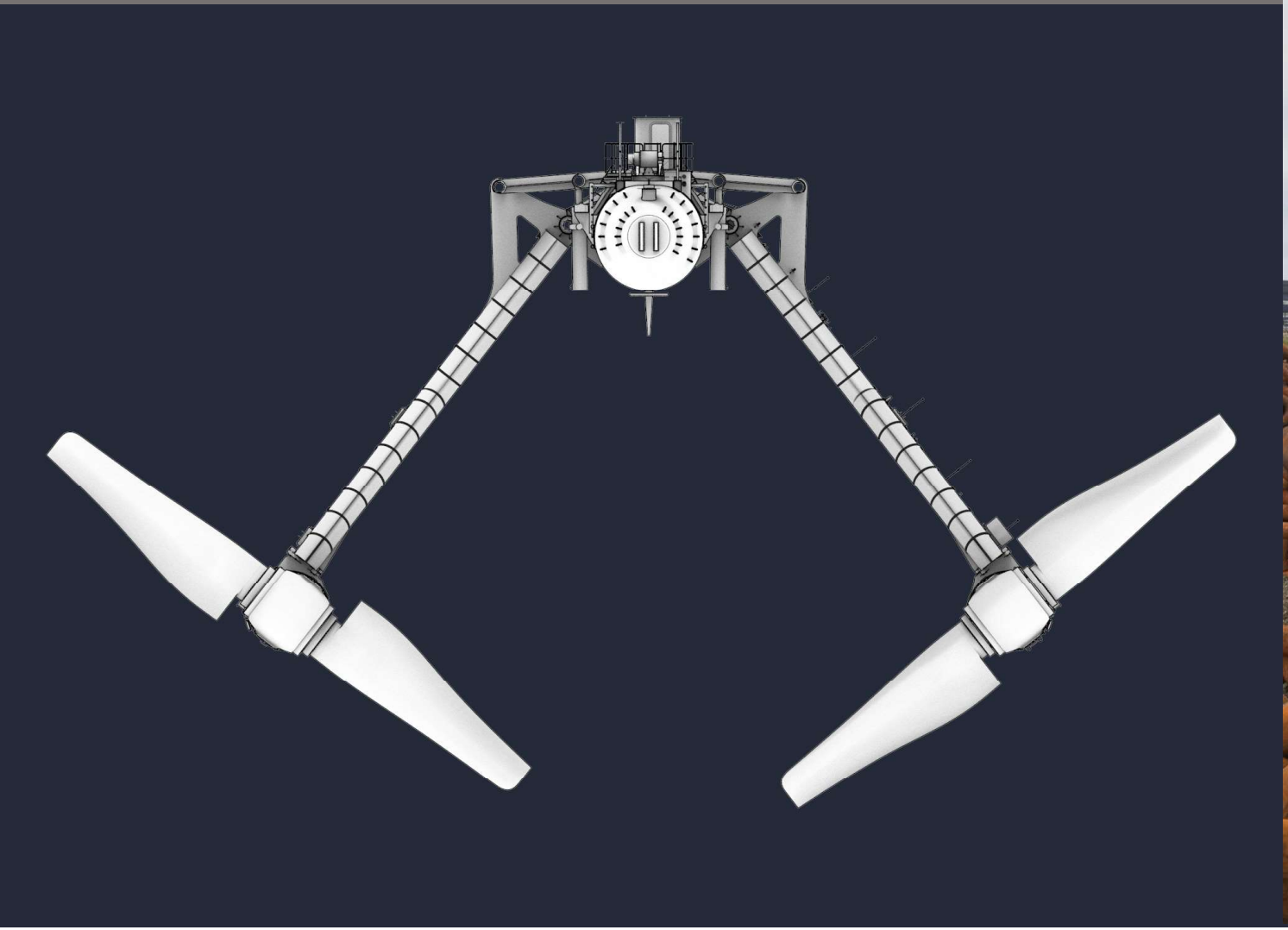

The Orbital Team

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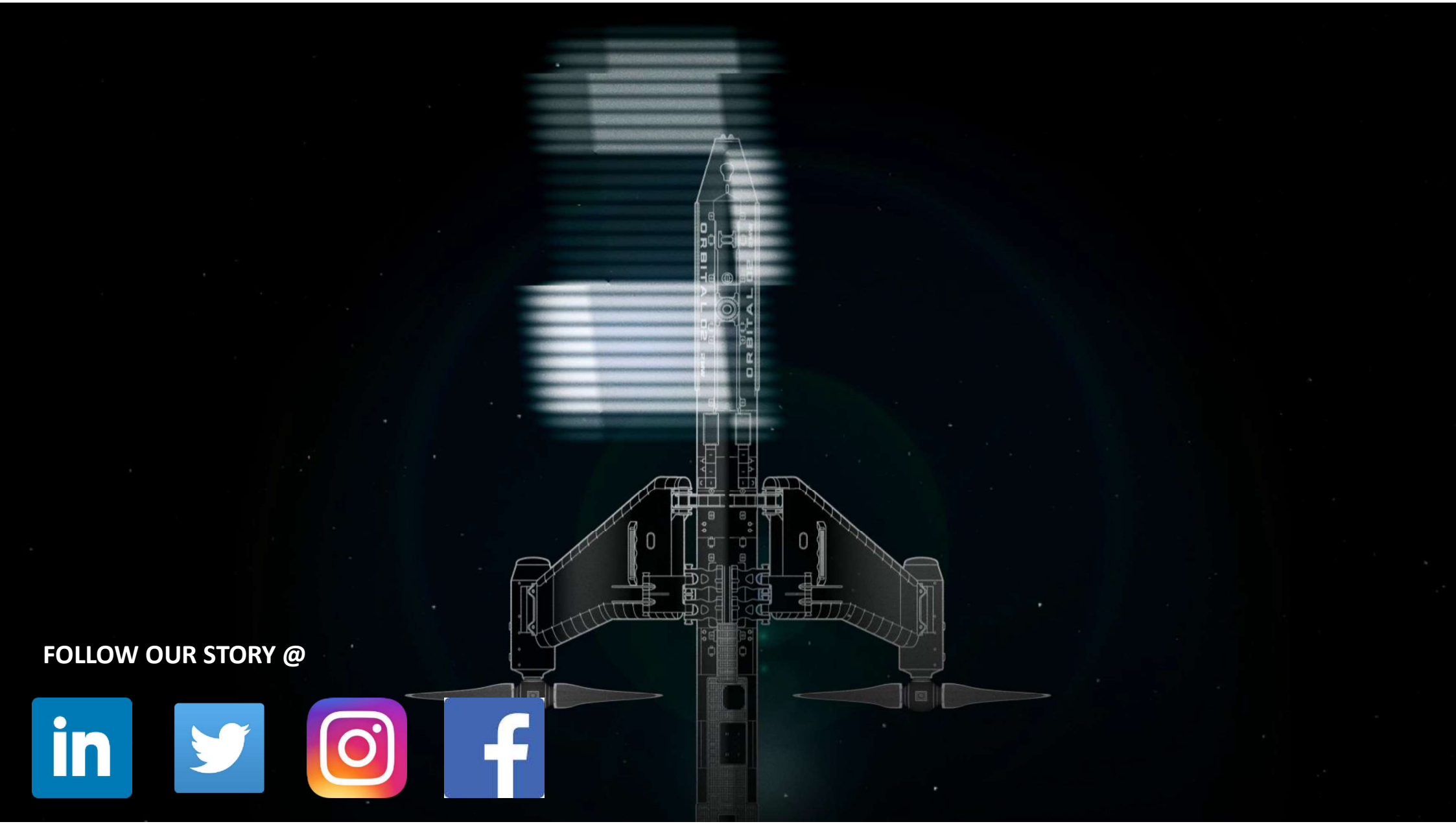
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HARNESSING TIDAL STREAM POWER FOR

A MORE SUSTAINABLE FUTURE

OPIN Webinar – 08/06/20

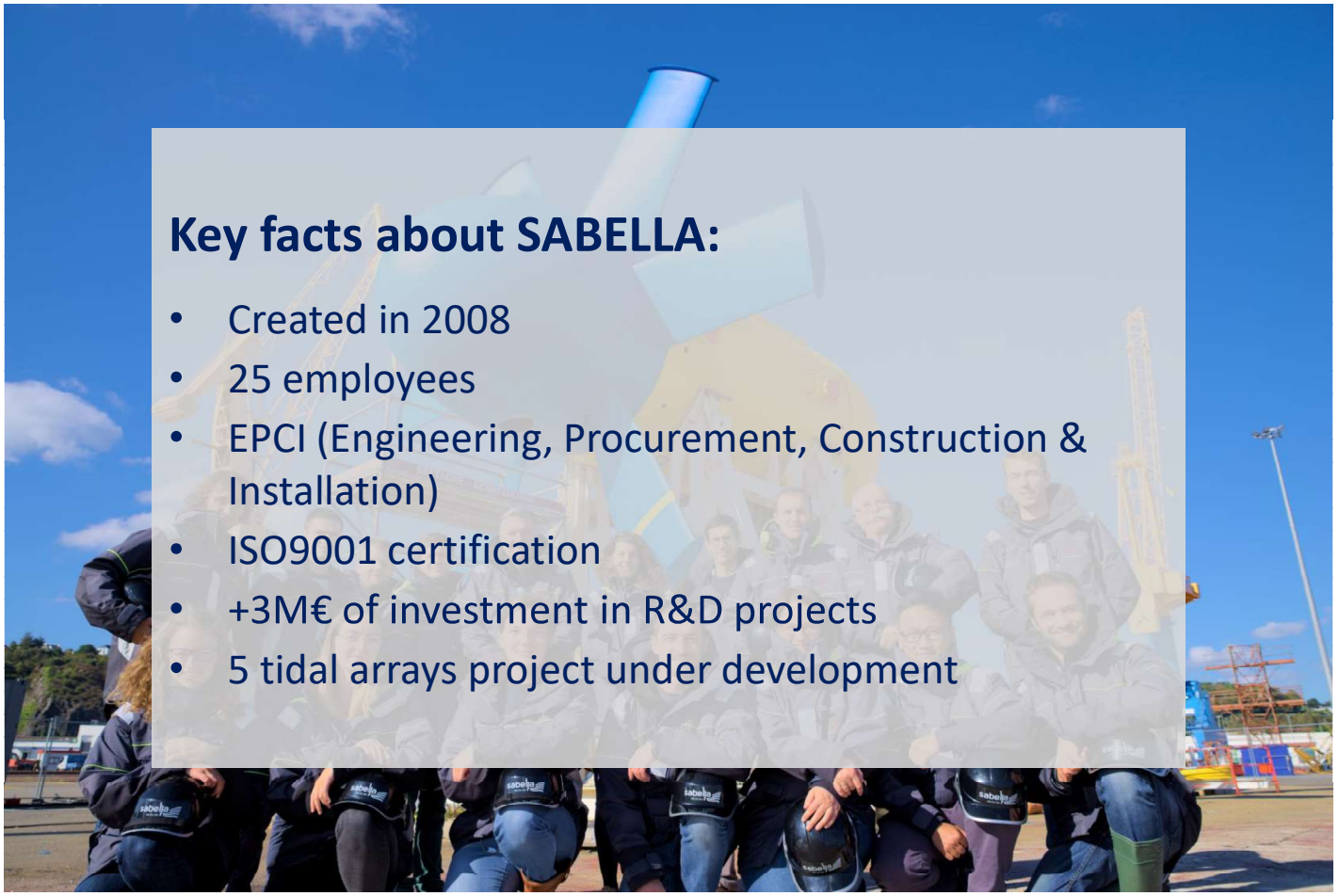
Marlène Moutel – business development engineer

THE COMPANY

SABELLA, driving force of the energy transition, 10 years of experience in ocean energy

THE COMPANY

SABELLA, driving force of the energy transition, 10 years of experience in ocean energy

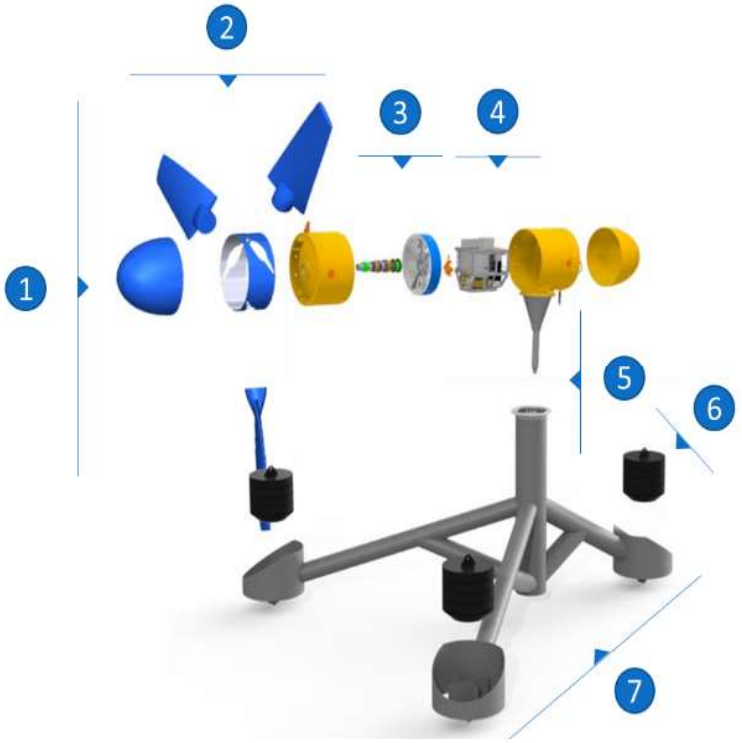


Key facts about SABELLA:

- Created in 2008
- 25 employees
- EPCI (Engineering, Procurement, Construction & Installation)
- ISO9001 certification
- +3M€ of investment in R&D projects
- 5 tidal arrays project under development

SABELLA TIDAL STREAM TECHNOLOGY

Simplicity, ruggedness and reliability



1. **Horizontal axis turbine**
   - ↳ Improved yield and proven design
2. **Fixed symmetrical blades and no yaw drive**
   - ↳ No complex electro-mechanical component
3. **Direct drive generator with permanent magnets**
   - ↳ No gearbox, no wearing parts, low rotation speed
4. **Inboard conversion and transformation**
   - ↳ Possibility to connect several devices to one export cable
5. **Modular architecture turbine/foundation**
   - ↳ Reduced installation and O&M costs
6. **Gravity-based foundation**
   - ↳ No seabed preparation, reversibility
7. **Bottom-fixed**
   - ↳ No visual nuisance, less interference with other marine activities

USHANT ISLAND – A CASE STUDY
Insular, off-grid and autonomous

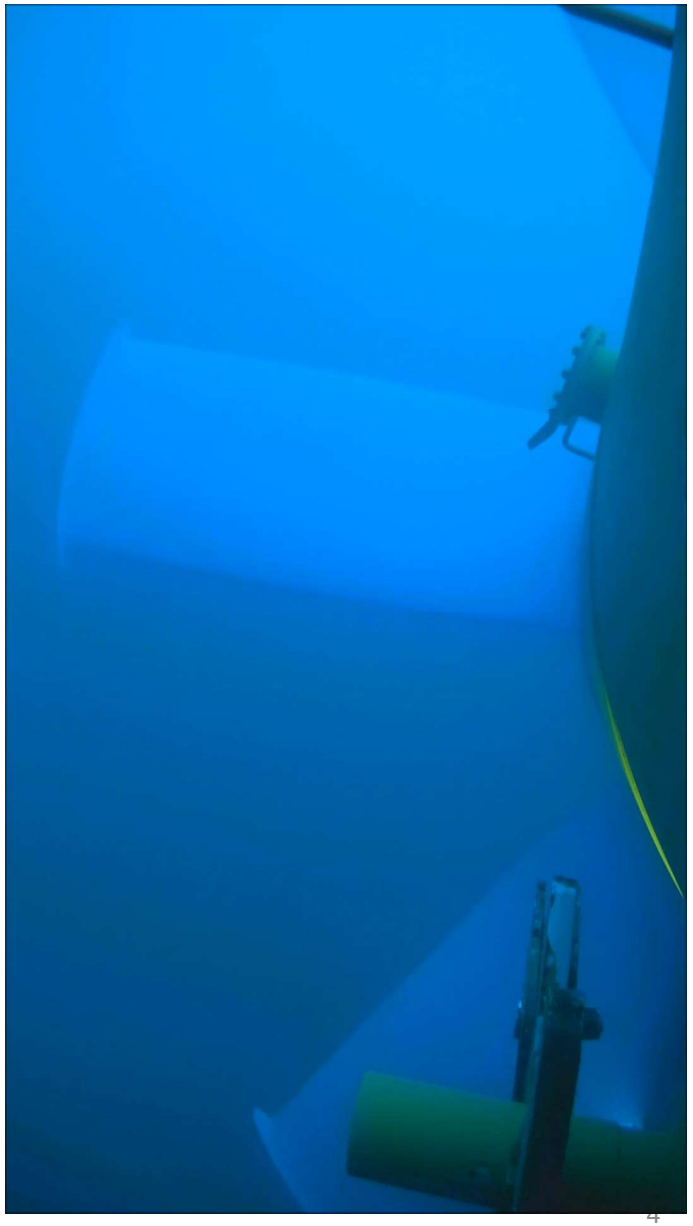
Ushant island
900 inhabitants – 4 Diesel power gensets
peak consumption 2 MW
7,000 MWh/year – 2 millions liters of fuel per year

SABELLA's projects at Ushant island
Deployment in the Fromveur passage – 55 meters deep
2 km away off the shore
up to 4.5 m/s (9 kt) current velocity

TIDAL TECHNOLOY DEMONSTRATION IN USHANT

Focus on remote and off-grid areas

- Supported by the French government and Brittany region
- 1 MW device of 10-meter rotor diameter
- 2015: deployment in the Fromveur passage and connection to the electrical network of Ushant Island, a weak and fragile off-grid network
- Operation and monitoring of the turbine during the 12-month authorized period
- First tidal turbine to have delivered energy to the French grid



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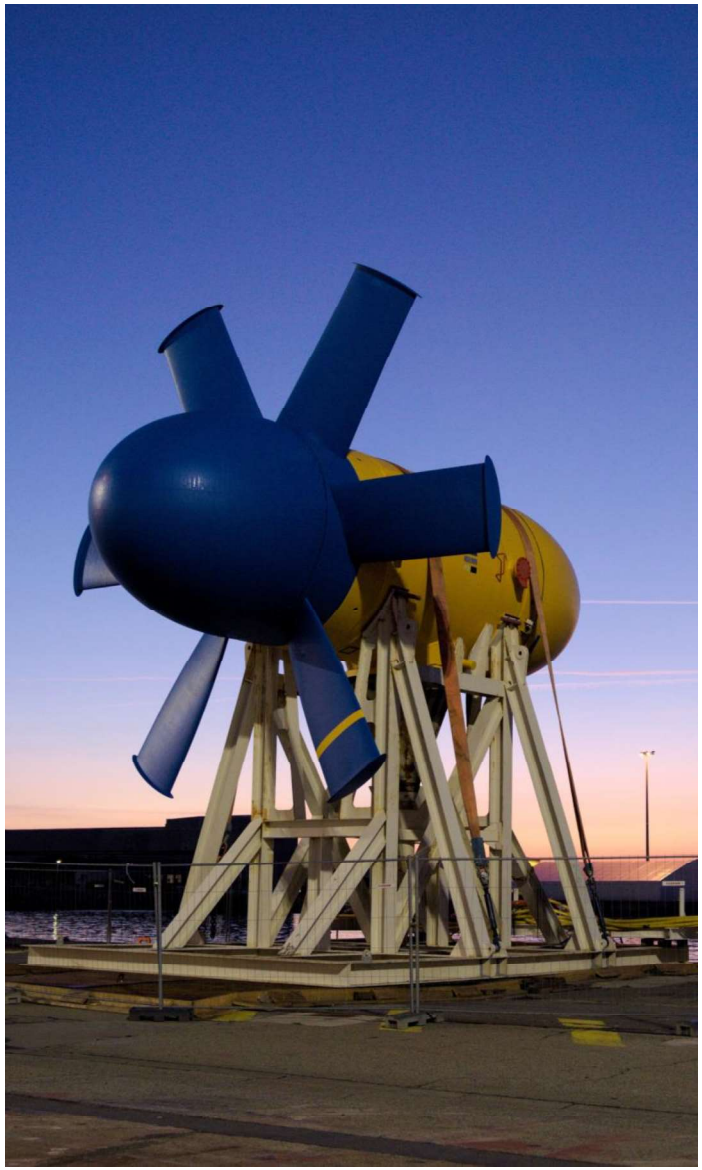
TIDAL TECHNOLOY DEMONSTRATION IN USHANT

Focus on remote and off-grid areas

- Onshore maintenance and optimization work: increase reliability and performance
- ICE project – Interreg: demonstration of D10-1000 up until 2021
- Next installation: Summer 2020 – delays due to COVID-19
- Return on experience: mechanical integrity, validation of electrical signal, optimization of environmental monitoring



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USHANT ENERGY TRANSITION
Environmental compatibility ✔

- Environmental monitoring protocol in collaboration with the **Iroise Marine Natural Park**
- Environmental study realized on each project's phase
- **Acoustic measurements with hydrophones** to measure the noise impact of the turbine
- Installation of **c-pods** to assess the behavior of marine mammals in different operation conditions
- Integration of feedbacks and concerns from stakeholders

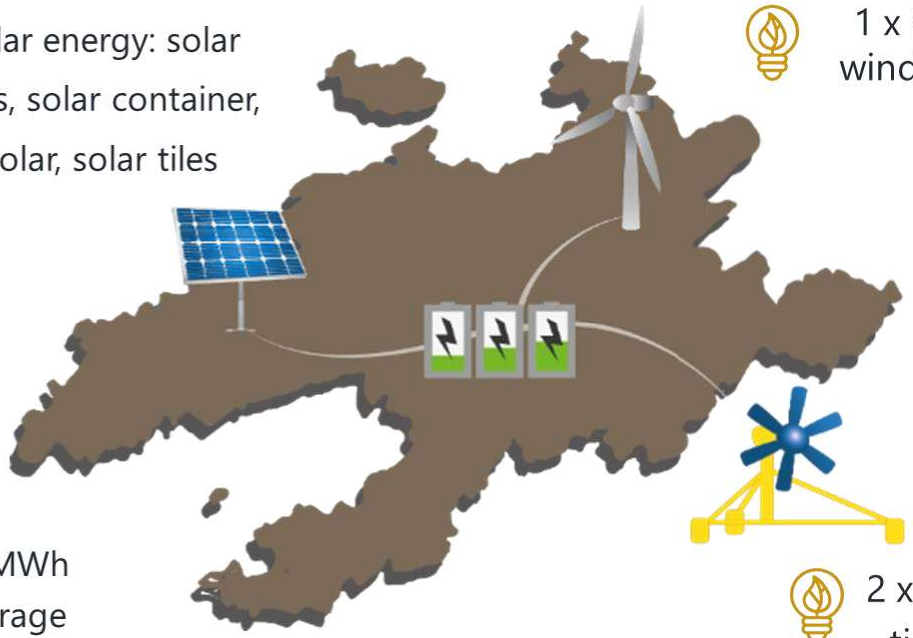
Environmental compatibility assessed during operation of both D03 and D10.

NEXT STEP FOR USHANT ENERGY TRANSITION

The PHARES project

500 kW solar energy: solar greenhouses, solar container, floating solar, solar tiles

1 x 900 kW wind turbine



2 MW / 2 MWh energy storage provided by EDF

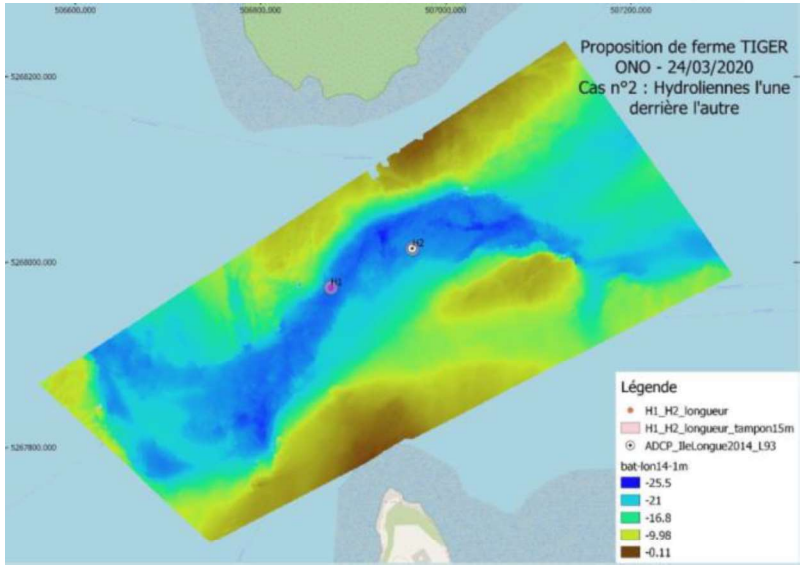
2 x D12-500 kW tidal turbines

akuoenergy

Entrepreneurs par nature

TIGER

Innovative technology and array demonstration

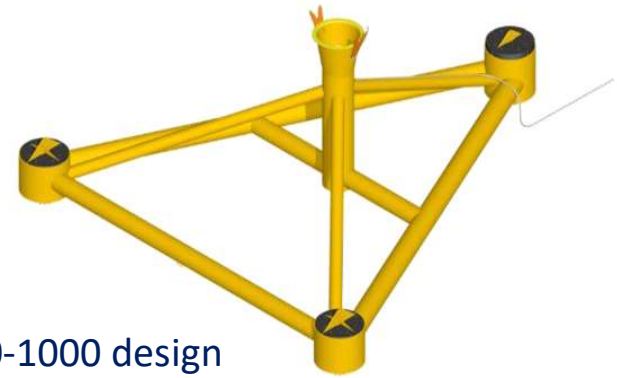


- Interreg funded project led by MHE
- Consenting and installation of infrastructure for a new tidal site in France, the Gulf of Morbihan
- Installation of two D08-250 tidal turbines
- Integration of innovation on sub-components of the devices
- Experiment on a site with specific characteristics: low bathymetry, high current velocity, close to the shore
- Engineering work in progress, commissioning expected in mid-2022

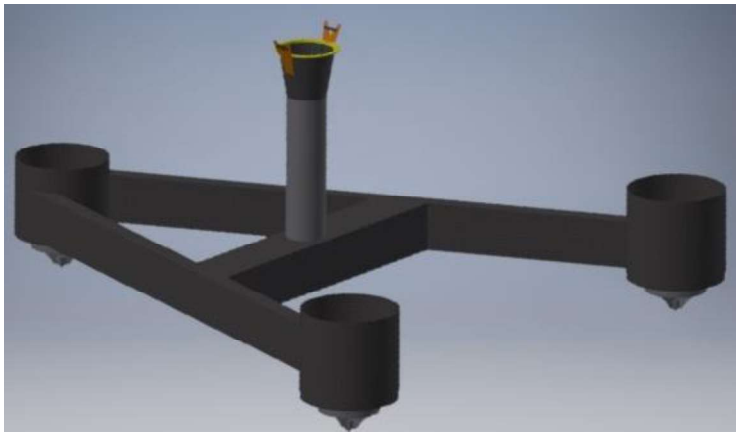
Interreg France (Channel Manche) England

EUROPEAN UNION
European Regional Development Fund

CF2T – OCEAN ERA-NET project
Competitive Foundation for Tidal Turbine



D10-1000 design



CF2T design in development

- 35-month OCEAN ERA-NET project managed by SABELLA
- Funded by the EU
- Development of a hybrid structure using steel and concrete
- Development of a modular interfaces to allow installation in several packages
- Implementation of a dedicated structure health monitoring

Main objective: **Reduce LCoE by lowering CAPEX and improve reliability**

Thank you for your attention !

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EMEC, Orkney:

World leading centre for wave and tidal energy development

Elaine Buck

Technical Manager

EMEC

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32 devices • **20** developers • **11** countries

Developer timeline

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Magallanes

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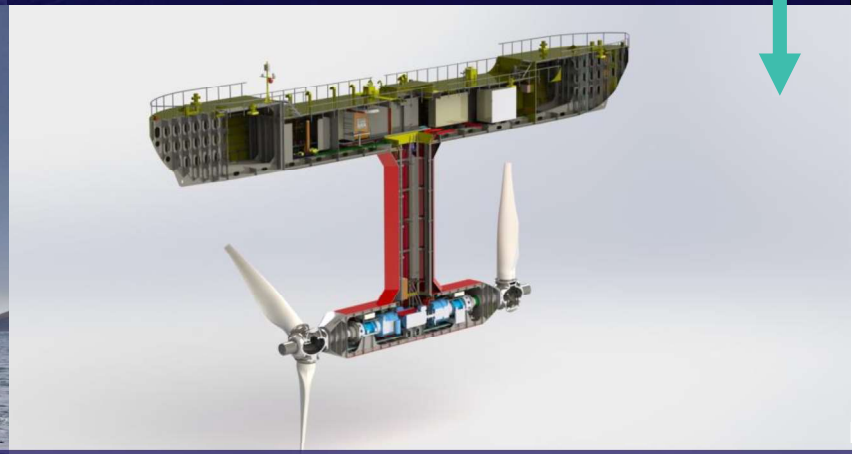
2014 | 1/10th scale

2018 | ATIR towed to EMEC

2019 March | 2MW connected to grid



Currently operating on site

Orbital Marine Power

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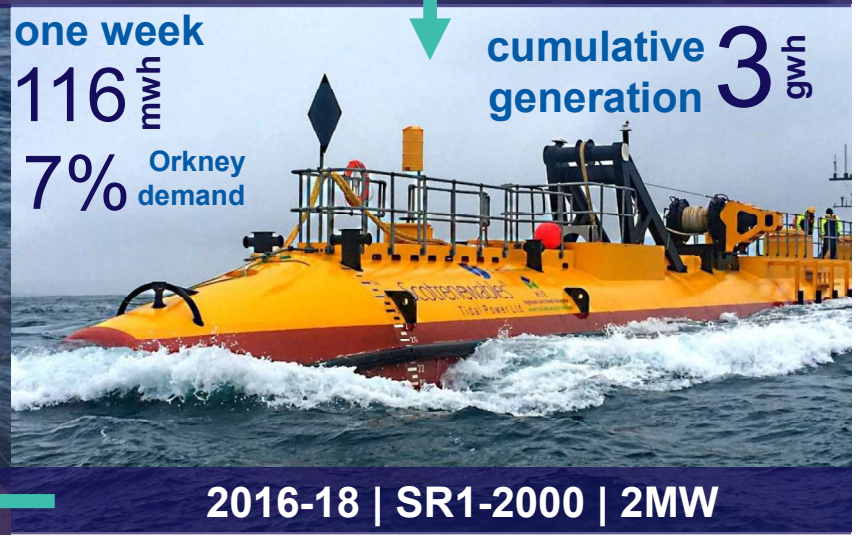
NTRE LTD

2010 | 1/5th scale

2011-13 | SR250 250kW

2020 | Orbital O2 | 2MW



2016-18 | SR1-2000 | 2MW

Real-sea learning & innovation

EMEC
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Installability +

Survivability +

Reliability +

Maintainability +

Operability

= Cost effectiveness

Accredited laboratory

EMEC
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Independent verification of performance data

EMEC is accredited to:

- ISO 17025
- ISO 17020

With:

- IMS: Integrated Management System Manual
- Standard Operation Procedures
- Emergency Response Procedures
- Marine Operating Guidelines

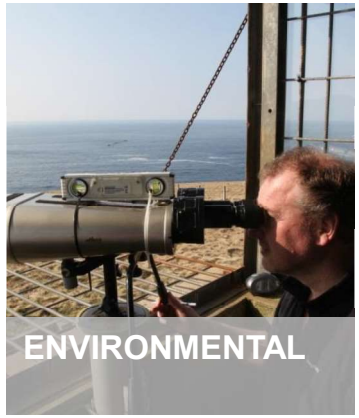
16 years' experience: Ocean energy projects

EMEC
THE EUROPEAN MARINE ENERGY CENTRE LTD

Interreg North-West Europe Marine Energy Alliance
Proto Atlantic
BLUEGIFT
Interreg North-West Europe FORESEA
MaRINET2
Interreg North-West Europe Ocean DEMO

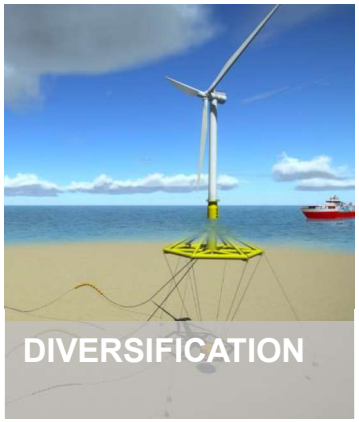
InToTidal
FloTEC
WaveBoost
ocean_2G

Interreg Atlantic Area MONITOR
RiaSoR2 RELIABILITY IN A SEA OF RISK



SEAWave

Interreg 2 Seas Mers Zeeën MET-CERTIFIED
RESOURCECODE MARINE DATA TOOLBOX



Interreg North-West Europe AFLOWT
ReFLEX ORKNEY

A GLOBAL CENTRE OF EXCELLENCE IN
MARINE ENERGY TESTING AND RESEARCH

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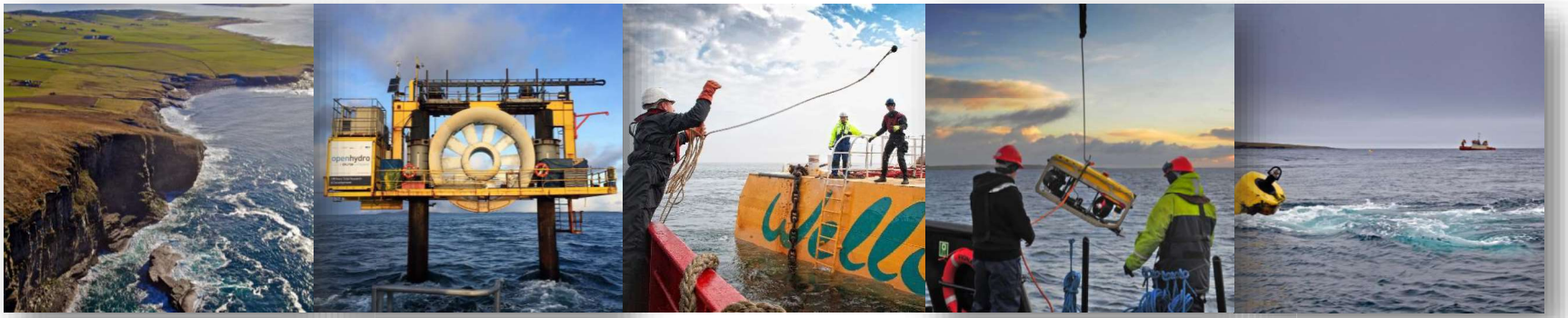

Support services to help develop the ocean energy sector

Orkney Islands Council · Highlands & Islands Enterprise · Scottish Enterprise · Carbon Trust · The Scottish Government · dti · Project Part-Financed by the European Union · European Regional Development Fund

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