



Understanding The Power of Tidal Projects

15 June 2023

sea
WORK MARINE
CIVILS
IN PERSON ONLINE

From CECA:

- **David Allen** - Executive Director CECA Southern
- **Peter Crosland** - CECA National Civil Engineering Director
- Members from the **CECA Flood & Marine and Environmental Sector Groups**

Our presenters & panellists:

- **Ian Dobson** -Director, Tilt/TPGen-24
- **Peter Crosland** - Regional Partnership Manager - Clean Maritime ORE Catapult
- **Capt. Martin Willis** - Executive Officer, UKHMA.

Agenda:

- Introduction to CECA
- TPGen24 Presentation -Tidal Island
- Offshore Renewable Energy Catapult - Overview
- Capt. Martin Willis, Executive Officer, UKHMA - Introduction
- Lunch & Networking

The Civil Engineering Contractors Association (CECA)

- Trade body for organisations who deliver, upgrade and maintain Infrastructure across Great Britain
- More than 300 members who deliver 70-80% of all civil engineering activity in UK
- Key sectors of transport, energy, communications, waste, water, flood and marine
- Employing c.250,000+ people and delivering around £15 billion of work every year
- CECA maintains close relationships with clients, governments, cross industry bodies and the media



- CECA Scotland
- CECA North West
- CECA North East
- CECA Yorkshire & The Humber
- CECA Wales
- CECA Midlands
- CECA Southern
- CECA South West

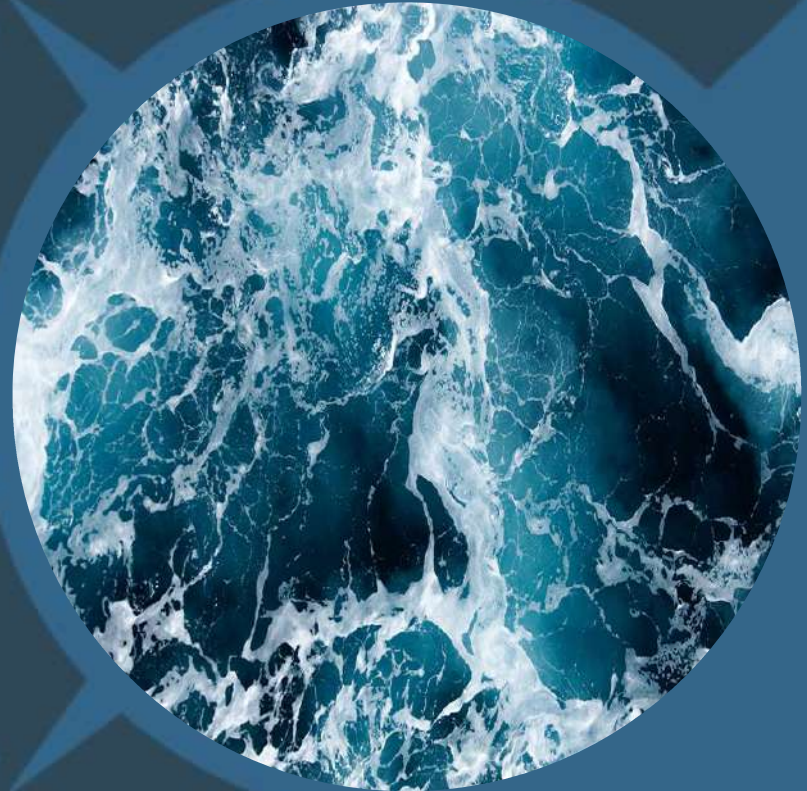
The Power of Tidal Projects

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Agenda

The Energy Mix debate

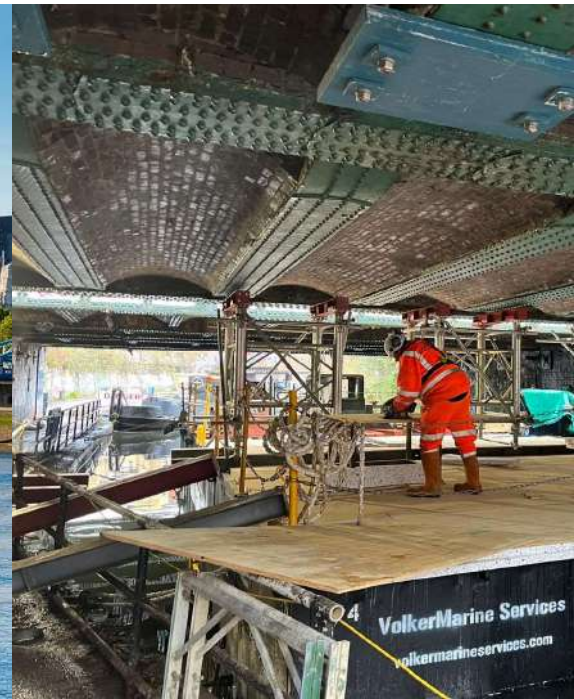
UK Tidal Schemes

What is TPGEN24?

Construction Challenges

Topic five





Wednesday, 14th June, 2023

Seawork 2023

Ian Dobson CEng MICE
Director
ian@tilt-ed.com



The Energy Mix Debate

Tackling the energy trilemma

Wednesday, 14th June, 2023

Seawork 2023

Energy Trilemma

Security

Energy security concerns have risen over the last year. This was brought about by high international gas and electricity prices, and the possibility of gas shortages during winter 2022-23, driven largely as a consequence of Russia's war in Ukraine.

Security also means reliability. Intermittency of renewable energy sources has major implications on the energy mix

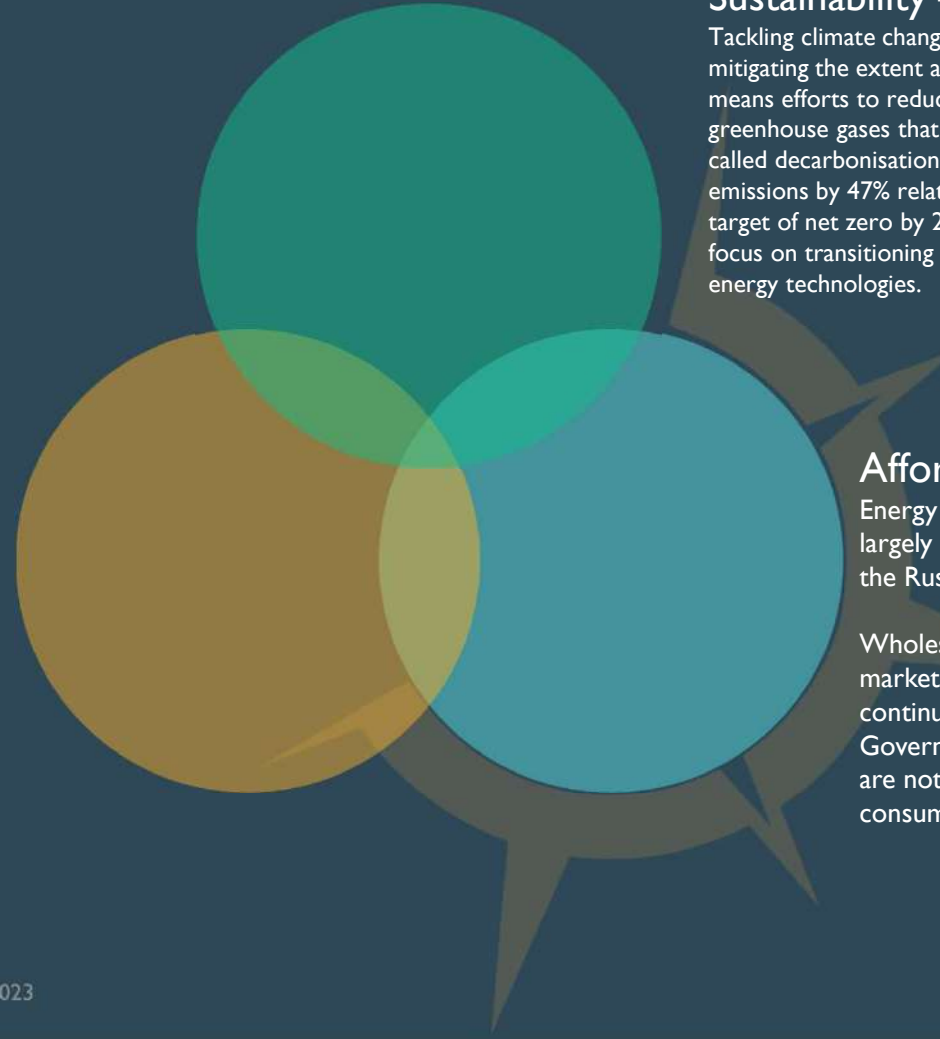
Sustainability – Net zero

Tackling climate change involves two strands of action: mitigating the extent and adapting to the impacts. Mitigation means efforts to reduce or prevent the emissions of greenhouse gases that cause climate change through a process called decarbonisation. The UK has already reduced domestic emissions by 47% relative to 1990 levels and has a statutory target of net zero by 2050. Efforts to mitigate climate change focus on transitioning from unabated fossil fuels to low carbon energy technologies.

Affordability

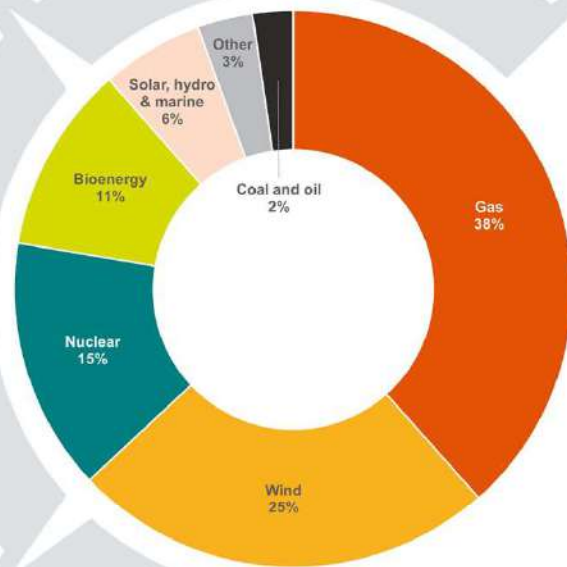
Energy prices rose substantially in 2022, driven largely by energy security concerns arising from the Russian invasion of Ukraine.

Wholesale gas and electricity prices on the spot market fell over the winter. If these lower prices continue they will cut the cost of the Government's energy bills support schemes, but are not expected to feed through to lower consumer bills until late 2023.



UK Energy Mix

Electricity Generation

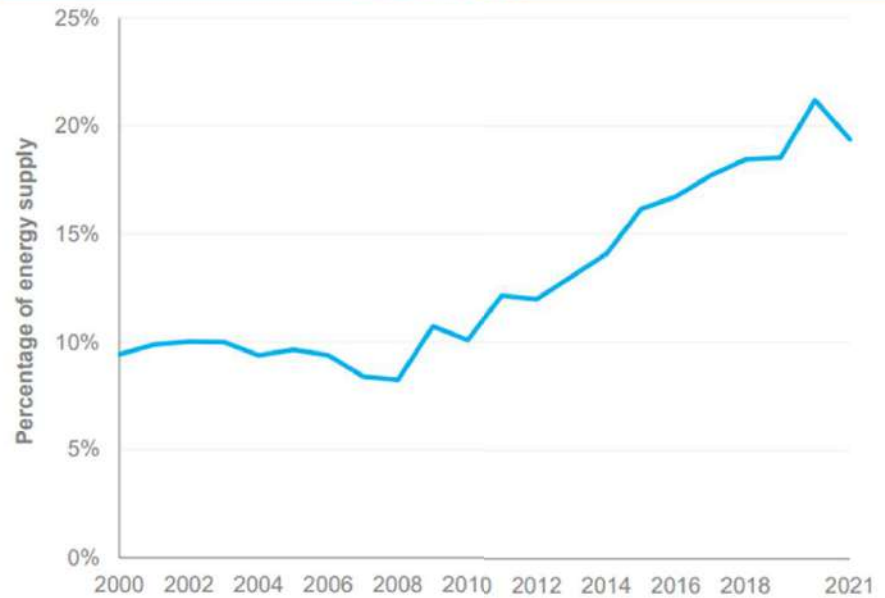


UK electricity generation, 2022

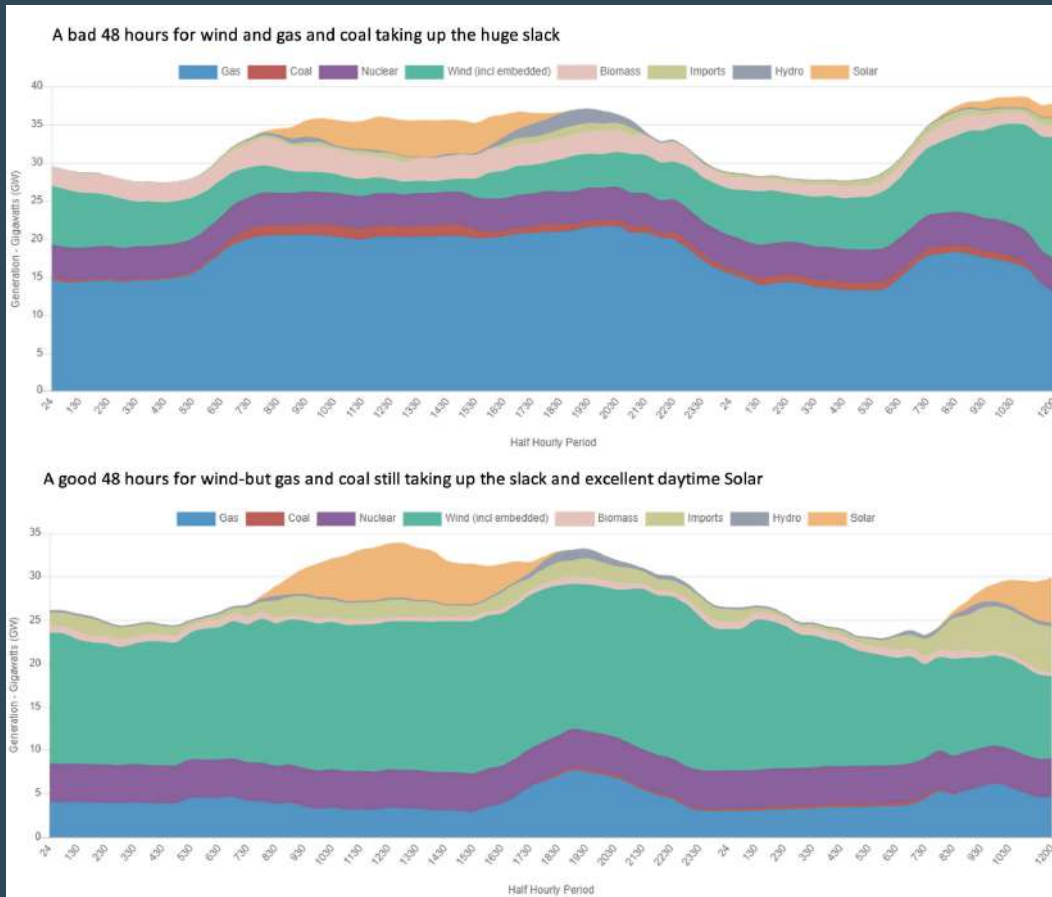
Source: Energy Trend March 2023 (DESNZ, 2023)

Total Energy

Proportion of UK energy supplied from low carbon sources, 2000 to 2021



The need for Base Load



British Energy Security Policy (April 2022)

“reduce our gas consumption by over 40% by 2030”

“deliver up to 50GW by 2030, including up to 5GW of innovative floating wind”

“increasing our plans for deployment of civil nuclear to up to 24GW by 2050 – 3 times more than now and representing up to 25% of our projected electricity demand.....subject to value for money and relevant approvals”

“doubling our ambition to up to 10GW of low carbon hydrogen production capacity by 2030”

A glaring omission was the potential contribution of tidal power!

Environmental Audit Committee (EAC) (January 2023)

“...tidal and other marine energy projects should be a vital component of the government’s strategies for delivering both net zero and energy security”

Tidal Power Projects

Tidal Stream

Potential to generate up to 34TWh/year (11% of current electricity demand from 11.5GW rated capacity).

LCoE is forecast to fall by at least 25% to £150/MWh

Next generation projects in development and construction incl. Orbital's floating tidal stream generator.

MeyGen – Phase 1 6MW Operational

Phase 2 – 28MW Awarded CfD @ £178/MWh

Phase 3 – 52MW Consented

Phase 4 – 312MW In Planning

Tidal Barrage

Severn Barrage – 8GW (10% of electricity demand) @ £150-£350/MWh

Mersey Tidal Scheme – ~4GW

Tidal Lagoon

Swansea Bay (Blue Eden) – 0.3MW

Various Severn Estuary





POWER TO CHANGE THE WORLD



TPGen24

Tidal Power : Clean, Perpetual, Base Load

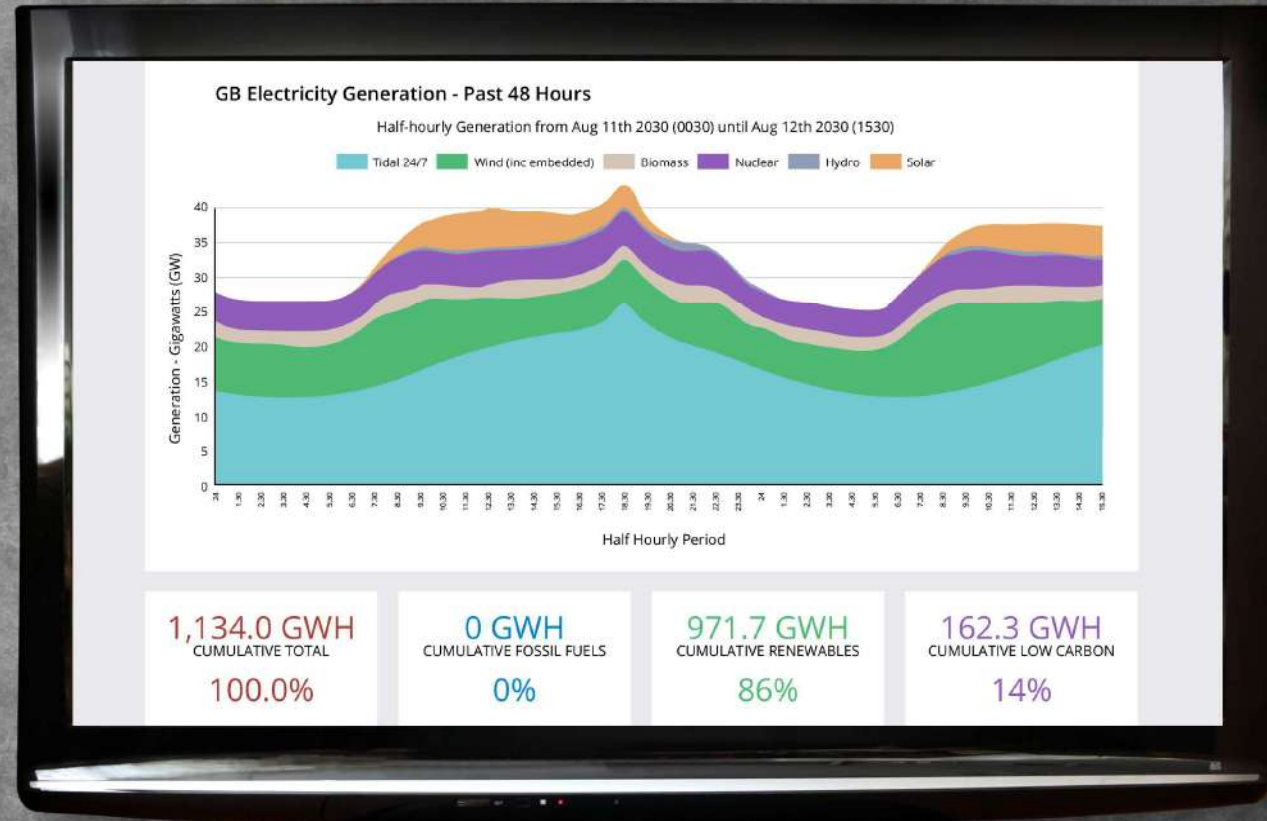
The UK's Energy dashboard

Good progress has been made, but we're **falling behind** target. Some targets unachievable without base Load renewables


40% of our energy comes from renewables


Gas, Coal and low carbon resources still account for **60%** of our energy generation

If we switched off the fossil fuel power tomorrow or in 5 or 10 years, we would **not have nearly enough electricity** to achieve base load-in order to meet demand



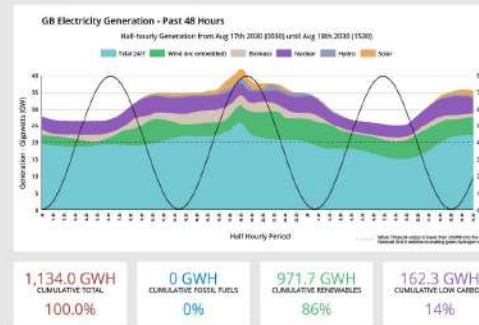
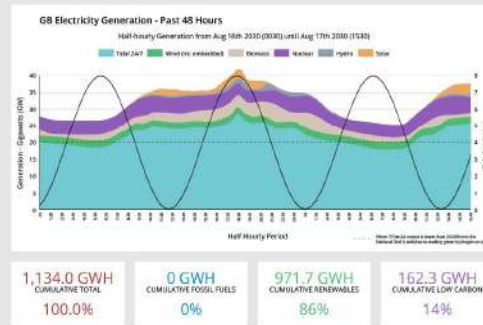
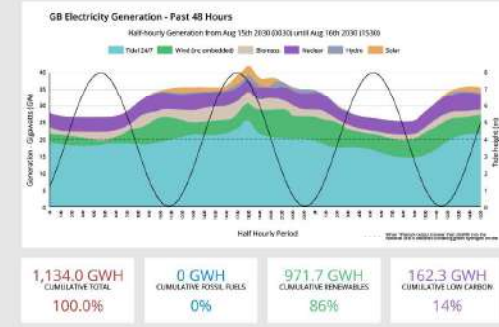
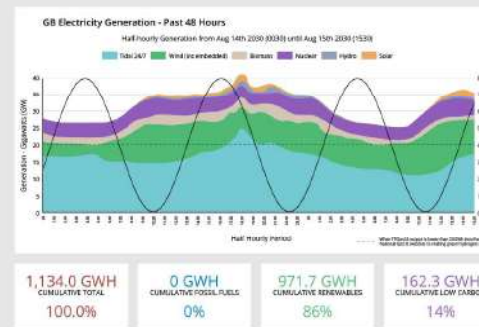
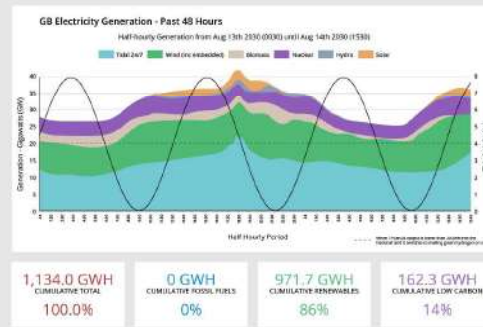
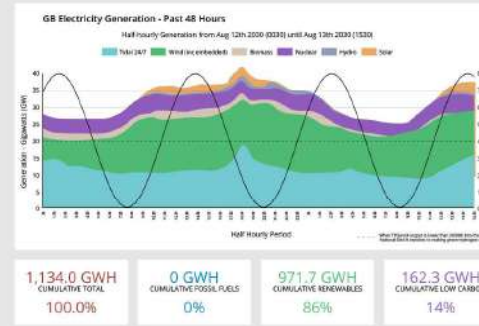
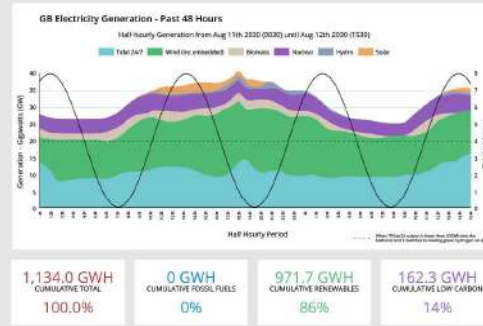
The potential of tidal for the UK

 Turbocharging UK tidal range

 'Water is Natures Battery'


 The UK is uniquely positioned to become a **world-leader** and pioneer in tidal range energy

 The sector is growing, with increasing interest from private investors



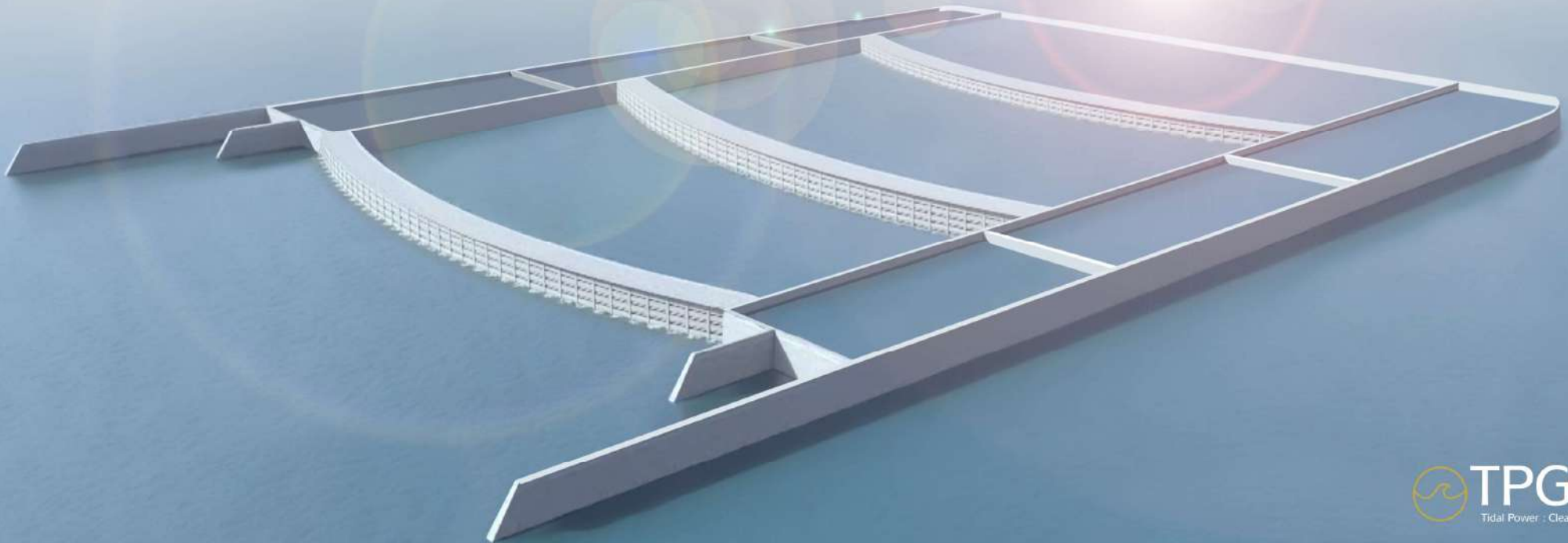
Introducing TPGen24

 The world's **first base load** renewable energy providing power 24/7

 A 100km² near-shore power island capable of generating the equivalent energy of **two nuclear power stations at a third of the cost**

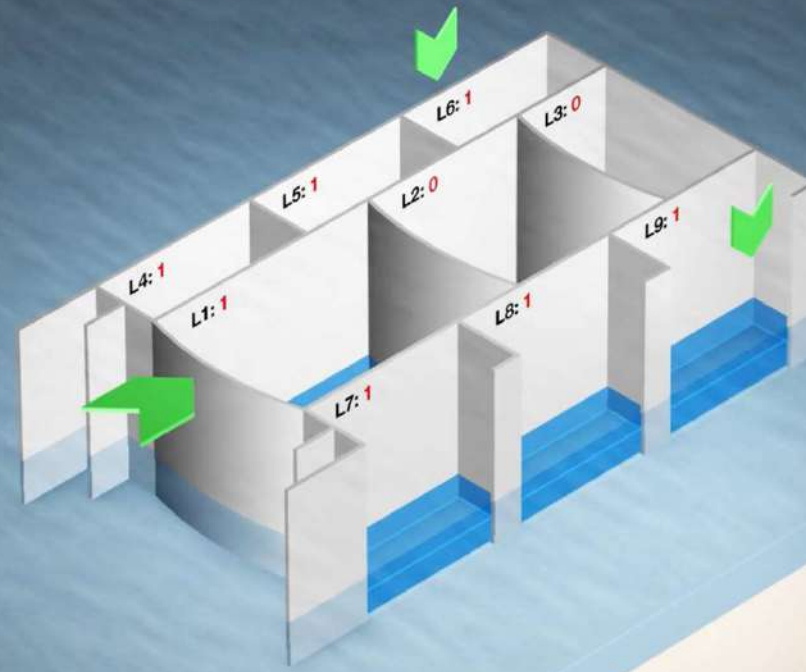
 The ability to **phase out fossil fuels** for electricity forever

 The potential to make the UK **100% energy self-sufficient** through renewable resources



How TPGen24 works

Stage 2



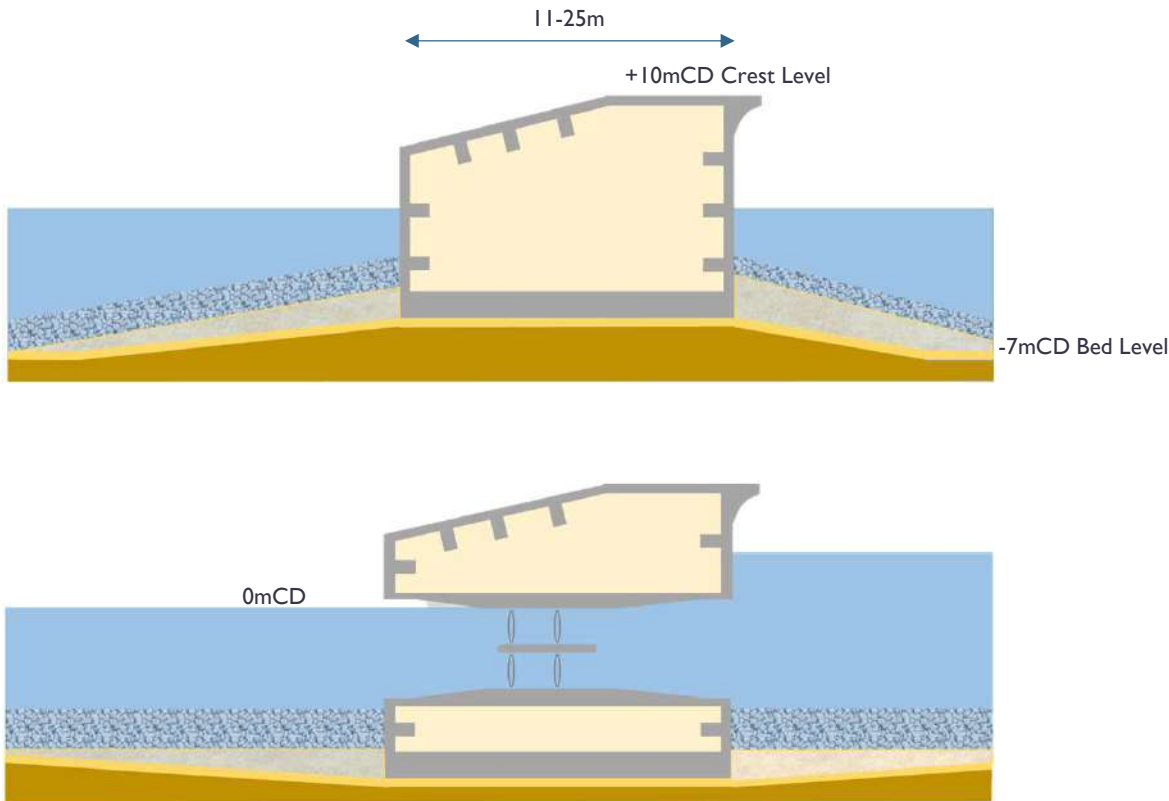
Fill cycle:

- High reservoir = Ocean
- Low reservoir = TPGen24
- L4 to L9 Lagoons emptying

Ocean: 2

24 hour operational cycle of a standard TPGen24 plant

Construction Methods



- Standard breakwater construction methods – precast caisson segments
- Opportunity to embrace multiple construction types
- Design life 120 years ++
- External walls versus internal walls
- Integral slow speed turbines optimised for 2-4m pressure head



Morecambe Bay






Ribble Estuary



Optimal locations

-  Lancashire/
Cumbrian Coast
-  Liverpool Bay
-  North Wales Coast
-  Severn Estuary
-  Channel Islands

TPGen24's Benefits

-  **24/7 green energy**, enough to power **over a million homes** and guarantee Base Load
-  Surplus energy generated will be diverted to produce **green hydrogen**
-  **Myriad socio-economic benefits** from greater employment opportunities to urban regeneration
-  **Energy self-sufficiency** for the UK, achieved through 100% Base Load renewables
-  **Enhance the natural ecosystems** of the local marine environment
-  Tackling climate change and bringing the UK closer to **Net Zero by 2050**

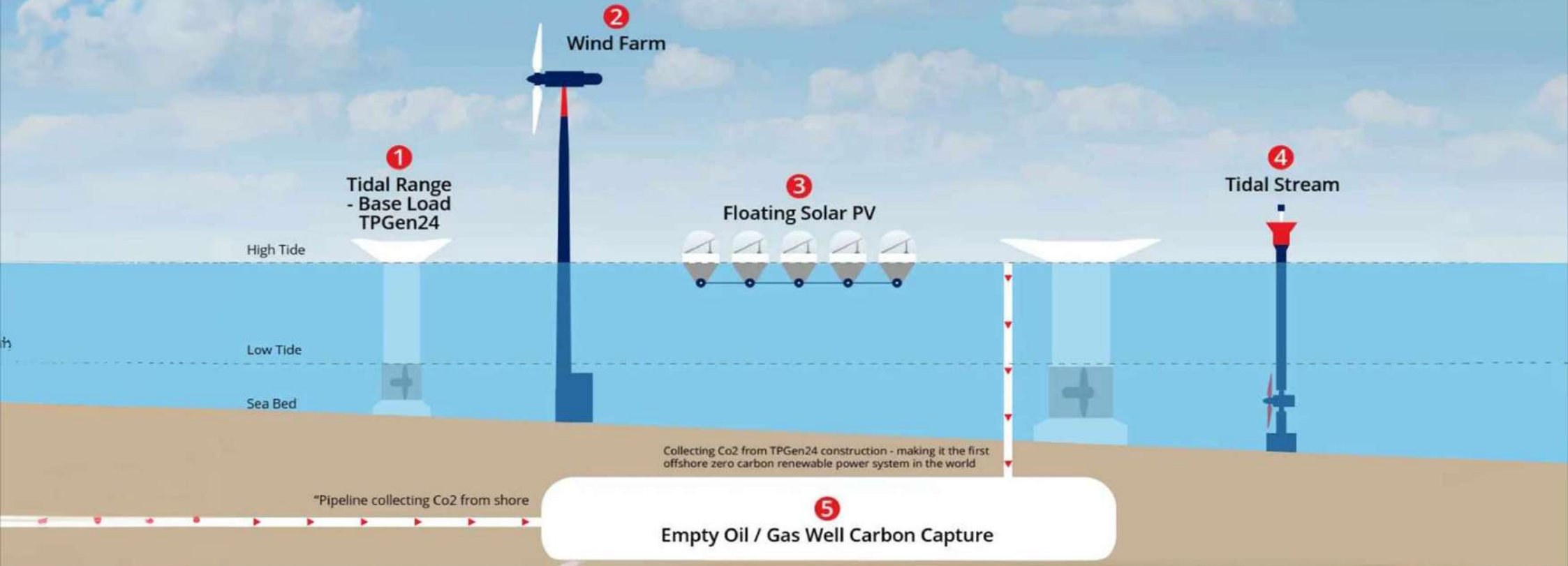
LIVERPOOL BAY POWER ISLAND

Currently we do not have, nor are we planning to introduce, a Base Load renewable energy source - and we have extremely limited onshore Real Estate available to generate electricity:

- **Onshore** - we have all of the original Base Load power sources such as Gas, Coal, Nuclear, Biomass and Hydro as well as renewables including/focusing on intermittent wind and solar, of which no two power sources occupy the same area of land.

- **Offshore** - a totally different story, because marine energy has so much more capacity and exceptional co-location opportunities which could provide up to five times more green renewable energy than anything on land.

- 1 **TPGen24 Power Islands** located offshore, around existing wind farms, can manipulate the huge tidal ranges found in Liverpool Bay to produce green renewable Base Load electricity 24/7.
- 2 Liverpool Bay already has one of the largest **Wind Farms** in Europe and National Grid connectivity.
- 3 **Floating Solar PV** fixed on calming pontoons with east/west sun tracking, located inside TPGen24 power islands to maximise Solar power and stability.
- 4 **Tidal Stream Turbines** could be installed inside and outside of the TPGen24 Power Island to take advantage of the high tidal currents.
- 5 **Carbon Capture** is ideally suited to disused gas and oil wells, under the seabed in these locations.

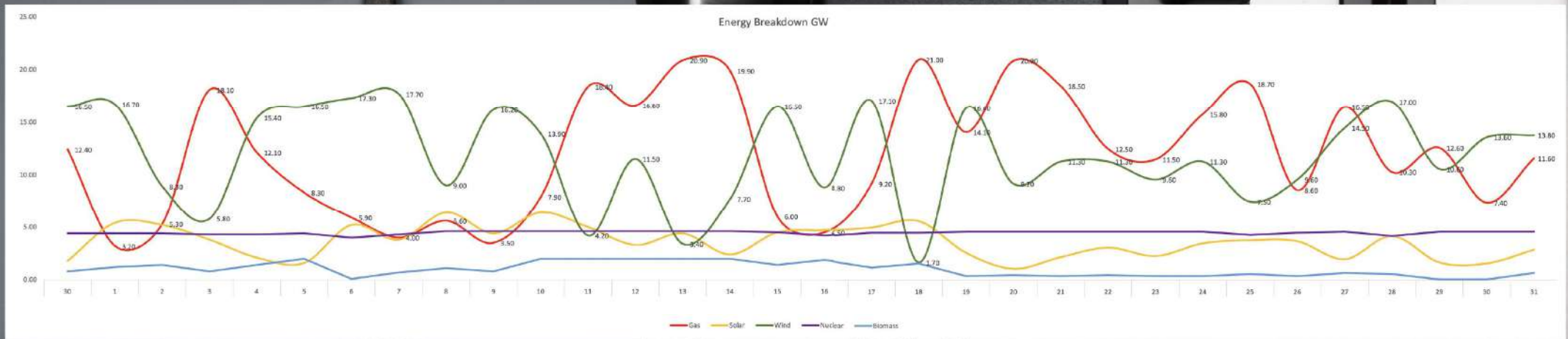


Challenges for Tidal Lagoons

TOO MANY TO LIST!

Challenges for Tidal Lagoons

- Government Policy – unlocking a funding vehicle for long term returns
- Environmental Impact – Complex large-scale impact on water flows over large footprint
- Capital Cost – Achieving value for money
- Optimising embodied carbon
- Construction
 - Supply chain to construct 75km of breakwater between 10 and 30km from the coast
 - Port facilities for fabrication and transport of precast units
 - Mass production of optimised turbines



Current Challenges



UK energy security has been compromised by the **Russia-Ukraine War**



The public face **soaring energy bills**, aggravating a growing cost-of-living crisis-electricity and fossil fuel vehicles -runs our entire economy



Our renewables infrastructure is **intermittent, and vulnerable** to meteorological droughts




We are still **tied to gas and coal** to prop up the grid and guarantee base load, hindering our ability to ever get to Net Zero



Government Energy Strategy is far too focused on intermittent resources and **short-term PR gains**



Tidal energy in the UK

 Unfortunately, tidal, one of our most plentiful resources, remains:

- **Untapped**
- **Underexplored**
- **Underfunded**

And it's **unbelievable!**



Progress to Date

-  **Steering committee established**
-  **Privately-funded** feasibility study in progress (Q.2 2023 completion)
-  **CapEx and OpEx** costs currently being calculated (Q.2 2023 completion)
-  **Project management**, civils and M&E partners secured
-  **Engagement** with Mersey Tidal Project to join technical assessment programme



If you have any questions or would like to express an interest in becoming involved in the TPGen24 renewable energy project, please contact:

Stuart Murphy Mobile +44 (0)7836 771488 Email s.murphy@tidalpower24.com
Paul McDermott Mobile +44 (0)7595 884830 Email p.mcdermott@tidalpower24.com



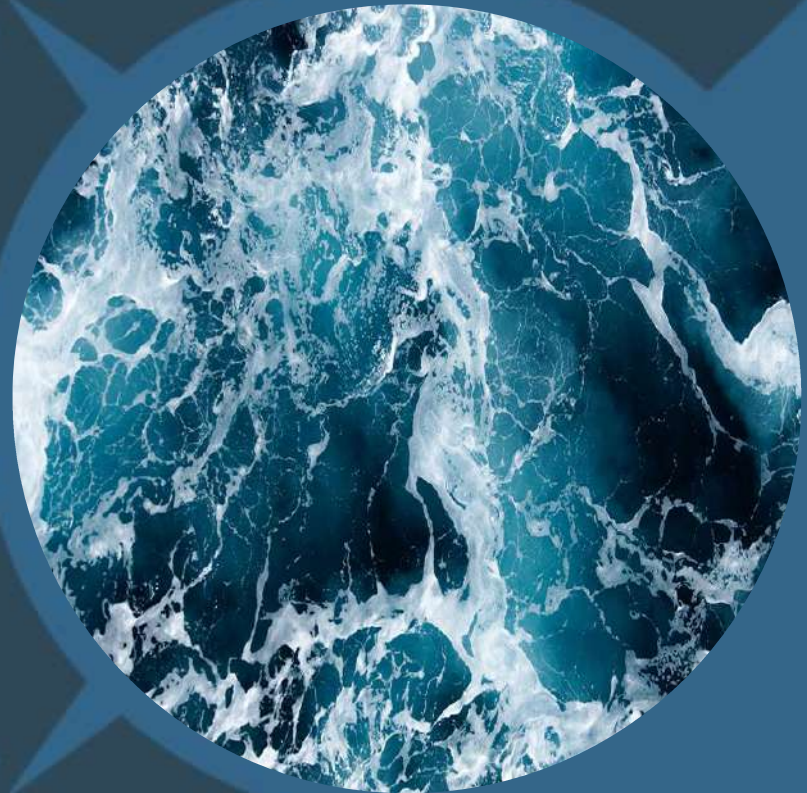
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Tidal Stream Industry Energiser project - TIGER

David Cooper – ORE Catapult,
Regional Partnership Manager
SeaWork Marine Exhibition,
Southampton
14th June 2023,

TIGER TIDAL STREAM
INDUSTRY
ENERGISER

sea
WORK MARINE
CIVILS
IN PERSON ONLINE

Interreg 
France (Channel) England
European Regional Development Fund

David Cooper

ORE Catapult: Regional Partnership Manager



David has worked at ORE Catapult for 2 years since joining the organisation on completion of his Masters in Sustainable Energy at Cardiff University. He works with organisations across the country with innovative offerings in the sector, with a particular focus on maritime decarbonisation.

David will be giving a general market update for offshore renewables and then focus in on marine energy, tidal stream in particular which now has ringfenced access to CfDs. He will then highlight some of the work we have published on energy system benefits of tidal stream and the opportunity it presents for the future energy system.

Offshore Renewable Energy Catapult

Our Mission:
deliver the UK's largest clean growth opportunity by accelerating the creation and growth of UK companies in offshore renewable energy.

1. 306 engineering & research experts with deep sector knowledge
2. Independent and trusted partner
3. Work with industry and academia to commercialise new technologies
4. Reduce the cost of offshore renewable energy
5. Deliver UK economic benefit



Before TIGER (run up to 2019)

- Governments had little confidence in tidal stream technology
- No UK or FR energy generation revenue stream for tidal stream, so no route to market
- Industry therefore struggling to attract investment
- No commercial insurance products
- Tidal sites gone into hibernation
- The tidal sector was on its knees

What is the TIGER project ?

TIGER TIDAL STREAM
INDUSTRY
ENERGISER

Interreg 
France (Channel) England
European Regional Development Fund

TIGER: 18 Partners, led by ORE Catapult



TIGER TIDAL STREAM
INDUSTRY
ENERGISER

Interreg 
France (Channel) England
European Regional Development Fund

TIGER (Tidal stream Industry EnerGiser Project)

- TIGER is a €48.4m (€29.9m ERDF), 4-year project, with 17 partners, approved 2 Jul 2019, extended 6 months from End Mar 23 and now completes Jul 23
- projects, installing new tidal turbines at 5 sites across the UK/FR Channel region, developing a broader UK/FR supply chain, UK/FR trade body alliance and evidence of cost reduction across the tidal sector
- Funded through the [Interreg France Channel \(Manche\) England programme](#), a collaborative cross border project
- Led by ORE Catapult from its regional office in Hayle, Cornwall, UK.
- Comprises a portfolio of 6

TIGER (Tidal stream Industry EnerGiser Project)



Cambrian Offshore

- Refurbish or replace Delta Stream and foundation structure. Redeploy in 2022.

Hydroquest

- Turbine testing at Paimpol-Bréhat in 2020/21
- New 3MW turbine design in progress for deployment in 2023

QED(Naval)

- Sub hub proving trials Isle of Wight in Autumn 2021
- Design work started on industrial scale Sub hub platform

Normandie Hydrolienne

- Consenting at Le Raz Blanchard for deployment in 2023/4
- New 3MW turbine design underway, largest rotor

Orbital

- New platform and turbine design underway
- Targeting deployment at a TIGER site from 2027/28

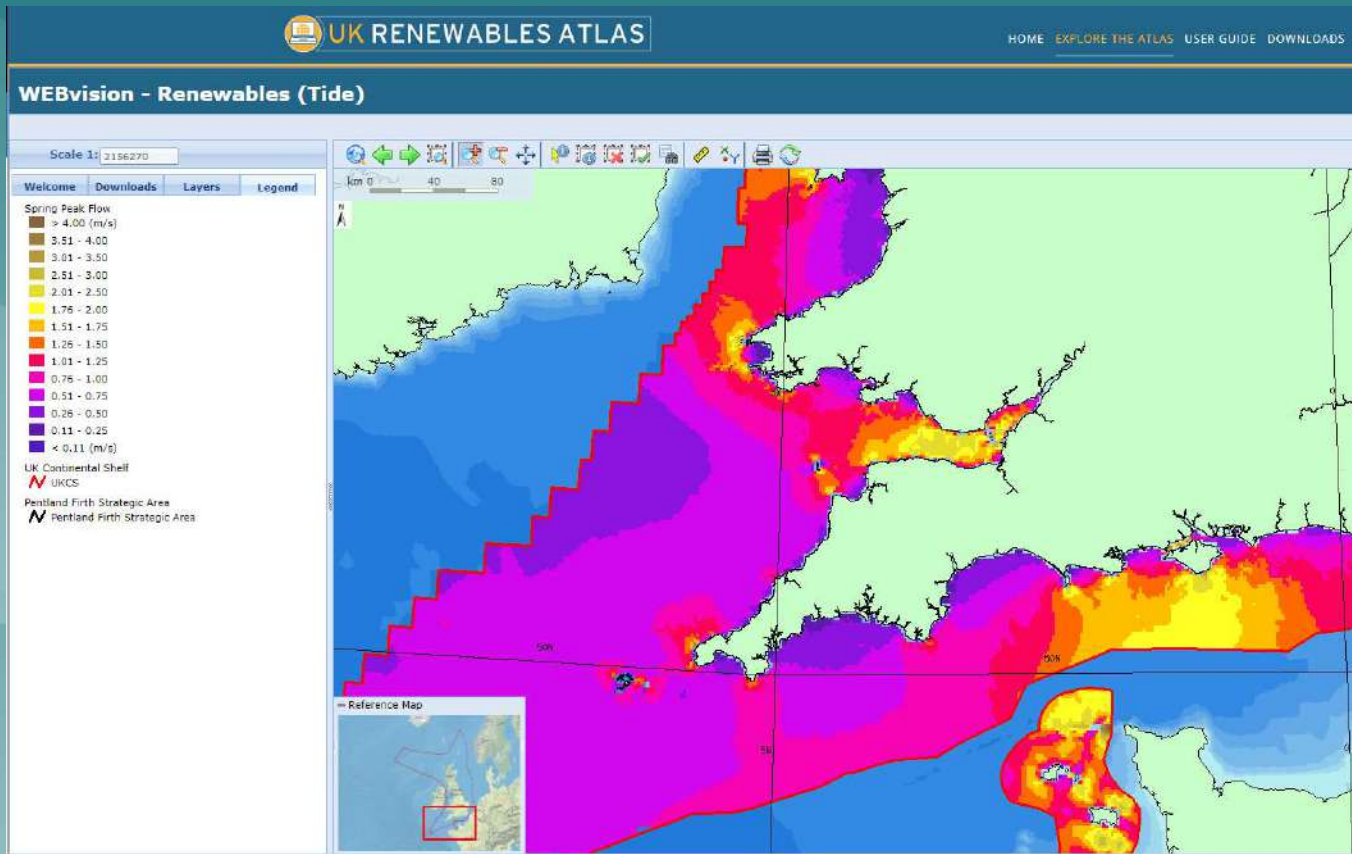
MHE56

- Sabella - new rotor and turbine design
- Deployment in 2022

MINESTO

- Consent and infrastructure planning for deployment at Paimpol-Bréhat in late 2021

Tidal Stream – A South West opportunity



Source ABP Mer UK Renewables Atlas

TIGER TIDAL STREAM
INDUSTRY
ENERGISER

Interreg 
France (Channel) England
European Regional Development Fund

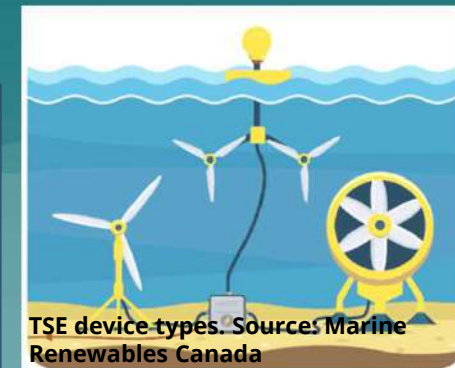
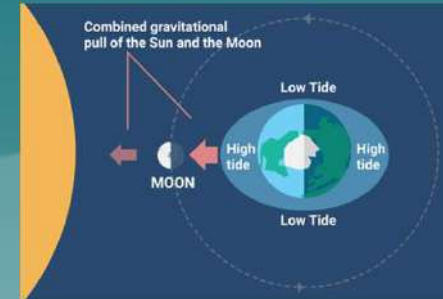
What we did.....

TIGER TIDAL STREAM
INDUSTRY
ENERGISER

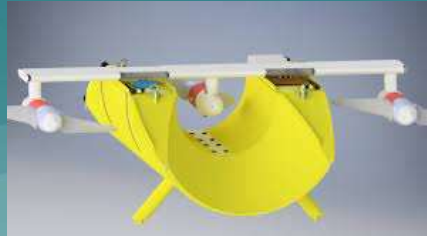
Interreg 
France (Channel) England
European Regional Development Fund

TIGER explained tidal stream energy

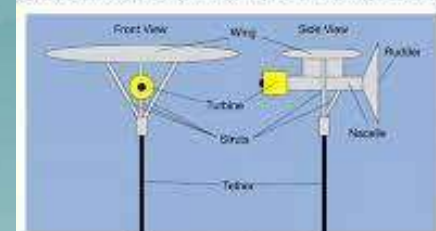
- Electricity generated from tidal currents
- Analogous to “underwater wind turbines”
- UK: 11.5GW potential, 11% of electricity demand, up to 6% in France
- 10.5MW deployed in UK providing reliable power into UK grid for over a decade
- UK Contracts for Difference, Allocation Round 4: 40.8MW awarded CfD, £20M per annum ringfence



We supported installation of 6 different types of tidal turbines



(a) Diagram showing the operation of the Deep Green tidal kite



(b) Schematic of Deep Green

EDF, SEENE OH, BDI

High-Resolution Bathymetry



Bathymetric data acquisition

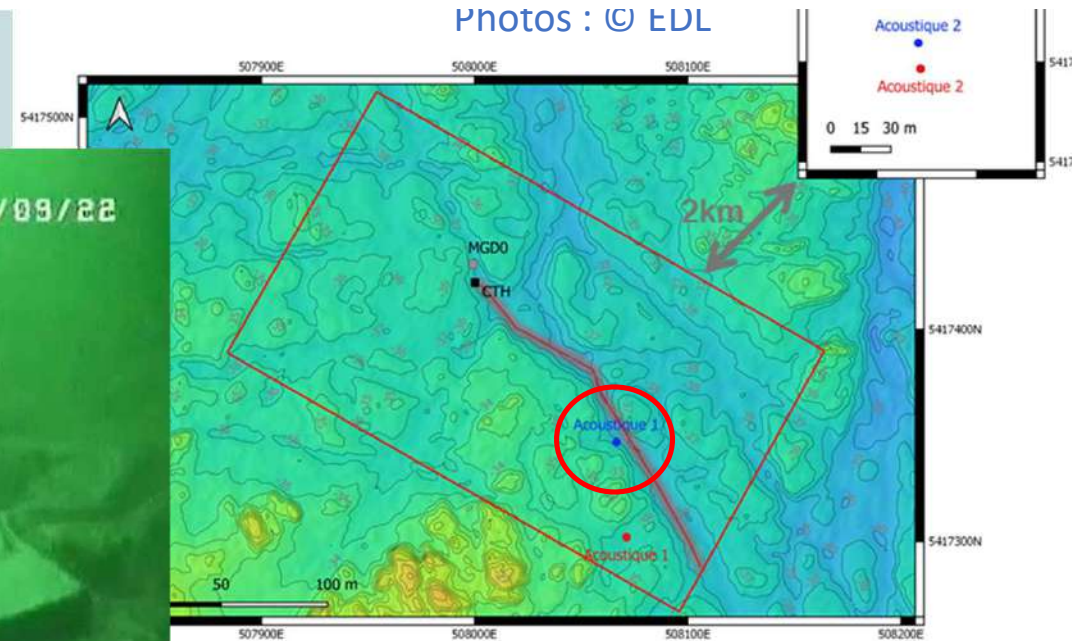


Station n°1: sound monitoring + sea mammals detection



Acoustic station maintenance

Hydrophone and recorder recovery



Stations 1 & 2 installed in Sept. In consented area
Red: theoretical position; Blue: actual position



Dolphins observed on site during the maintenance

TIGER issued Technical Journals

- Target 48
- 44 papers on website
- 46 listed on tracker
- 4439 downloads



TIGER validated tidal stream cost reduction potential

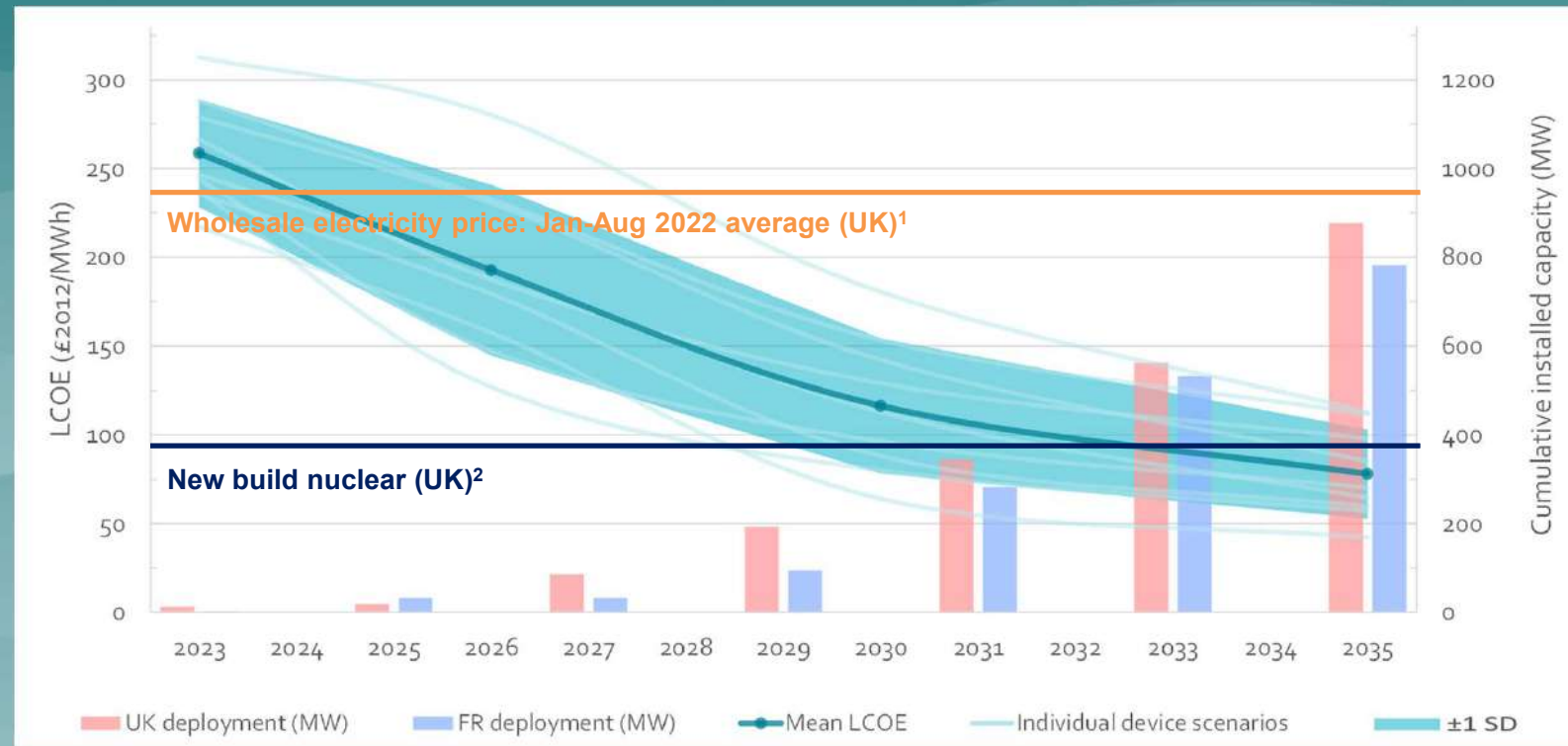
“Present”: £259 ± 30/MWh

2026: £193 ± 48/MWh

2030: £116 ± 38/MWh

2035: £78 ± 25/MWh

2045: £45/MWh ??

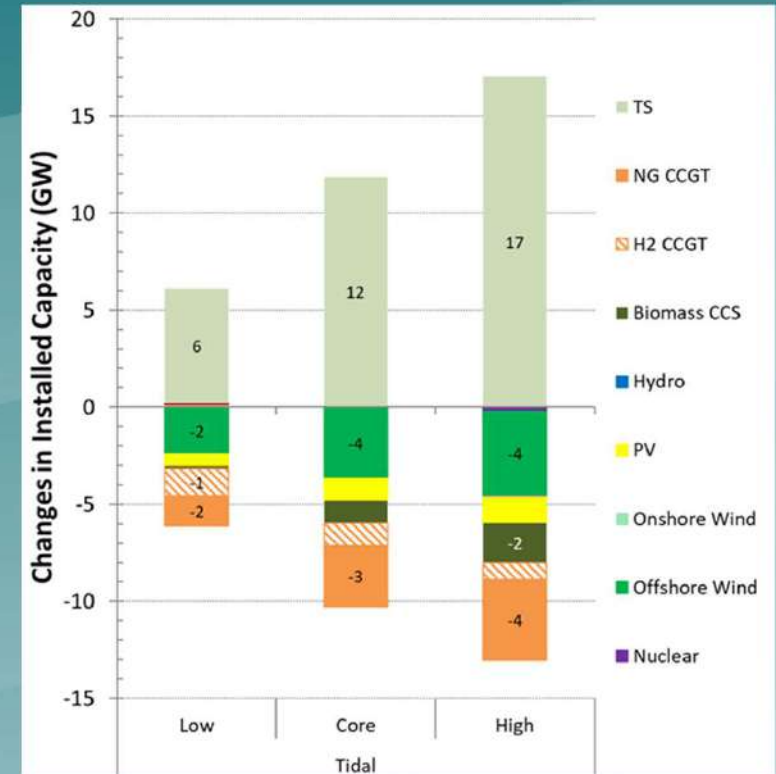


¹ Forward delivery contracts, weekly average. Published by Ofgem (<https://www.ofgem.gov.uk/energy-data-and-research/data-portal/wholesale-market-indicators>)

² Based on "first of a kind" new nuclear published by BEIS (Electricity Generation Costs 2016)

TIGER quantified the energy system benefits

- OREC led study examined 2050 net-zero energy system
- Modelling by Imperial College London (IWES model)
- Study found that:
 - **10.5GW of TSE could provide £2bn of gross cost savings (excluding subsidy)**
 - Including cost of TSE, **TSE could provide net savings of £100-600M** depending on scenario
 - **Low wind year: cost savings increase by ~50%**
 - **40% reduction in CCGT (gas)** for net-zero system
- Results in agreement with other studies (e.g. EVOLVE project, modelling led by University of Edinburgh)



TSE displaces both renewable and non-renewable sources

TIGER Other activities

- **Website:** online presence, educational & closure videos available
- **Project Partner collaboration:** consenting lessons, cable routing, blade pitch control
- **Site data gathering:** data centres established at each tidal site
- **Meetings with finance community:** reduce cost of capital and provide tailored insurance
- **UK/FR Supply Chain portal:** solution identified and under development
- **New technology designs:** over 40 new components identified so far
- **Supply Chain support:** engineering support for component test & validation
- **Conferences:** project/ sector updates, introductions, B-2-B facilitated sessions
- **Links to other EU projects:** e.g. SELKIE – tidal system design tools , SAMARCH - monitoring



UK/FR MRE Supply Chain portal

EUROPEAN UNION EUROPEAN REGIONAL DEVELOPMENT FUND **TIGER** TIDAL STREAM INDUSTRY ENERGISER

OVERVIEW **TIDAL MARKET** TIDAL FACTS RESOURCES EVENTS NEWS CONTACT

Search by keywords Type of MRE activities MRE Technologies More filters (1)

Back to the 485 Entities

Request to add an entity Source(s)

This is a cross border UK/FR supply chain portal developed by the TIGER project through a partnership between **ORE Catapult** (the UK's leading technology innovation research centre for offshore renewables) and **Bretagne Développement Innovation** (Brittany's regional development agency). The portal categorises organisations and identifies clusters active within the marine renewable energy sector. You can update your company record on this directory by finding your profile and clicking the pencil icon at the top. If you would like to add your company to the database simply click the "request to add entity" button at the bottom left of the portal map.

Project Information for Supply Chain

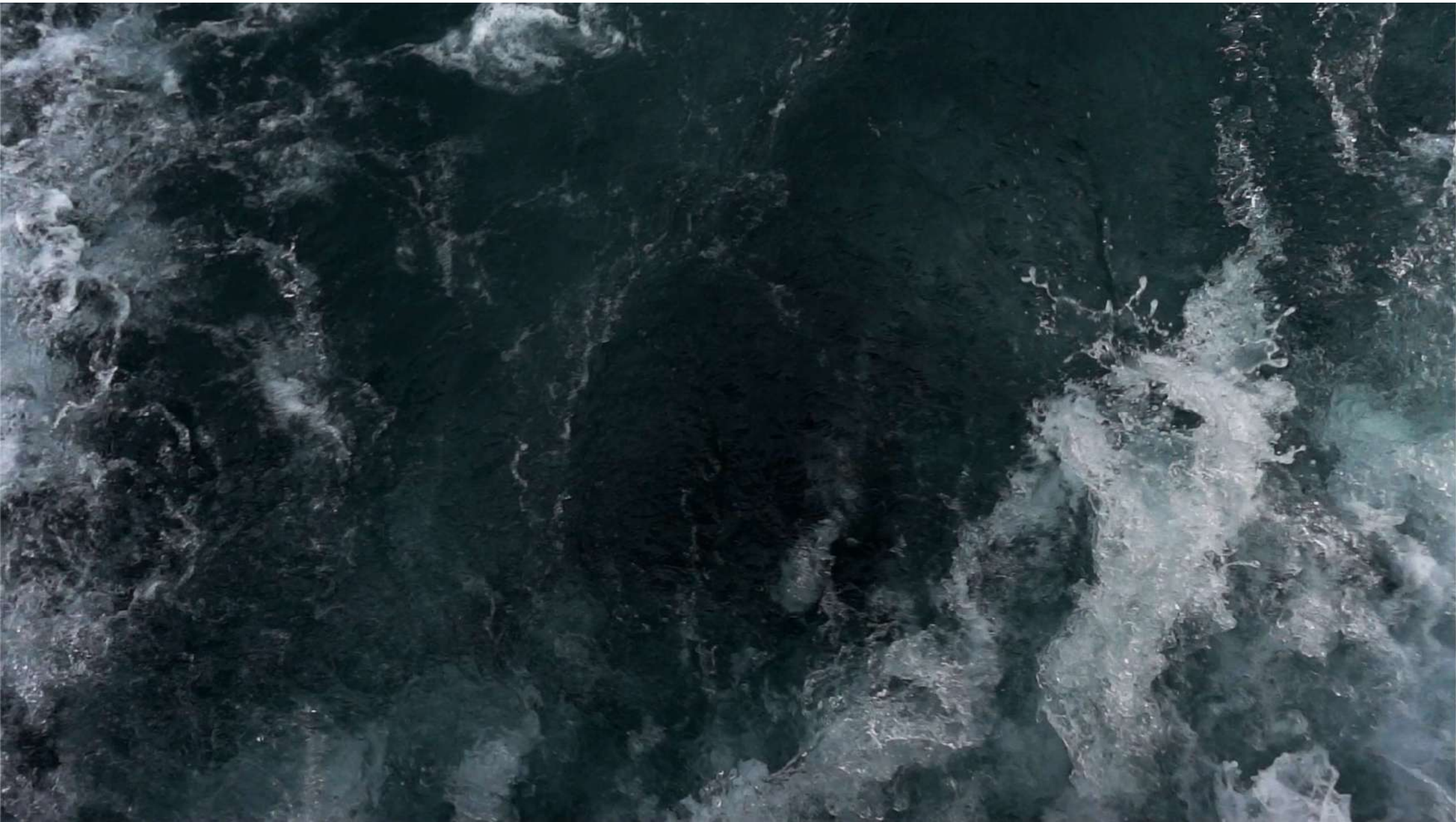
The screenshot shows the TIGER website interface. At the top, the navigation menu includes 'OVERVIEW', 'TIDAL MARKET', 'TIDAL FACTS', 'RESOURCES', 'EVENTS', 'NEWS', and 'CONTACT'. The 'RESOURCES' menu item is circled in red. Below the navigation, the main heading is 'Meet the Buyer Data Packs'. Underneath, there is a 'Files' section with a table of data packs. Each row in the table includes the file name, a file icon, the size, and a green 'DOWNLOAD' button. To the right of the table is a summary box with a large green 'DOWNLOAD' button at the top, followed by statistics: CATEGORY (DATA PACKS), NUMBER OF FILES (12), TOTAL SIZE (14.34 MB), DATE ADDED (MAY 13, 2021), and LAST UPDATED (JUNE 10, 2022). Below the table is a 'Details' section with a paragraph of text. In the bottom left corner, there is a language selector showing 'EN'.

File Name	Size	Action
Raz Blanchard Normandie Hydroliennes paquet de données (FR) v2.pdf	1.03 MB	DOWNLOAD
Raz Blanchard Normandie Hydroliennes data pack (EN) v2.pdf	1.15 MB	DOWNLOAD
Ramsay Sound data pack (EN).pdf	1.23 MB	DOWNLOAD
Ramsay Sound paquet de données (FR).pdf	1.25 MB	DOWNLOAD
Yarmouth Harbour data pack (EN).pdf	1.58 MB	DOWNLOAD
Yarmouth Harbour paquet de données (FR).pdf	1.55 MB	DOWNLOAD
Raz Blanchard Hydroquest data pack (EN).pdf	719.10 KB	DOWNLOAD
Raz Blanchard Hydroquest paquet de données (FR).pdf	760.24 KB	DOWNLOAD
Paimpol Bréhat Minesto data pack (EN).pdf	1,004.97 KB	DOWNLOAD
Paimpol Bréhat Minesto paquet de données (FR).pdf	1.12 MB	DOWNLOAD
Morbihan Gulf data pack (EN).pdf	1.38 MB	DOWNLOAD
Golfe de Morbihan paquet de données (FR).pdf	1.65 MB	DOWNLOAD

Details
These data packs contain full details for each demonstration site, including project timescales, technology, location details and logistics.

After TIGER

- UK Government has confidence in the sector and in 2022 provides £20m of CfD ringfenced funding for tidal stream over 15 years and £10m in 2023 (AR5)
- Route for FR Feed-in-Tariff established (award pending)
- Investment starting to flow
- PTEC site brought out of hibernation and bids into Allocation Round 5
- Ocean Energy Accelerator insurance model developed supported by Lloyds of London
- We put tidal stream back on the map, we justified the investment by Channel Manche and delivered on the uptake of new low-carbon technologies that have the highest potential for a reduction in greenhouse gas emissions.



Full video with further info found here:

Video: <https://interregtiger.com>

Check out **resources** section for latest industry reports

Check out **tidal market** section for details on tidal development sites and potential supply chain opportunities

Thank You

David Cooper

David.cooper@ore.catapult.org.uk

Teo Van Der Kammen

Teo.vanderkammen@ore.catapult.org.uk



CORNWALL

ORE Catapult TIGER Team

Chi Gallos

Hayle Marine Renewables

Business Park

North Quay

Hayle

Cornwall

TR27 4DD



TIGER TIDAL STREAM
INDUSTRY
ENERGISER

Interreg 
France (Channel
Manche) England
European Regional Development Fund

Capt Martin Willis AFNI, Executive Officer of the UK Harbour Masters Association

- Port Management for over 18 years
- British Ports Association Executive Council
- Wide experience in the development of offshore renewable energy.
- Been party to large scale energy developments
- Has a wealth of invaluable awareness



Panel Session



Thank-you for attending!