

An underwater scene with a light blue-green tint. Numerous small fish are swimming in the background, and several larger, translucent bubbles are scattered throughout the water. The overall atmosphere is serene and aquatic.

Tidal Stream Technology

...an overview

Michael-Evans

Green-Tide Turbines Ltd

Cleanpower 2009

Green-Tide

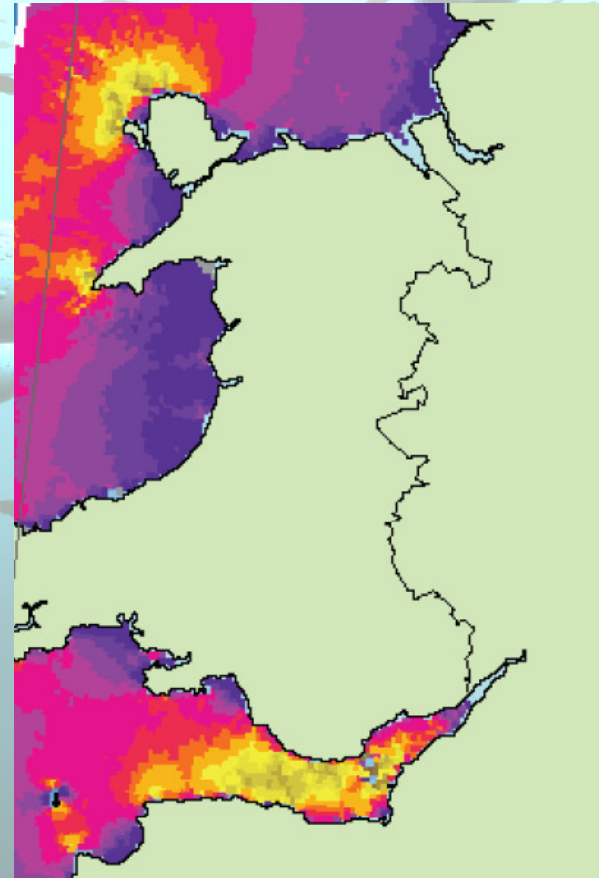
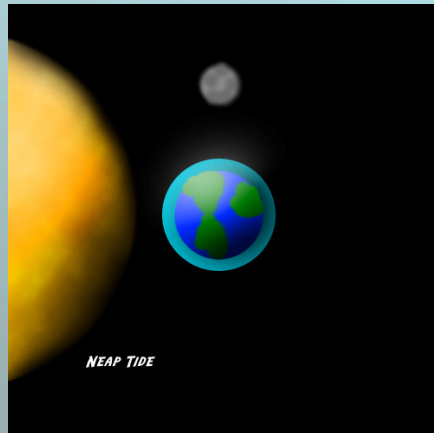
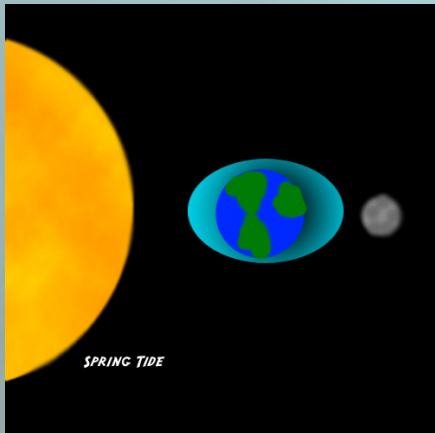
- Michael J Evans
 - Serial Entrepreneur and Innovator, co-founder of CMR Fuel Cells plc and co-inventor of their technology. Award winning company and technology. CMR floated on AIM at valuation of £50m in 2005.
 - Experienced project manager and design engineer
 - BSc (hons) in Design for Manufacture and MA in Industrial Design



- Green-Tide
 - Developing patented tidal stream turbine technology
 - Developing PowerHub large scale power storage concept

Tidal Stream

- How it works
 - A product of the actions of the moon and the sun combined with landmass & seabed geography

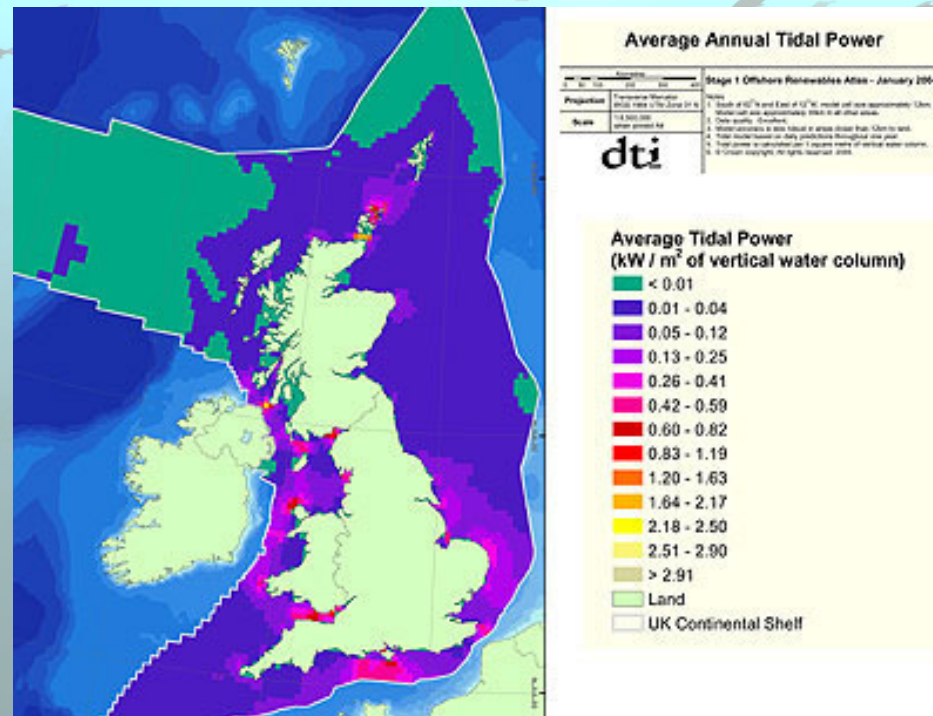


Tidal Stream

- Tidal Power Potential

UK has some of the best tidal stream resources in the World.

The Carbon Trust estimates 2.5GigWatt capacity from tidal stream by 2020.



Tidal Stream

- Advantages

- Predictable power delivery – (suitable for base-load)
- High energy density
- UK tide times staggered around the coast so power available 24/7
- UK has amongst the World's richest tidal stream resources
- Low visual impact
- Potential for low cost per kWh

Tidal Stream

- Challenges

- Must withstand extremely aggressive environment

- Large forces - mooring and electrical connection
- Uneven loading
- Abrasion from sediments in strong currents
- Entanglement + damage from debris
- Barnacle growth
- Silting

- Sea-life survivability

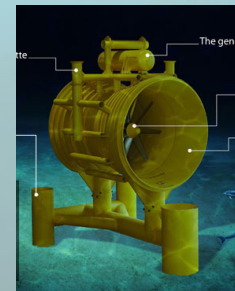
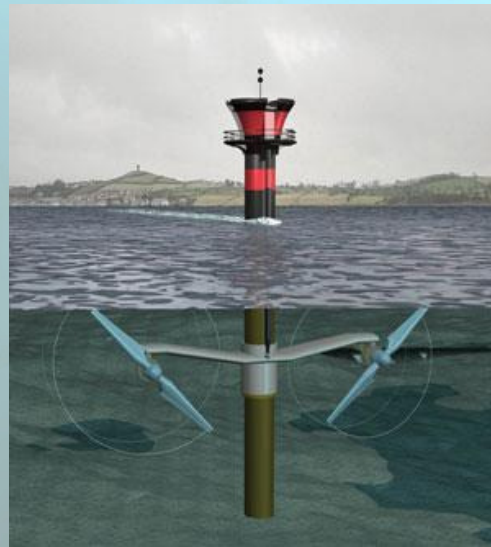
- Installation & Maintenance

Technologies Types

- Axial Turbines

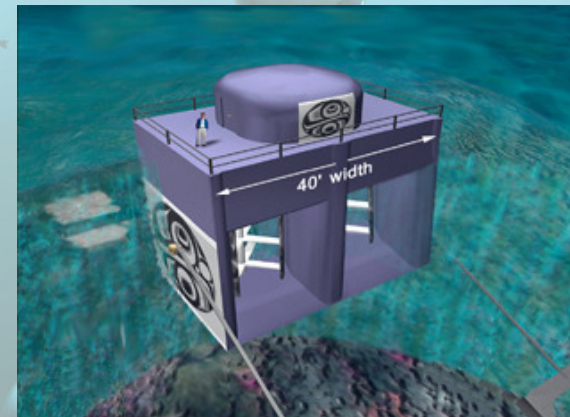
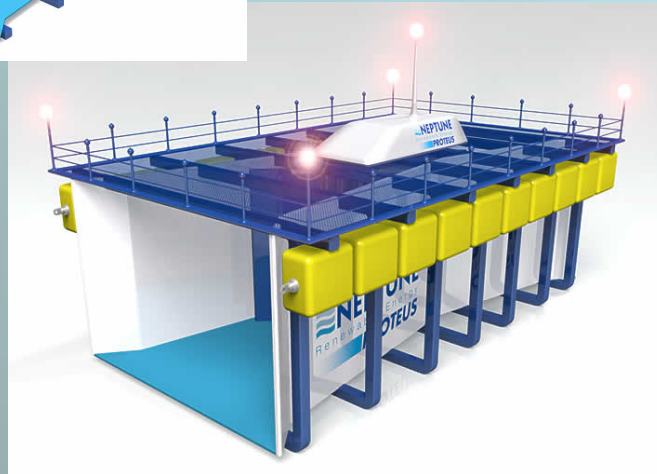
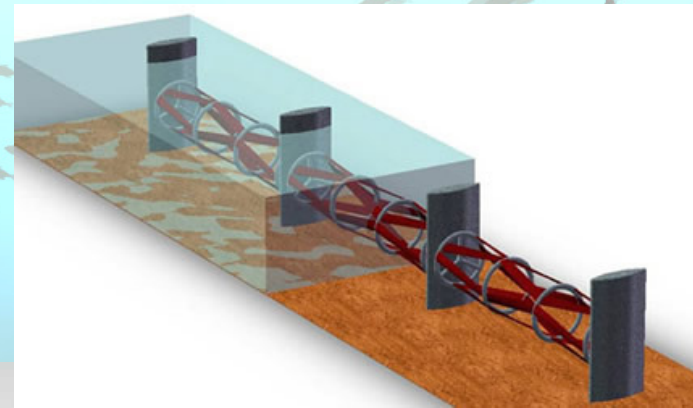
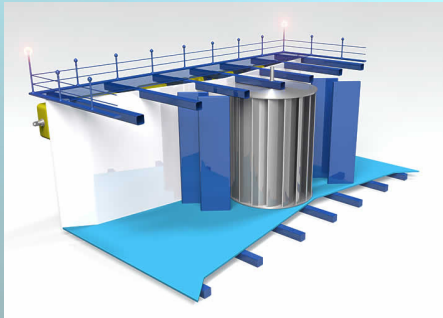
Free Flow

Ducted



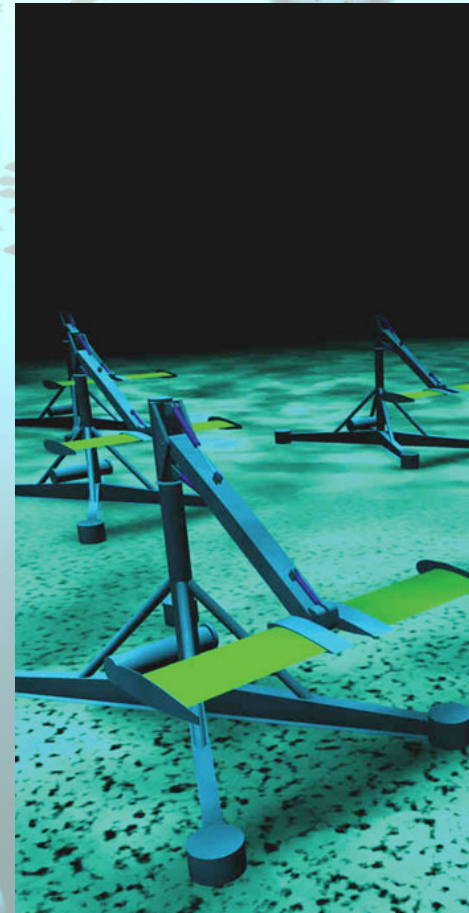
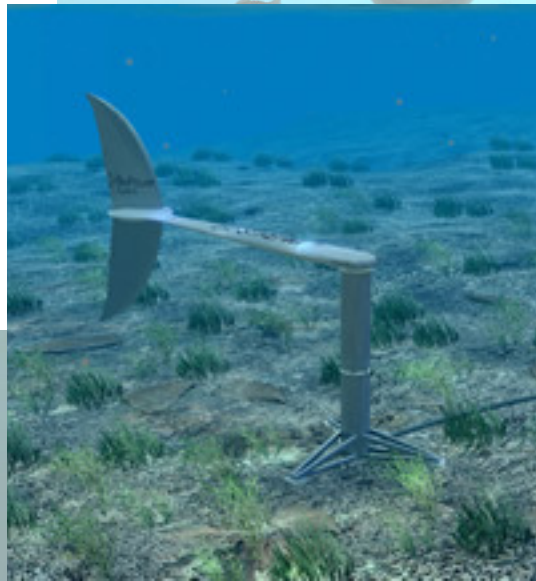
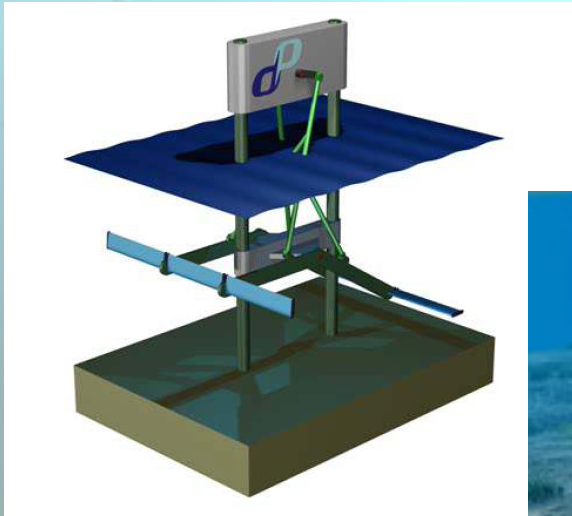
Technology Types

- Cross Flow



Technology Types

- Reciprocating Hydrofoil



Technology Types

- **Green-Tide Turbines**



Technology Types

- **Green-Tide Turbines**

Simple

A large, swirling vortex of water, representing a Green-Tide Turbine, with the word 'Simple' written next to it. The vortex is composed of concentric, swirling bands of blue and green water, creating a sense of motion and energy. The background of the entire slide is a light blue gradient with a pattern of small, stylized fish and bubbles.

Technology Types

- **Green-Tide Turbines**

Simple

No Gearbox



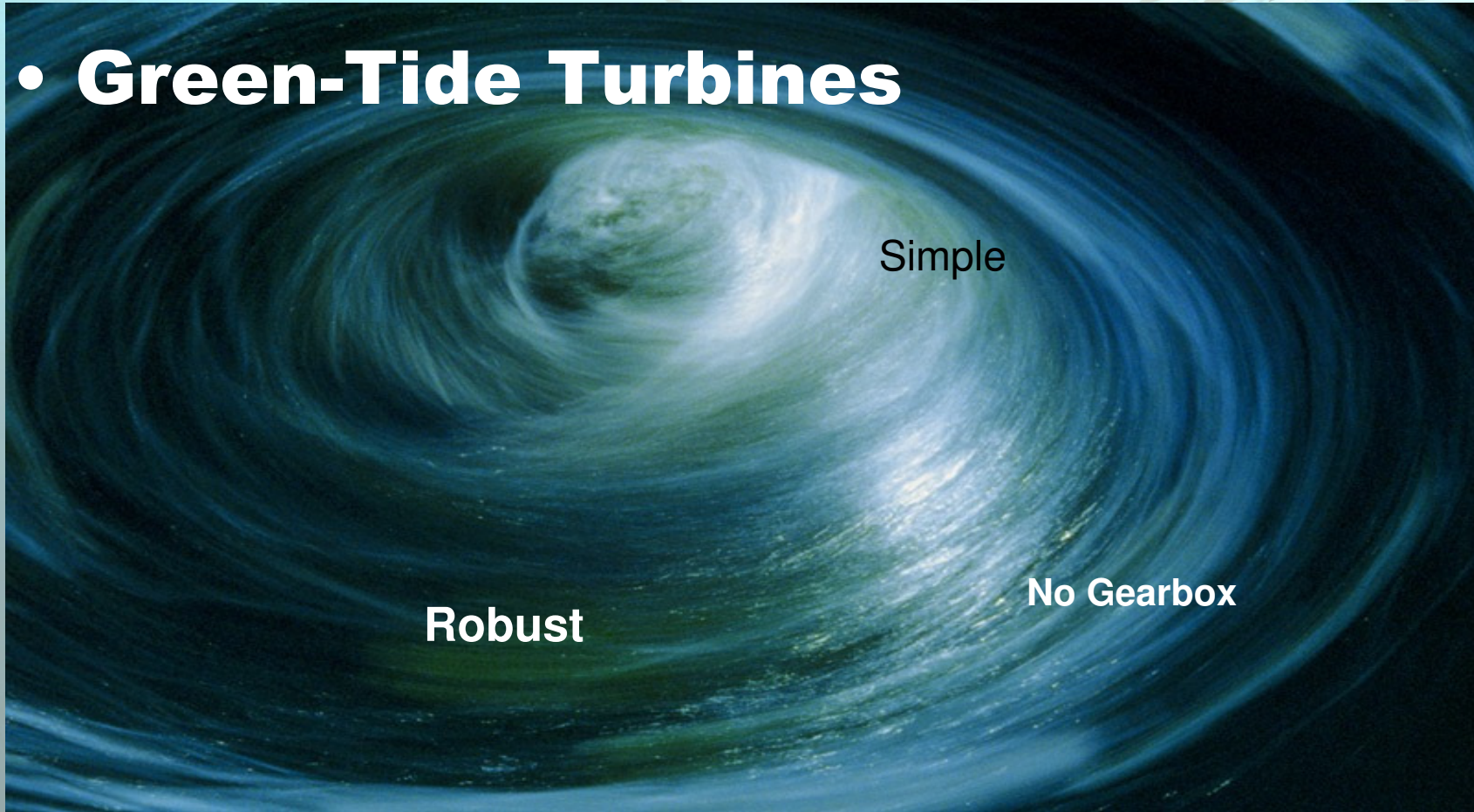
Technology Types

- **Green-Tide Turbines**

Simple

Robust

No Gearbox



Technology Types

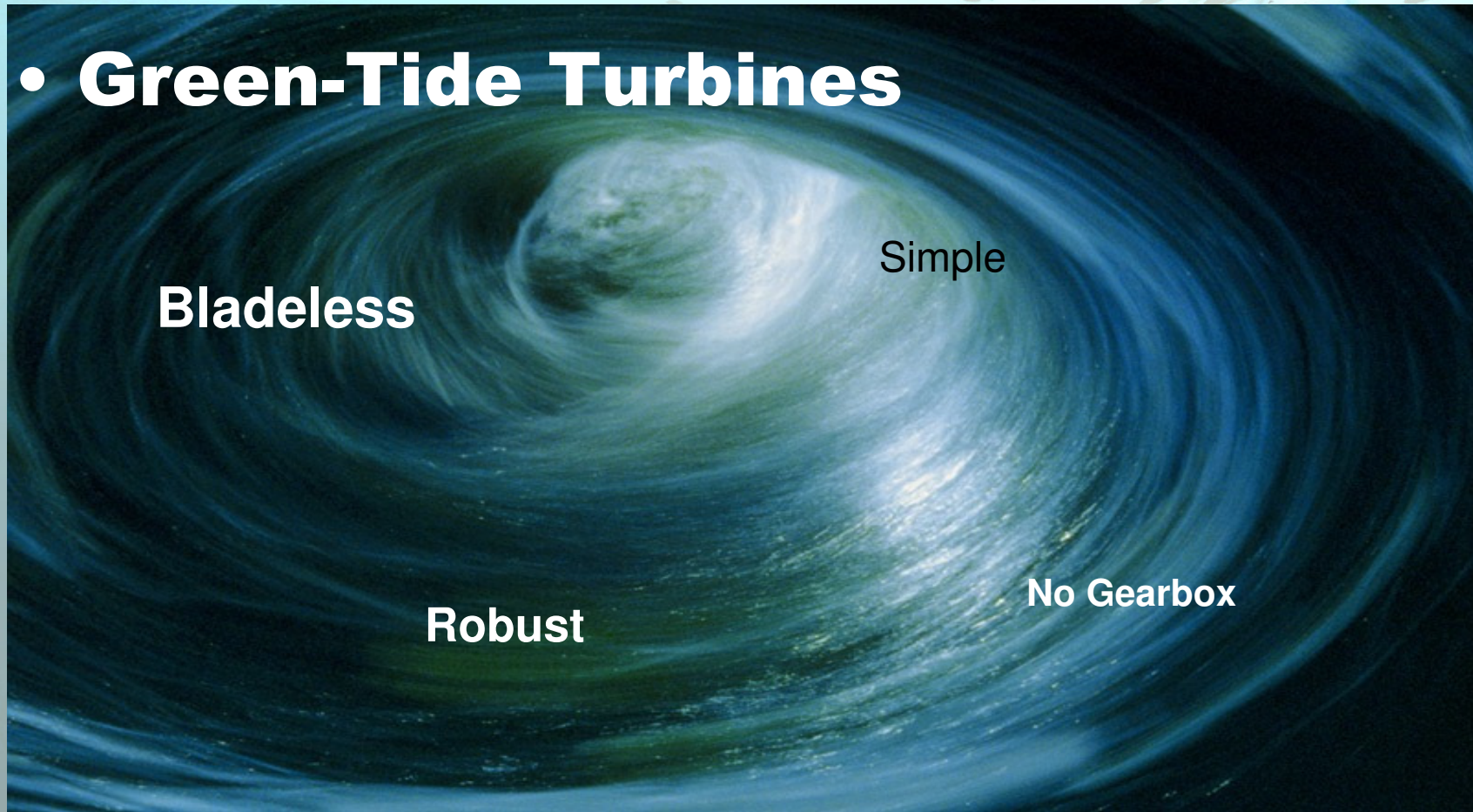
- **Green-Tide Turbines**

Bladeless

Simple

Robust

No Gearbox



Technology Types

- **Green-Tide Turbines**

Bladeless

Simple

Patent Pending

Robust

No Gearbox

G-TT Technology

- Advantages

- Better energy conversion efficiency (2.2 x bladed turbines)
- Can operate in slower tidal streams – more sites available
- No need for gearbox
- No blades
 - robust design
 - no risk of damage due to cavitation
 - even loading on turbine and bearings
- Sea-life friendly
- Designed for mass production and ease of installation and maintenance
- Promises to do to Tidal Stream what the jet engine did for aviation

G-TT Strategy

- Market Trends
 - Competition is getting established
 - Over 20 UK tidal stream turbine developers
 - UK Government soon to chose top 3 to receive support
 - Supply chain model being adopted by the industry
 - Fledgling industry and complex devices involving integration of many technologies
 - 32 turbines built and installed every week to hit 2020 target.

G-TT Strategy

- G-TT aim to be a 1st Tier supplier of turbine/generator units to established tidal stream turbine developers
 - Lower R&D costs
 - Quicker to market
 - Competitors as customer
 - Access to refit market

G-TT Current Status

- Stage of Development
 - Early stage
 - Patented technology
 - Planned research programmes into duct and turbine design with Cambridge University
 - Aim to prove technology benefits and establish scientific credibility
 - Seeking Seed Funding