

# **ORBITAL**

**MARINE POWER**

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**Engineering Manager**

# Who Are Orbital Marine

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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.

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Company  
founded:  
2002



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.



Company  
rebrands,  
2018

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



Company  
starts build of  
first 2MW O2.  
2019



# Breakthrough Industry Project: SR2000

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



# Maintenance Philosophy

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**Maximise generator uptime by enabling fast response maintenance interventions.**

**Major maintenance done by disconnecting the turbine and towing to local harbour.**

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





- ✓ 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.

# Development Process – Lessons Learned

- SR2000 design driver was quick connection and disconnection to allow maintenance at harbourside

What we found:

- The turbine is a very safe, stable platform for manned intervention.
- We can significantly affect yield by doing maintenance on-site

Therefore:

- The need for remote, quick connection and disconnection is lessened
- We can move away from wet mate connectors.
  - Reducing cost, size, complexity and voltage constraints



# Orbital O2: Most Advanced Tidal Turbine in the World

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2.5MW of power at rotor shaft.

20m rotor diameter / 628m<sup>2</sup>

74m main hull structure.

Pitch controlled rotors.

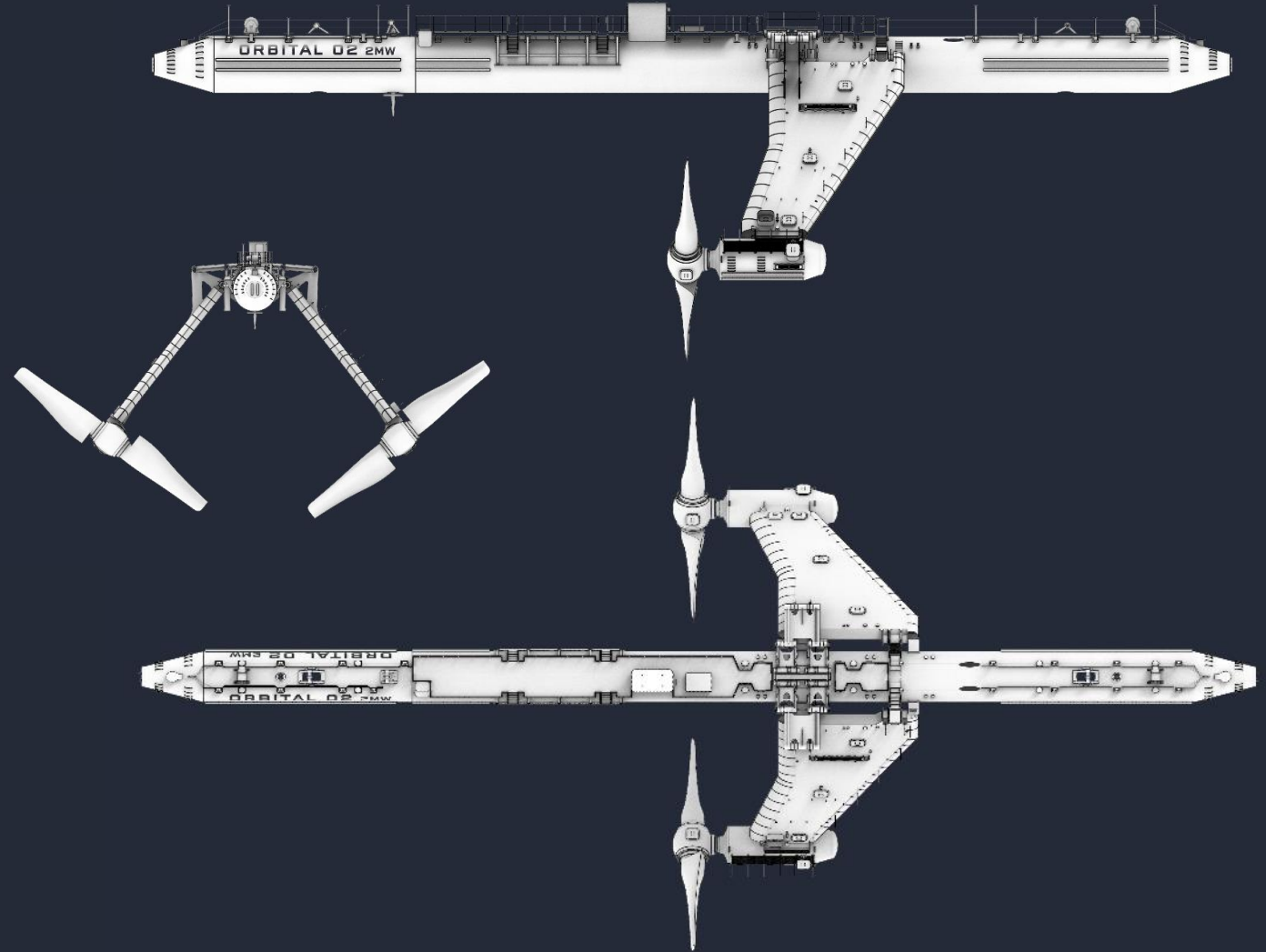
Forward and aft catenary mooring.

Standard dry mate connection.

Manually mated (30 minute process).

11kV export.

No slip ring/connection system actuation.



# UK Build Story

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

**ORBITAL**  
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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.



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.

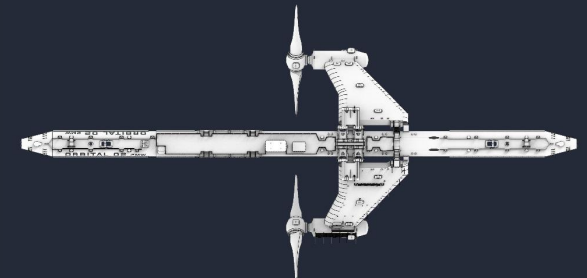
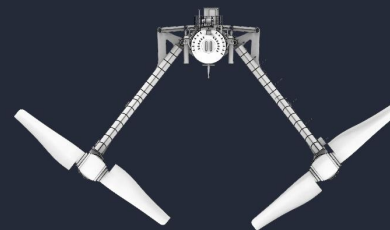
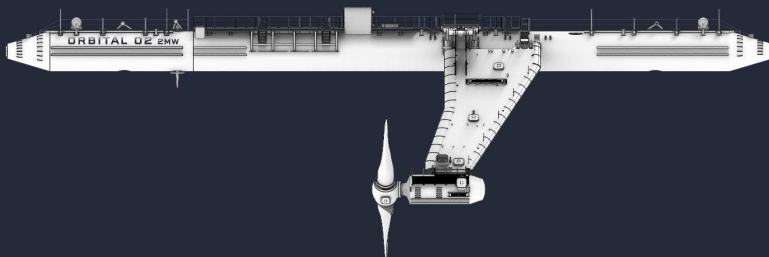


Location: Scunthorpe.  
Contractor: Bonds Heavy Castings.  
Activity: Load bearing heavy castings.

**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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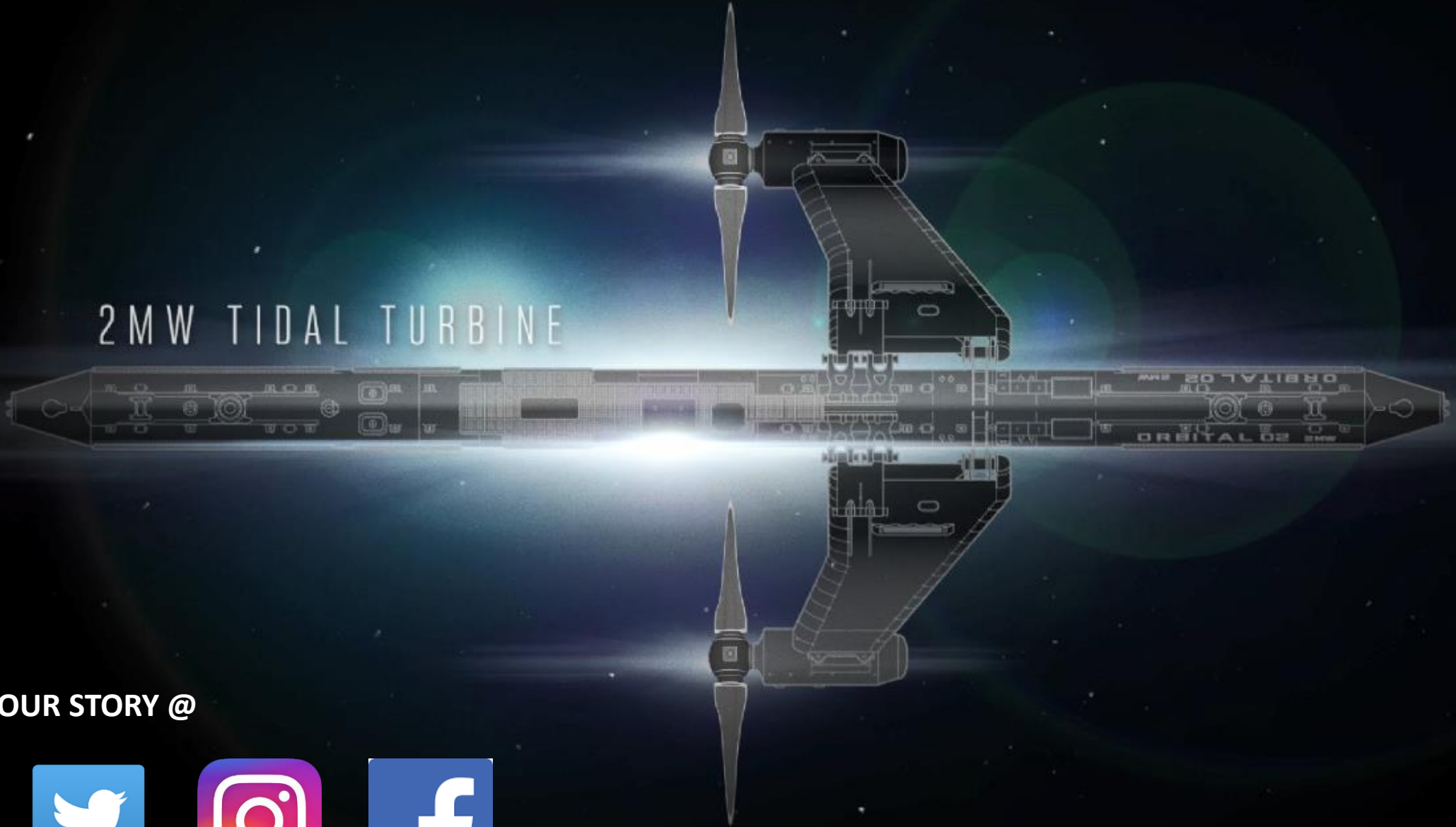


**R&D program with Black & Veatch**

**Areas for future development:**

- **Cable anchoring**
- **Cable hang-offs**
- **Electrical Infrastructure, including:**
  - **Multiple turbine subsea connections**
  - **Floating hubs**

# 2MW TIDAL TURBINE



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