

Expanding wave energy converters deployment time to enhance production of potable water

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Introduction

Energy Demands:

- Global demand for energy continues to increase
- Marine energy has enormous potential for sustainably supplying energy needs

Oceans provide several advantages compared to wind and solar energies:

- Predictable
- Stable during day and night
- Significantly greater energy density

Major forms of marine energy resources:

- Waves (e.g., drag from wind)
- Tidal (e.g., Moon's gravitational pull)

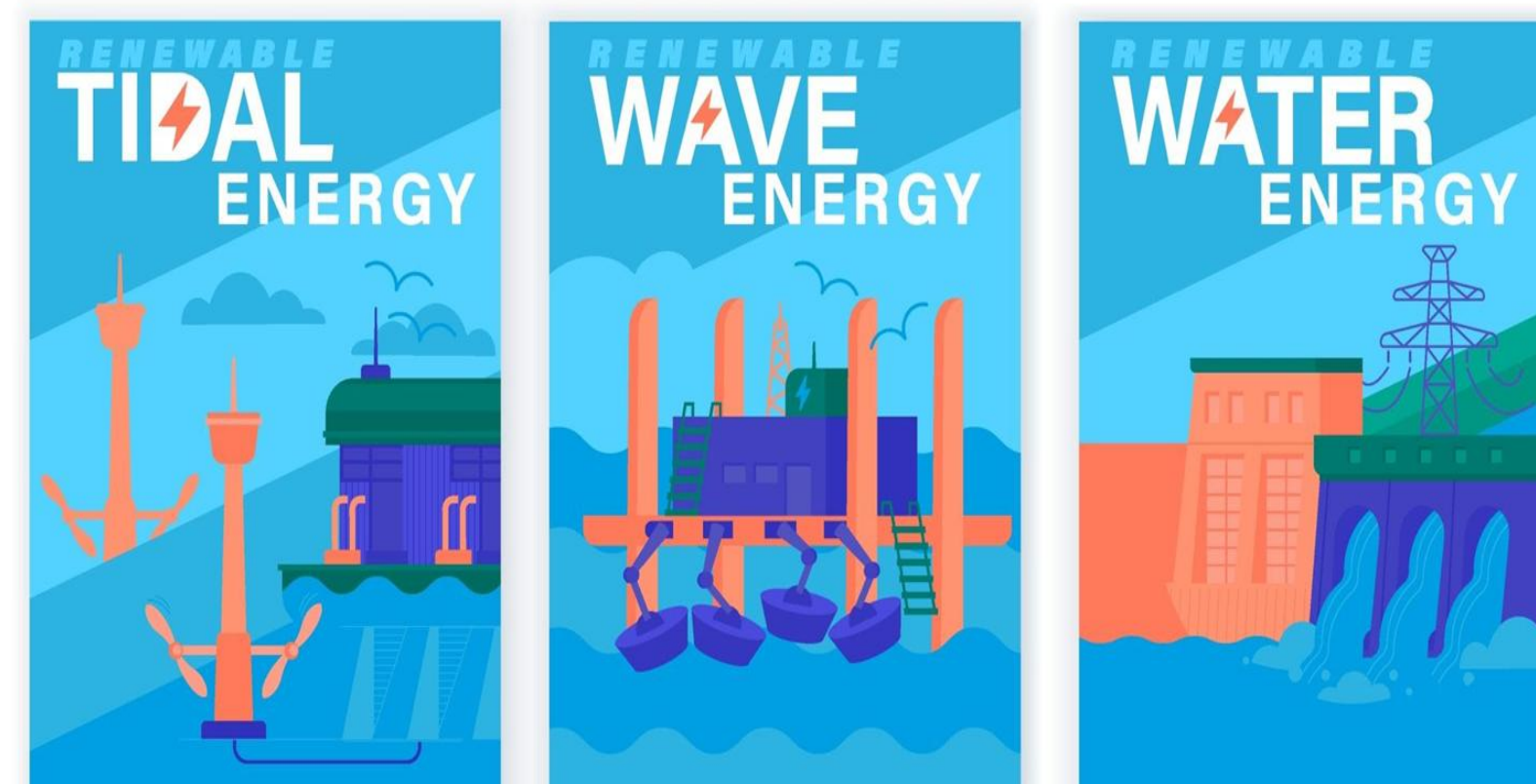


Fig. 1: Types of marine energy

(<https://www.vectorstock.com/royalty-free-vector/renewable-energy-source-posters-collection-vector-42795241>)

Harnessing Marine Energy Resources:

- Wave Energy Converters (WECs) capture kinetic energy from ocean waves and convert it into usable power.

WECs transform energy captured from wave motion into useful outputs:

- Electricity via a generator through a power-take-off system
- Potable water via desalination pumps powered by the WEC

Swivel-based Instrumented Mooring (SWIM) device

- When WECs are moored to the ocean floor, there are often cables that will run electricity back to the shore. These cables can tangle underwater and break.
- The SWIM device solves this by allowing free rotation of the buoy separate from the mooring line underneath.

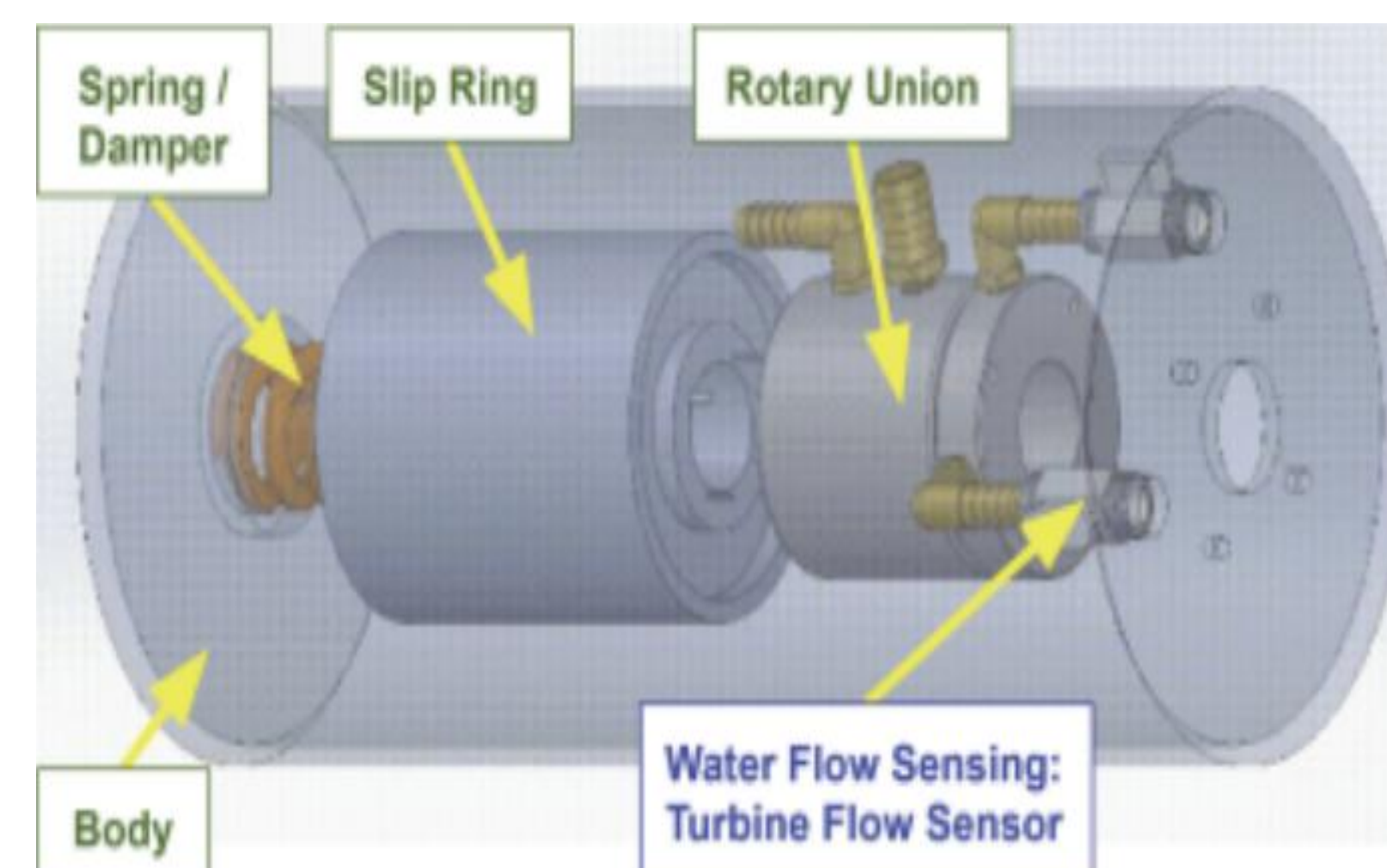


Fig. 2: SWIM Device with a turbine flow sensor [1]

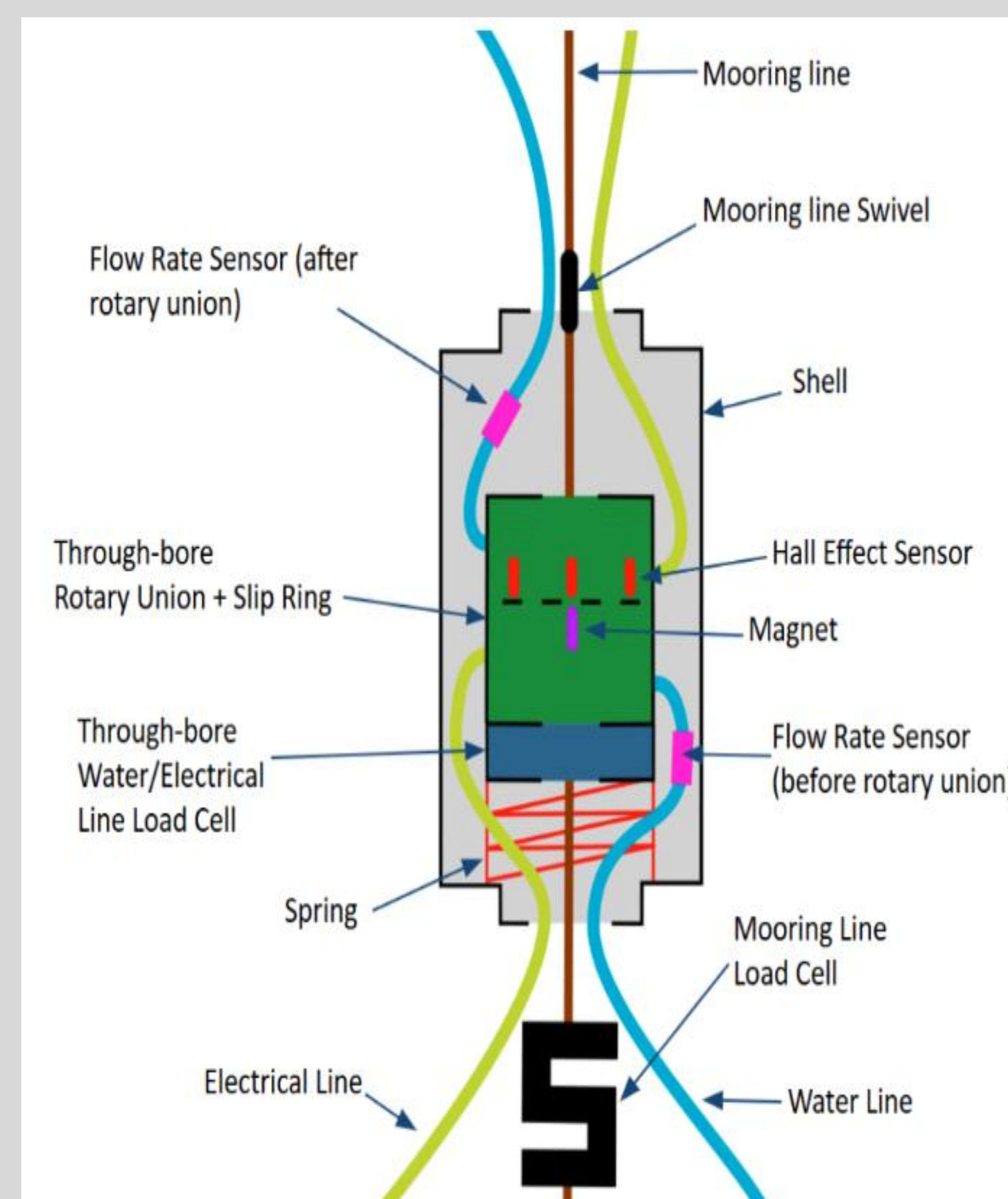


Fig. 3: A schematic of the SWIM device [1]

Water Bros WEC

- The Water Bros WEC has a point absorber (PA) design and uses the vertical 'heave' motion of the ocean to generate rotational motion for the pump.
- This motion is used to drive seawater through reverse osmosis (RO) pump, producing potable water.



Fig. 4: The Water Bros WEC [2]

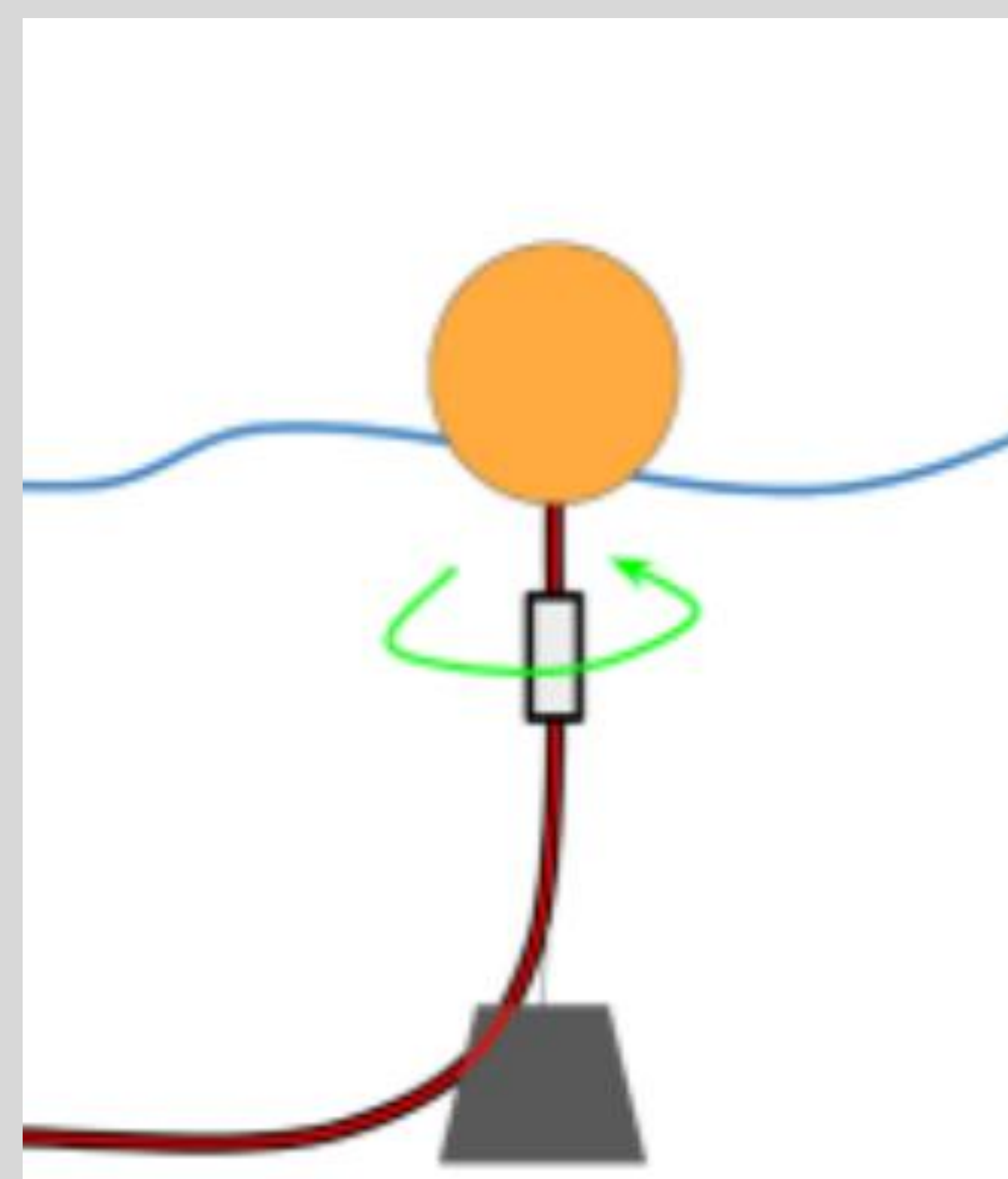


Fig. 5: A point absorber buoy with the SWIM Device attached for rotation [1]

Contributions

SWIM

- Researching sealing methods for ingress protection (IP) to allow rotation when the device is watertight.

WaterBros

- Researching communication devices and sensors to ensure the device is functioning properly. Assisting in Power-take-off design and assembly.

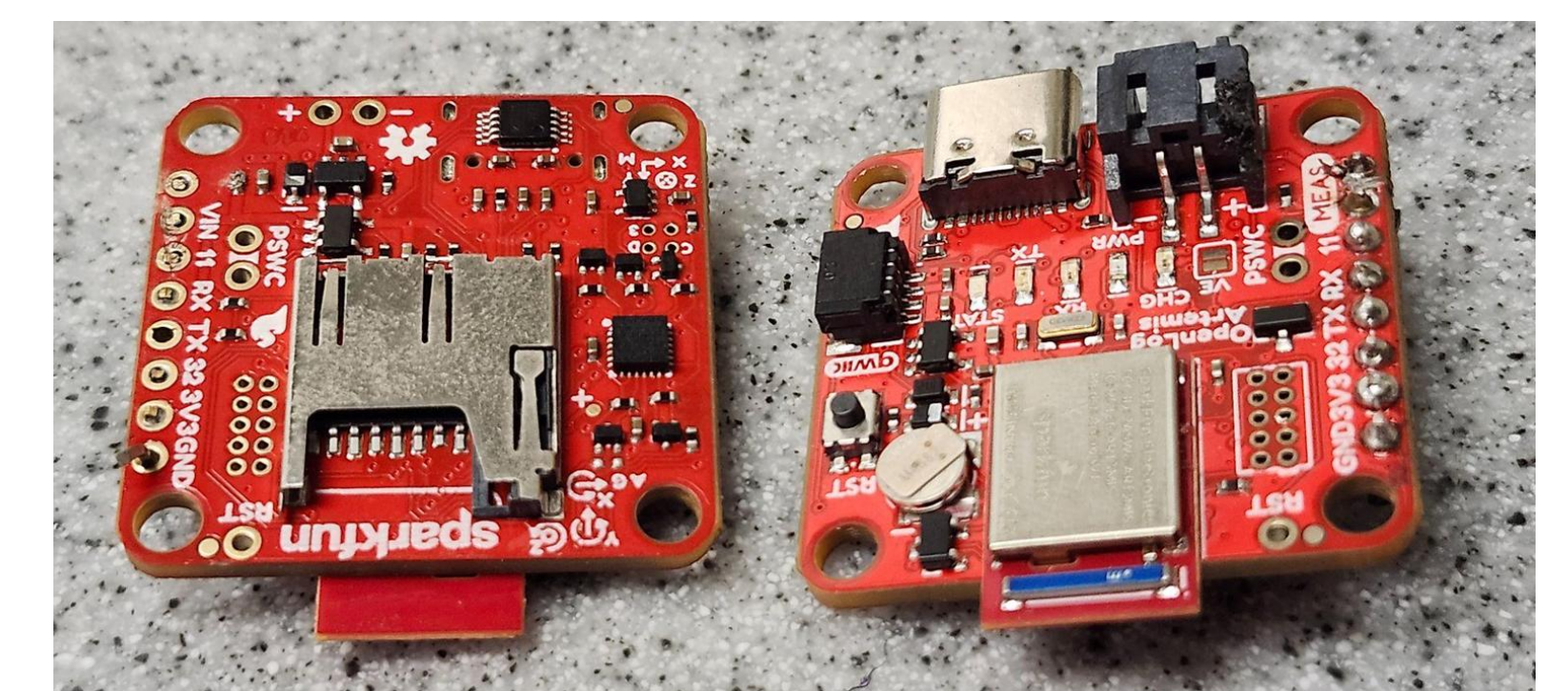


Fig. 6: Two Sparkfun Artemis Printed Computer Boards

Future objectives

SWIM

- Currently working on detailed design and analysis, functional prototype fabrication and testing, and a feasibility assessment

WaterBros

- Currently working towards a one-month and a four-month deployment in the ocean at the Outer Banks.

References/Acknowledgements

- [1] M. Smith, C. Lowcher, T. Taylor, B. Hollister, J. Hawkins, J. Bercik, "Advances in the Design of an Instrumented Swivel-Based Mooring System to Improve Process Knowledge of Marine Energy Devices," IEEE SoutheastCon 2026.
[2] Note. Photograph by Water Bros, 2026. Copyright 2026 by Water Bros. Reprinted with permission.