Washington Wave Presents:

RealWave/VirtualWave

OCEAN OBSERVATION POWERED BY WAVE ENERGY

THE PROBLEM

As the Blue Economy continues to grow, more stakeholders depend on ocean observation to develop their understanding of the ocean and make informed decisions. Collecting in situ oceanographic data requires significant capital and operational capabilities, with an inherent risk of system failure. The process of delivering data from sensors to users requires the integration of a diverse range of technologies. Optimizing this technology integration for data accessibility and cost reduction is difficult because projects are usually completed on a case-by-case basis, often with different entities handling different aspects under the constraints of flat funding.

BUSINESS MODEL

Washington Wave's operational business model provides Blue Economy stakeholders with accessible and cost effective data through two service offerings under a recurring subscription model.

- **Ocean Sensing as a Service (OSaaS).** This service aims to provide subscribers with accessible data through integration of real time data from RealWave deployments into the VirtualWave environment.

- **Marine and Environmental Consulting.** As the user base of OSaaS grows and target customers are established, Washington Wave will use VirtualWave as a platform to offer a supplemental consulting service.

This full-stack oceanographic observation system permits optimization of integrated technologies to increase profit margins and pass cost savings onto subscribers. This business model will deliver long-term growth by capturing a large portion of the operations and infrastructure within the ocean observation market of the Blue Economy.

TARGET CUSTOMERS

Washington Wave's target customers are stakeholders looking to establish robust data sets, prepare environmental assessment documents , create mitigation plans, conduct monitoring programs, and assess the impacts of marine activities. These entities include:

- Governments
- Research Institutions
- Marine & Environmental Consultants
- Infrastructure Developers

POTENTIAL IMPACT AREAS

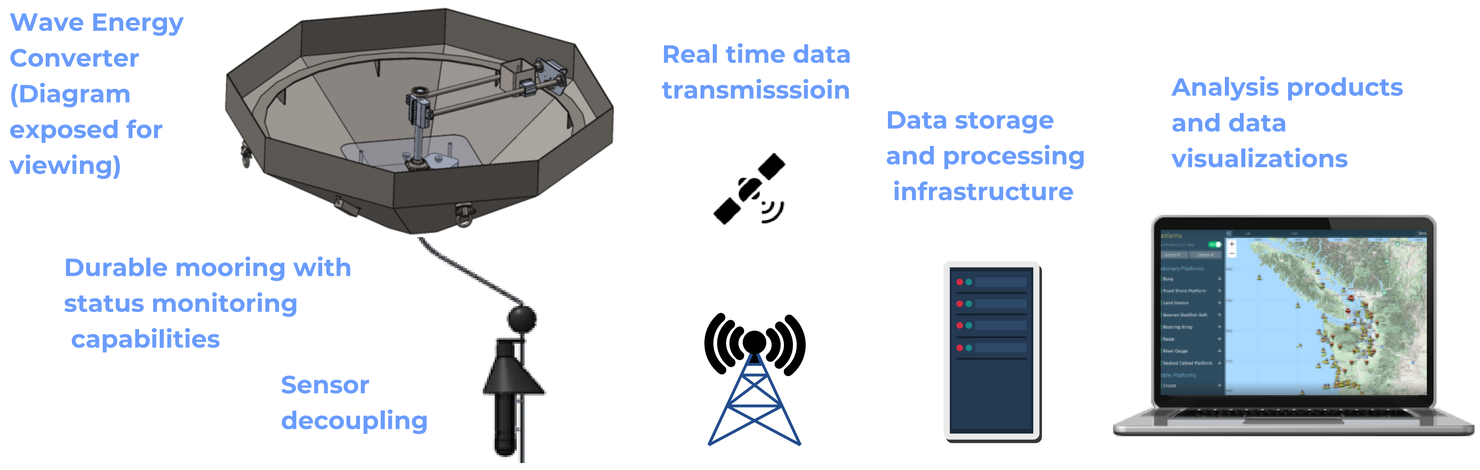
The UN's Sustainable Development Goals, which are based on international perspectives, offer a useful framework for understanding the impact of our service offerings.

PROPOSED SOLUTIONS

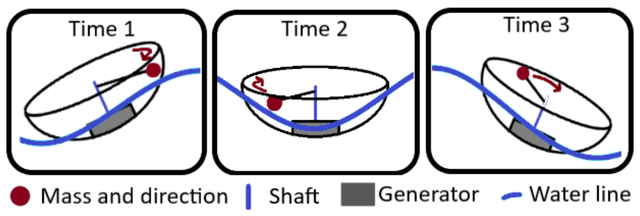
RealWave is a moored oceanographic observation system with a Wave Energy Converter (WEC) serving as a buoy at the surface. The WEC provides additional power to the buoy system beyond the capabilities of standard battery stores. This additional power can be applied to record data at higher resolutions, transmit real-time data, support more intensive sensor arrays, facilitate adaptive sampling, or power additional system functions without increasing the system's dependence on traditional battery stores. The enclosed nature of the rotating-mass archetype provides increased durability and reliability to the system, as well as allowing for easier deployment, as it is a singular unit.

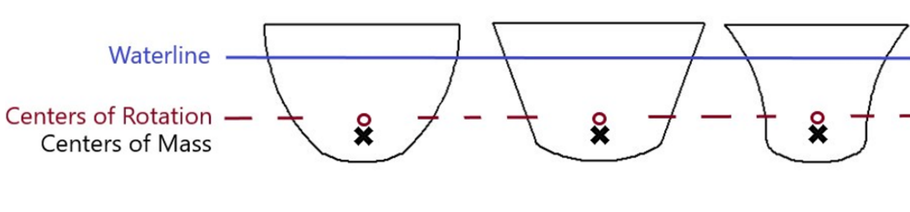
VirtualWave is a user facing product that provides accessible and relevant data and analysis products to stakeholders.

VirtualWave depends on integrated technologies to receive, store, and process the large volumes of data that is transmitted from RealWave deployments, in addition to other available and relevant data. The development of analysis products provided on VirtualWave will focus on the meeting the needs of users, benefiting from an established database of oceanographic data and market outreach that can inform decisions.

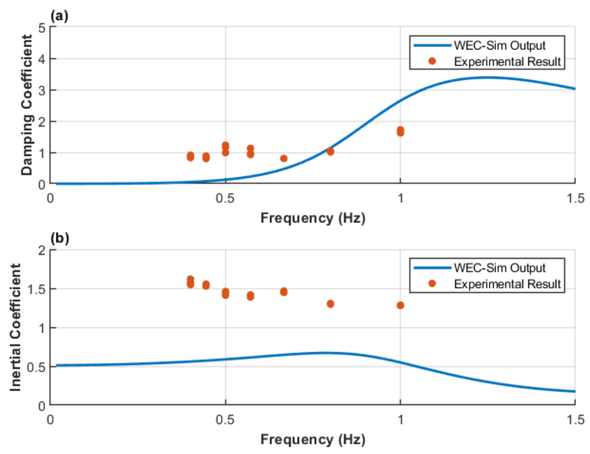


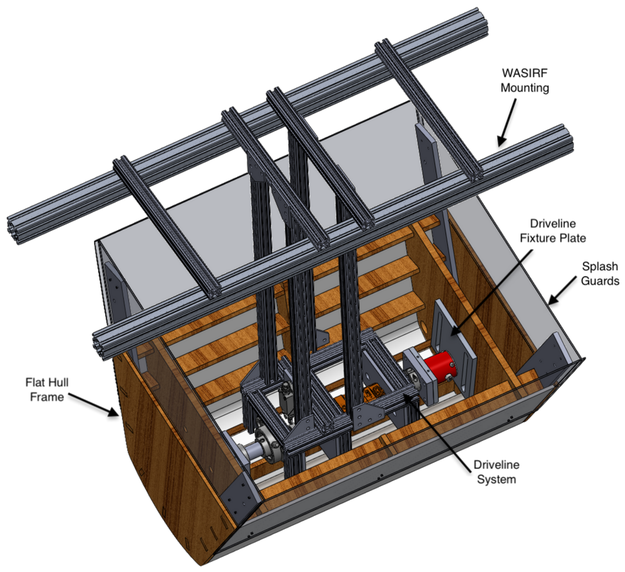
Technical Design Following previous design iterations that failed to replicate simulated power performance in experimental testing, the design scope was simplified to improve understanding of the rotating mass WEC hydrodynamics. Geometric manipulation of a two-dimensional hull cross-section provided a workable scope for conceptual hull design. Comparing power production over a set range of sea states, the concave in hull far outperformed the other concavities at every test point, indicating that no matter what the real-world conditions are, concave in is the optimal concavity for a rotating mass WEC.





Build and Test This year's prototyping approach was to investigate the hydrodynamics torques on a 2D hull pitched in still water. The outcome of this was a characterization of the torques that act on a pitching WEC and a comparison to the radiation damping and added mass coefficients input to WEC-Sim. Our experimental results revealed a trend of damping torques increasing with pitch oscillation frequency and inertial torques decreasing with frequency. This information will help to drive future design decisions.





WASHINGTON WAVE TEAM

Megan Andersen, Owen Boram, Elizabeth Dale, Marshall Lee, Prashant Mohite, Zachary Nachod, William Nelson, Kavya Niranjan, Brian Ola, Ingrid Phillips, Heidi Resing, Brittani Shappell, Carmen Twitchell

ADVISORS

Dr. Shana Hirsch, Dr. Brian Polagye, Dr. Fritz Stahr

UNIVERSITY OF WASHINGTON

School of Oceanography
Foster School of Business,
Mechanical Engineering, Civil & Environmental Engineering, Human Centered Design & Engineering