NEWSLETTER

Welcome to the first edition of the SUREWAVE Research Project Newsletter!

We are thrilled to share with you our progress and achievements in unlocking the vast potential of Floating Photo-Voltaic (FPV) technology in offshore environments. SUREWAVE is dedicated to revolutionizing renewable energy solutions and contributing to achieving climate neutrality by 2050 by utilizing a floating breakwater structure, to protect against extreme offshore environments.

In this edition, we are excited to present some of the deliverables handed in so far. Our team has been hard at work shaping use case scenarios, defining requirements for the surface mooring system, and gaining a high-level understanding of the system's general loads. Additionally, we delve into the detailed design description of the internal floating PV components, bringing us closer to realizing our vision of a cutting-edge FPV system.

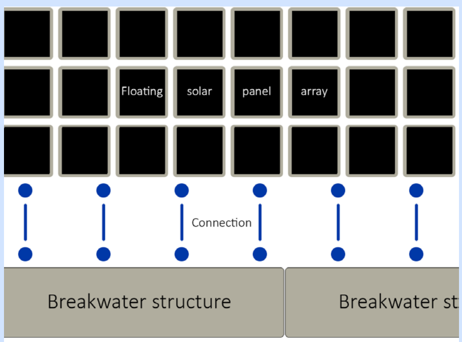
SUREWAVE aims to solve the main challenges of offshore FPV by developing a solution adapted to the most critical sea states, being able to mitigate the harsh conditions for the FPV.

The primary goal is to create and test a new and concept for a Floating Solar Power system. This system includes a special floating barrier made of strong circular materials that shields the solar panels from powerful waves. The solar panels can work better and produce more energy, imroving the operational availability of the system.

Our project is represented by seven companies within the EU, with people from four different countries: SINTEF, Sunlit Sea, CEIT, MARIN, Acciona Construcción, S.A. Clement Germany GmbH and IFEU

Ensuring Stability and Performance: Technical Requirements for Surface Mooring System between FPV Array and Breakwatebetween FPV array and breakwater

The floating breakwater (FB) plays a pivotal role in protecting FPV systems from waves, and our research focuses on pontoon-type breakwaters constructed with reinforced concrete modules. These precast modules offer a cost-effective and technically feasible solution backed by careful consideration of wave conditions at the installation site. Depending on the location, we determine the optimal arrangement, be it circumferential or sectional, to maximize the protection of the FPV system.



Our FPV arrays consist of Sunlit Sea FPV units, which integrate photovoltaic panels sealed to aluminium floats. These units create a fully integrated solution that remains flat on the water surface, and multiple units are interconnected to form larger FPV arrays.

Ensuring the stability of both the FB and FPV system requires effective anchoring, especially in deep-sea conditions. We consider various anchoring methods, such as fluke anchors, plate anchors, anchor piles, suction anchors, and gravity anchors. Connection options like anchor chains, steel wire ropes, or fibre ropes are also evaluated.

To achieve secure connection and load transfer between the FB and FPV, meticulous analysis of their interaction is crucial. Tension and compression forces may come into play depending on the breakwater layout. In certain cases, additional anchoring might be necessary for the FPV system, particularly when the FB is deployed only in the direction of predominant waves at partially protected locations.

Moving forward, we emphasize key technical requirements. Force transmission takes centre stage, as the connection between the FB and FPV serves a dual purpose: anchoring and maintaining a consistent distance between the components. We prioritize moveability, aiming for a connection that minimizes moment transmission and enables relative motion between the FB and FPV, thereby achieving effective damping.

Geometric boundaries and material properties are also significant considerations in our project. We investigate the impact of FB geometry on wave attenuation and determine harmful wave spectrums for the FPV system, establishing necessary attenuation levels. Furthermore, we explore using ultra-high-performance fibre-reinforced concrete (UHPFRC) as an innovative material to enhance strength while reducing overall weight compared to traditional materials.

Committed to meeting durability requirements, we align with Eurocode standards to ensure a design life of at least 50 years. We focus on defining wear parts subjected to dynamic loads or relative motion between components, acknowledging that proper maintenance practices extend the service life and mitigate wear and tear effects.

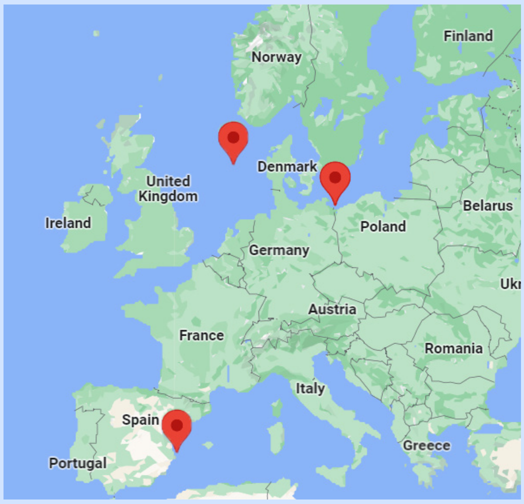
Join Our Stakeholder Advisory Board and Shape the Future of FPV and Floating Offshore Breakwater Structures

We invite you to be part of our exciting Stakeholder Advisory Board!
This exclusive opportunity allows you to provide critical feedback, share industry insights, and help shape the direction of this groundbreaking initiative.

Join us in driving innovation, enhancing sustainability, and influencing the future of renewable energy. Don't miss out on being at the forefront of this exciting endeavor. Sign up now and make a difference!

Visit our webpage or connect via LinkedIn for more information *www.surewave.eu*

Use case scenario basis for typical, rough location - Defining Metocean Design Criteria



The project has reached an important milestone in establishing a set of Metocean design criteria for the SUREWAVE concept. These criteria are based on European Waters and encompass a range of environmental conditions, including wave directionality. By carefully selecting relevant locations and providing hindcast data, the project team has laid the foundation for designing the system to withstand these challenging conditions.

Collaboration with DNV and Applicable Standards

To ensure adherence to industry standards and regulations, the project follows the guidelines set forth by DNV (Det Norske Veritas) and other applicable Norwegian standards. In cases where specific design criteria are not defined, compliance with DNV-RP-0584 or other relevant standards is required. The project team has established a hierarchy for resolving conflicts between documents, prioritizing applicable rules and regulations, company-specified criteria, and DNV-RP-0584.

Extreme Wind and Wave Analysis

Through extensive analysis of hindcast data provided by the European Centre for Medium-Range Weather Forecasts (ECMWF), the project team has developed long-term models for wind and wave conditions. These models, based on Weibull and logarithmic distributions, enable the estimation of extreme values for return periods of 1, 5, and 50 years. Such insights are crucial for designing a resilient and robust FPV system.

Considerations for Wind Sea, Swell, and Marine Growth

To account for separate wind sea and swell conditions, the project employs the JONSWAP spectrum, allowing for a comprehensive understanding of wave characteristics. Additionally, the impact of marine growth on the system is considered by incorporating site-specific data whenever available. Thickness and density parameters are established based on water depth, ensuring accurate assessment of structural and hydrodynamic effects.

Evaluation of Mild, Mid, and Harsh Conditions

Recognizing the need to evaluate the FPV concept in varying conditions, the project team has chosen three distinct locations to represent mild, mid, and harsh conditions.
By conducting thorough analyses and establishing design conditions at these sites, the SUREWAVE project aims to validate the effectiveness of the breakwater concept across a range of operational scenarios. The project team has chosen three distinct locations, including a site representing mild conditions in the Mediterranean Sea, a site representing mid-conditions in the North Sea, and a site representing harsh conditions in the Atlantic Ocean, to thoroughly evaluate the effectiveness of the breakwater concept. The ongoing collaboration with leading industry experts and adherence to established standards ensures that the resulting design will withstand the harshest offshore conditions, while also considering the more frequent mild conditions.

Table 5 Relevant locations in semi-open European waters

Region	Coordinates	Water depth (m)	$H_{S,median}$ (m)	Extreme values; R = 50 years			
				H_S (m)	T_P (s)	u_W (m/s)	
Baltic Sea	54°12'N 4°24'E	16	0.6	4.4	9.6	22.4	Mild
Western Mediterranean	39°00'N 0°00'E	38	0.5	7.0	11.7	20.8	Mid
Greater North Sea	56°54'N 5°00'E	49	1.6	12.3	14.8	26.0	Harsh

Surewave Shines at Intersolar Europa 2023!

Intersolar Europa 2023, the premier event for the photovoltaic industry, provided an incredible platform for Surewave to unveil our revolutionary floating PV project, featuring an innovative breakwater concept.

The event facilitated the dissemination of our ongoing research and fostered valuable collaborations among industry experts, paving the way for a brighter and more sustainable future.

The project garnered attention and sparked engaging discussions among professionals, highlighting Surewave's commitment to pushing the boundaries of renewable energy solutions.

Surewave expresses heartfelt gratitude to all visitors and event host.

Collaborating with Key Stakeholders in the Seaweed Industry

Surewave participated at the prestigious Seagriculture conference, where we had the privilege of connecting with leading experts and stakeholders in the dynamic world of seaweed.

The event provided us with a remarkable platform to engage with experts in seaweed utilization for feed, food, and cultivation.

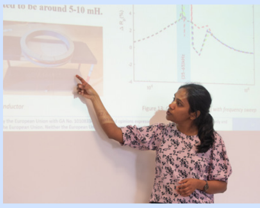
The seaweed industry, being a significant stake-holder in our research project, played a vital role in shaping our understanding and contributing valuable perspectives.

We extend our sincere appreciation to the organizers of Seagriculture for hosting this extraordinary event that fosters collaboration and knowledge exchange.

Consortium meetings in Brussel and San Sebastian

Since the project kick-off, our consortium has successfully conducted two physical meetings to facilitate collaboration and enhance our understanding of the project's objectives. The first meeting took place in October 2022 at SINTEF's offices in Brussels, where we had the opportunity to establish relationships, delve into each work package, and gain valuable knowledge. Building on this momentum, the second consortium meeting was held six months later at CEIT's research and technological center in San Sebastian, affiliated with the University of Navarra. During this meeting, we reviewed the progress made over the past six months in each work package, highlighting significant advancements achieved. In addition, the plans for the next six months were presented and discussed in detail.






What's next?

- Advancements will be made in work package 3, on deliverable 3.2, which covers the floating breakwater design in shape, size, and composition.
- The submission of D3.1, under work package 3 – Design description of internal floating PV components. Part of it covers global PV design considerations and challenges unique to this project's PV system.
- As part of work package 4, the consortium will continually refine and enhance the circular material solutions for the offshore floating PV breakwater, ensuring they meet the project's structural integrity, durability, and performance objectives in challenging environmental conditions.
- In WP5, partners will initialize research involving concrete materials properties modelling, coupled aero-hydrodynamic analysis and design optimization, structural integrity assessment, and development of a Structural Health Management System. The system will eventually materialize as an easy-to-use APP that evaluates the structural integrity and reliability of the PV solution in service.
- Mechanical testing and material composition evaluation of the hinge connections between the PV floats will be conducted by SINTEF

Stay tuned for further updates on this innovative project as we continue to revolutionize the future of renewable energy through offshore FPV systems.

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