

### **What is CalWave?**

Calwave Power Technologies Inc. (CalWave) is a California-based wave energy developer. CalWave spun out of UC Berkeley and the prestigious Cyclotron Road program in 2016, and was awarded by the U.S. Department of Energy's Wave Energy Prize. Our mission is to provide reliable, cost-effective ocean wave technologies for sustainable energy access.

### **What products and services does CalWave offer?**

CalWave's xWave™ product series transforms the motion of ocean waves into electricity to equip coastal communities with a clean and reliable source of localized power without taking up land or causing any visual impact. This cabled application is scalable to meet the needs of varied end-users ranging from remote island communities to utility-scale farms, and can be co-located with offshore wind to greatly increase the joint capacity factor. CalWave's core xWave™ products, the x100 and x800, are rated at 100 and 800 kW respectively.

For uncabled applications offshore, CalWave offers the xNode™ productline.

The xNode™ product series presents a versatile platform for converting and storing the power of ocean waves, serving as a facilitator in the Ocean Internet of Things. Devices utilize CalWave's scalable, multi-kW PTO platform and are customized toward the needs of end-users in maritime markets and Blue Economy applications.

All solutions utilize a digital twin application, which creates a virtual model of the physical devices to allow for data analysis enabling predictive maintenance and systems monitoring. Comprehensive services also include:

- predictive maintenance solution to ensure the lowest inspection and maintenance costs,
- improvement evaluations to ensure optimal efficiency and performance,
- site assessments to conduct region-specific investigations and provide decision-making materials that identify potential risks and uncover needs.

### **Who can CalWave's products serve?**

Our commercial turnkey solutions are capable of powering a range of offshore applications, communities, and different industries around the globe. Not only can CalWave's products provide clean electricity for coastal regions worldwide, but we also offer our power and data products to Blue Economy sectors like aquaculture, security and defense, inspection, navigation, disaster relief, and ocean science.

### **How are device risks (e.g. corrosion, biofouling, moving parts) addressed?**

CalWave collaborated with our naval architecture partners to specify corrosion-resistant marine paint, and sacrificial anodes are used in several locations. Additionally, all interfaces have been reviewed for appropriate material selection. To address biofouling, the marine coating used on our devices includes a 2-part epoxy base coat for corrosion protection and a top layer of bio-growth resistant paint. These are specified in collaboration with our naval architecture partners, ensuring the chemical makeup of all coatings adheres to local regulations.

Furthermore, the technology has been deemed to have an acceptable environmental impact according to the latest State of Science report and we are continuing to gather empirical environmental monitoring data (visual and auditory) for further assessment with support from our partners at the Pacific Northwest National Laboratory (PNNL) and Integral Consulting.

### **What does device maintenance involve?**

A full maintenance cycle is expected to occur every 4-5 years. Annual inspections will take place both remotely and locally. Bio-growth on non-functional surfaces of the xWave and xNode devices is of no concern and does not reduce performance. Bio-growth on functional surfaces is significantly reduced, as per definition, these surfaces are constantly cleaned via actuation/operation. CalWave has validated the above during our multiple month-long prototype deployment. Further, all technical operation and maintenance processes occur on the surface via hot-swap capabilities.

### **How does CalWave differ from peers in the ocean energy industry?**

The xWave™ architecture achieves the highest efficiency by operating fully autonomously and fully submerged, absorbing power from multiple degrees of freedom. Unlike many other technologies that extract wave energy at the ocean surface, our device's refined approach enables several improved operating capabilities: It survives stormy seas and extreme conditions, permits energy capture from multiple degrees of freedom, allows for precise control of structural loads, and causes no visual pollution. CalWave's devices are also designed for simple transportation and deployment.

### **When will CalWave's technology become commercially available?**

CalWave anticipates the potential for our xWave™ series to enter the commercial market after 2025. In the interim, we are building a series of projects at different scales to demonstrate our technology's increased performance and reliability, with each project building upon the results of the last. These projects will serve as important milestones toward driving down production costs and achieving commercial-scale return on investment (ROI).

We are currently piloting our demonstration device, which represents a scaled version of our utility-scale xWave™ architecture off the coast of San Diego, California. The scaled system has been successfully operating fully autonomously in the open ocean since September 2021, contracted to run for six months. In March 2021, CalWave surpassed the six-month mark of continuous deployment with 99.8% operational time. Due to the confidence gained in the stability and reliability of our xWave™ technology, we have decided to extend this deployment in order to gain additional data and incorporate further performance optimizations. The learnings from this demonstration will inform our next project at PacWave, which will enable CalWave to validate our technology for use on local energy grids and microgrids.

We plan to roll out the production of our xNode™ series in 2022-2023.

### **Why is now the right time for CalWave to bring its technology to market?**

Global energy consumption is projected to grow by nearly 50% between 2018 and 2050. Unfortunately, almost 80% of worldwide energy demand currently comes from fossil fuels, an unsustainable resource we won't be able to rely on for much longer. Given the urgency for action, governments are beginning to commit to the clean energy transition to tackle anticipations of shortage and the pressing threat of human-driven climate change. Ocean-based solutions have enormous potential to address these challenges, yet they are completely underutilized at the moment.

There is no doubt that wave power is at a major inflection point. Commercially, the growth of offshore wind in the U.S. and globally presents a promising opportunity for accelerating wave energy adoption. Given the technical similarities of our technology with offshore wind, our ability to co-locate and share infrastructure enables greater capacity factor and long-term cost benefits. Increasing levels of support in the form of project financing, green bonds, and availability of capital dedicated to clean energy, alongside the reduced cost and access to advanced simulations and testing, also provide favorable conditions for market entry.

Factors like the widescale, relatively low cost of advanced sensors, electric machines, SCADA controllers, etc., which were not feasibly available to developers even a few years ago, are further supporting industry development and technical efforts to bring wave energy to the market. Similarly, the specific modeling and design tools that CalWave has developed are based on software and approaches not available or affordable a decade ago.

CalWave's wave energy converter technology has been tested as a feasible solution for unlocking the vast and steady carbon-free power from ocean waves worldwide. We now have the opportunity to complement existing energy solutions to equip communities with clean, reliable, and local energy while keeping our planet and the health of future generations in mind.

### **What is the potential impact of CalWave's solutions?**

Wave energy is the world's largest unused and third-largest renewable resource after wind and solar in the U.S. Recent studies have shown that it has the potential to satisfy 20-30% of the global energy demand and over 30% of the U.S. electricity demand. Additionally, ocean energy has one of the lowest lifecycle emissions at 17 gCO<sub>2</sub>e/kWh, and forecasts project that it has the ability to displace up to 1.38 - 1.9 GtCO<sub>2</sub> emissions equivalent annually. By leveraging our technology to unlock this untapped resource, we see a tremendous opportunity to contribute to the renewable energy mix, thus supporting a more reliable, decarbonized grid.

Further, we primarily anticipate our short-term impact being in small island developing states. They still heavily rely on diesel imports, yet diesel has emissions as high as coal in terms of CO<sub>2</sub>/kWh. They have limited space, and even with wind and solar as alternative resources, hurricanes are a constraint. Tourism is one of their biggest industries, so having a renewable resource that works completely underwater and doesn't take up space while providing power close to baseload is a great opportunity for these communities.

CalWave recognizes that access to affordable and clean energy is inextricably linked to a number of other social impacts. By bringing our solutions to market, we believe that we can help meet other Sustainable Development Goals including climate change adaptation, jobs, health, education, food security, sustainable cities, transportation, poverty eradication, and gender equality.

### **What additional projects are in CalWave's pipeline?**

Supported by CalWave's U.S. DOE awards received in 2019 and 2022, CalWave plans to test the x100 rated at 100 kW at PacWave, the first commercial-scale, grid-connected wave energy test site in the US, expected to start operating in 2024.

### **How can I connect with CalWave for additional information?**

Please contact [team@calwave.energy](mailto:team@calwave.energy) for business inquiries and [press@calwave.energy](mailto:press@calwave.energy) for press/media inquiries.

[press@calwave.energy](mailto:press@calwave.energy)  
**calwave.energy**