BioPower Systems

Australia's ocean energy company, BioPower Systems

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Next Generation Ocean Energy Technology

Australia's ocean energy company, BioPower Systems, is commercialising proprietary technology to harness the renewable energy of tides and waves and convert it into electricity.

The unique energy conversion systems are designed to be more robust, easier to install, and less expensive on a price-per-unit-of-power basis, than competing ocean energy technologies.

Through the application of biomimicry, BioPower Systems has adopted nature's mechanisms for survival and energy conversion in the marine environment and has applied these in the development of the bioWAVE™ ocean wave energy system and the bioSTREAM™ tidal energy system.

These systems inherit benefits developed during 3.8 billion years of evolutionary optimisation in nature's ocean laboratory. Like their natural counterparts, the systems move and sway in tune with the forces of the ocean, and naturally streamline when extreme conditions prevail. This leads to the engineering design of lightweight structures with lower costs.

Multiple bioWAVE™ or bioSTREAM™ units would be deployed in the coastal ocean as a farm, not unlike how a wind farm is arranged on land, with a cable running ashore and connected into the distribution grid.

Unlike other renewable energy technologies, the bioWAVE™ and bioSTREAM™ systems are mounted on the seabed and fully submerged, and consequently will have zero visual impact.

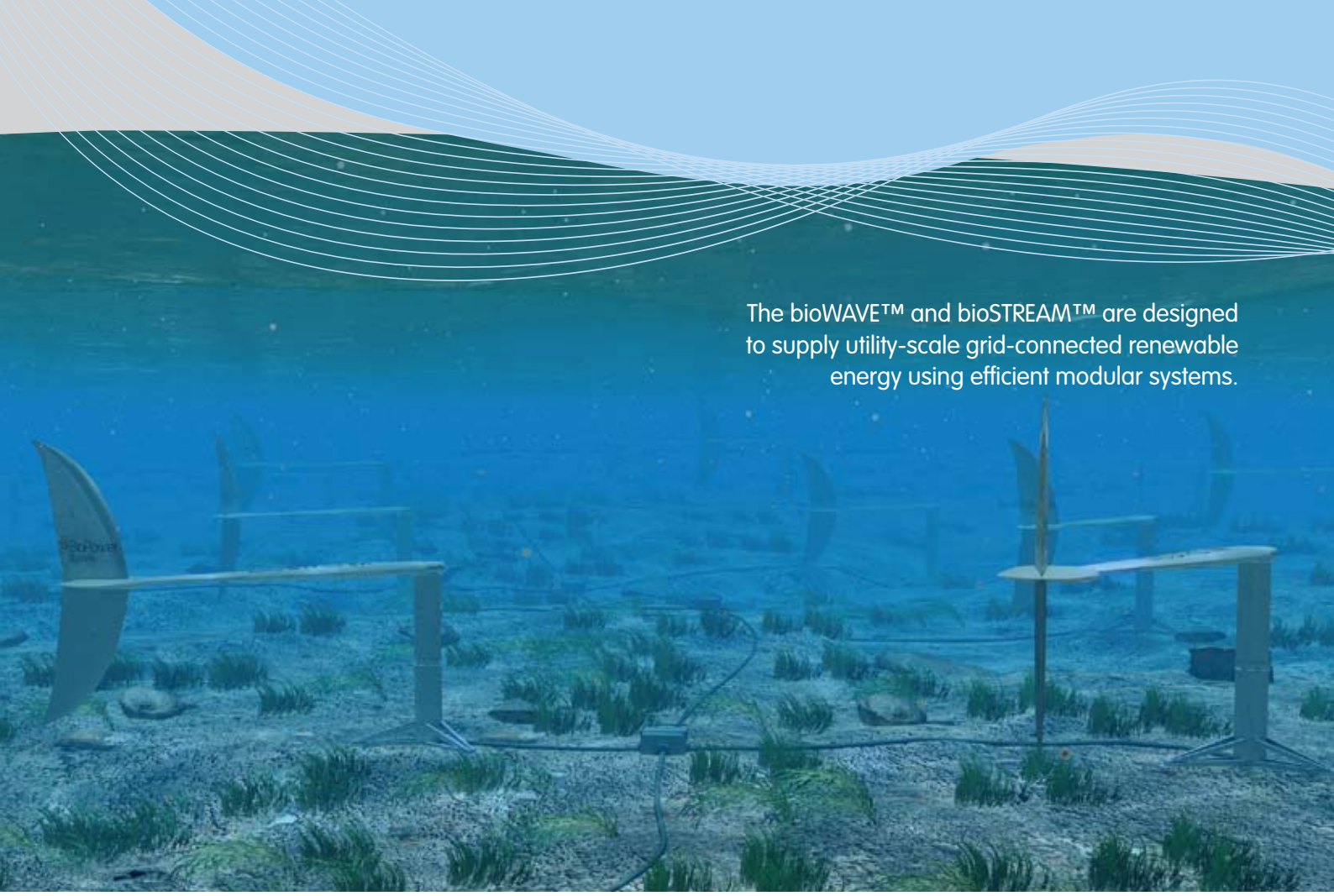
bioWAVE™

The wave energy system, bioWAVE™, is based on the swaying motion of sea plants in the presence of ocean waves.

The hydrodynamic interaction of the bioWAVE™ with the oscillating flow field is optimised for energy absorption. The bioWAVE™ captures a wide swath of incident wave energy without using a large heavy structure.

When extreme wave conditions occur, the bioWAVE™ automatically lies flat against the seabed to avoid damage. The natural motion of the bioWAVE™ also allows it to continually self-orient to the direction of the waves. These features eliminate exposure to extreme forces, allowing for lighter designs and cost savings.

The motion of the bioWAVE™ is used to drive an onboard generator to produce electric power. A 250kW pilot system is being developed and larger systems, with capacities of 1-2 MW, are planned for future development.



The bioWAVE™ and bioSTREAM™ are designed to supply utility-scale grid-connected renewable energy using efficient modular systems.

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bioSTREAM™

The tidal energy conversion system, bioSTREAM™, is based on the highly efficient propulsion of swimming species such as the shark, tuna, and mackerel. The motions, mechanisms, and caudal fin hydrofoil shapes of such species have been optimised through natural selection and are known to be highly efficient at converting body energy into propulsive force.

Through biomimicry, the propulsion mechanism is reversed and the bioSTREAM™ mimics the shape and motion characteristics of these species but is a fixed structure in a moving stream. In this configuration, the energy in the passing flow is used to drive the bioSTREAM™ oscillatory motion against the resisting torque of an onboard electrical generator.

When ocean currents become excessive, the bioSTREAM™ would automatically assume a streamlined orientation in line with the flow direction to avoid damage. This feature allows for lightweight engineering designs and lower costs.

A 250kW pilot system is currently under development. Lightweight systems with 1MW and 2MW capacities would be used in commercial tidal energy farms.

bioBASE™

BioPower Systems has developed a novel singular foundation system called bioBASE™.

This system is designed to have a modest footprint area to minimise disruption to the seabed, and would use low impact anchoring mechanisms tailored for each site. The bioBASE™ is designed to be affixed to the seabed by gravity, rockbolting, piles, suction caissons, or a combination of the above, depending on the local seabed material. One of the aims of the design is to avoid the use of large specialised vessels and drill rigs, and thereby minimise costs.

Once the bioBASE™ has been installed on the seabed, the bioWAVE™ or bioSTREAM™ would be mounted on the bioBASE™ and secured. The bioBASE™ design also allows for the generating device to be quickly detached and retrieved for servicing. General purpose tugs and service vessels would be used for installation and servicing.

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