SubSurge: Subsurface Kinetic Wave Generator

Deep Innovation Report

Executive Summary

SubSurge is a subsurface wave energy system designed to harvest kinetic power from the coastal waters of BCP without impacting its famous marine views.

This dossier outlines how a localized, submerged energy trial could pioneer invisible green power generation, building new collaborative ties between local marine tech, research, and public partners.

The Better Everyday

What if a clean energy future was completely invisible, generating power from the constant sway of the sea?

SubSurge is a seabed-anchored kinetic wave generator designed to sit entirely underwater, using the natural back-and-forth movement of nearshore ocean surges to generate green electricity. Because it operates beneath the surface, it avoids the visual and spatial challenges of offshore wind turbines while remaining protected from extreme coastal storms.

In 2030, a walk along the cliffs at Boscombe reveals a busy, modern coastal town powered entirely by the invisible swell of its own bay. Residents enjoy clean local power without a single wind turbine or floating barrier cluttering their horizon, preserving the natural beauty that defines the region.

This technology meets the fundamental human need for clean, reliable energy without compromising the cherished natural environments where people live and play. Today, people rely on distant fossil-fuel grids or visually intrusive land-based systems that cause localized objections and environmental pushback.

By proving that renewable infrastructure can coexist harmoniously with leisure and tourism, SubSurge could change how communities view public utilities. This success would raise expectations for other municipal infrastructure, encouraging the invisible integration of water recycling, waste management, and energy storage across the region.

Who It Could Matter To

From marine conservationists to coastal business owners, clean invisible power shifts how different communities relate to the sea.

The Coastal Hotel Owner

They operate a busy hotel on the seafront and face rising energy costs alongside growing pressure from guests to show real sustainability.

They look for ways to transition to renewable energy but worry about projects that might spoil the scenic views their guests pay to experience.

They gain access to reliable, locally generated green power that enhances their business's eco-credentials without altering the beautiful views of the bay.

The Marine Ecologist

They conduct research at Bournemouth University, focusing on protecting local marine habitats and tracking the health of coastal ecosystems.

They need to ensure that any new marine engineering project does not disrupt delicate seabed life or alter natural current flows.

They gain a unique undersea research platform to study marine life colonization on artificial structures, provided the installation uses non-toxic materials.

The Watersports Instructor

They run a sailing and paddleboarding school in Poole Harbour, relying on safe, unobstructed waters for their daily lessons.

They worry about surface-level energy hazards or restricted zones that could limit where their students can safely navigate.

They get to operate in safe, open waters with the peace of mind that the energy infrastructure is completely submerged far below their boards.

What This Could Change for BCP

By utilizing the natural power of the coastal shelf, BCP could turn its unique geography into a clean energy asset.

The local connection lies in BCP's extensive coastal setting, spanning the waters of Poole Harbour, Christchurch Harbour, and the open bay. This natural maritime environment provides the ideal consistent swell needed to test and run submerged wave energy generators year-round.

The direct effect would be a resilient, localized energy supply that supports BCP Council's ambition for sustainable, year-round economic growth. By generating power locally, coastal businesses and public amenities can insulate themselves from national energy market fluctuations.

A potential ripple effect is the growth of a specialized marine-tech cluster, drawing on the digital and tech expertise within the local Silicon South network. This could position BCP as a national pioneer in coastal green tech, attracting new clean-energy businesses and research funding.

The key trade-off involves balancing the deployment of undersea generators with the needs of local commercial fishing and marine transport. While the systems are submerged, anchoring them requires careful planning to avoid disrupting traditional trawling routes and navigation channels.

Who Must Connect

Bringing underwater wave generation to life requires a collaborative effort spanning marine technology, academic research, and public administration.

Delivery: A specialized marine renewable energy start-up would lead the technical deployment, partnering with a local marine engineering firm to manage the physical installation on the seabed. This partnership combines cutting-edge kinetic technology with vital local knowledge of coastal currents and vessel operations.

Participation: Local sea-user groups, including recreational divers, fishermen, and watersports clubs, would actively shape the placement of the submerged generators. This participation ensures the devices are positioned in areas that minimize conflict with existing marine activities and leisure routes.

Enabling: BCP Council and the Crown Estate would act as key enablers, providing the necessary seabed leases, planning permissions, and land-side grid connections. Their support is vital for streamlining the regulatory approval process and ensuring compliance with local environmental standards.

Sustaining: A consortium of local seafront businesses and Poole Quay operators would act as the primary energy buyers, committing to long-term power purchase agreements. These reliable contracts provide the financial security needed to fund ongoing maintenance, which would be carried out by local marine service vessels.

The missing link: The critical connection that does not yet exist is between local marine tech innovators and academic researchers at Bournemouth University. To bridge this gap, the university's environmental science department must make the first move by hosting a joint workshop to co-design an impact study.

Why This Fails

Even the most promising marine technology can falter if it cannot withstand the harsh underwater environment or secure lasting community trust.

Maintenance cost spiral Underwater equipment faces relentless salt corrosion, biofouling, and shifting sands, which can quickly drive up the cost of routine repairs. If specialized dive teams and vessels are constantly needed for maintenance, the cost of the electricity generated will soon exceed what local businesses can afford.

Grid connection bottlenecks The physical cables connecting the submerged plates to the onshore grid may face severe regulatory delays or high connection fees from utility operators. The project will stall on the beach if the energy generated cannot legally or physically enter the local power network.

Ecosystem disruption Unexpected changes in localized underwater currents could cause sand erosion around the device anchors or disturb sensitive seabed habitats. The first warning sign would be negative environmental monitoring reports showing altered sediment patterns along the nearby beaches.

One Experiment to Start

A modest, highly focused test can validate the physical durability and community support of the wave generator before scaling up.

The single most important uncertainty is whether a localized, submerged plate can withstand the continuous physical forces of the coastal swell without shifting or failing. If the physical anchoring system cannot handle the daily underwater forces, any future plans for grid integration are irrelevant.

The proposed test would involve installing a single, scaled-down, non-generating dummy plate anchored to the seabed near Boscombe pier for a fortnight during the autumn. This temporary installation would let engineers monitor the physical movement, sand displacement, and structural integrity of the device under real wave conditions.

Keep going if the dummy plate remains securely anchored, shows no signs of structural failure, and causes zero measurable sand erosion around its base. Stop or rethink if the device shifts position, suffers structural damage, or if local marine wildlife monitoring shows significant behavioral disruption in the area.

Next step: A local marine engineering start-up could draft a formal project brief and share it with the Crown Estate within 90 days to explore licensing requirements for a temporary seabed trial.