

Description of Additional Supplementary Files

File Name: Supplementary Movie S1

Description: Demonstration of the working mechanism of the chaotic pendulum. This mechanism isolates the generator's motion from the buoy's oscillations, stabilizing the generator's barycenter relative to the buoy frame and guaranteeing steady operational output.

File Name: Supplementary Movie S2

Description: The temperature and humidity sensors powered by the hybrid nanogenerator motivated by the rotation motor.

File Name: Supplementary Movie S3

Description: Demonstration of the navigation light and the temperature and humidity sensors powered by the CP-TEWEC buoy excited by water wave in the tank. The CP-TEWEC buoy efficiently converts harvested wave energy into regulated outputs capable of driving low-power devices.

File Name: Supplementary Movie S4

Description: Demonstration of the functional verification of the CP-TEWEC buoy in the South China Sea. This successful field validation under authentic marine conditions confirms the buoy's ability to simultaneously harvest wave energy and power wireless telemetry, demonstrating a practical solution to extend the operational endurance of autonomous monitoring systems.