DOCKETED	
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Initiatives 1(3) Floating Wind & 6(1,2,3) Energy Storage

1(3) Floating Wind Power "grid integration innovation": Synchronous Condensers are proven technology to grid stabilization and the Bardex Corporation Subsea Power Generator has this capacity: see attached 'FOA 2415 Concept Paper.draft, page 2 yellow highlight.

6(1,2,3) Energy Storage "real time, storage & interconnection". California's wave energy resource coupled with the State's coastal mountain ranges' elevations in conjunction with Bardex Corporation Subsea Power Generators can provide these solutions via pumped storage of desalinated ocean water. Potable water spent in hydropower production is provided to the State's water demands.

Additional submitted attachment is included below.

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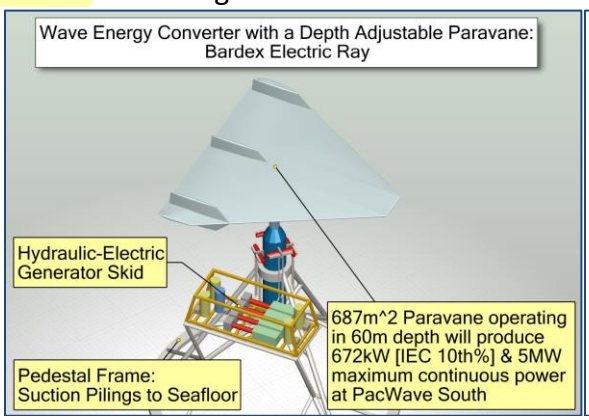
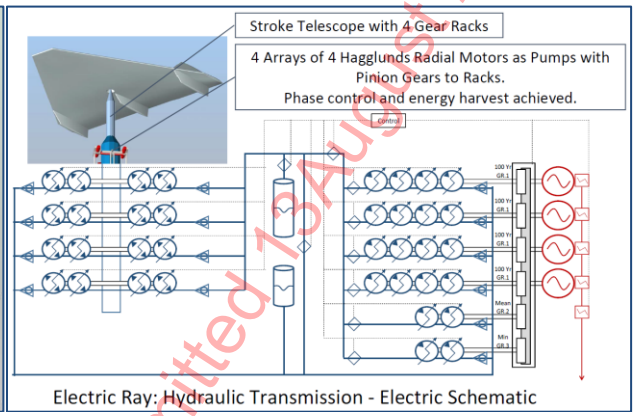
Technology Description
Subsea Power Generation is reliable and continuous utilizing the "Wave Energy Converter Using a Depth Adjustable Paravane", US 2018-0030953 & WIPO WO_2018023051_A4. The Depth Adjustable Paravane operates subsea; its supporting structure is fixed to the ocean floor. Reliable, continuous power generation is possible in all sea states up to and including the DNV-GL defined 100 Year Extreme Wave Event for any worldwide location by simply extending stroke or retracting to greater depth, to operate in its design optimum energy level. Achieving: IEC TS- 62600-2 and IEC 62600-4, 62600-10 & 62600-102. See also https://youtu.be/t3B-H9-8ORc.

The neutral buoyant Paravane is dynamically stable requiring no controls to align with resultant wave force velocities and ocean currents as may occur: its planar area closely parallels the waves' surface contours. The active Paravane is neutral buoyant and absorbs all wave +/- Surge and +/- Heave incident forces that are resolved to normal and then +/- Heave Stroke Forces only. The neutral buoyant Stroke Telescope's 4 geared racks mechanically transfer +/- Stroke Forces to four (4) Arrays of four (4) Hagglunds Radial Hydraulic Motors as Pumps. Correct switching of these 16 Pumps creates Phase Control: correct impedance so the Paravane achieves Wave Phase with optimum power generated at 50% of Wave Height. Operation redundancy is retained if any 1 Array is removed for maintenance in 90th Percentile or less wave conditions.

The sixteen (16) Pumps are part of this Hydraulic Transmission as the switching of twenty (20) Hagglunds Motors resolve the variable flows and pressures from the Pumps to constant input RPMs to the Common Gear Box. All Gear Box Output Shafts are interconnected by Idler Gears to provide simultaneous, correct RPMs to the four (4) Synchronous Generators. This interconnection of all Output Shafts allows any one (1) or all Generators to be powered by any combination the appropriate number of the 20 Motors. The "20 Motors x 4 Generators" arrangement nets multiple layers of redundancy in the system.

The result is that all four (4) Generators' four (4) Armatures may continually spin without Field Excitement at their correct operating RPM. Switching in and out of the grid is by correct Field Excitement only, which simplifies grid interconnection. Generators' Engineers posit that this arrangement of constantly spinning off-line Generators also offers the possibility of a Synchronous Condenser capacity that provides power stabilization to other variable power sources. Achieving: IEC 62600-30 & IEEE 1547.





With all wave forces resolved to +/- Stroke, Impedance and Course Depth Control is established by 4 onboard sensors providing real time data: Stroke Telescope position, Hydraulic Pressure & Flow, and Distance to Wave Surface (up looking sonar). Control Logic for safe operation and maximum power production is simply extend (+) or retract (-) from the Wave Surface. This control of operating depth allows reliable, continual energy harvesting in design optimized energy levels when other devices are in 'survival mode'. Grid providers pay for more reliable, continuous power generation than renewable power that comes from energy resource limited devices (no sun, too much wind). Long-term economic viability is assured and this will reduce insurance rates. All components are engineered neutral or slightly positive buoyant so no 'heavy-lift ship' is required for installation or removal: CapEx and LCoE are minimized.

Bardex Corporation Key Personnel		
Name	**Qualifications**	**Responsibility**
Frank Stapelmann	Principal Investigator	Project Lead & Manager
Nick Atallah	Director of Engineering	Controls Engineer & Oversight
Paul M. Johnson	Senior Project Engineer	Hydraulic Controls Engineer
Charlie O'Rouke	Senior Structural Engineer	SolidWorks FEA Analysis
Robert Taylor	Structural Engineer	RISA & SolidWorks FEA Analysis
Daniel Lyons	Solid Works Designer	SolidWorks RISA & FEA
Edmond Dinescu	Software Controls Engineer	Design & Engineering

Bardex and Team Members are preeminent in their marine mechanical engineering fields, all accomplishing first of kind concepts that are now industry standards. With correct simulations and onshore/tank testing a full design to 2 years' service for PacWave South will net 670kW & 1.2MW [10th & 50th Percentile] and maximum 5MW capacity.

I, Frank Stapelmann certify that this project meets the minimum requirements outlined in Topic Area 2, Requirements for Eligibility.