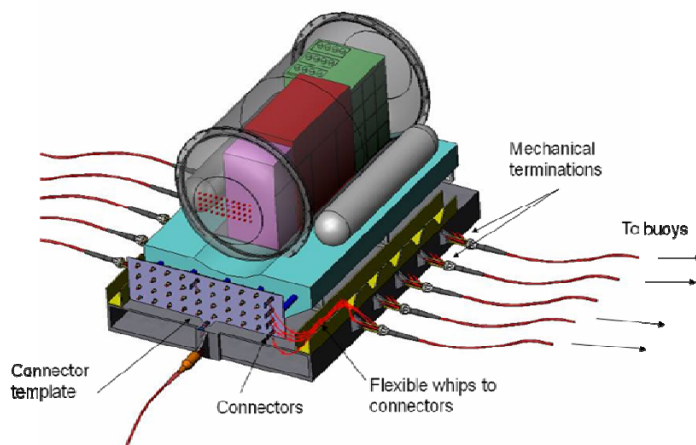


### Ocean Power Technologies (OPT)

OPT is a leading wave power technology company based in the UK and USA. The company is commercialising its PowerBuoy® and offshore connections technology to convert and transmit wholesale amounts of electrical power from offshore. In 2007, OPT raised US\$100m through its listing on NASDAQ and in 2003 OPT raised US\$40m by listing on the London Stock Exchange's AIM market.

### Offshore Power Transmission

The majority of offshore renewable energy systems, including wind, tidal and wave, generate power at low voltage and need to step-up the voltage to medium or high voltage for efficient transmission to shore. Additionally, offshore projects typically have a number of devices (turbines, wave energy converters, tidal devices) that need to be networked offshore such that a single subsea cable can export the power to the shore. OPT has fully analysed these requirements and developed an innovative solution called the USP or Underwater Substation Pod.

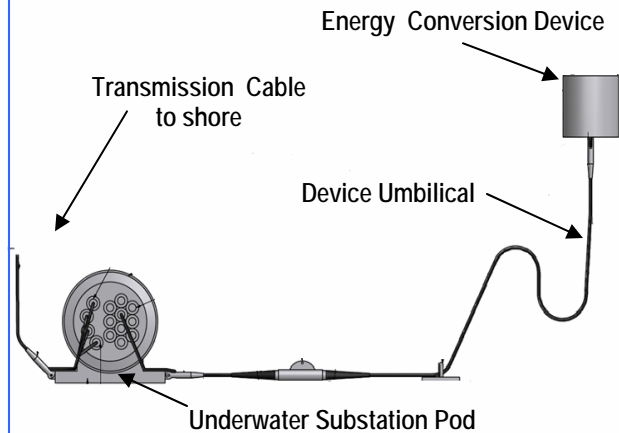


USP (Underwater Substation Pod)

### USP (Underwater Substation Pod)

The USP collects and transforms low voltage power generated offshore to a higher voltage for transmission to shore. In the case of the PowerBuoy, the electrical output from a farm of surface floating wave energy converters is networked by the USP at a voltage of 600V and stepped-up to 11kV.

## Underwater Substation Pod (USP)



### Typical Offshore Connection Layout

The USP also acts as a central node for a SCADA (Supervisory Control And Data Acquisition) system communicating over fibre optics through the subsea cable to shore. Designed for deployment in depths greater than 50m, the USP is comprised of a water-tight pressure vessel containing low voltage (LV) power distribution equipment, a transformer to step-up to medium voltage (MV) for efficient power transmission, SCADA and other auxiliary equipment.

### Turnkey Connection Services

In addition to the USP, OPT can also provide the full turnkey connection service through our experience in supplying complete, grid connected wave power projects for the US Navy in Hawaii and Iberdrola in Spain.



Undersea Cable Deployment in Hawaii

### Turnkey Connection Services

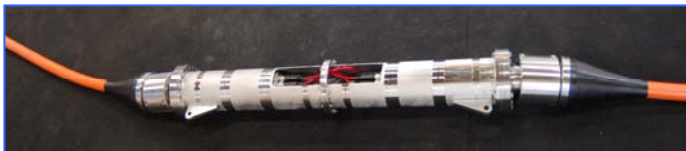
OPT is currently working under a joint venture agreement with Iberdrola S.A., to provide the full EPC (Engineering, Procurement, Construction) services to build an OPT wave farm up to 1.4MW, 5km off the northern coast of Cantabria, Spain. The first phase includes a 1.5MW subsea transmission cable and 1.5 MVA USP in 50m water depth.

### Reliability and Life-cycle

The USP has a 30 year design life with minimal maintenance requirements. All items of equipment are designed for the full life and a 10 year scheduled maintenance period is foreseen. The control systems in the USP are fully redundant and the USP has 20% spare capacity. The switchgear in the USP provides for fault protection of the energy device and shore transmission cables, and provides disconnection capabilities to allow servicing of the individual energy devices and cables.

### Deployment and Installation

The USP is designed to minimize the cost and complexity of marine operations. All exterior maintenance operations can be performed by ROV and a need for heavy lifting equipment and vessels



**In-line Connector** (courtesy of MacArtney)

### USP System Applications

The USP System is suitable for any off-shore generation installation that requires an economical solution for the collection of power and data for transmission to shore, including:

**Wave**

**Tidal Stream**

**Offshore Wind**

**Oil and Gas**

Customers are welcome to discuss this exciting opportunity with OPT. Please refer any questions to Herb Nock in USA ([hnock@oceanpowertech.com](mailto:hnock@oceanpowertech.com)) or Paul Jordan in UK ([pjordan@oceanpowertech.com](mailto:pjordan@oceanpowertech.com)).

is minimized. The USP uses an inline connector methodology to provide 'plug and play' connectivity for any device linked to the USP. Innovative connections and disconnections are designed to be undertaken at the sea surface using standard vessels. This means the USP itself is not raised to the surface for any device connection.



**USP Electrical Internals** (courtesy of Humber Electrical)

### User Interface

OPT has designed control software and algorithms to manipulate and control the USP. This software can be accessed via any PC with an internet connection giving a single user control of multiple USPs deployed around the world. Conditions inside the USP are logged and recorded in real-time prior to shipping the data back to shore. All aspects of the control scheme can be modified with the user interface at site or from the comfort of the office. Multiple access levels can be set dependent on the intended users, and the USP is protected with the latest firewall and security systems.

### Scaleable

The USP is a versatile product that can be scaled to suit any power level requirements from any offshore generation. The 1.5 MVA USP mentioned earlier has been designed and built while OPT already has plans to design the next generation USP.

**OPT**  
**OCEAN POWER TECHNOLOGIES**  
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