



Radar Transmitters



Advanced RF Systems

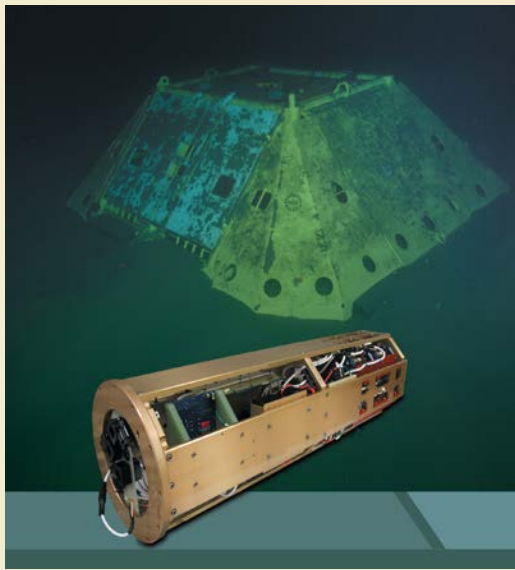


Power Converters

PowerMod™

Subsea MVDC Power Distribution

System in Action



Subsea MVDC Power Converter. This 18" diameter pressurized module (foreground) resides within the Primary Node (background) at depths up to 3,500 meters. It converts 10 kVDC to 375 VDC directly on the seafloor for use by a wide range of specialized electronics.

(Photo Credit: NSF Ocean Observatories Initiative, University of Washington, Canadian Scientific Submersible Facility (NSF-OOI/UW/CSSF))

The Regional Scale Nodes (RSN) project is an ambitious effort to provide unprecedented power (10 kW at 10 kVDC) and bandwidth (10 Gbps) to each of several scientific hubs on the seafloor. Led by the Consortium for Ocean Leadership and the University of Washington, and part of the greater NSF Ocean Observatories Initiative, the network consists of a shore station located in Pacific City, Oregon, ~900 km of undersea high power and high bandwidth cable, and seven underwater power distribution terminals. These terminals, called Primary Nodes (sidebar), are located at depths up to 3500 m (2.2 miles) and house DTI power conversion technology which enables an array of low voltage equipment instruments to provide continuous acquisition of real-time data in one of the world's most inaccessible, difficult-to-study environments.

Technology Overview

Central to the technology within the power conversion node is DTI's high voltage, solid-state switch. Enabled by the patented ability to series and parallel semiconductor devices in large numbers such that no single device is subjected to full voltage, DTI's solid-state switches are capable of directly



Power Feed Equipment for the MVDC Conversion and Transmission System. This system is shore-located and is housed in two 20-foot ISO containers and powered by two 200 kV high voltage power supplies run in parallel.

Regional Scale Nodes Power Converter	Product Specification
Input Voltage	10 kV, negative polarity
Output Voltage	375 VDC +/- 5%
Nominal Output Power	10 kW operating, 20 kW designed
Upstream Cable Length	200 - 600 km
Operating Depth	3500 m
Design Life	25 years
Reliability	> 90% over 25 years

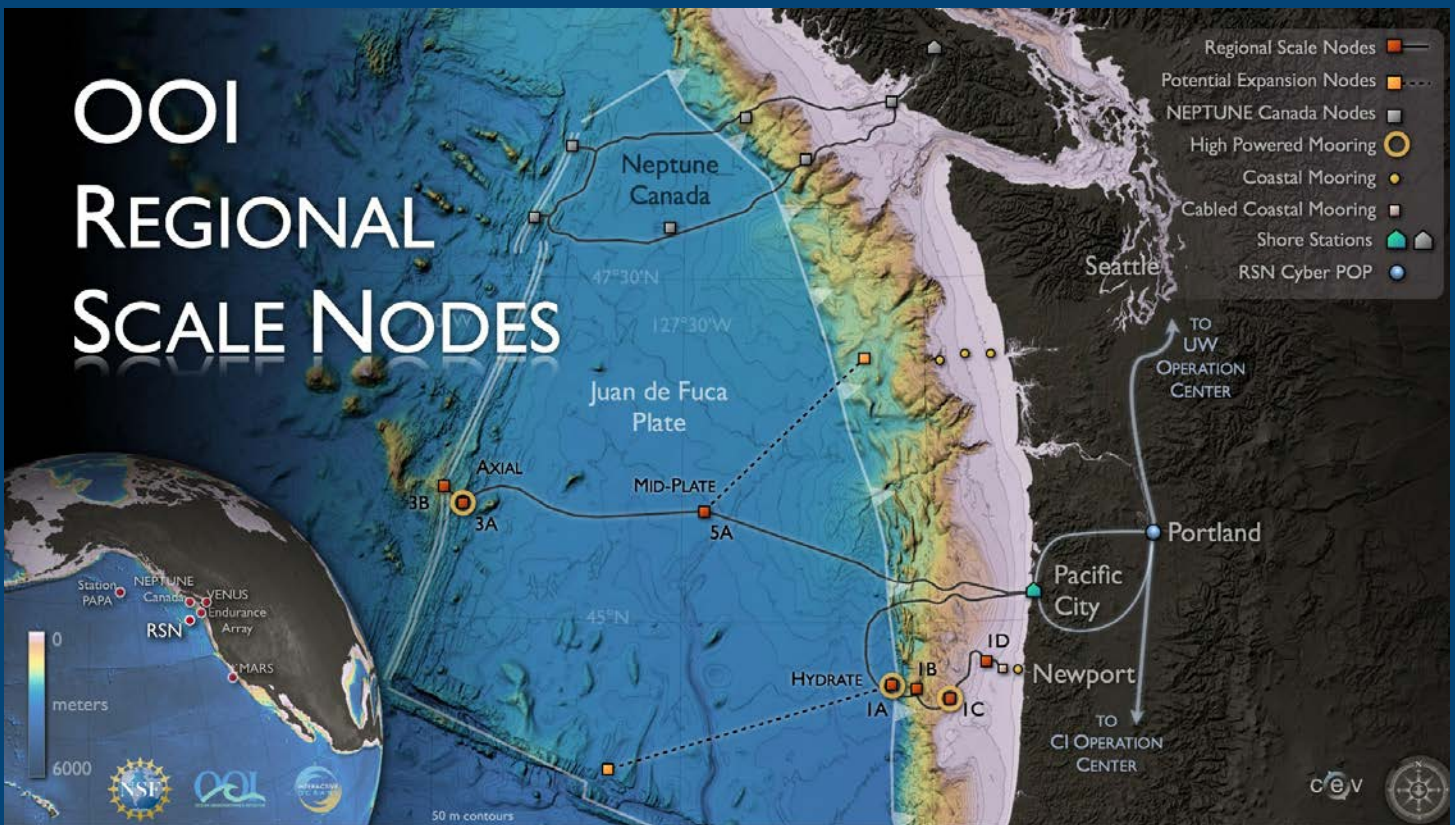
switching voltages up to 200 kV and currents up to 10 kA. This allows for drastically improved system reliability, efficiency, and performance. The RSN switches can withstand 100 A peak at 10 kV and operate in a full bridge configuration at high frequency (20 – 25 kHz) to minimize the size of the system, while providing sufficient bandwidth for load regulation.

Beyond pure functionality, the most important specification of the converter is reliability. Repair requires not only bringing the converter to the surface, but lifting as much as several miles of cable off the seafloor (reconnection must be done dry). Accordingly, the nodes were designed for extreme longevity and resilience, with 90% probability of operation for 25 years (or a mean time between failures (MTBF) of approximately 2.2 million hours).



PowerMod™ High Voltage Solid-State Switches.

Consisting of IGBTs in series, DTI's patented technology is inductively driven to ensure that the stack acts as a single switch. Each IGBT is fixed to a heatsink which visibly extends from the plate.



Ocean Observatories Initiative Regional Scale Nodes Network. The ~900 km network provides unprecedented power and bandwidth to the subsea environment.

(Photo Credit: OOI Cabled Array program and the Center for Environmental Visualization, University of Washington.)

