ITU Green standards week

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Requirements and Options – Wet Demonstrators for Sensors and Interfaces to Telecom Cables

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Wet Demonstration - Motivation

- While many cabled sensor systems have been deployed over the years, sensors deployed on commercial submarine cables are a new application.

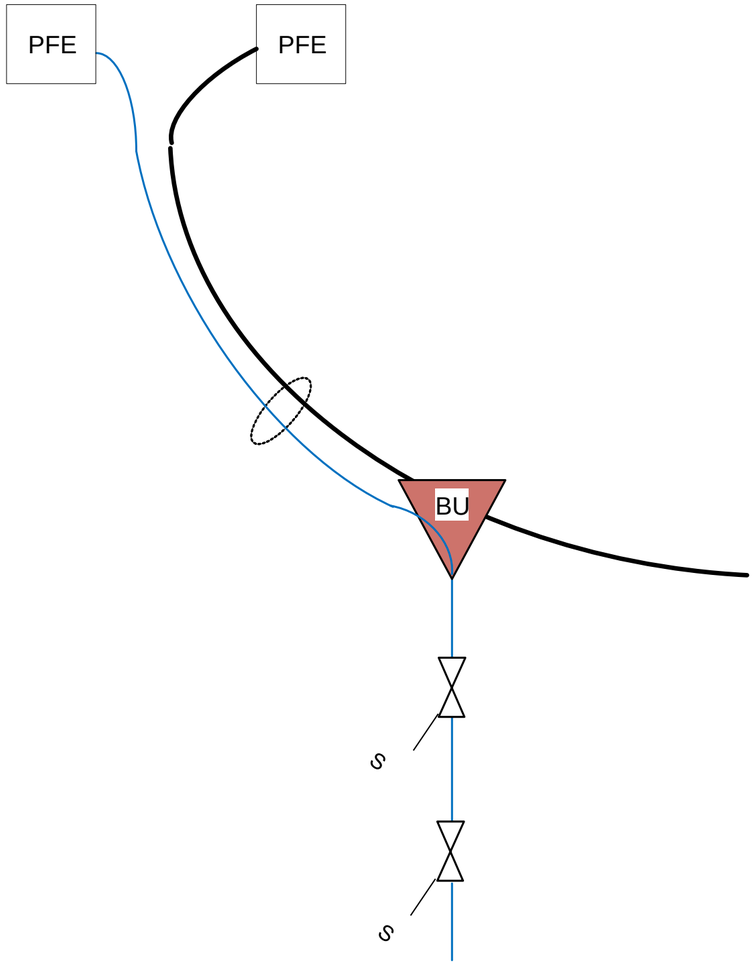
- Cable owners/operators and climate research funders are more likely to accept and fund the application if the specific technology is proven.

- Technology prove-in should follow a similar path to the current testing regimen performed for technology deployment.
  - Technology which mixes telecom and sensors, which normally have not shared system elements, remains the motivation for a wet demonstration at-sea test.

Wet Demonstration – Overview of Options

- As a first step to prove-in the required sensors and interfaces, a phased approach is recommended that would allow engineering trade-offs to be evaluated and would build confidence within the industry for future deployment of sensors on commercial telecom systems.
- Allows match to funding profiles.
- Progression of test bed demonstrations include:
  - Desktop simulations and modeling
  - Laboratory hardware and system tests
  - Use of test facilities (pressure tanks, mechanical testing, deployment simulation)
  - Pier side tests (shallow water dunk tests, cable machinery tests)
  - Deployment on existing coastal observatories
  - Deployment on out-of-service or other scientific cable systems
  - Deployment of a limited test bed on a commercial telecom cable or oil and gas infrastructure cable

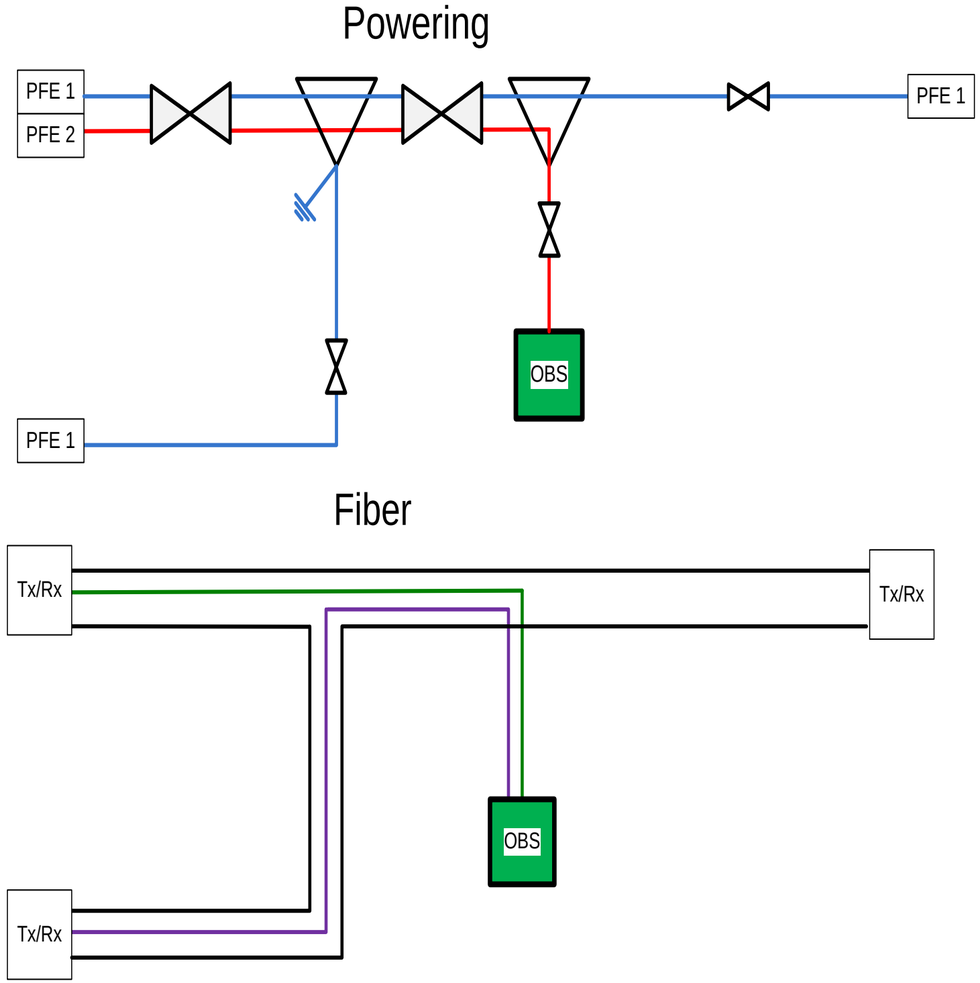
Telecom Wet Demonstrator



- For example, the use of existing telecom Branching Units on a telecom system, with or without dual conductor cable, would allow sensors to be tested and allow data and power interfaces to be evaluated with a relativity small investment and with limited impact to the primary telecom system.
- The sensor interface could be largely isolated from the telecom power and data path.
- Depending on location, the test site could be reconfigurable to test a number of sensors.

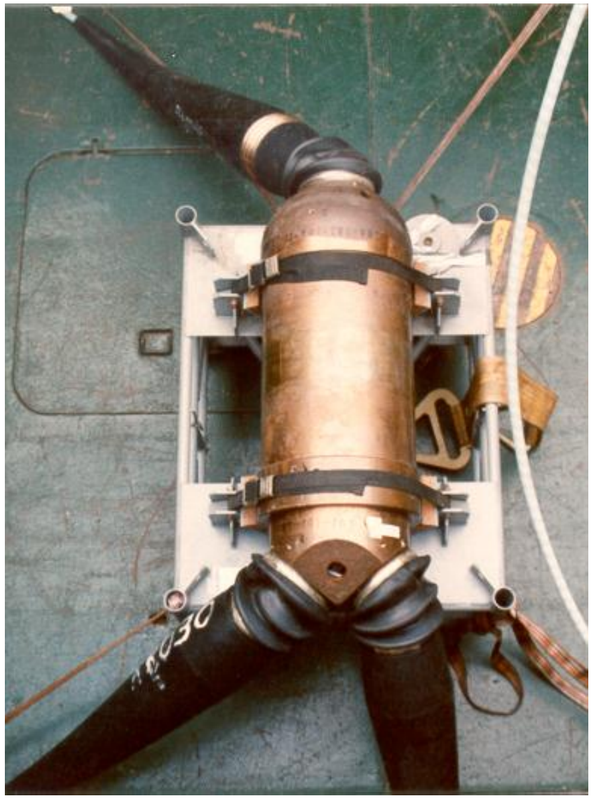
Configuration Options
Products Support Unique Architecture

- Dual Conductor Cable
  - Power and Data via Backbone
  - Direct Access to Shore Facility
  - No Dependence on Offshore Facility
- Branching Unit
  - Up to 3 Independent Power Paths
  - Adds Fiber Interconnect Options
  - PSBU and OADM Variants



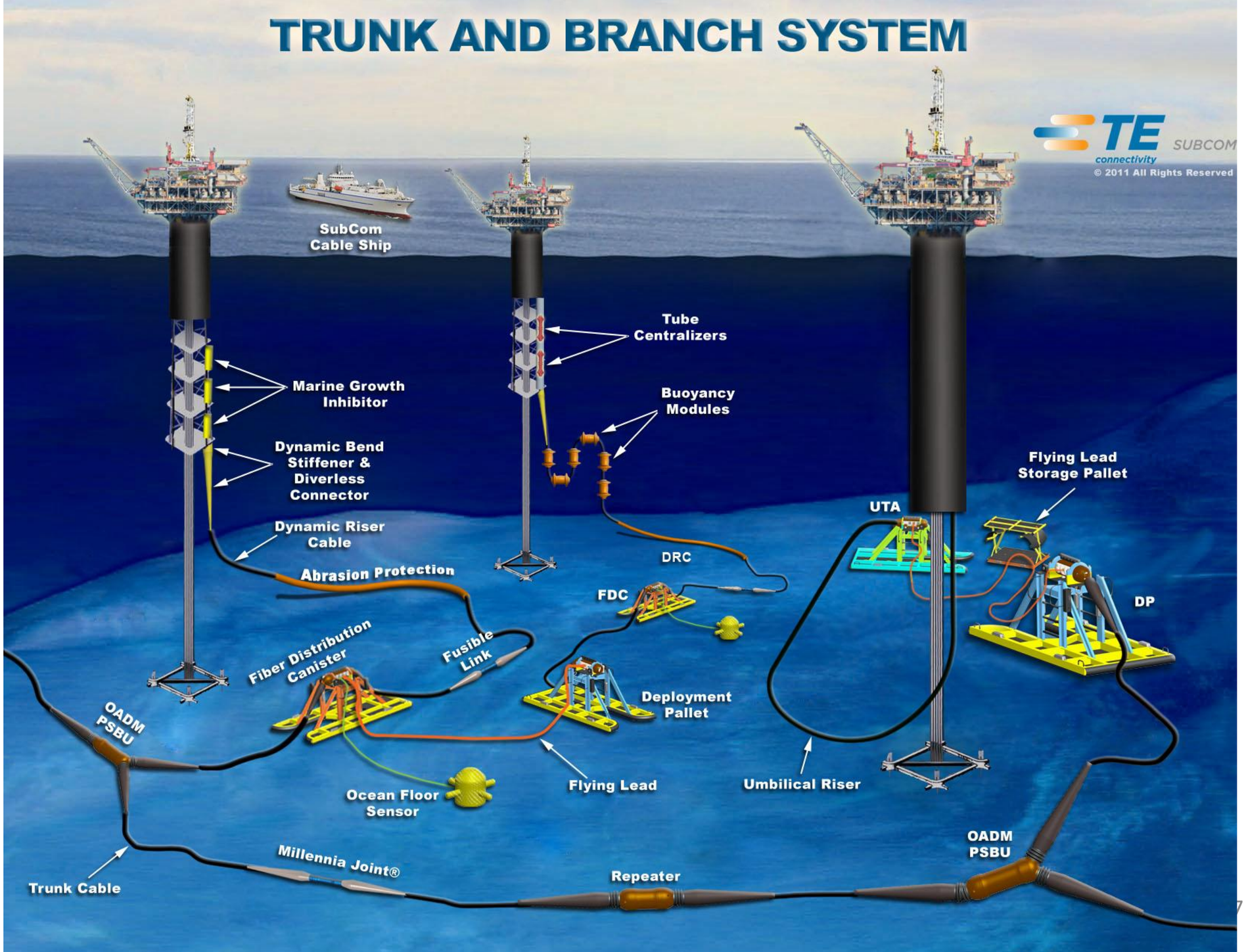
Technology Elements to support Wet Demonstrator

Repeater



Branching Units -Power Switched and Passive; OADM Units; 3 Port; 4 Port

Fiber Distribution and Wet Mate Connectors



TE connectivity SUBCOM

The Objectives – Wet Demonstrator

- Assess impact on telecom system reliability
- Prove-in deployment and maintenance operations/methods
- Assess sensor performance and reliability
- Evaluate sensor calibration methods, accuracy, drift and influence of the repeater on the measurements (i.e. local heating)
- Demonstrate minimal impact to environment. (for future permitting)
- Assess impact and mitigation of bio fouling over the short and long term
- Evaluate site specific characteristics that could impact sensor measurements (i.e. currents, seamounts, shelf slope etc.)
- Assess data and power interfaces on both wet and dry side
- Other……

Requirements – Wet Demonstrator

- Simulate end system to the extent possible
- Must be cost effective and match to funding availability
- Select a site of scientific interest (seabed, acoustics, bathymetry, currents, temperature variation, salinity)
- Select an existing or suitable cable landing site
  - Dual use with existing or new telecom system
- Location should allow ease of permitting
- Site to have minimum risk from fishing and anchoring.
  - Burial and armor will add to cost
- Proximity to vessels of opportunity for deployment and maintenace
- Reconfigurable and repairable
- Within ROV depth if possible (<2500m water depth allow many ROVs)

Interface Requirements

- Physical Interface for external sensor packages
- No. and type of conductors for power & data signals
- Electrical power consumption available to sensors
- Electrical isolation from ocean
- Fault tolerance
- Reliability for sensor package
- Data protocol to sensor package
- Operational environment

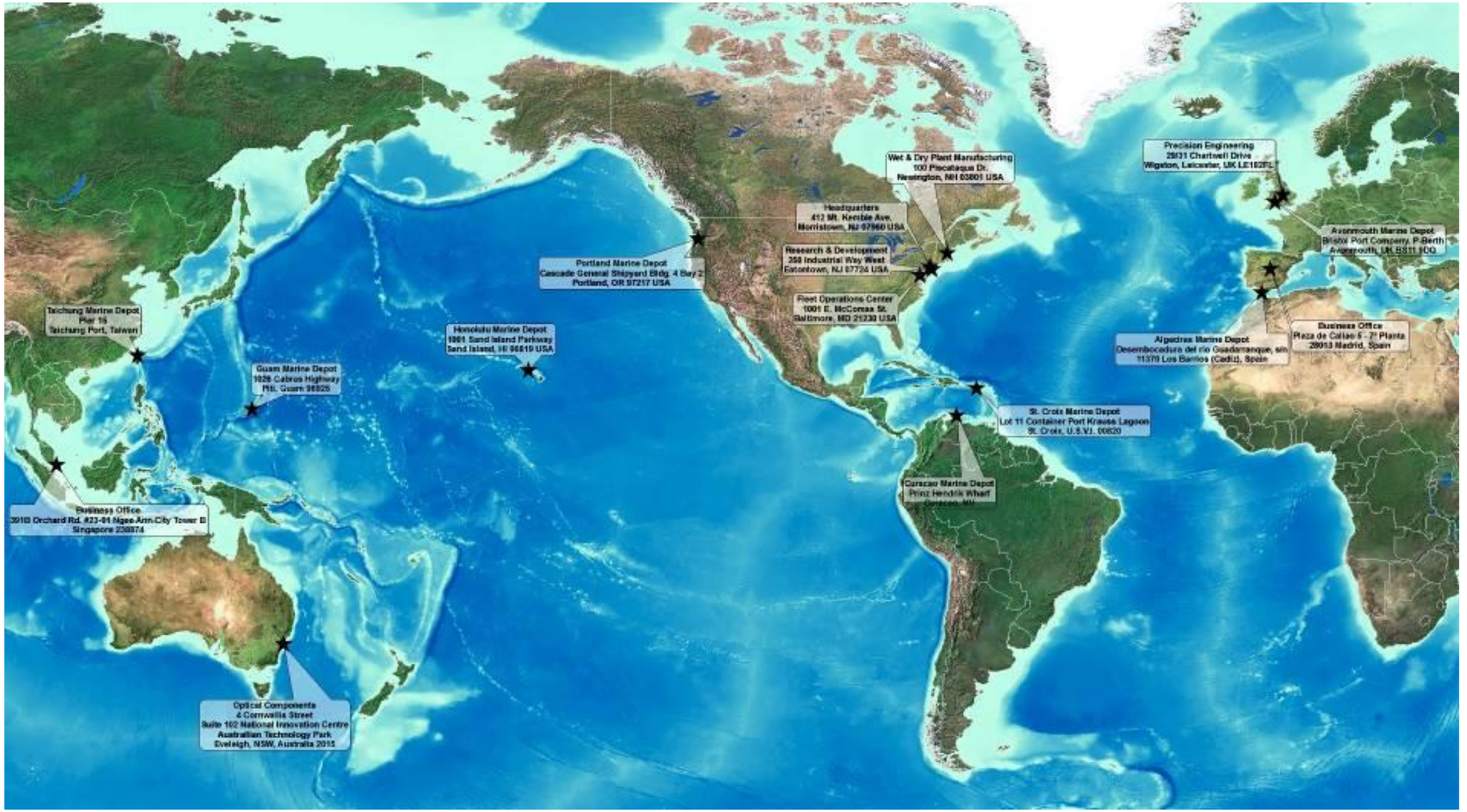
Phased Demonstrator Options

Test Phase	Key Objective
Desktop simulations and modeling	*Sensor behavior in presence of repeater and cable*
Laboratory hardware and system tests	*Power and data interfaces to repeater and transmission system*
Use of test facilities (pressure tanks, mechanical testing, deployment simulation).	*Mechanical and environmental tests of sensors and interface to repeater and cable*
Pier side tests (shallow water dunk tests, cable machinery tests)	*Mechanical tests in handling equipment. Easy access to sensors for wet tests.*
Deployment on existing coastal observatories	*Real ocean environment. Could be sensors only, could be repeater and sensors.*
Deployment on out-of-service or other scientific cable systems.	*Dedicated cable that could be used for longer term testing and close to actual application*
Deployment of a limited test bed on a commercial telecom cable or oil and gas infrastructure cable.	*Actual telecom cable application to demonstrate dual use over the longer term*

Cable Ship and Cable Handling System Interfaces

Linear Cable Engine/tire pairs to deploy cable and repeaters

Support Facilities



Summary – Conclusions – Next Steps

- A wet demonstrator is a required first step to gain industry and science community buy-in needed to attract funding and end user clients.
- A progression of wet demonstrator options exist that could be matched to funding availability while allowing high priority engineering evaluations to be made.
- Next Steps
  - High priority sensor suit and science/society application should be agreed.
  - Define, in greater detail, a requirements document and test plan for the wet demonstrator, clearly indentifying the test objectives with the highest priority.
- With a realizable plan with a clear roadmap, funding sources and end clients will be able to develop the needed business/science case and prioritize funding.

Thank you

Further information:

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