



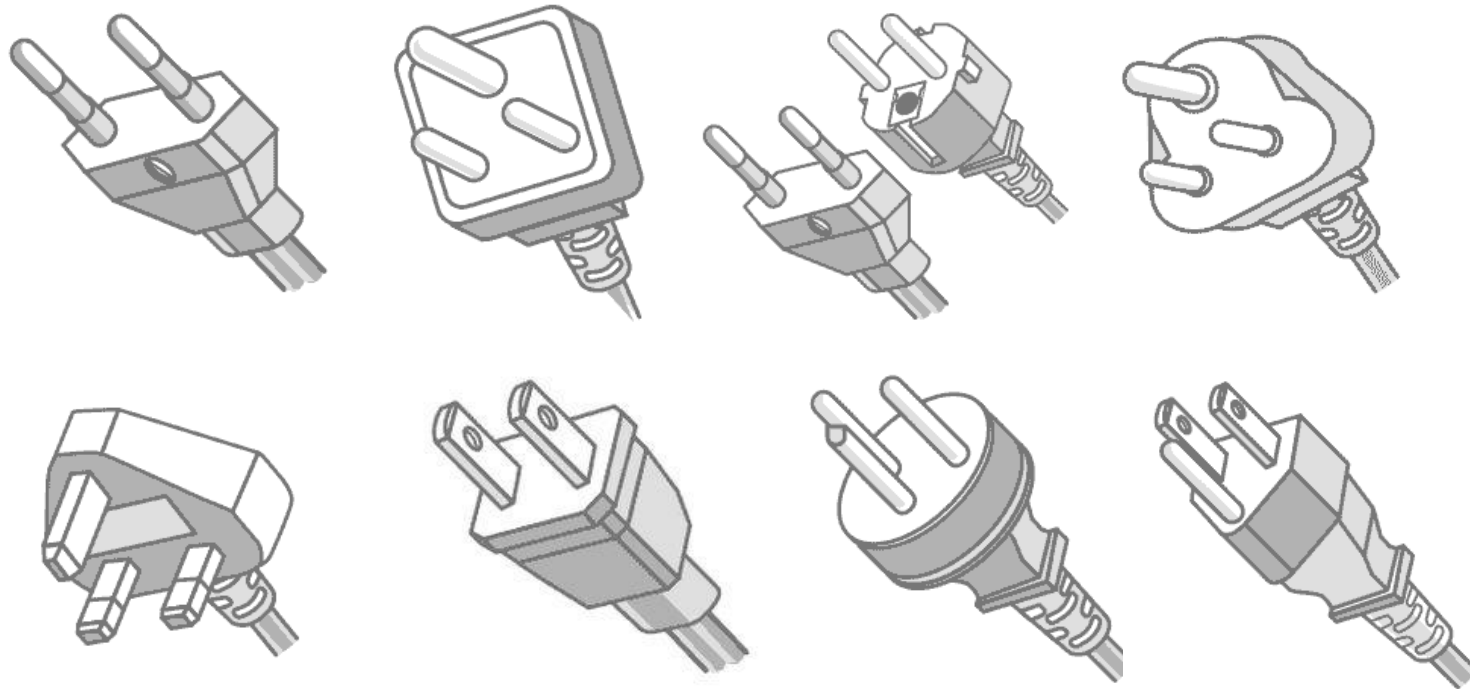
Enabling Automated Subsea Inspection and Monitoring through a
Universal AUV Interface System, Oct 2017

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Agenda

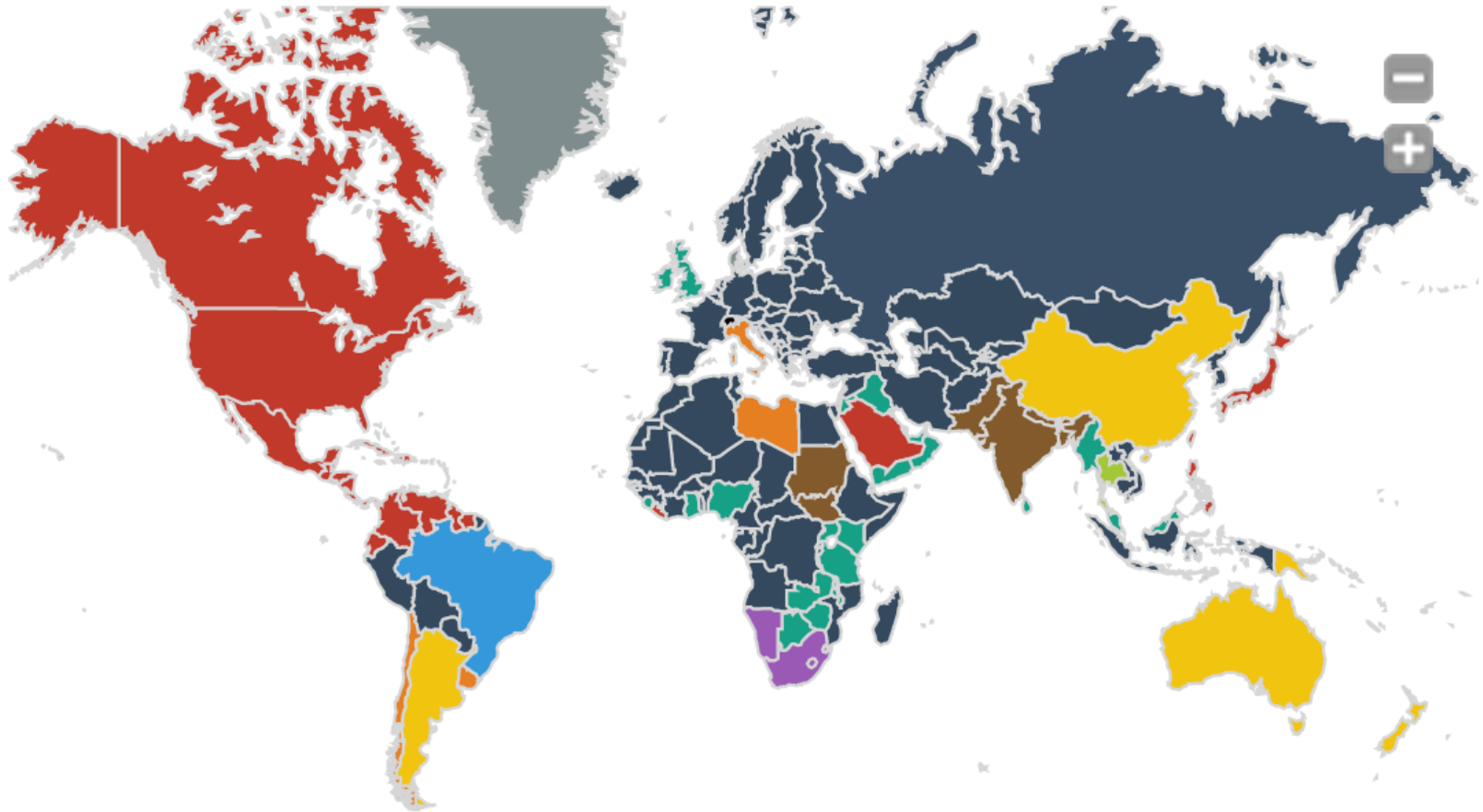
- Universal plugs
- JIP - an overview
- Applications - resident AUVs in Australia
- Challenges - environments and logistics
- Involvement?

A brief history – universal plug



15 types of electrical outlet plugs in use today, each of which has been assigned a letter by the US Department of Commerce International Trade Administration (ITA)

<http://www.worldstandards.eu/electricity/plugs-and-sockets/>



<http://www.worldstandards.eu/electricity/spread-plug-types-map/>

A brief history – universal plug



For decades, the International Electrotechnical Commission (IEC) tried to develop a universal domestic power plug. In 1986, the IEC finally presented the universal standard plug ([type N](#)) to the world.

Similar plug story subsea...
...what about communications?

A very brief history – subsea telecommunications



Telegraph Era
1850 - 1950



Telephone Era
1950 - 1986



Optical Era
1986 - present



Wireless ?

Recent subsea developments,
catalyst for the JIP.

Pinless communications and power



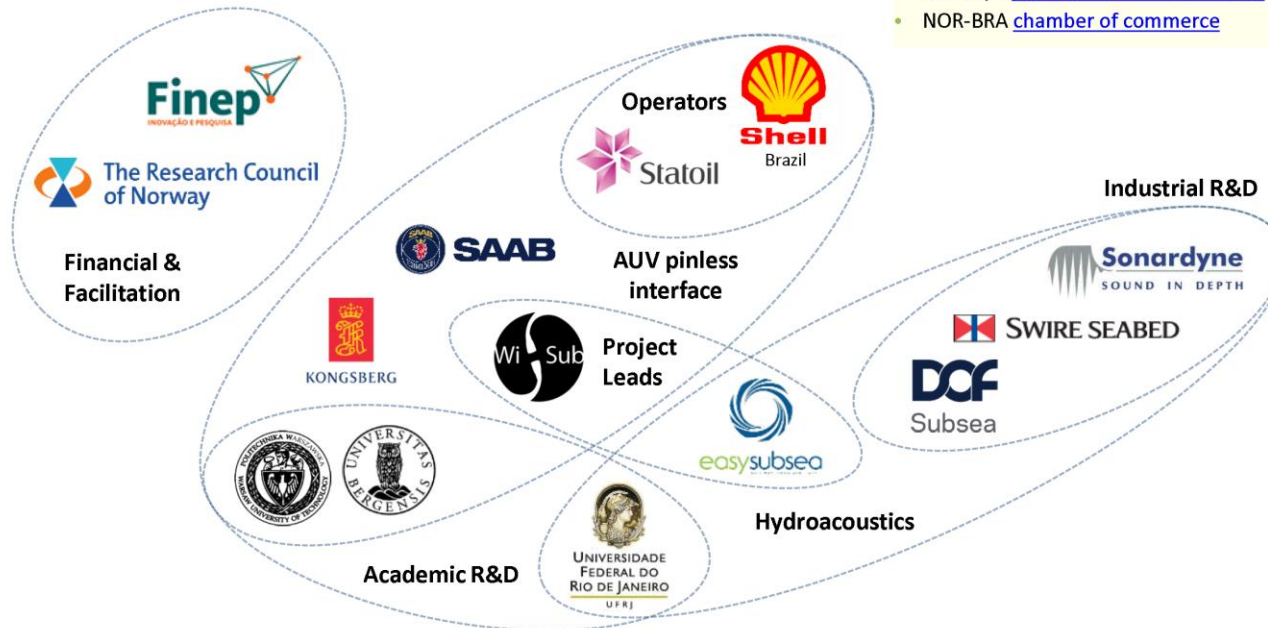
Brazil-Norway R&D Collaboration



- SME-led R&D, funding granted from National R&D bodies
 - Goal: standardized **AUV seabed interface** for wireless power & communication

In the news:

- Selection of [R&D funding recipients](#)
- Norway's [petroleum minister in Brazil](#)
- NOR-BRA [chamber of commerce](#)

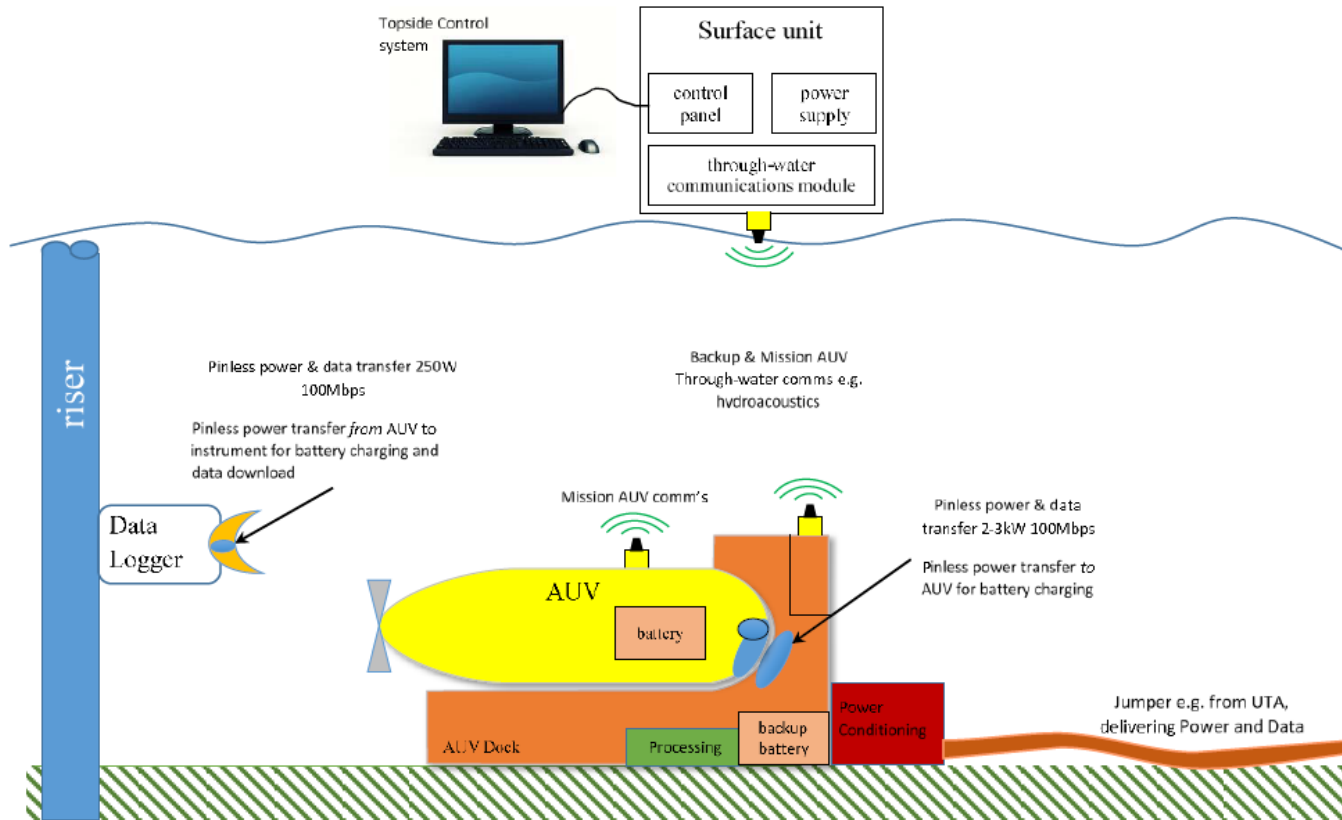


JIP Goal

Long-term remote operation of underwater vehicles, using seabed docking stations:

- battery charging
- high-bandwidth data transfer

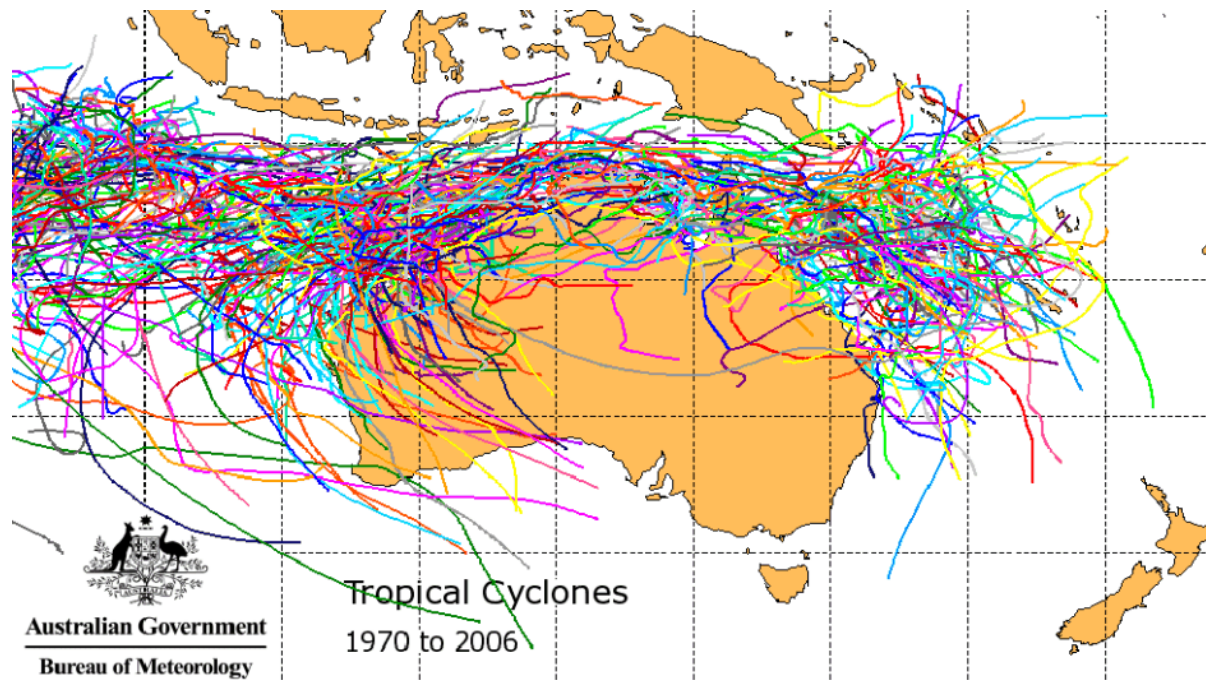
The ability to charge distributed sensor networks from AUV systems should also become possible with bi-directional power transfer being developed.



Resident AUV applications - Australia

Trunklines

- 100's of kms of gas trunklines NWS and Timor Sea
- Critical parameters:
 - Position
 - Burial status
 - Cathodic protection
 - 3rd party interaction
- Currently inspected via ROV / vessels (~ 750m/hr)
- Post cyclone inspections will become increasingly important due to location of new offshore fields



<http://www.bom.gov.au/cgi-bin/silo/cyclones.cgi>

Flowlines

- Increasing reservoir (gas) temperature trend in Australia: 120 -170°C
- Critical parameters:
 - Axial walking
 - Buckle size / curvature
 - Burial at touch down
 - Spans at buckle initiator sites
- Greatly increased positional / dimensional info required
- Corollate with production parameters

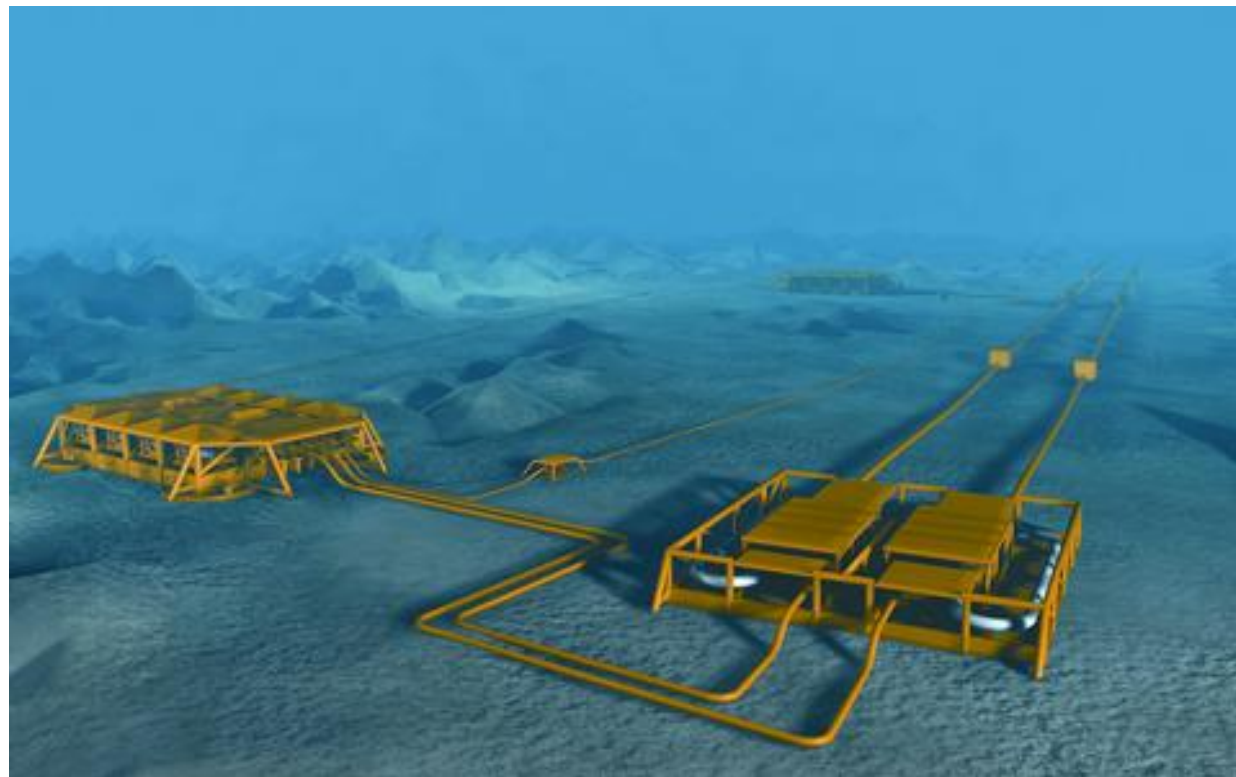


Image courtesy of [DNV](#)

Moorings and risers

- Increasing trend in permanently moored facilities
- Designed for cyclones
- Design lives 25-40 years
- Mooring chain condition monitoring
 - corrosion
 - wear
 - touch down points / trenches / burial
 - holdback suction piles
- Flexible risers
 - Position / motion
 - Outer sheath condition

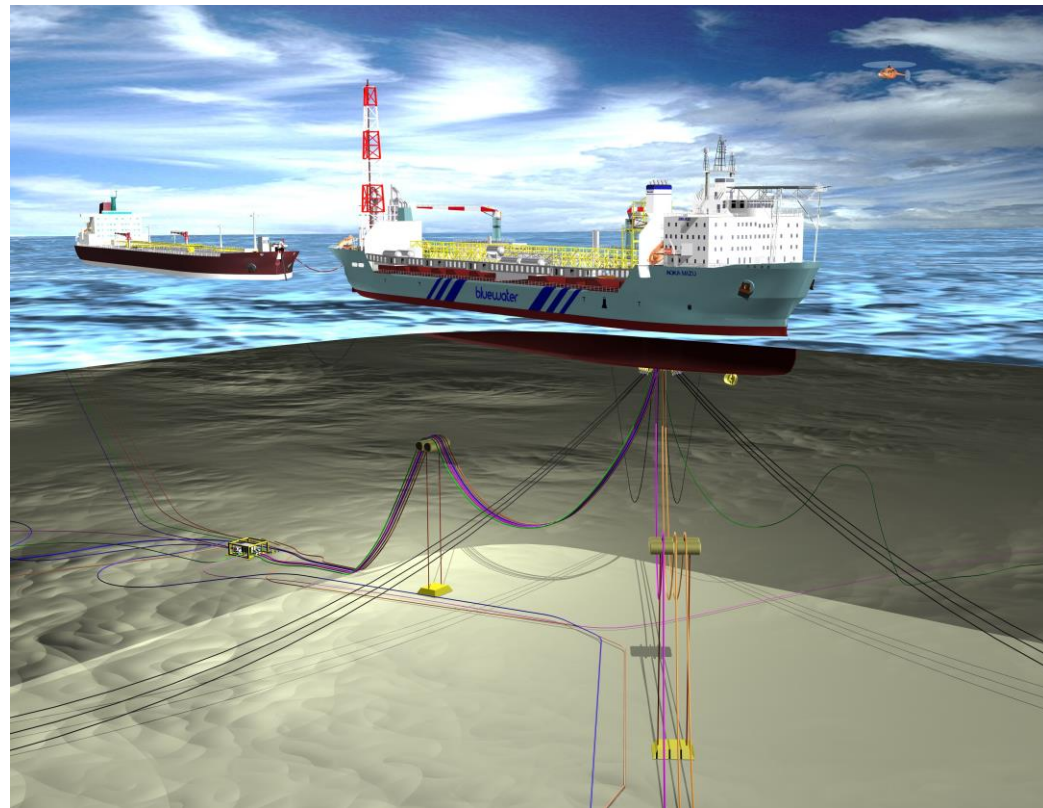
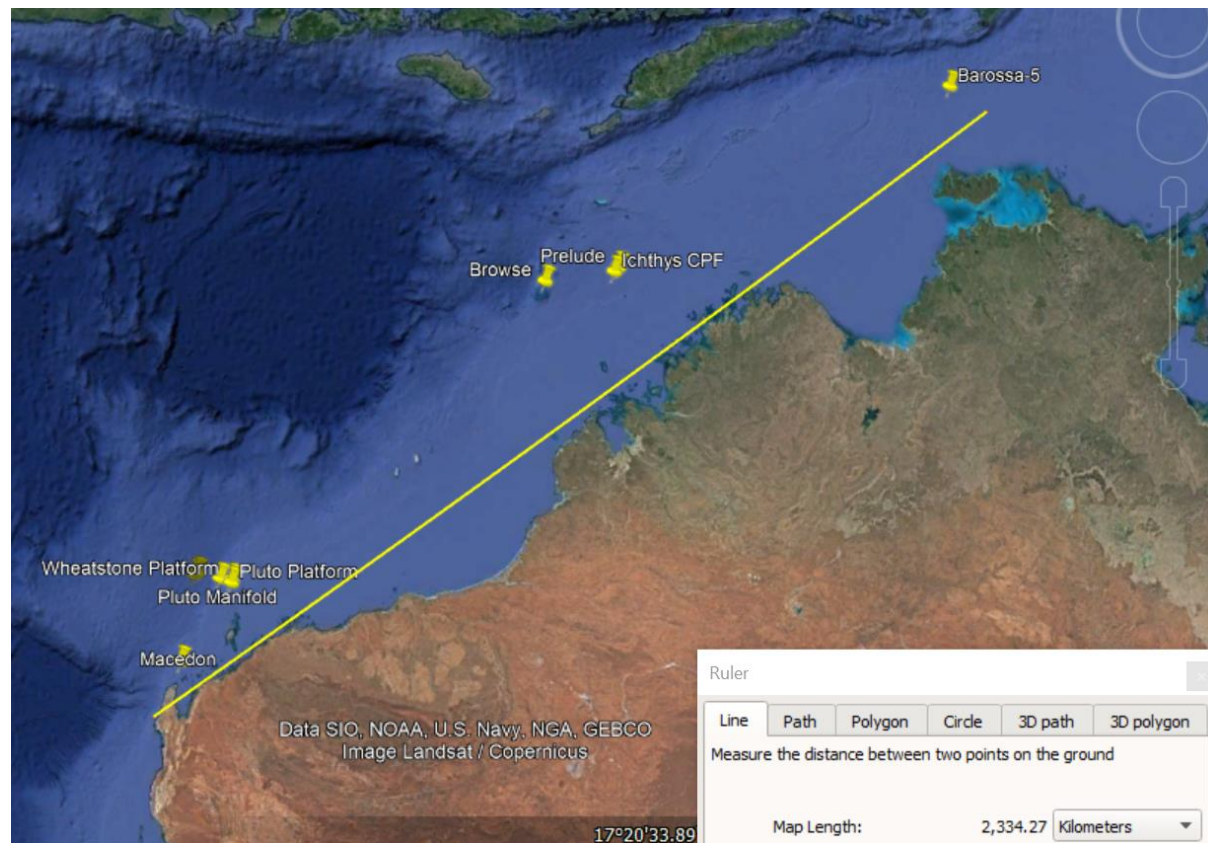


Image courtesy of [bluewater](#)

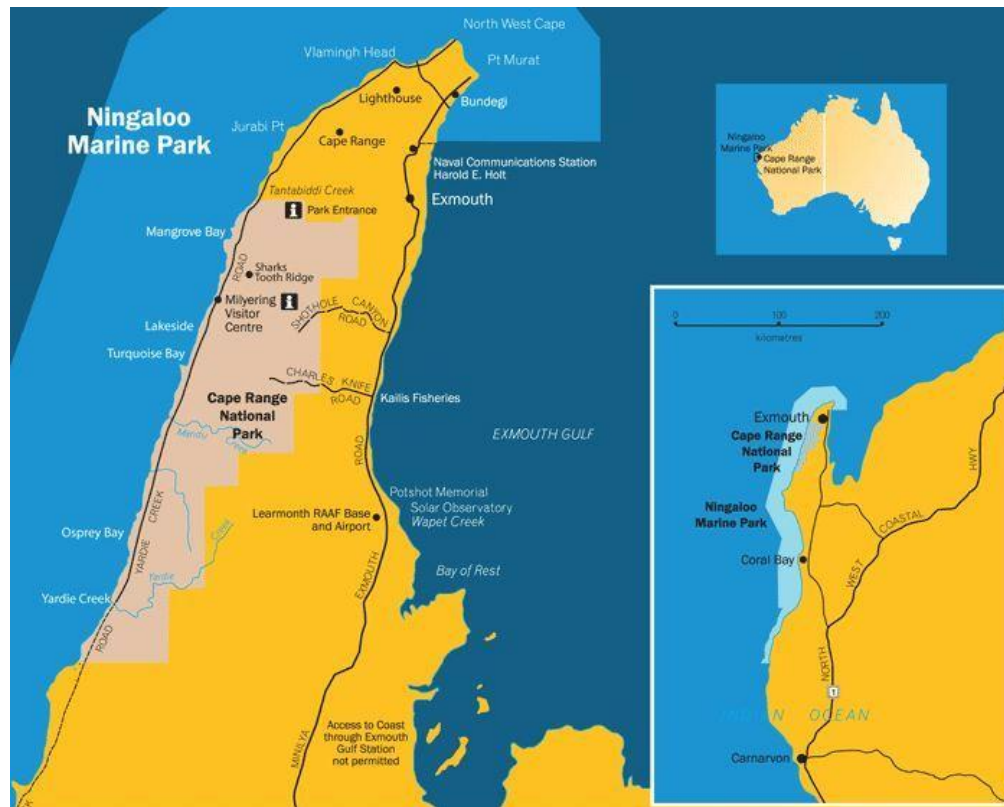
Long tie-backs

- Future trend in long tie-backs to existing LNG infrastructure
- Trench / canyon / scarp crossings
- Scarp crossings (continental shelf) monitoring for motion / position and fatigue related analysis
 - Upper and lower touch down points
- Seabed mobility monitoring
 - Sandwaves / spans



Environmental monitoring

- Benthic habitat mapping
 - Character
 - Spatial distribution
- Specific to WA
 - Seagrass / macroalgal coverage and health
 - Corals coverage and health (Ningaloo Reef ~ 260km long)
 - Marine fauna
 - Sediment transportation
 - Dredging monitoring



<https://parks.dpaw.wa.gov.au/park/ningaloo>

Plenty of opportunities....
..what about the Australian challenges?

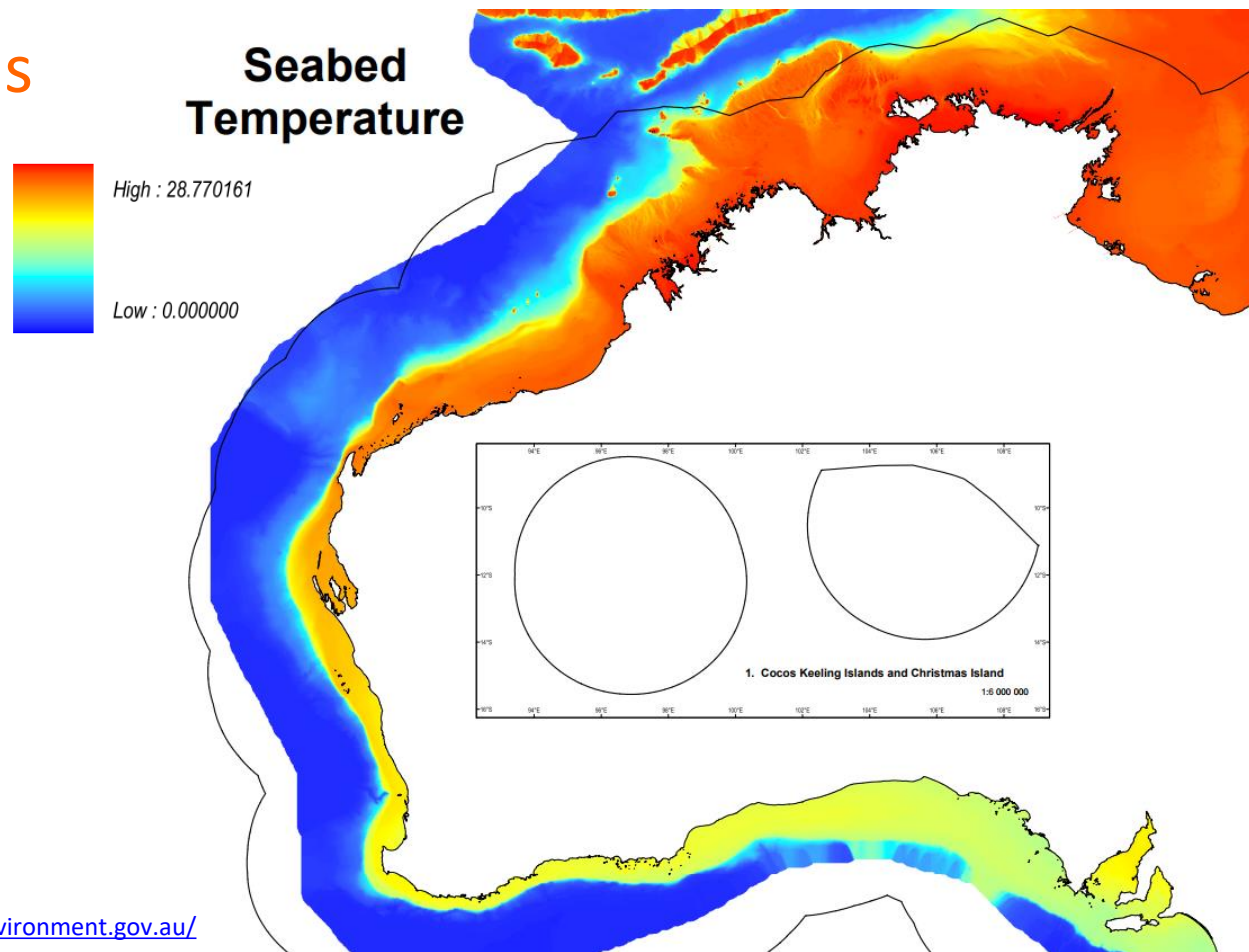
Marine growth

Australia has some of the most diverse and prolific marine growth in the world



Operating conditions

- Resident temperatures significantly higher than:
 - North Sea
 - GoM
 - West Africa
 - Brazil
- Seabed temperatures
 - 20-30°C
- Equipment would need to be specifically designed and tested for Australian conditions



<https://www.environment.gov.au/>

Resident AUVs. An opportunity worth pursuing in Australia?

