

Wave Energy

Harnessing Ireland's Largest Renewable Energy Resource
Ocean Energy Experience with Large Scale WEC

Prof Tony Lewis

**Emeritus Beaufort Professor
MaREI – SFI Centre for Energy, Climate and Marine
Sustainability Institute, University College Cork**

**Chief Technology Officer
Ocean Energy
Cobh, County Cork**

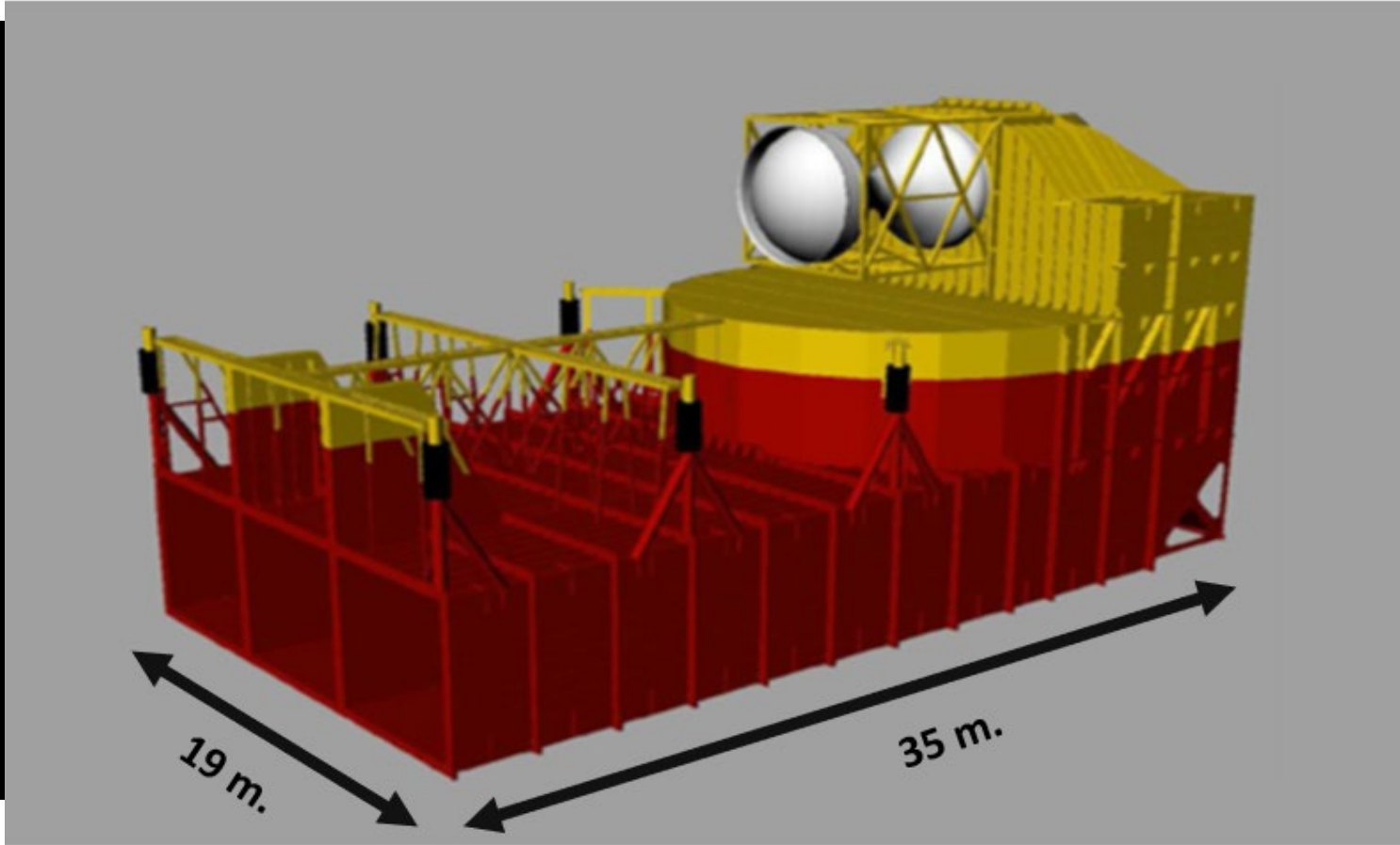
**COER Annual Workshop 2026
Maynooth – 23rd January**



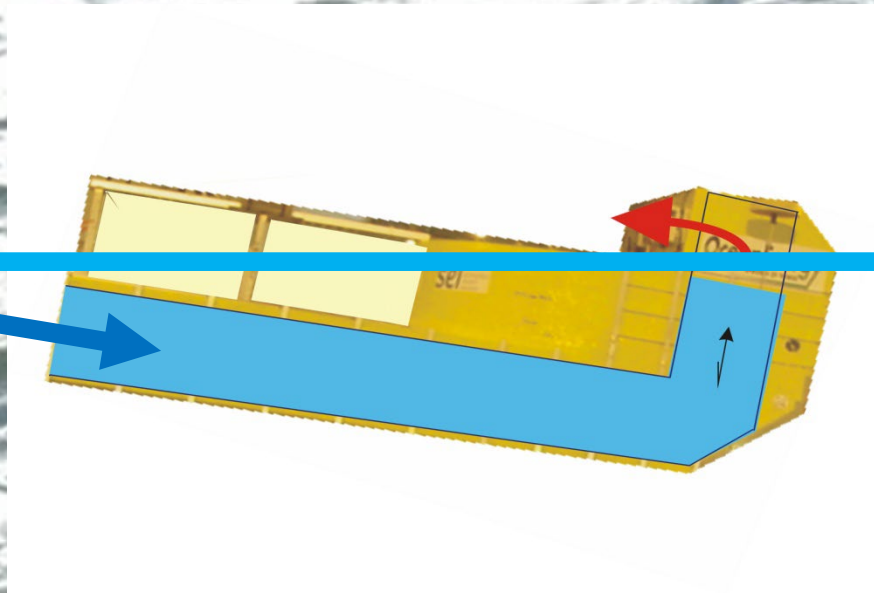
The OE Buoy Construction

Technology Highlights

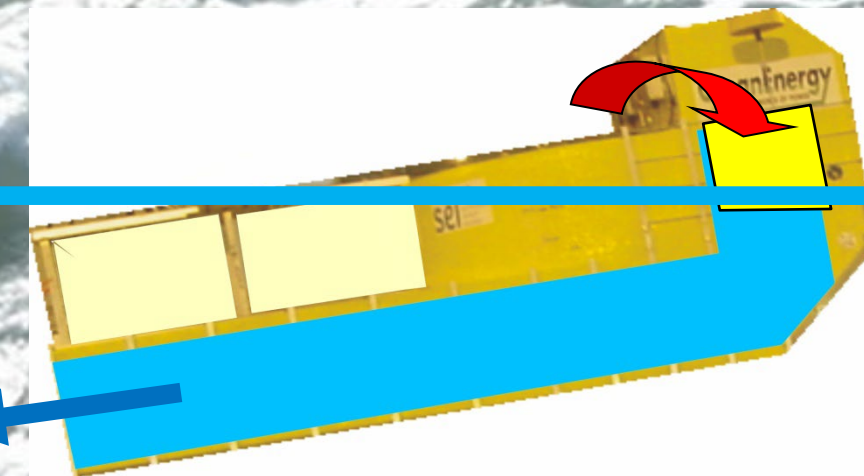
- 1. No Moving Parts in the Water
- 2. Unparalleled Survivability at Sea
- 3. Exceptional Power Performance
- 4. Simple Construction
- 5. Low Maintenance
- 6. Environmentally Benign



**JET
EFFECT**



**PITCH
ENHANCEMENT**

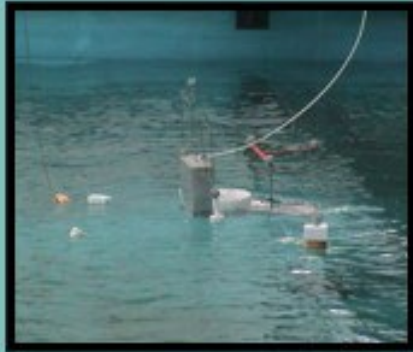


How does it Work?

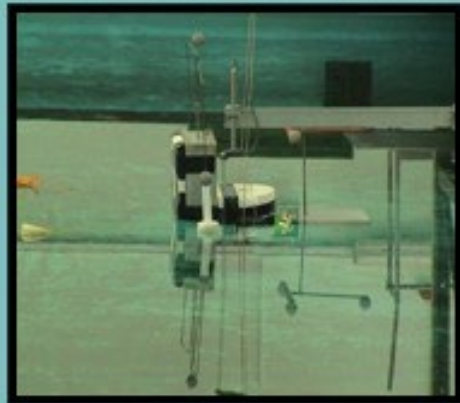


STAGE 1: 1:50

Improvements: OWC



Improvements: OE Buoy



STAGE 2: 1:15

OE Buoy



OE Buoy Sea Keeping



STAGE 3: 1:3

Sim. PTO: Orifice Plate



PTO #1: Well's Air Turbine



PTO #2: Impulse Air Turbine



STAGE 4: 1:1

OE35 Buoy - Build



OE-35 Hawaii





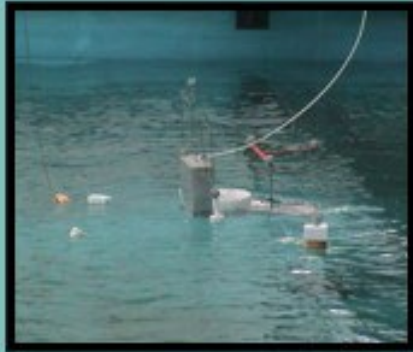
After 24,000 hours of testing, OceanEnergy's technology proved its:



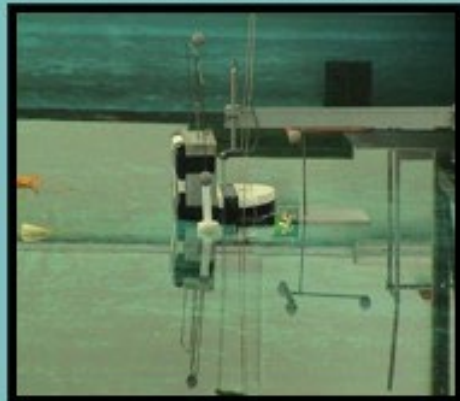
- **Survivability**, functioning in wave heights scalable to over 100 feet (32 meters)
- **Full-scale energy output** enough to power 1,500 homes for a year
- Mooring design & Operating characteristics which resulted in **low mooring tensions** that kept device safely in place

STAGE 1: 1:50

Improvements: OWC

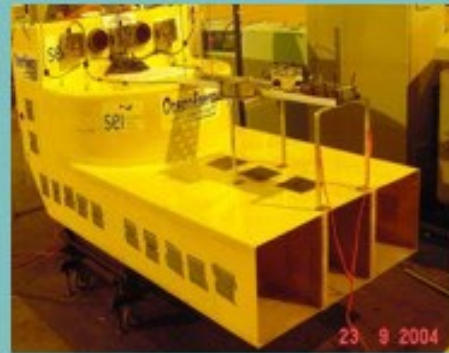


Improvements: OE Buoy



STAGE 2: 1:15

OE Buoy



OE Buoy Sea Keeping



STAGE 3: 1:3

Sim. PTO: Orifice Plate



PTO #1: Well's Air Turbine



PTO #2: Impulse Air Turbine



STAGE 4: 1:1

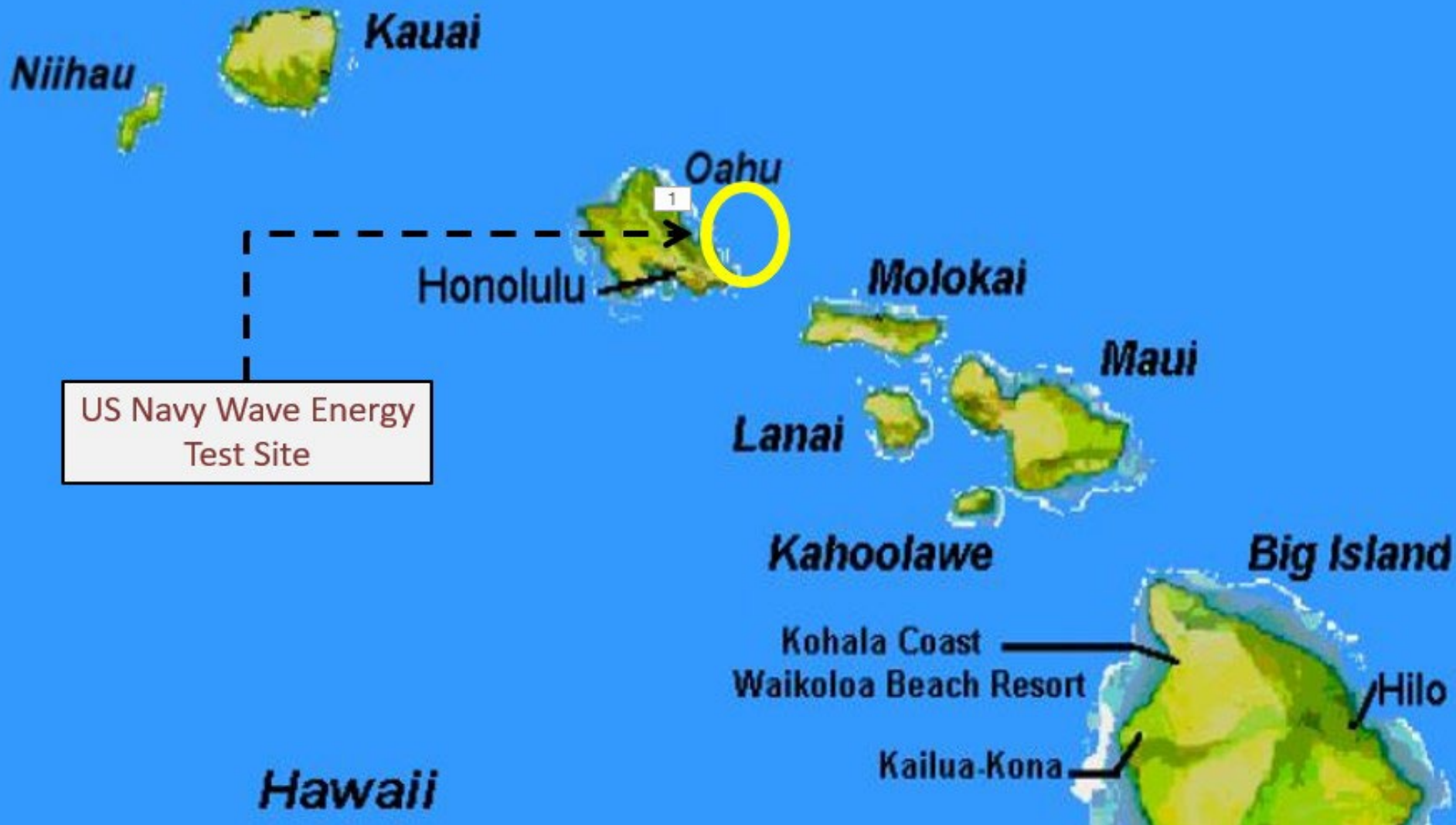
OE35 Buoy - Build



OE-35 Hawaii



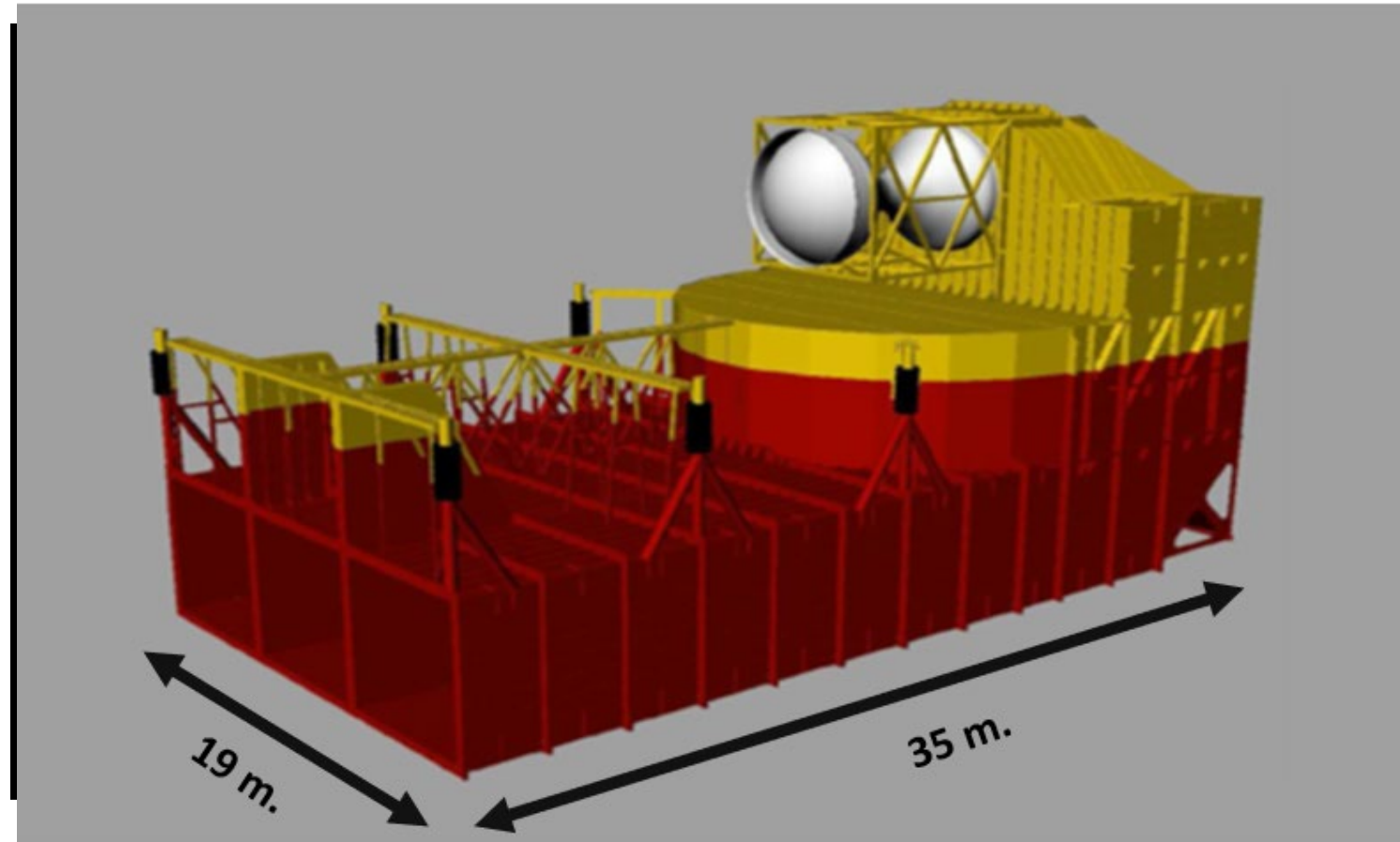
Hawaii Test Site



The OE Buoy Construction

Technology Highlights

1. No Moving Parts in the Water
2. Unparalleled Survivability at Sea
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5. Low Maintenance
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The OE Buoy Fabrication

Techno Highlig

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The OE Buoy Load Out



Portland to Hawaii





Deployment Plan – Key Dates



- **Depart Portland to Hawaii - Oct 2019**



- **Arrive Hawaii - Dec. 2019**



- **Planned Deployment at test site - Jan/Feb 2020**

COVID 19



Hawaii Pearl Harbour - Honolulu



Deployment Plan – Key Dates



- **Depart Portland to Hawaii -** Oct 2019
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COVID 19
- **Investigation Visit** Summer 2022
 - » Generator short cct. issue



SIEMENS

3~ MOT. FW4 405-1H2701AA0-Z NoN-PN1652081010001/2022 IM B3 ThCl. 1SF1

V(U _N)	Hz	A	kW	V(U _G)	1/min	Nm	IP
690 Y	86.7	455	500	734	650	7346	56

ROTOR PERMANENT MAGNET IEC/EN 60034-1 Gew./Wt 3.7 t

MAX. WASSERDRUCK / MAX. WATER PRESSURE 5 BAR

KÜHLWASSER / COOLING WATER 30 L/min bei/at 38°C MAX.

S1 n_{max} 780 1/min

NON HEAVY SEA

MADE IN GERMANY D-90441 Nürnberg **CE**

Lager D-Sole / D-end bearing 6232C3	Lager N-Sole / N-end bearing 7220BG
Betriebsstunden / Operating hours 8000 h	
Fettmenge / Quantity of grease 120 g	
je Schmierstelle während des Laufes erpressen at each lubricating point. Press in during operation	
Schmierfett Grease LUBCON Turmogrease DSV 2 EP	

Stillstandsheizung
Anti-condensation heating

110-120 V 183-218 W

zul. Bereich/perm. range

100-132 V 151-264 W



Deployment Plan – Key Dates



- **Depart Portland to Hawaii -** Oct 2019
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COVID 19
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- **WETS Test Site Cable Damage in Storm** February 2022
- **New Generator Arrives** October 2023

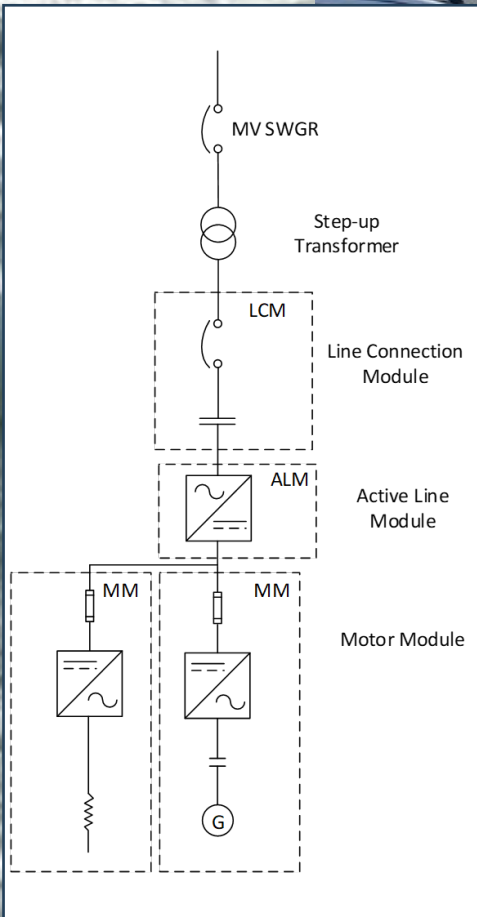
Deployment Plan – Key Dates



- **Depart Portland to Hawaii -** **Oct 2019**
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- **WETS Test Site Cable Damage in Storm** **February 2022**
- **Recommissioning – End 2 End Testing** **March 2024**



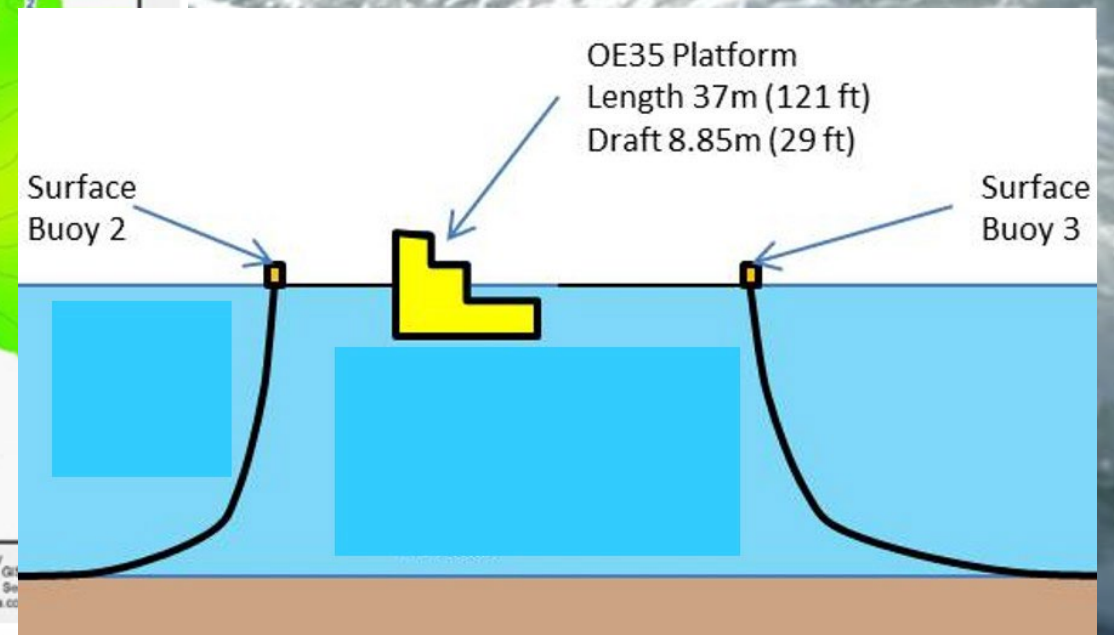
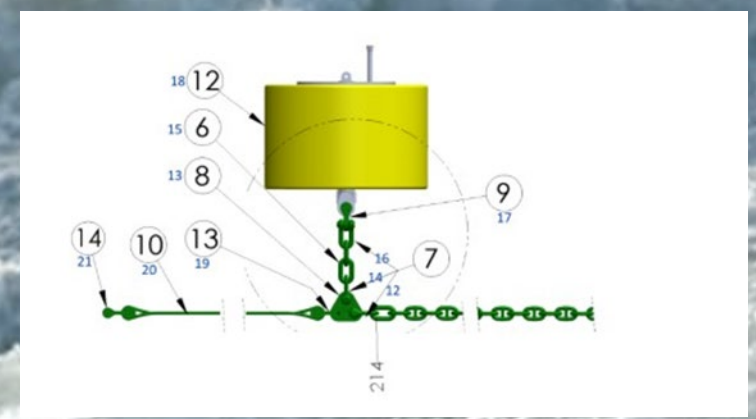
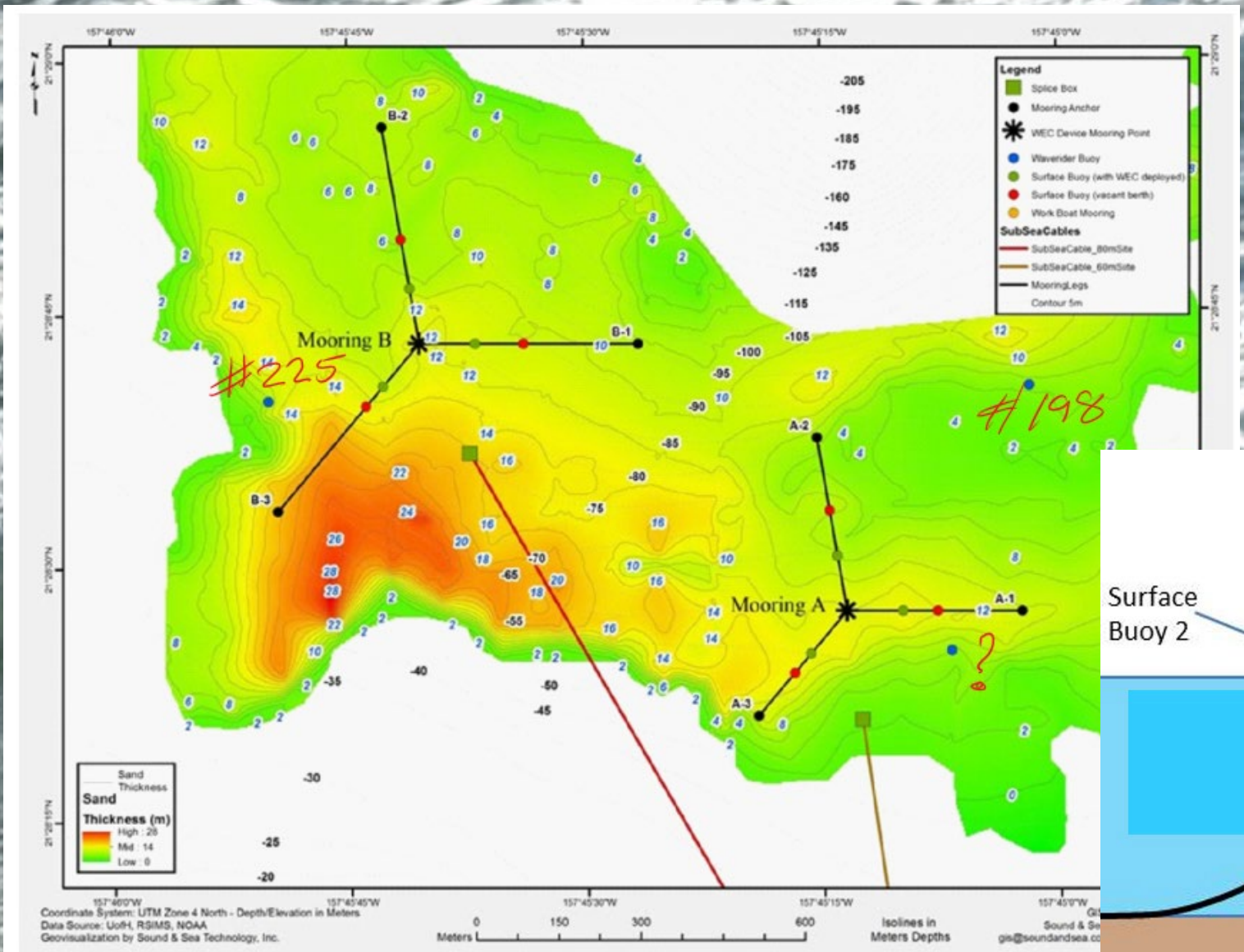
SIEMENS							
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KÜHLWASSER / COOLING WATER				30 L/min bei/al		38°C MAX.	
S1				n _{max}		780 1/min	
NON HEAVY SEA							
MADE IN GERMANY D-90441 Nürnberg				CE			
Lager D-Seite / D-end bearing		6232C3		Lager N-Seite / N-end bearing		7220BG	
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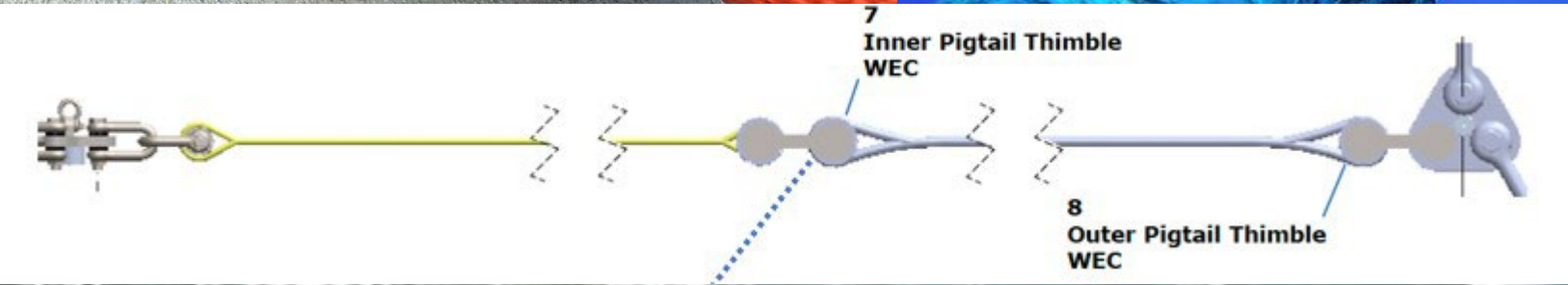
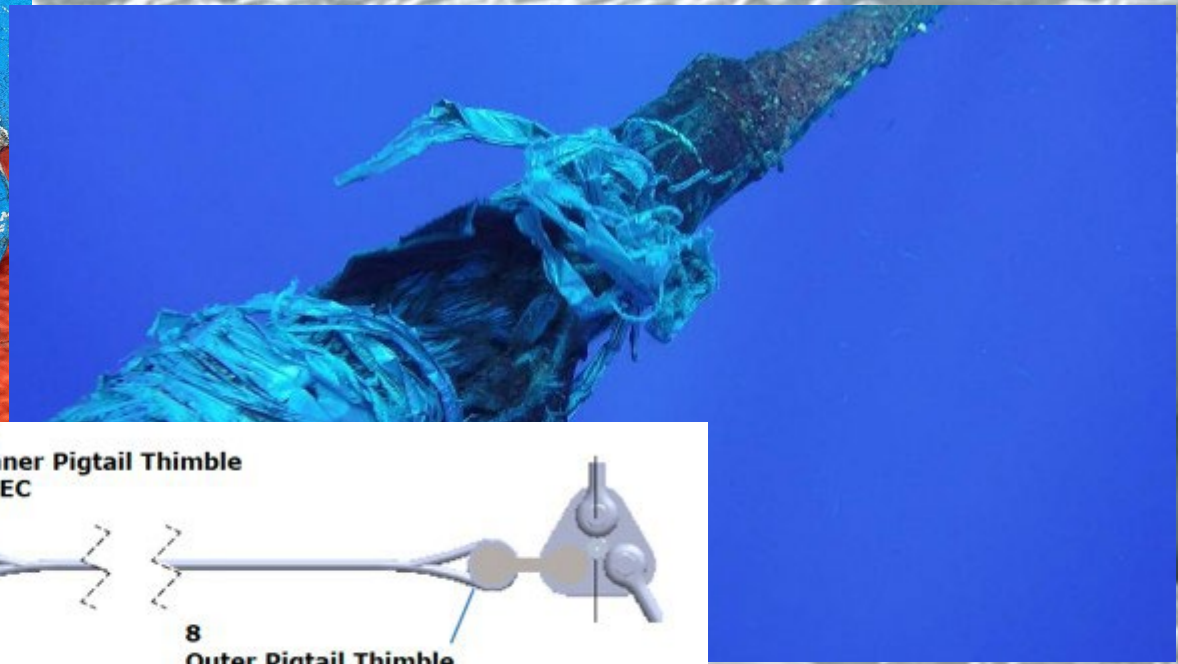
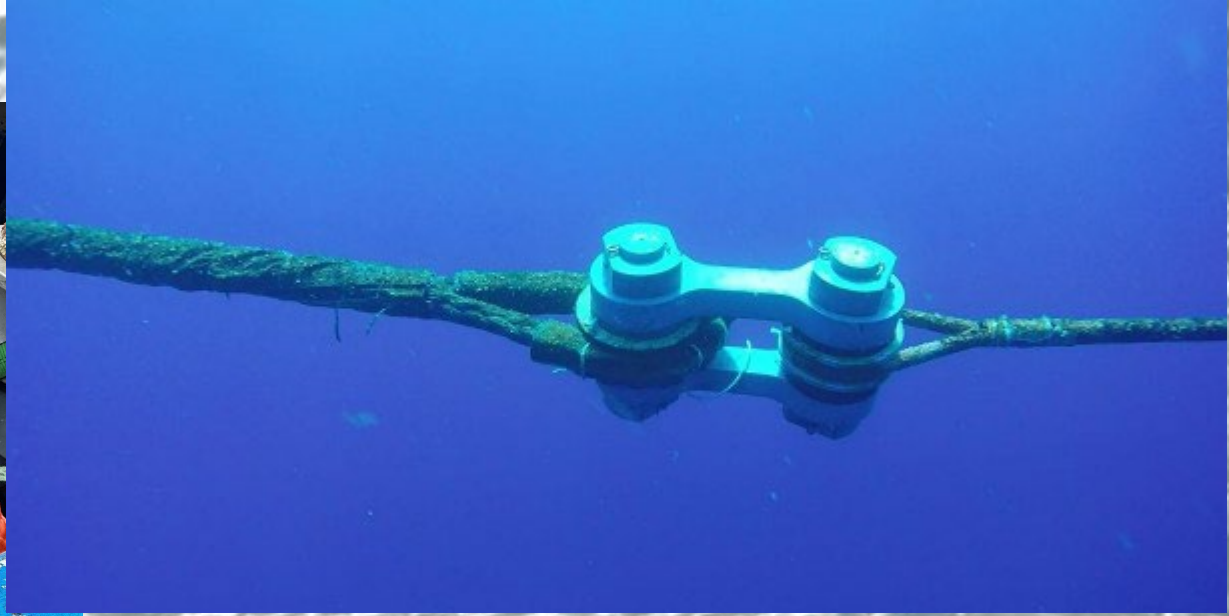
Deployment Plan – Key Dates



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COVID 19
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- **Cable Repair / Mooring Repair** April 2024



PRE-INSTALL SURVEY SHOWING MOORINGS
 PLAN (TO SCALE)



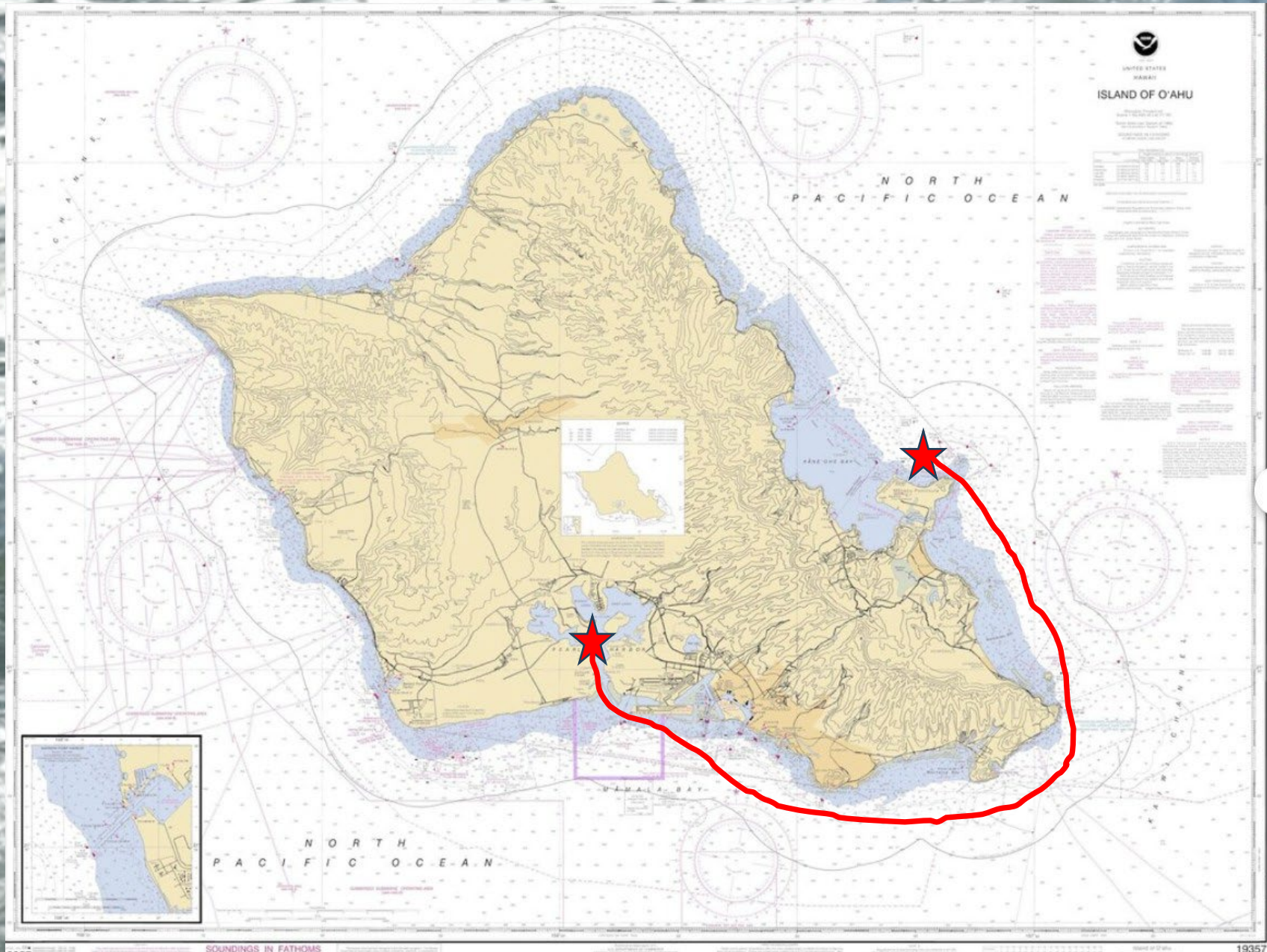
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- **Cable Repair / Mooring Repair** April 2024
- **Deploy at Test Site -** July 2024









07-19-2024 Fri 14:53:46



Exterior Aft

2:37:44



10-16-2024 Wed 11:21:20



Exterior Forward



10-16-2024 Wed 11:21:20



Exterior Aft Exterior Aft

16-10-2024 11:21:16 MED



Control Room Port

Control Room 1



Control Room Centre



Control Room Starboard

Connected to SCADA

Current Local Time 22/07/2024 01:57:19

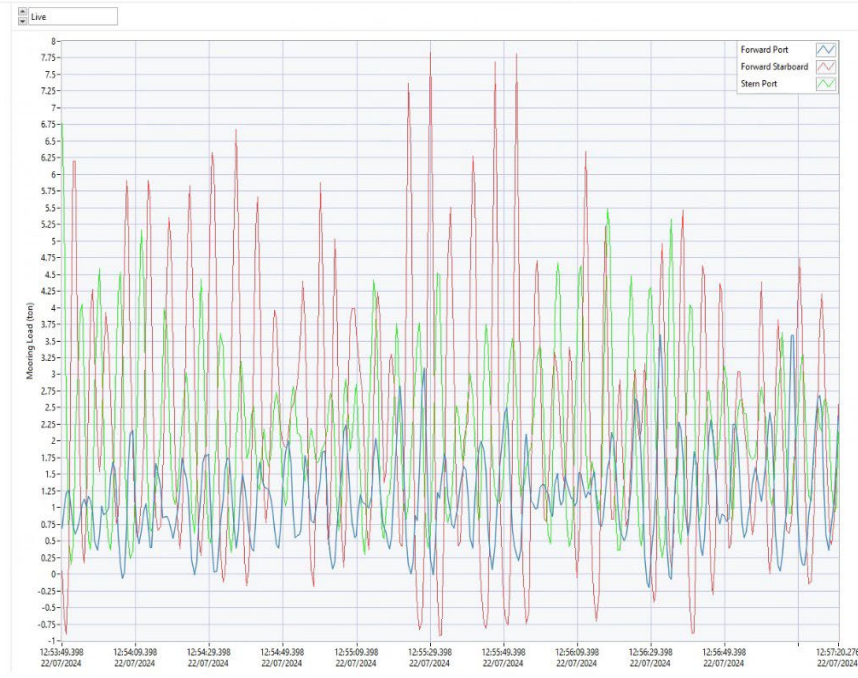
Irish Time 22/07/2024 12:57:19

Current User Engineer

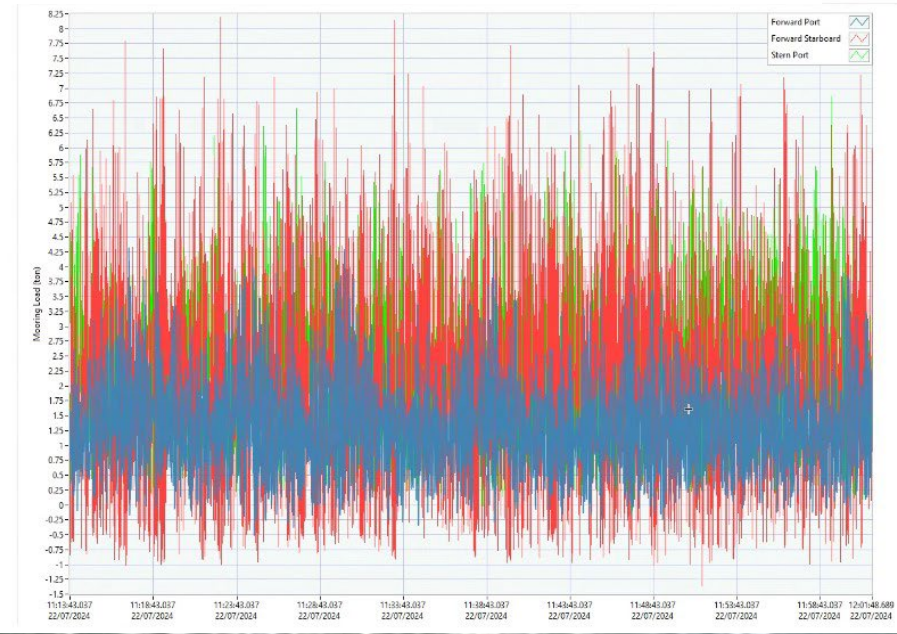
- 0 Critical 2 Warning ● Water Level
- All Good ● Mooring
- 3 Critical 2 Warning ● GPS
- Server Wired Conne... ● Umbilical
- Signal Loss ● SGT Connection

Mooring Load

- 2.39717 Forward Port Shackle (tonne)
- 2.54516 Forward Starboard Shackle (tonne)
- 2.13232 Stern Port Shackle (tonne)



- 3.21893 Forward Starboard Shackle (tonne)
- 2.32433 Stern Port Shackle (tonne)



Current Local Time 22/07/2024 01:01:47

Irish Time 22/07/2024 12:01:47

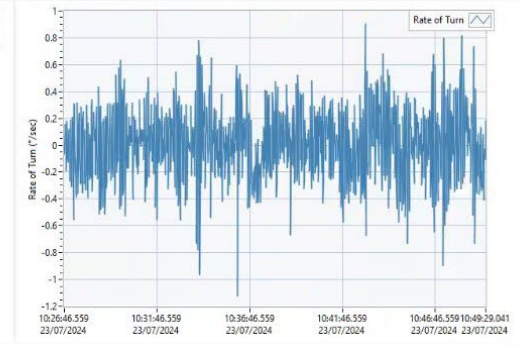
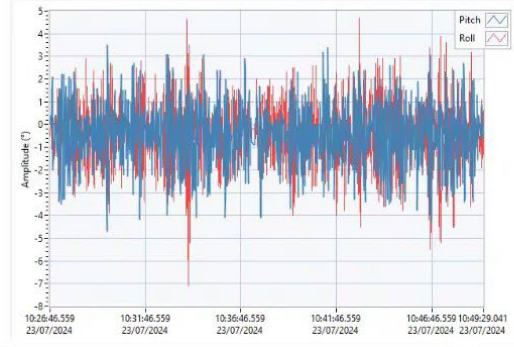
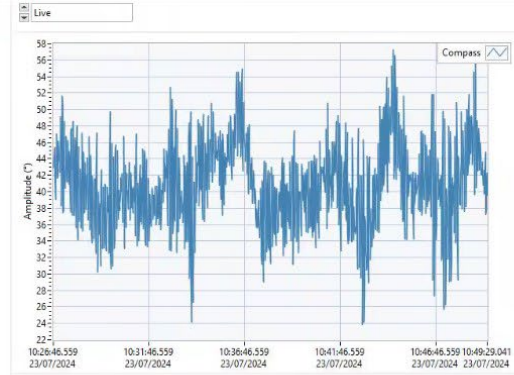
Current User Engineer

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Mooring and GPS

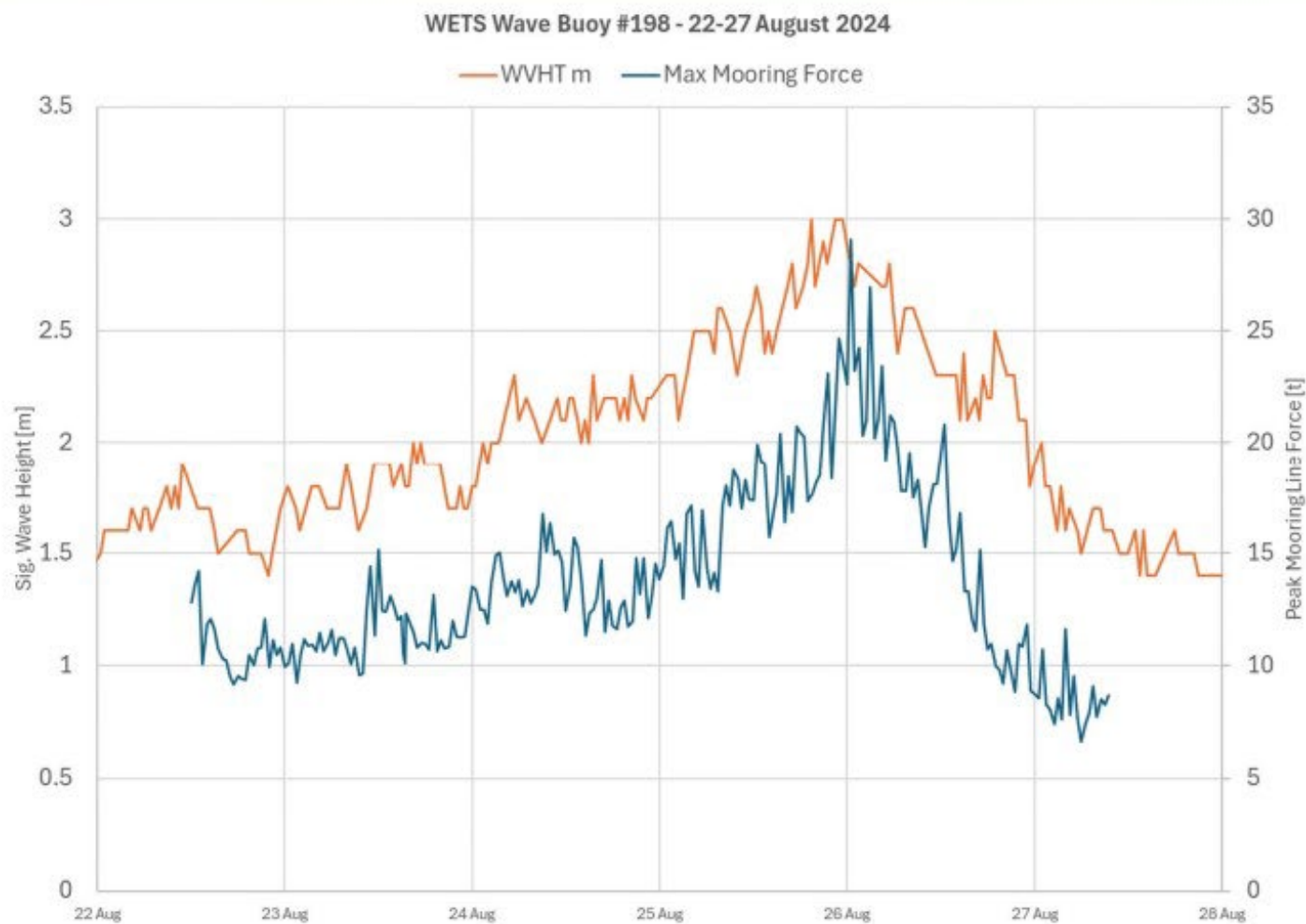
- 39.4 Compass Heading (°)
- 0 Pitch (°)
- 1.3 Roll (°)
- 188333 Rate of Turn (°/sec)
- 468° N GPS Longitude
- 662° W GPS Latitude
- Dif. Fix GPS Fix Quality
- 10 Number of Satellites
- PS Fix
- 4 10:49:36.000
- from Expected Position 3.85892



August Storm Data

Largest Wave: 3m (~10ft) Hs

Largest Recorded Force: 29t





Center for Operational Oceanographic Products and Services (CO-OPS)

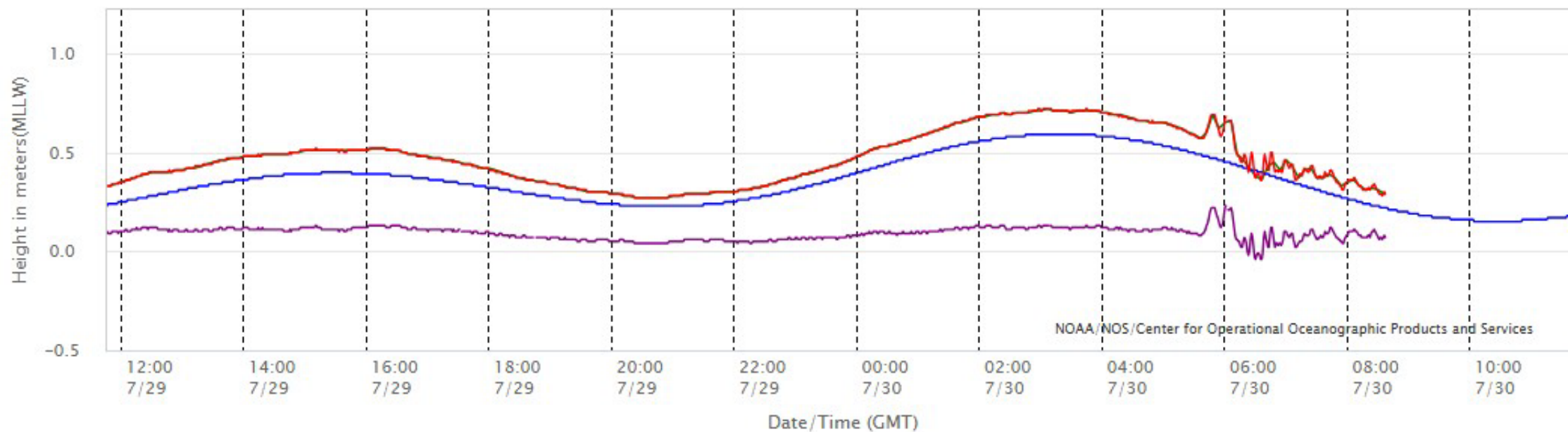
Water levels for 1612480 - Mokuoloe, HI

From 07/29/2025 11:46 through 07/30/2025 11:46 GMT

Disseminating sensor: **A1** | Datum: MLLW

Auto-Refresh is off

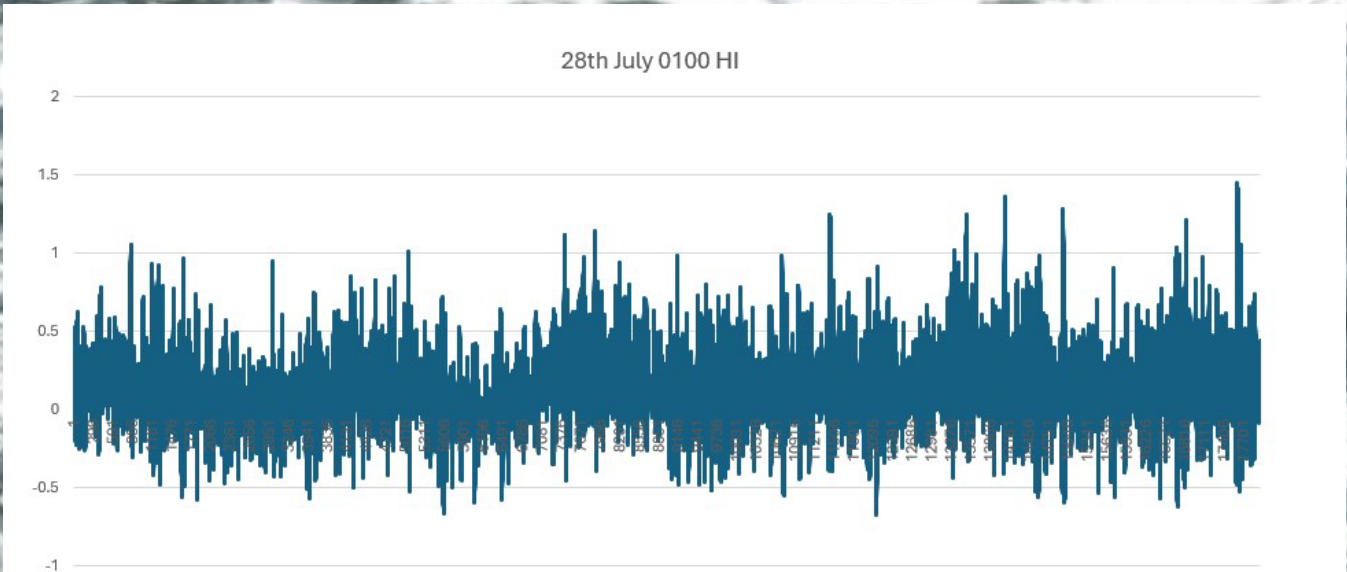
NOAA/NOS/CO-OPS Tsunami Water Levels at 1612480, Mokuoloe, HI From 07/29/2025 11:46 to 07/30/2025 11:46 GMT



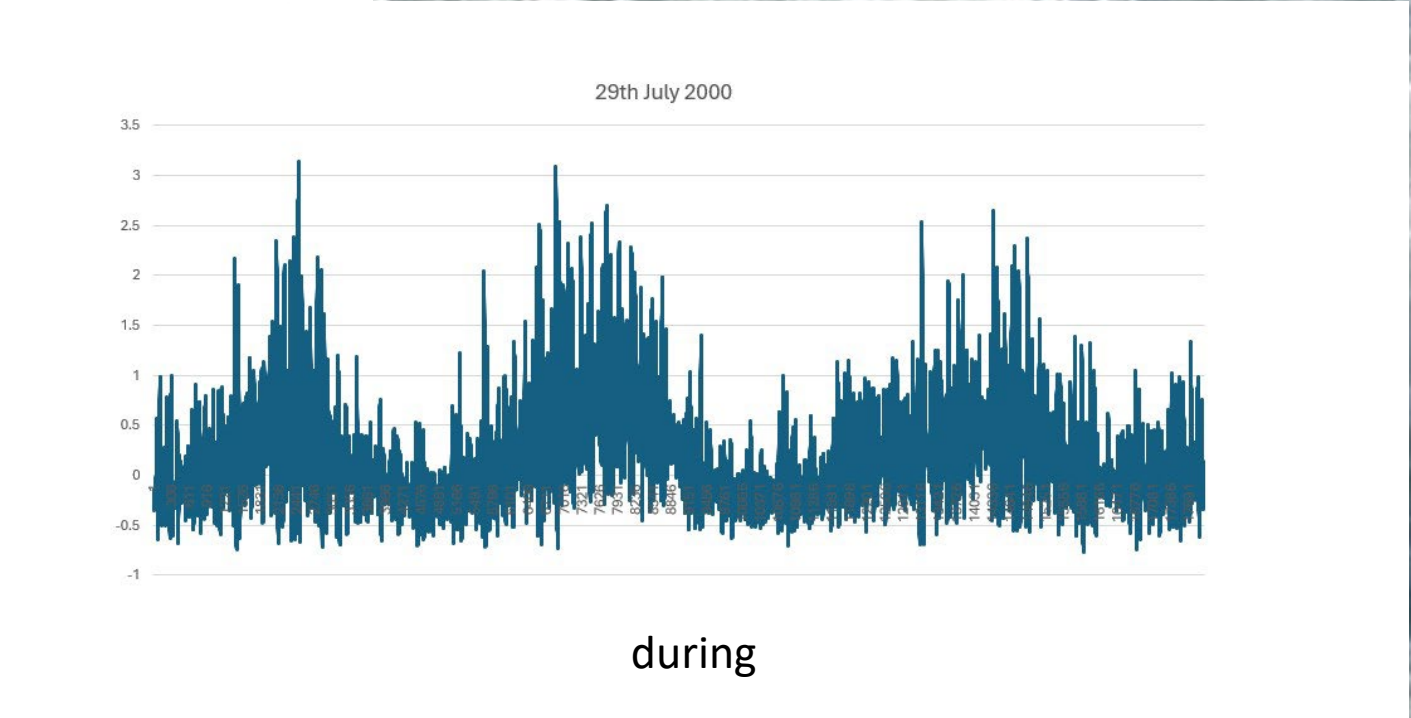
NOAA/NOS/Center for Operational Oceanographic Products and Services

— One Minute — Six Minute — Predictions — Residual

Hint: Click items in legend to enable or disable on plot. Click and drag to zoom to a time period.



OE35 Mooring Forces during Tsunami





30 10 2024


STAGE 4 – Single Device Demonstration

Part 1 – 500kW

STAGE 4: 1:1
OE35 Buoy - Build




OE-35 Hawaii



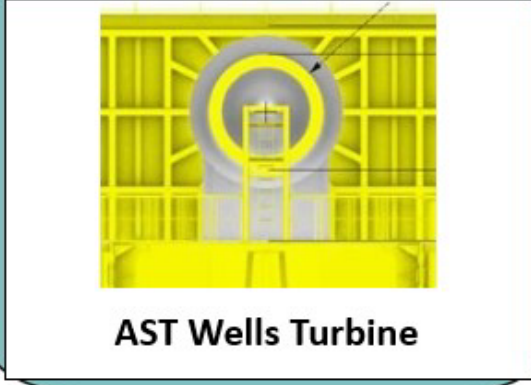
2024-2025

Part 2 – 1MW

STAGE 4: 1:1
OE35 Buoy



OCEAN ENERGY
A WORLD OF POWER



AST Wells Turbine

2024-2026



A step change for wave energy



Wave Energy Demonstration at Utility Scale to Enable Arrays

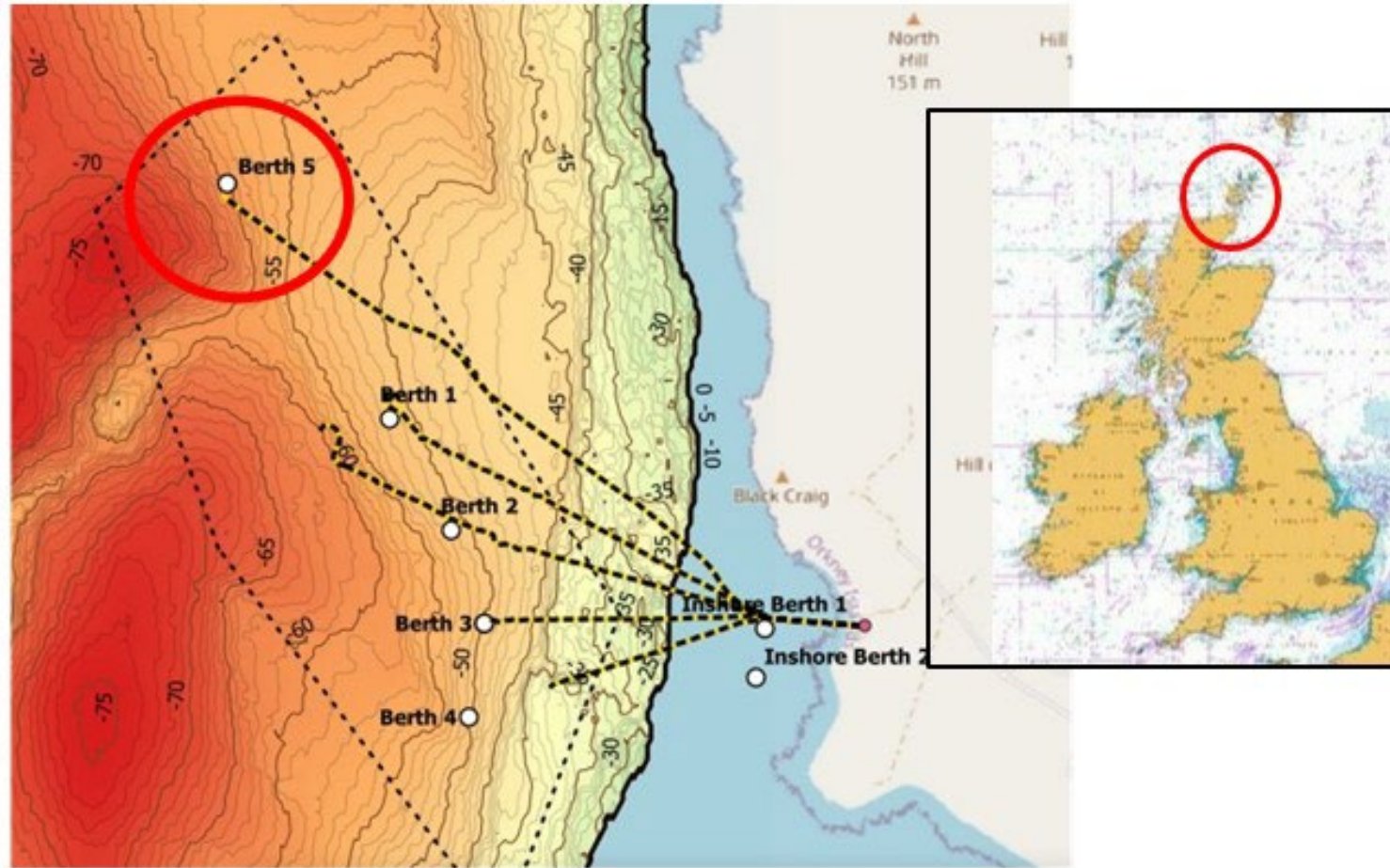


Funded by
the European Union



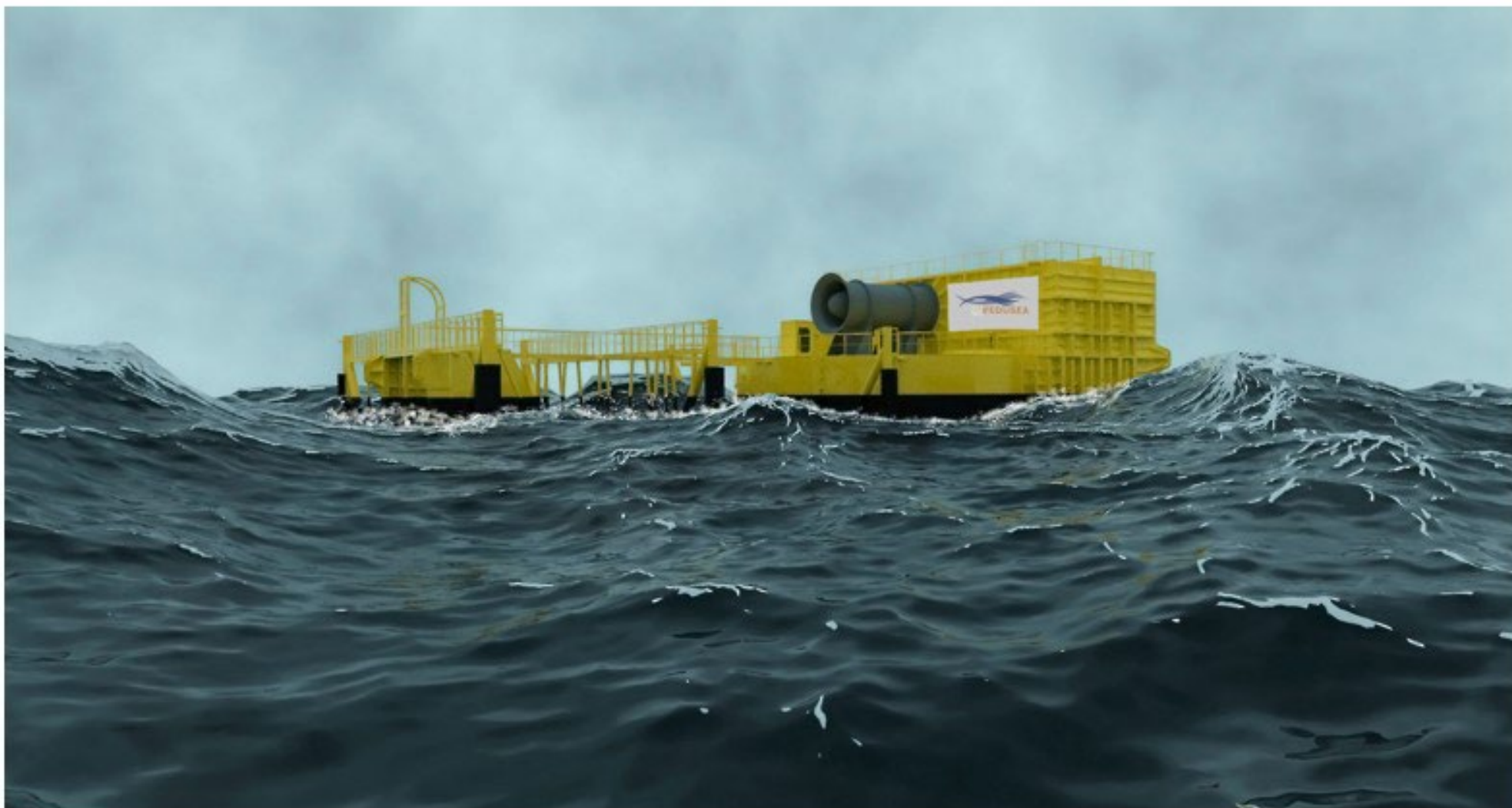
Innovate
UK

WEDUSEA Deployment at EMEC



Billia Croo Wave Energy Test Berths at EMEC, Orkney

Operational Testing Q4 2024 – Autumn 2026



STAGE 5 – SUSTAINABLE WAVE ENERGY FARM



FUTURE ARRAYS



Thank You !



Contact Details : Prof. Tony Lewis

t.lewis@ucc.ie

tl@oceanenergy.ie

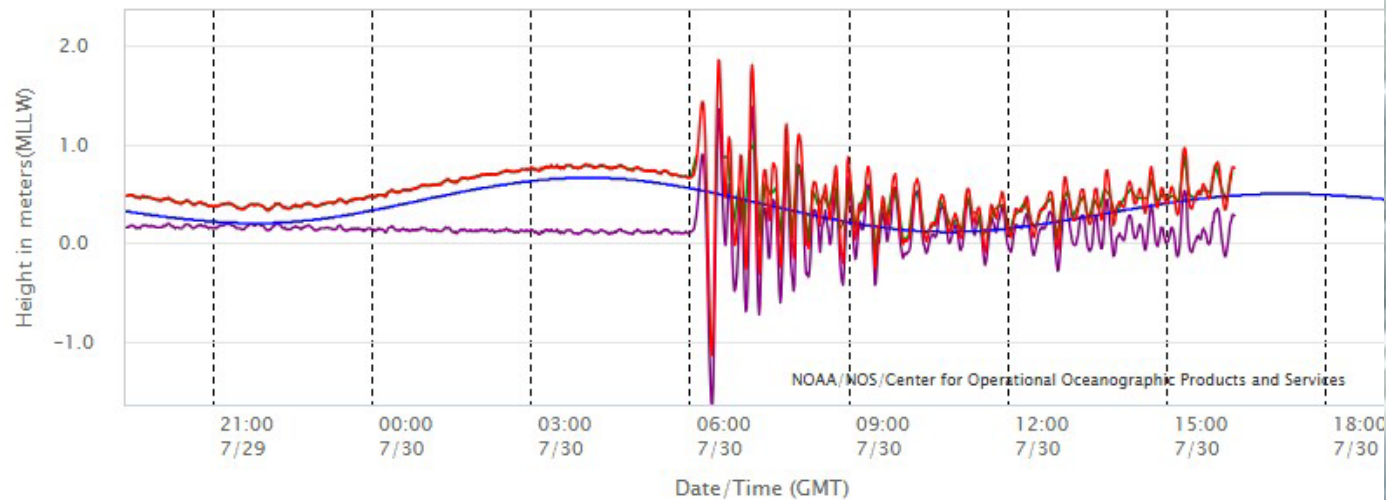




Center for Operational Oceanographic Products and Services (CO-OPS)
Water levels for 1617760 - Hilo, Hilo Bay, Kuhio Bay, HI
From 07/29/2025 19:20 through 07/30/2025 19:20 GMT
Disseminating sensor: **Y1** | Datum: MLLW

Auto-Refresh is off

NOAA/NOS/CO-OPS Tsunami Water Levels at 1617760, Hilo, Hilo Bay, Kuhio Bay, HI From 07/29/2025 19:20 to 07/30/2025 19:20 GMT



— One Minute — Six Minute — Predictions — Residual

Hint: Click items in legend to enable or disable on plot. Click and drag to zoom to a time period.

From: Jul 29 2025 Time: 1920 h:mm

To: Jul 30 2025 Time: 1920 h:mm

Timezone:

Units:

Datum:

GMT

Metric

MLLW

Plot

Honolulu

UNITED STATES

Hilo, Hilo Bay, Kuhio Bay 1617760

Water Level Data

Hilo

Hawaii

Kau