NHA Marine Energy Council & DOE WPTO Dialogue

May 10, 2023 1:30 PM

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Opening Remarks

Jenn Garson, DOE WPTO

Malcolm Woolf, NHA

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Introductions

Please share your name, position and company

Agenda

- Opening Remarks
- Introductions
- Priorities discussion
  - Overview of MEC Priorities Position Paper
  - Individual technology and project developer priorities
  - Open discussion
- Testing infrastructure discussion
  - PacWAVE status update
  - Open discussion
- (break)
- Program discussion
  - TEAMER
  - UMERC
  - ETIPP
- Discussion of DOE international collaborations
- Discussion of DOE-MEC future engagement
- Other business

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Priorities Discussion

- Overview of MEC Priorities Position Paper
- Individual technology and project developer priorities
- Open discussion

Priorities Discussion:

Overview of MEC Priorities Position Paper

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Executive Summary

Key Recommendations by MEP WG

- Increased federal funding for the advancement of U.S. marine energy technologies
- Increased number of FOAs issued in predictable increments
- Data sharing
- Knowledge/Lessons learned sharing
- Stage-gated funding from small systems up to large system development
- Clarity of different requirements for different sectors
- Ensure funding for concurrent robust supply chain and manufacturing development

All target audiences of this document should note that there is a clear and expressed need for System, Subsystem and Component R&D funding. System, subsystem and component R&D funding is a high-level need to the success and much-needed rapid development of the marine energy sector. System level funding remains critical.

In a survey conducted by the MEC sent to developers and stakeholders in the marine energy industry the results reflected that the three main priorities are:

1. Funding of Research and Development
2. Array Testing at Macro and Meso Scale
3. Developing and adhering to IEC Standards

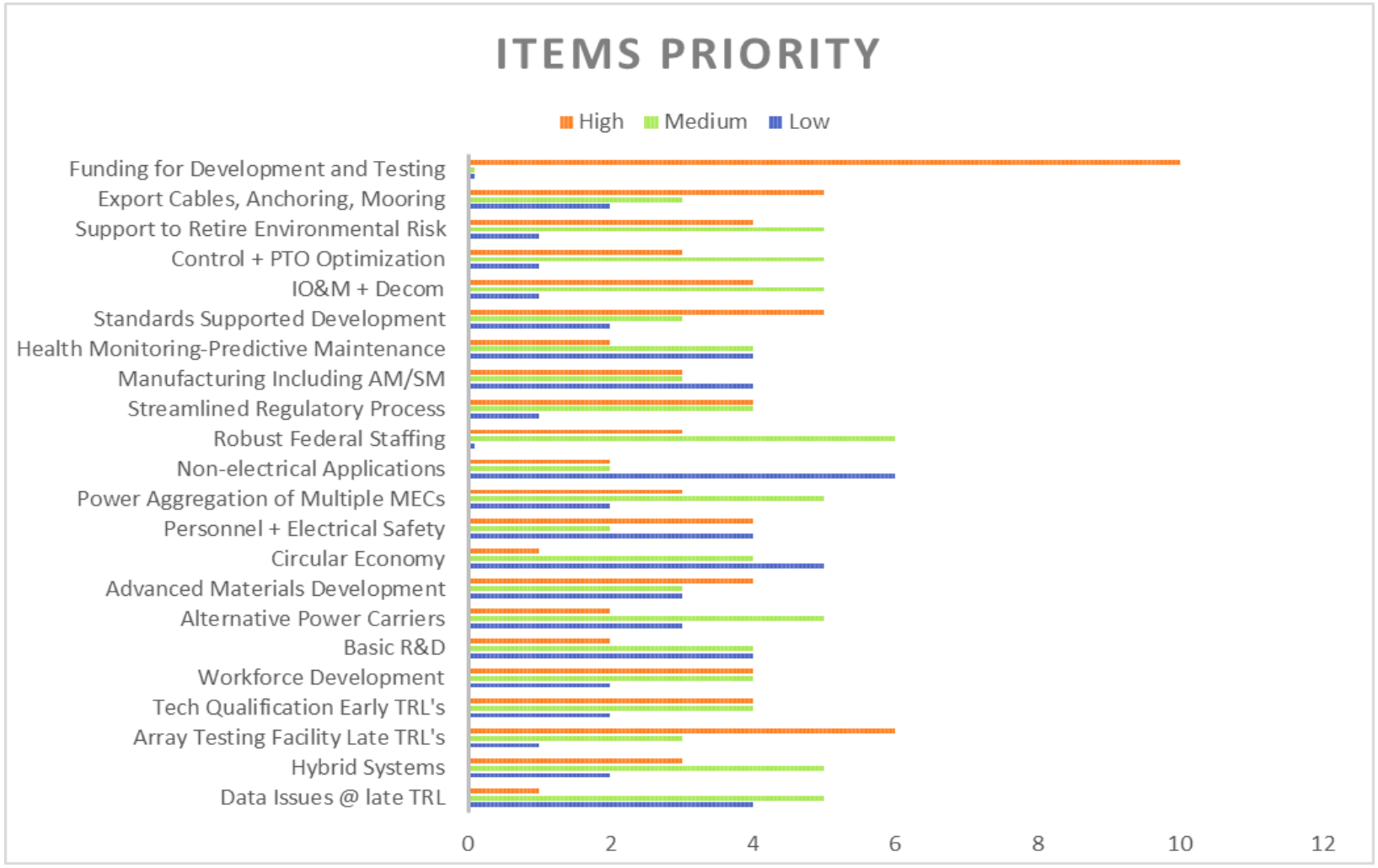
LINK TO POSITION PAPER ED. 2 IS AVAILABLE ON WWW.HYDRO.ORG & HERE!

Generalized Industry Priorities

HIGHER PRIORITIES	MEDIUM PRIORITIES	LOWER PRIORITIES
Funding for development and testing of the industry	Controls/Power Take-off optimization	Non-electrical applications: direct desalination
Continued support of process that will retire environmental risk	Power aggregation of multiple MEC	Data Issues at higher TRL
Array testing facilities at higher TRL	Offshore & electrical safety	Basic Research
Installation, Operation, Maintenance and Decommissioning	Hybrid systems at lower TRL	Circular economy aspects
Standards supported development suitable for utility-scale market	Advanced materials development thermoplastics and composites etc.	Health monitoring of dynamic elements / predictive maintenance
Export cables; Anchoring; Mooring	Alternative power carriers to eliminate the export cable	
Streamlining the regulatory process	Technology Qualification at lower TRL	
Robust Federal staffing	Workforce development	
	Manufacturing including Additive/Subtractive Manufacturing	

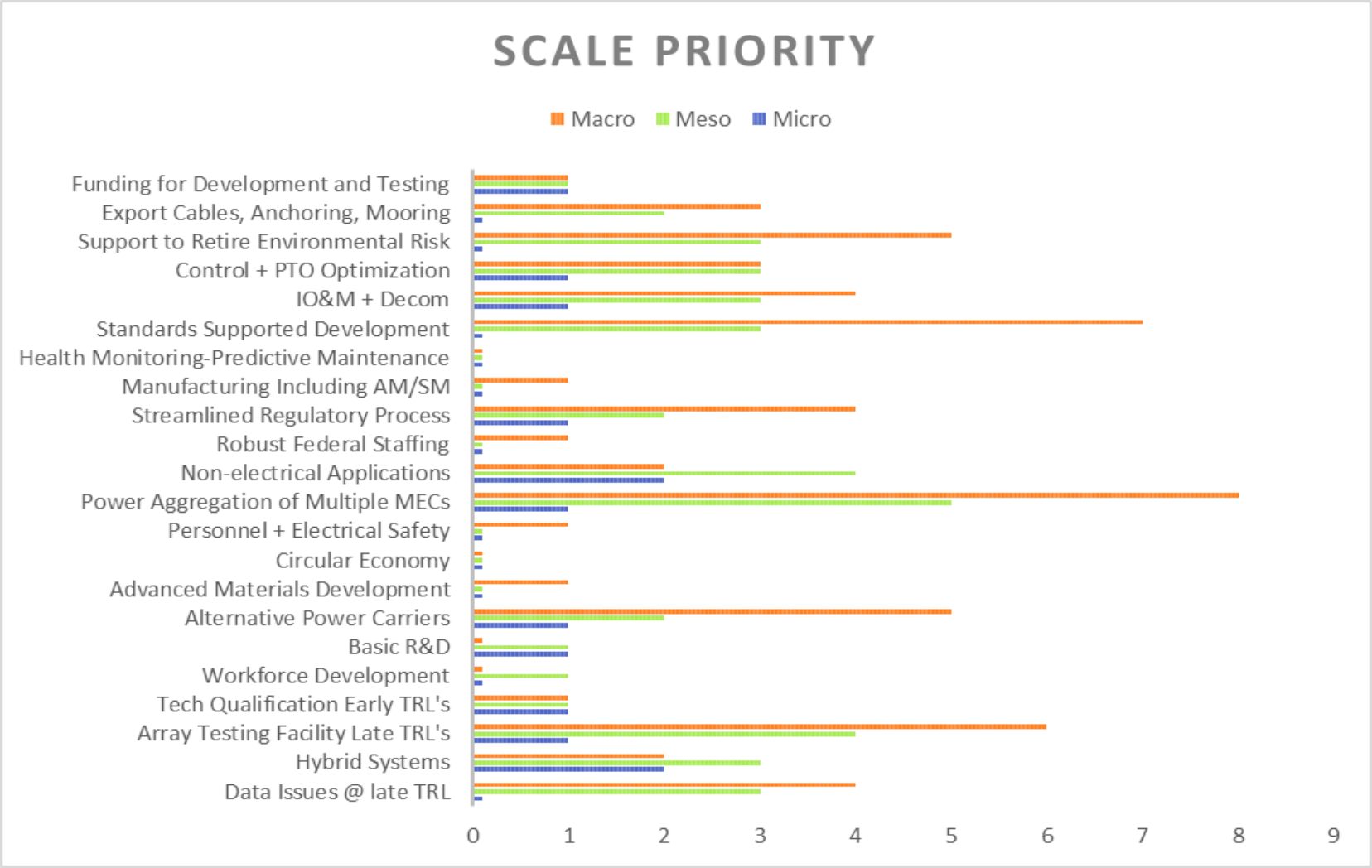
Item Priorities Survey

by Marine Energy Council



Scale Priorities Survey

by Marine Energy Council



Priorities Discussion:
Individual Technology and Project Developer Priorities

Hydrokinetic Energy Corp
Oscilla Power
Emrgy
Littoral Power Systems
CalWave
Tidal Energy Corp
DLZ Corporation
ORPC
C-Power

Hydrokinetic Energy Corp

- Support for ocean testing of current prototypes
  - 6 months
  - $0.25M
- Support for research of new 3-D printing materials (turbine component)
  - 1 year
  - $0.2-0.3M
- Funding to design & build 2 more larger prototypes
  - 2 years
  - $1-1.5M
- Design & Construction of deployment structures
  - 6 months
  - $0.35-0.4M
- Support for ocean testing of next 2 prototypes
  - 1 year
  - $0.6-0.75M
- Funding for demonstration project
  - 2.5 years
  - $1.2-1.7M

Oscilla Power

- Construction and Deployment of 1MW utility-scale system at Pacwave
  - 2-3 years
  - $11-13M
- Concept design and sub-scale ocean testing of a utility-scale system variant for low energy environments
  - 2 years
  - $3-5M
- Drivetrain optimization (PTO and power electronics)
  - 1 year
  - $1-2M
- Annual recurring key sub-component development
  - 1 year projects
  - $0.5-1M

Emrgy

- Comprehensive resource assessment and model development
  - <1 year
  - $0.5-1M
- Design, build and in-water testing of utility-scale in-conduit distributed hydro arrays
  - 1-2 years
  - $2-4M depending on system
- Small scale (<25 kw) and low speed (<200rpm) PTO development
  - <2-3 years
  - $1.0-2.0M

Littoral Power Systems

- PTO design/test
  - 2 years
  - $2M
- Moorings and systems for installing/removing same autonomously (adjacency w/marine robotics field)
  - 1.5 years
  - $4M
- PHM – remote prognostics/health monitoring systems
  - 1.5 years
  - $2M
- Power electronics/controls
  - TBD

CalWave

- PTO design/test >500kW
  - 2-yrs
  - $4-5M
- WEC and associated system (anchors, power off-take) design for PacWAVE
  - 1.5-yrs
  - $1.5-2M.
- Open water deployment at PacWave >500kW,
  - 4-yrs
  - $10-12M

Tidal Energy Corp

- Detailed Bathymetry
  - <8 weeks per site
  - $1,000,000/25 Square Km or approximately $40,000/km (higher per Km cost with smaller sites)
- Geotechnical Survey / Silt movement study
  - < 8 weeks per site
  - $500,000
- Community and Stakeholder outreach
  - Years TBD
  - $4-500,000, per year per site
- Concurrent development of power storage and transport solutions, manufacturing outreach and supply chain set up with all relevant technology developers using crosscutting partnerships with other pertinent programs within DOE.

DLZ Corporation

- Advance materials development
  - On going
- Funding for development and testing
  - On going
- Manufacturing assistance
  - On going

ORPC

- Build a 10-15 unit array of next generation Modular RivGens
  - 1 year
  - $3-8M
- Build a 3-5 unit array of RivGens and integrate with battery storage
  - 1 year
  - $5-10M
- Annual recurring key sub-component development
  - 1 year projects
  - $0.5-1M

C-Power

- Design, build and in-water testing utility-scale next-gen devices and arrays
  - 2-4 years
  - >$10M depending on system
- Design, build and testing of utility-scale next-gen PTO and electric plant
  - <2 years
  - $1.5-2M
- Hull structure optimization
  - 1 year
  - $0.5-1M
- Annual recurring key sub-component development
  - 1 year projects
  - $0.5-1M

Priorities Discussion:
Open Discussion

Testing Infrastructure:
PacWave Update

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Marine Energy Testing Manager, PacWave

PacWave
TESTING WAVE ENERGY FOR THE FUTURE

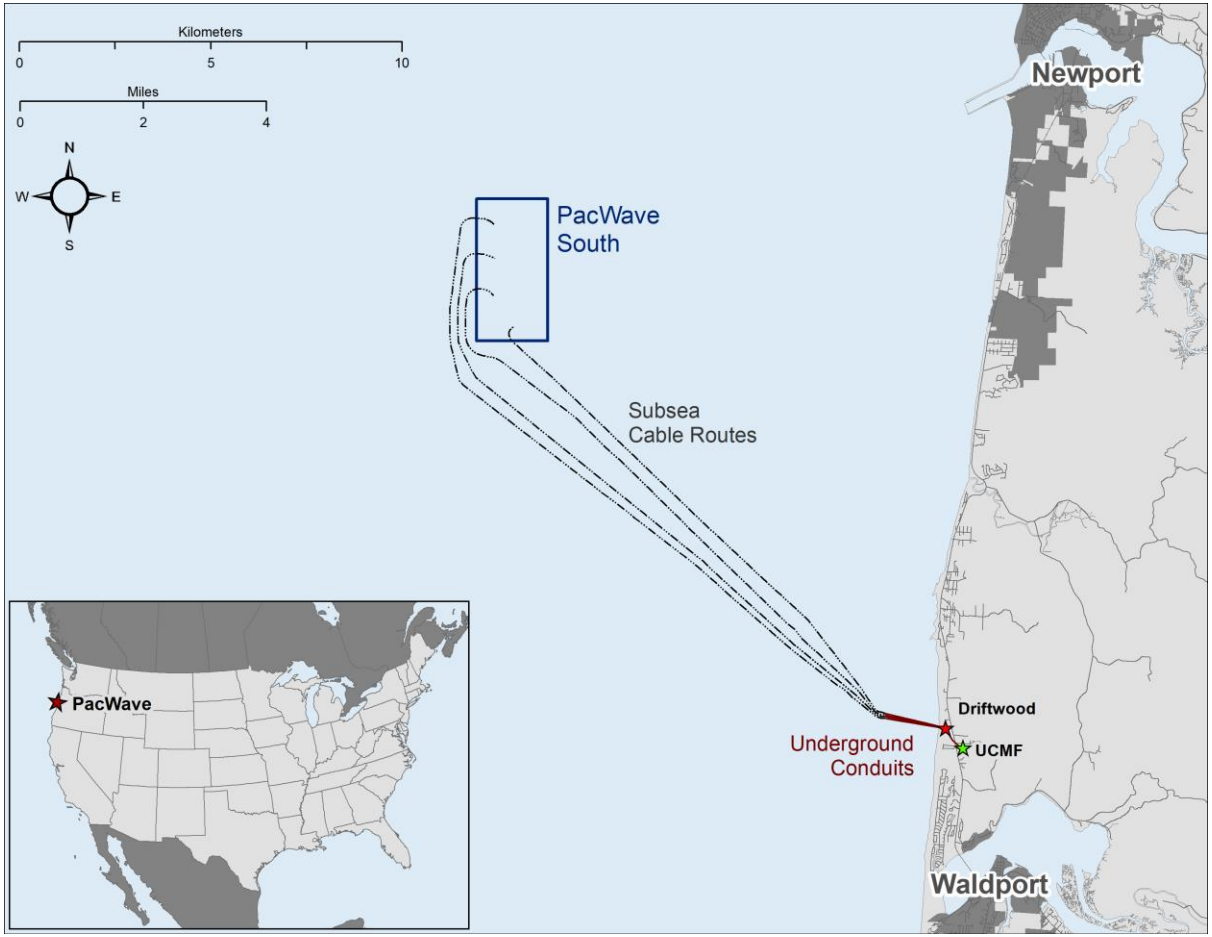
PacWave South Update

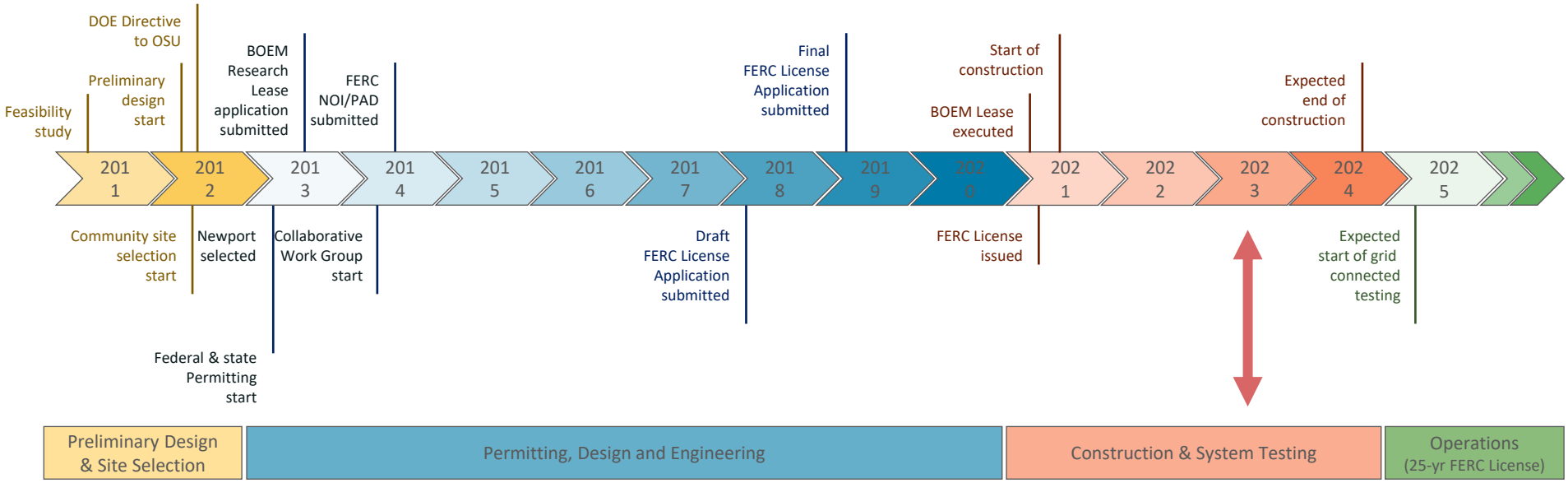
U.S. Department of Energy & Marine Energy Council Dialogue

Water Power Week - May 10, 2023

PacWave South is pre-permitted for most types of WECs.

- Location: 11 km offshore
- Depth: 65-78 m MLLW
- Seabed has a soft, sandy bottom
- Area: ~7 km^2
- Divided into four test berths
- Each berth equipped with a dedicated power & data cable with dry mate connector

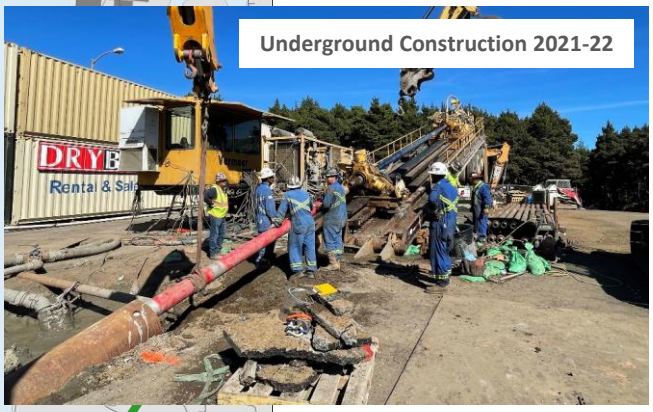




Timeline & Status

PacWave

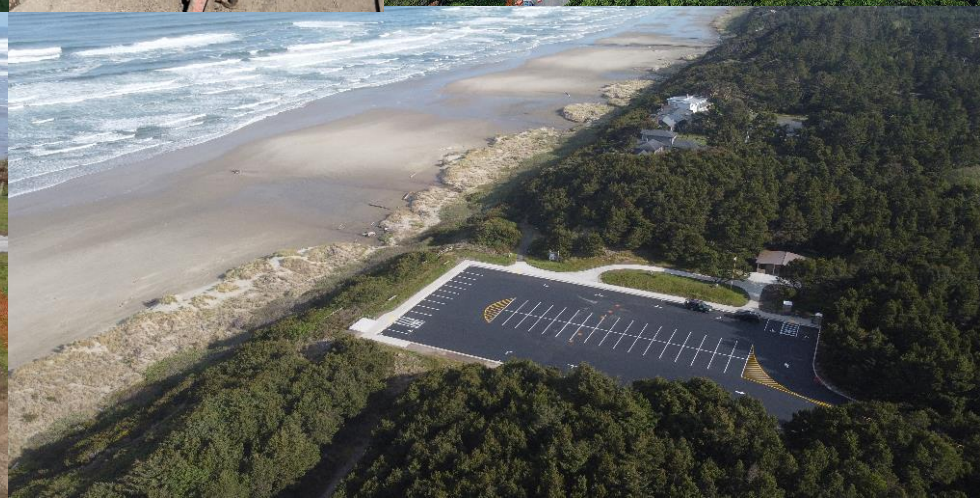
Grid-connected
Testing Operations
2025



PacWave South Construction


Subsea Cables
Driftwood Beach State Recreation Site
HDD-installed Offshore Conduits
HDD-installed Terrestrial Conduits
NW Ray Ridge Dr
NW Terrace St
NW Powe Dr
NW Wenger Ln
NW Camese Dr
Utility Connection & Monitoring Facility
2000 ft
N


JCB

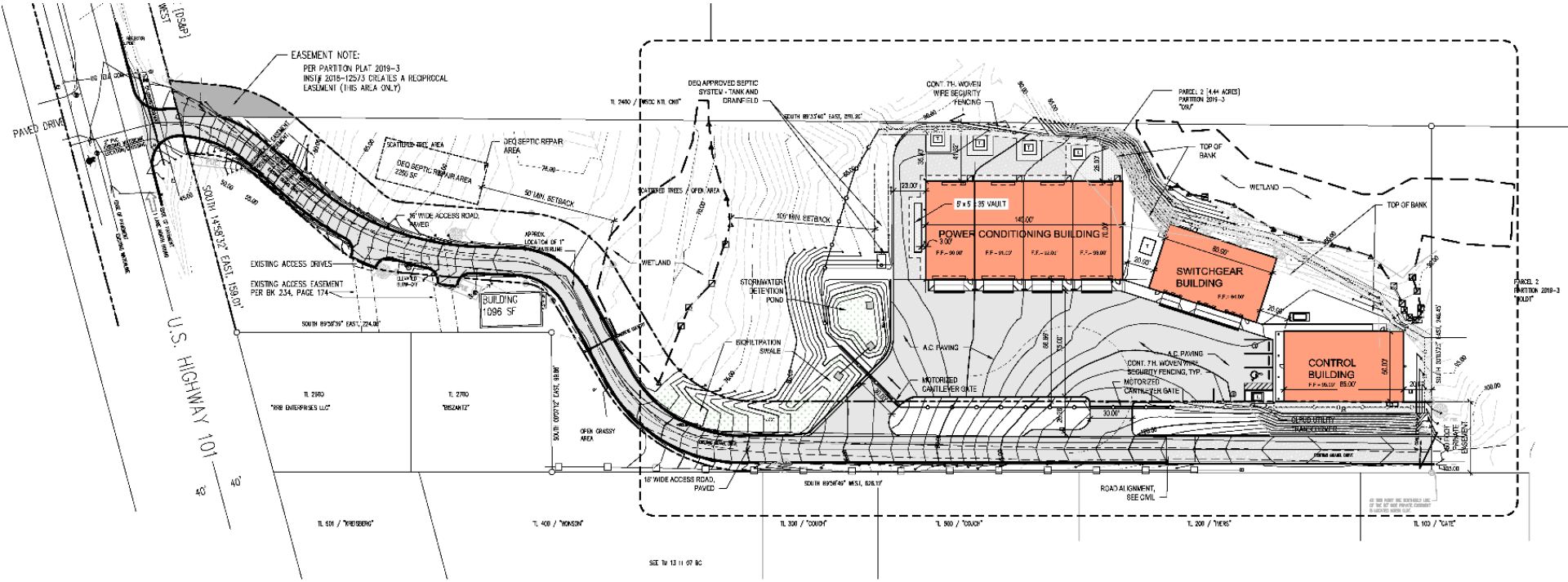


HGE ARCHITECTS

ARCHITECTURE
LANDSCAPE ARCHITECTURE
INTERIORS & PLANNING

Utility Connection & Monitoring Facility (Phase 2)

PacWave



Utility Connection & Monitoring Facility (Phase 2)

UCMF Construction - Underway

R.T. CASEY, L.L.C.

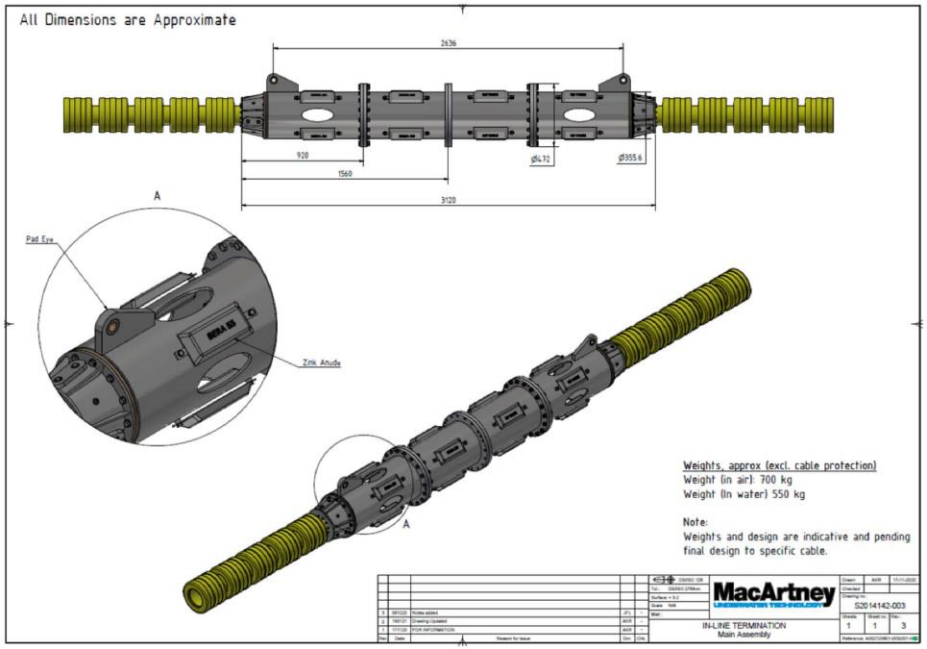
ELECTRIFY THE FUTURE

UNDERWATER TECHNOLOGY

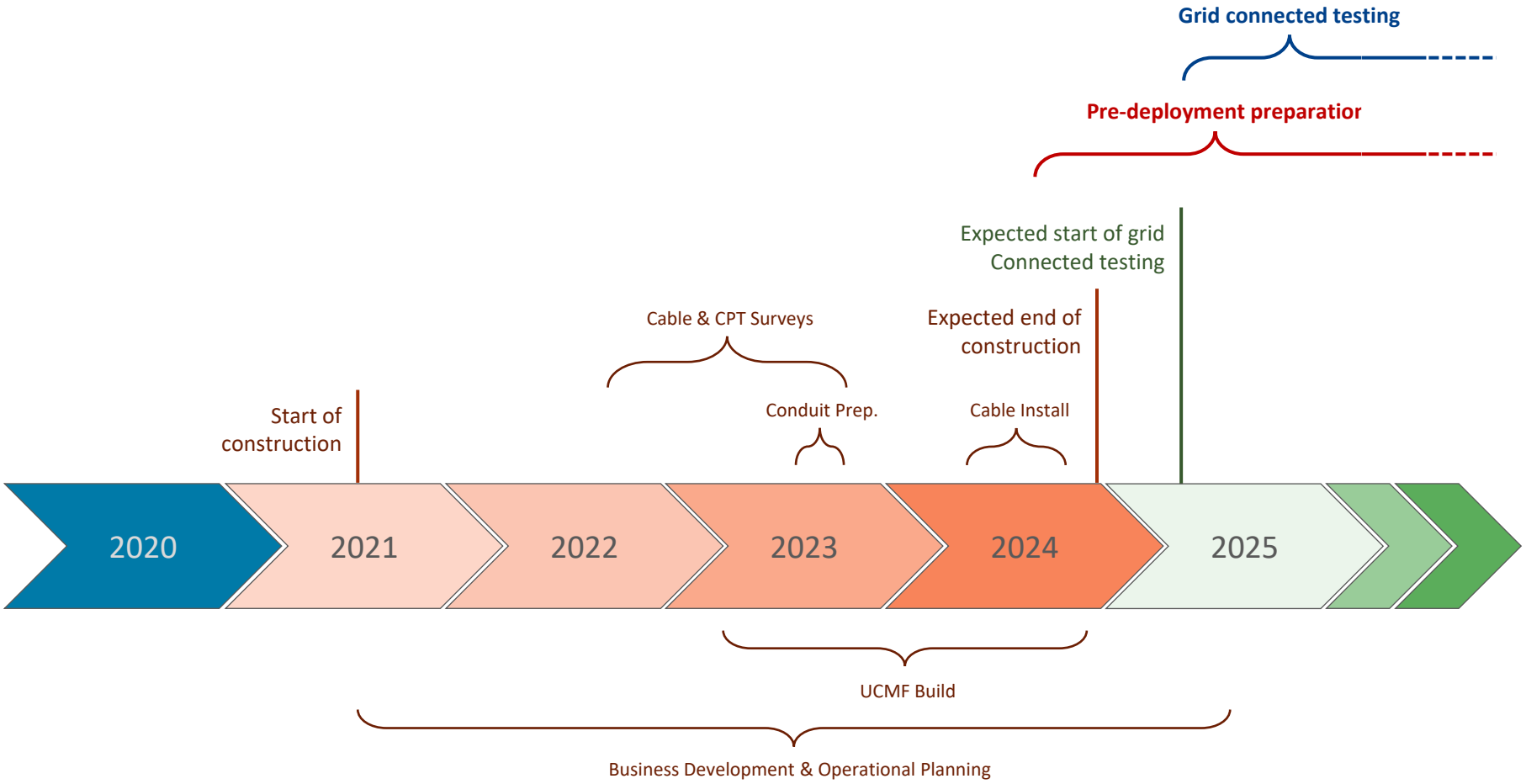
- Four subsea and terrestrial cables
- Total cable length of approximately 50 miles
- Currently being manufactured in Norway & Switzerland
- Final FAT: February 2024
- Shipping: March 2024
- Installation start: late June 2024
- Completion: September 2024

Subsea & Terrestrial Cable Design & Installation (Phase 3)

MacArtney
UNDERWATER TECHNOLOGY



MacArtney Greenlink Inline Termination



Timeline for Testing Operations

PacWaveEnergy.org

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PacWave

Testing Infrastructure:
Open Discussion

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Break

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Program Discussion

- TEAMER
- UMERC
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Discussion of DOE International Collaborations

Discussion of DOE-MEC Future Engagement

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Other Business