

MHK Track 1

Foundational R&D, Technology Design, and Validation

Grand Ballroom A&B

Foundational R&D, Technology Design, and Validation Peer Review Panel

- Elaine Buck, European Marine Energy Centre (MHK Chair/Panel Lead)
- Alex Fleming, iMetalx Group LLC
- Andy Hamilton, Monterey Bay Aquarium Research Institute
- Henry Jeffrey, The University of Edinburgh
- Jim Bretl, Korvis Automation
- Mike Muglia, University of North Carolina



THANK YOU, REVIEWERS!

- Project presentations will be kept to a strict 20 minutes, with 10 minutes of Q&A following, unless otherwise stated on the agenda.
- A yellow card will be flashed at the last 5 minutes, and then a red card will be held when time is up.
- Please respect your fellow presenters by keeping within your allotted time.
- The Review Panel Lead will kick off the Q&A, then allow questions from the other reviewers, and then the audience, time permitting.
- Any questions left unanswered due to time limitations can be addressed during the End-of-session Networking Activity.



Track 1: Agenda-at-a-Glance

Tuesday,
October 8th

Plenary

MHK Program
Overview

WPTO Support to
Testing

Foundational and
Crosscutting R&D

Wednesday,
October 9th

PacWave

Foundational and
Crosscutting R&D

Technology-
Specific Design
and Validation

Thursday,
October 10th

Technology-
Specific Design
and Validation

Powering the Blue
Economy

Town Hall

Track 1: Tuesday, October 8th

Start	End	Agenda Session	Presenter	Affiliation	Track
1:20 PM	1:40 PM	Overview of Foundational & Crosscutting R&D	Bill McShane	WPTO	Foundational R&D
1:40 PM	1:50 PM	Introduce FOA Projects	Yana Shininger	WPTO	Foundational R&D
1:50 PM	2:20 PM	Reduction of System Cost Characteristics through Innovative Solutions to Installation, Operations and Maintenance	Michael Ondusko	Columbia Power Technologies, Inc.	Foundational R&D
2:20 PM	2:50 PM	Demonstration of an Advanced Multi-Mode Point Absorber for Wave Energy Conversion	Tim Mundon	Oscilla Power, Inc.	Foundational R&D
2:50 PM	3:20 PM	Advanced TidGen Power System	Jarlath McEntee	Ocean Renewable Power Company (ORPC) - Maine	Foundational R&D
3:20 PM	3:35 PM	End-of-Session Networking Activity	All recent presenters	All recent presenters	Foundational R&D
3:35 PM	3:50 PM	Coffee Break			
3:50 PM	4:00 PM	Introduce Lab Projects	Jeff Rieks	WPTO	Foundational R&D
4:00 PM	4:30 PM	Wave Energy Converter (WEC) Modeling	Yi-Hsiang Yu	NREL, SNL	Foundational R&D
4:30 PM	5:00 PM	DTOcean (Optimal Design Tools for Ocean Energy)	Jesse Roberts	SNL	Foundational R&D
5:00 PM	5:30 PM	Material Design Tools for Marine and Hydrokinetic Composite Structures	Bernadette Hernandez-Sanchez	SNL, PNNL, NREL	Foundational R&D
5:30 PM	5:45 PM	End-of-Session Networking Activity	All recent presenters	All recent presenters	Foundational R&D
5:45 PM	6:15 PM	Peer Reviewer Only Meetings			

Date:

- Issued 4/28/2015; Selections announced 12/28/2015

Objective:

- Focus on the robustness of innovative MHK design systems with high performance potential by improving the system cost characteristics (CAPEX, OPEX, Availability, and System Life) of MHK systems undergoing development for commercial application through the establishment and validation of survival conditions by testing model prototypes in a controlled laboratory environment.

Topics Areas:

- Topic Area 1: Survivable WEC
- Topic Area 2: Marine Installation, Operations, and Maintenance (IO&M)

Projects For Review:

- Columbia Power Technologies (EE0007347 - *Reduction of System Cost Characteristics through Innovative Solutions to IO&M*)
- Verdant Power (EE0007349 - *Kinetic Hydropower System TriFrame Mount Integrated Development and IO&M Testing at RITE*)

Date:

- Issued 3/1/2016; Selections announced 8/30/2016

Objective:

- Support MHK R&D projects in the designing and testing of full-scale MHK systems that integrate advanced hardware and software technologies, as well as the development and innovation of technologies for monitoring the environmental impacts of MHK technologies.

Topics Areas:

- Topic Area 1: Next-Generation MHK Hardware and Software Technologies
- Topic Area 2: Reducing Environmental Monitoring Time and Costs

Projects For Review:

Topic Area 1:

- Oscilla Power, Inc. (EE0007819 – Demonstration of Advanced Multi-Mode Point Absorber for WEC)
- ORPC Maine, LLC (EE0007820 – Advanced TidGen Power System)

Topic Area 2:

- BioSonics Inc. (EE0007824 – Long-range Target Detection)
- Florida Atlantic University (EE0007828 – Unobtrusive Multi-Static Serial LiDAR Imager)
- Integral Consulting, Inc. (EE0007822 – NoiseSpotter)
- Integral Consulting, Inc. (EE0007826 – Benthic Habitat Monitoring Tools)
- University of Washington (EE0007823 – DAISY)
- University of Washington (EE0007827 – 3G-AMP)
- Woods Hole Oceanographic Institution (EE0007825 – Combined Electric/Magnetic Field Instrument)

- **Annual Operating Plans**

- EERE is committed to funding multi-year project plans
- Plans include Go/No-go decisions in 12-18 month period
- Merit reviewed externally on a 3-year cycle project cycle
- Reviewed and approved by WPTO annually



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Track 1: Wednesday, October 9th

Start	End	Agenda Session	Presenter	Affiliation	Track
9:50 AM	10:00 AM	Introduce Lab & FOA Projects	Bill McShane	WPTO	Foundational R&D
10:00 AM	10:30 AM	Optimal Wave Energy Converter (WEC) Controls using Causal and MPC Methods	Mirko Previsic	Re Vision Consulting, LLC	Foundational R&D
10:30 AM	11:00 AM	Wave Prediction Leveraging Multiple Measurement Sources – A Sensor Fusion Approach	Mirko Previsic	Re Vision Consulting, LLC	Foundational R&D
11:00 AM	11:10 AM	Coffee Break			
11:10 AM	11:40 AM	Advanced Wave Energy Converter (WEC) Dynamics and Controls	Ryan Coe	SNL	Foundational R&D
11:40 AM	12:10 PM	Wave Energy Converter (WEC) Design Optimization	Ryan Coe	SNL	Foundational R&D
12:10 PM	12:30 PM	End-of-Session Networking Activity	All recent presenters	All recent presenters	Foundational R&D
12:30 PM	1:15 PM	Lunch			

FOA 1182: MHK Systems Performance Advancement II (SPA II)

Date:

- Issued 1/12/2015; Selections announced 8/6/2015

Objective:

- Improving the performance and reduce the technical risk of MHK technologies Advancements in MHK technologies to help these devices harness even more sustainable energy from marine environments.

Topics Areas:

- Topic Area 1: Advanced Controls
- Topic Area 2: Crosscutting PTO Component
- Topic Area 3: Innovative Structures

Projects For Review:

- Re Vision Consulting (EE0007173 - *Optimal WEC Controls using Causal and MPC Methods*)

Date:

- Issued 12/15/2016; Selections announced 6/15/2017; Alternate 10/1/2018

Objective:

- Support MHK technologies aiming for economic competitiveness in either early-adopter or large utility scale markets.

Topics Areas:

- Topic Area 1: Wave Energy Converters (WEC) System Advancement
- Topic Area 2: Open Topic for MHK Technology Development

Projects For Review:

- California Wave Power Technologies (EE0008097 - *CalWAVE Open Water Demonstration*)
- Re Vision Consulting, LLC (EE0008099 - *Wave Prediction Leveraging Multiple Measurement Sources – A Sensor Fusion Approach*)
- Portland State University (EE0008100 - *A Hermetically Sealed Magnetically Geared Marine Hydrokinetic Generator*)
- Enorasy LLC (alternate, selected 10/1/2018) (EE0008388 - *Robotic Juggler Offshore WEC*)

Track 1: Wednesday, October 9th

Start	End	Agenda Session	Presenter	Affiliation	Track
1:15 PM	1:35 PM	Overview of Technology-Specific Design and Validation	Lauren Moraski Ruedy	WPTO	Foundational R&D
1:35 PM	1:45 PM	Introduce FOA Projects	Erik Mauer	WPTO	Foundational R&D
1:45 PM	2:05 PM	HydroAir Power Take Off System	Rod Blunk	Siemens Government Technologies	Foundational R&D
2:05 PM	2:25 PM	Demonstration of the Ocean Energy (OE) Buoy at US Navy's Wave Energy Test Site	Erik Mauer (on behalf of OE)	Ocean Energy USA	Foundational R&D
2:25 PM	2:45 PM	Joint Q&A for Siemens & OE			Foundational R&D
2:45 PM	3:00 PM	Coffee Break			
3:00 PM	3:30 PM	Azura Demonstration at the Navy's Wave Energy Test Site (WETS)	Bradley Ling	Northwest Energy Innovations	Foundational R&D
3:30 PM	3:35 PM	Introduce Lab Projects	Carrie Schmaus	WPTO	Foundational R&D
3:35 PM	4:05 PM	WaveSPARC	Jochem Weber	NREL	Foundational R&D
4:05 PM	4:35 PM	Flexible Material WEC Technology Techno-Economic Performance	Jochem Weber	NREL	Foundational R&D
4:35 PM	5:05 PM	Standards Development for Marine Energy	Walt Musial	NREL	Foundational R&D
5:05 PM	5:25 PM	End-of-Session Networking Activity	All recent presenters	All recent presenters	Foundational R&D
5:25 PM	5:55 PM	Peer Reviewer Only Meetings			

FOA 848: Marine and Hydrokinetic System Performance Advancement

Date:

- Issued 4/22/2013; Selections announced 10/1/2013

Objective:

- Advance technology performance of existing marine and hydrokinetic systems through the development and application of innovative components that are designed and built specifically for MHK applications will focus on improving the cost competitiveness of systems already in development.

Topics Areas:

- Topic Area 1: Advanced Controls
- Topic Area 2: Next-Gen Power Take-Off (PTO)
- Topic Area 3: Optimized Structures

Projects For Review:

- Siemens Government Technologies (formerly Dresser-Rand) (EE0006609 - *HydroAir Power Take Off System*)

FOA 1081: MHK Demonstrations at the Navy's Wave Energy Test Site

Date:

- Issued 4/25/2014; Selections announced 10/29/2014

Objective:

- Deploy two wave energy converter (WEC) systems, one at each of the Department of Navy's Wave Energy Test Site (WETS) berths located at 60 meters and 80 meters depths in Kaneohe, HI for testing, evaluation and comparison of performance, reliability and levelized cost of energy (LCOE) to provide the industry with the opportunity to test the most current and effective technology archetypes.

Areas of Interest:

- Deploy and test technology at close to full scale in the ocean environment
- Collect a comprehensive set of measurements to enable quantitative comparisons of WEC system cost, performance and reliability
- Make quantitative comparisons of WEC systems for reliability and techno-economic evaluation

Projects For Review:

- Northwest Energy Innovations (NWEI) (EE0006923 – *Azura Demonstration at the Navy's Wave Energy Test Site (WETS)*)
- Ocean Energy (OE) (EE0006924 – *Demonstration of the Ocean Energy (OE) Buoy at US Navy's Wave Energy Test Site*)

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Track 1: Thursday, October 10th

Start	End	Agenda Session	Presenter	Affiliation	Track
9:00 AM	9:05 AM	Introduce FOA & Lab Projects	Carrie Noonan	WPTO	Foundational R&D
9:05 AM	9:35 AM	Kinetic Hydropower System (KHPS) TriFrame Mount Integrated Development and IO&M Testing at RITE	Dean Corren	Verdant Power, Inc.	Foundational R&D
9:35 AM	10:05 AM	CalWAVE Open Water Demonstration	Thomas Boerner	CalWave Power Technologies Inc.	Foundational R&D
10:05 AM	10:35 AM	A Hermetically Sealed Magnetically Geared Marine Hydrokinetic Generator	Jonathan Bird	Portland State University	Foundational R&D
10:35 AM	10:45 AM	Coffee Break			
10:45 AM	11:15 AM	Robotic Juggler Offshore WEC	Vassilios Vamvas	Enorasy LLC	Foundational R&D
11:15 AM	11:45 AM	Techno-Economic Analysis and Program Support	Scott Jenne	NREL	Foundational R&D
11:45 AM	12:05 PM	End-of-Session Networking Activity	All recent presenters	All recent presenters	Foundational R&D
12:05 PM	12:25 PM	Closing Remarks on Foundational R&D	Lauren Moraski Reudy & Bill McShane	WPTO	Foundational R&D
12:25 PM	1:15 PM	Lunch			

FOA 1310: Next-Generation Marine Energy Systems

Date:

- Issued 4/28/2015; Selections announced 12/28/2015

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Topics Areas:

- Topic Area 1: Survivable WEC
- Topic Area 2: Marine Installation, Operations, and Maintenance (IO&M)

Projects For Review:

- Columbia Power Technologies (EE0007347 - *Reduction of System Cost Characteristics through Innovative Solutions to IO&M*)
- Verdant Power (EE0007349 - *Kinetic Hydropower System TriFrame Mount Integrated Development and IO&M Testing at RITE*)

Date:

- Issued 12/15/2016; Selections announced 6/15/2017; Alternate 10/1/2018

Objective:

- Support MHK technologies aiming for economic competitiveness in either early-adopter or large utility scale markets.

Topics Areas:

- Topic Area 1: Wave Energy Converters (WEC) System Advancement
- Topic Area 2: Open Topic for MHK Technology Development

Projects For Review:

- **California Wave Power Technologies (EE0008097 - *CalWAVE Open Water Demonstration*)**
- Re Vision Consulting, LLC (EE0008099 - *Wave Prediction Leveraging Multiple Measurement Sources – A Sensor Fusion Approach*)
- Portland State University (EE0008100 - *A Hermetically Sealed Magnetically Geared Marine Hydrokinetic Generator*)
- Enorasy LLC (alternate, selected 10/1/2018) (EE0008388 - *Robotic Juggler Offshore WEC*)