

Water Power Technologies Office (WPTO) Marine and Hydrokinetic



Overview of Environmental Research

February 14, 2017

Hoyt Battey

Program Manager for Market Acceleration
and Deployment

Water Power Technologies Office
U.S. Department of Energy

Proactively address the highest priority environmental information needs to reduced the time and cost of permitting and licensing for MHK projects

Data Collection
&
Experimentation

Monitoring &
Mitigation
Technologies
and Techniques

Information
Sharing &
Outreach

Technology Maturity

- Test and demonstrate prototypes
- Develop cost effective approaches for installation, grid integration, operations and maintenance
- Conduct R&D for Innovative MHK systems & components
- Develop tools to optimize device and array performance and reliability
- Develop and apply quantitative metrics to advance MHK technologies

Deployment Barriers

- Identify potential improvements to regulatory processes and requirements
- Support research focused on retiring or mitigating environmental risks and reducing costs
- Build awareness of MHK technologies
- Ensure MHK interests are considered in coastal and marine planning processes
- Evaluate deployment infrastructure needs and possible approaches to bridge gaps

Market Development

- Support project demonstrations to reduce risk and build investor confidence
- Assess and communicate potential MHK market opportunities, including off-grid and non-electric
- Inform incentives and policy measures
- Develop, maintain and communicate our national strategy
- Support development of standards
- Expand MHK technical and research community

Crosscutting Approaches

- Enable access to testing facilities that help accelerate the pace of technology development
- Improve resource characterization to optimize technologies, reduce deployment risks and identify promising markets
- Exchange of data information and expertise

2014 Peer Review and Response:

Relevant Peer Review Panel Comments:

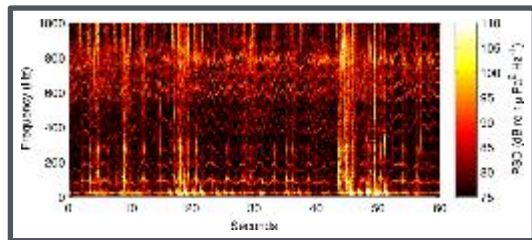
“Continue to support the industry through: Addressing regulatory issues by having the national labs provide solid scientific data to address environmental concerns when possible.”

“The overall program alignment is good but there are still some gaps, especially with regards to licensing uncertainty and time required.”

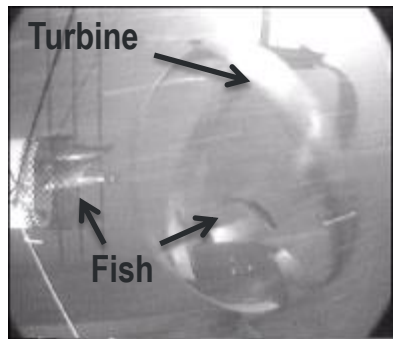
“The Program needs to review Federal and State regulatory processes to identify research required to streamline permitting processes.”

Program Response from 2014 Peer Review:

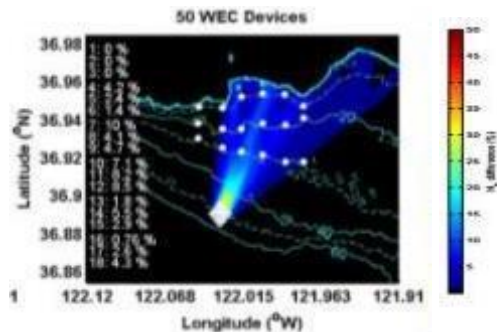
“In the area of MHK market acceleration, the Program intends to: increase international engagement; expand the role for cross-agency work; and broaden the scope of market acceleration projects.”



Bassett, C., J. Thomson, B. Pology, and K. Rhinefrank (2011) Underwater noise measurements of a 1/7th scale wave energy converter, MTS/IEEE Oceans 2011, Kona, HI, September 19-22.



- Data collection around deployed MHK devices and surrogates
 - Fish behavioral response to tidal turbines
 - Marine organism susceptibility and response to EMF
 - Reefing effects
 - Acoustic signature of WECs
 - Marine mammal response to marine renewable energy converter noise
- Laboratory Experiments
 - Fish response to noise
 - Fish survival when passing through tidal turbines
- Numerical Modeling
 - Impacts of energy removal from Wave and Tidal Energy converters
 - Acoustic propagation of MHK-produced noise
 - Eulerian-Lagrangian Agent Method for modeling fish behavior near tidal turbines





ENVIRONMENTAL EFFECTS OF MARINE ENERGY DEVELOPMENT AROUND THE WORLD

- This report is the **most comprehensive** synthesis of the state of scientific understanding of environmental research of marine renewable energy ever produced.
- Summarizes interactions and effects of MHK devices on the marine environment
- The report will be used to:
 - **retire environmental risk** for marine energy technologies;
 - **avoid duplication of research and monitoring** efforts;
 - **promote the sustainable development** of marine renewable energy technologies;
 - and to ensure that accurate and up-to-date **information is available** to regulators, industry members, and scientists worldwide.

<http://tethys.pnnl.gov/publications/state-of-the-science-2016>

New Report Published July 1, 2016

Results from workshop held in Washington D.C. in 2015 with U.S. regulators and prominent scientific experts to review:

1. Historical experiences related to environmental monitoring required for U.S. deployments;
2. Existing information on the potential likelihood and severity of any environmental impacts;
3. Any recommendations for future shifts in regulatory considerations or approaches



A Review of the Environmental Impacts for Marine and Hydrokinetic Projects to Inform Regulatory Permitting:

Summary Findings from the 2015 Workshop on Marine and Hydrokinetic Technologies, Washington, D.C.

E. Ian Baring-Gould, Corrie Christol, and
Al LiVecchi
National Renewable Energy Laboratory

Sharon Kramer
H.T. Harvey & Associates

Anna West
Kearns & West

NREL is a national laboratory of the U.S. Department of Energy
Office of Energy Efficiency & Renewable Energy
Operated by the Alliance for Sustainable Energy, LLC

This report is available at no cost from the National Renewable Energy
Laboratory (NREL) at www.nrel.gov/publications.

Technical Report
NREL/TP-5000-66688
July 2016

Contract No. DE-AC36-06GO28308

MHK Program Peer Review

Session 2A - Timeline

Window for 2017 Peer Review

Improvements to Hydrodynamic and Acoustic Models for Environmental Prediction - SNL

Evaluating Potential for Impacts from Seal Collisions with Tidal Turbines - PNNL

Acoustics Exposure Experimentation for Sensitive Fish Species - ORNL

FY13 Funding Opportunity (FOA):
“Environmental Effects Assessment and Monitoring” (Partnered with BOEM, ~\$2M in Federal Funding), 7 Projects

Annex IV and Tethys: International Environmental Data Sharing Initiative - PNNL

Marine and Hydrokinetic Energy Regulator Trainings - NREL

2013 2014 2015 2016 2017 2018

Agenda (TUESDAY AFTERNOON):

- Improvements to Hydrodynamic and Acoustic Models for Environmental Prediction - Jesse Roberts, SNL
- Evaluating Potential for Impacts from Seal Collisions with Tidal Turbines - Andrea Copping, PNNL
- Acoustics Exposure Experimentation for Sensitive Fish Species - Mark Bevelhimer, ORNL

BREAK

- Interactions of Aquatic Animals with the ORPC OCGen in Cobscook Bay, Maine - Gayle Zydlewski, University of Maine
- Informing a Tidal Turbine Strike Probability Model through Characterization of Fish Behavioral Response using Multibeam Sonar Output - Mark Bevelhimer, ORNL
- Current Ability to Assess Impacts of Electro Magnetic Fields Associated with Marine and Hydrokinetic Energy Technologies on Marine Fishes in Hawaii - Jeremy Claisse, Vantuna Research Group
- Evaluating the Potential for Marine and Hydrokinetic Devices to Act as Artificial Reefs or Fish Aggregating Devices - Sharon Kramer, H.T. Harvey and Associates

Agenda (WEDNESDAY MORNING):

- Effects of EMF Emissions from Cables and Junction Boxes on Marine Species - Manhar Dhanak, Florida Atlantic University
- Assessment of Potential Impact of Electromagnetic Fields from Undersea Cable on Migratory Fish Behavior - Ximena Vergara, Electric Power Research Institute, Inc.
- Marine Mammal Behavioral Response to Marine Energy Converter Sound - Brian Polagye, University of Washington
- Annex IV and Tethys: International Environmental Data Sharing Initiative - Andrea Copping, PNNL

BREAK

- Marine and Hydrokinetic Energy Regulator Trainings - Ian Baring Gould, NREL