

# Water Power Technologies Office (WPTO) Marine and Hydrokinetic

U.S. DEPARTMENT OF  
**ENERGY** | Energy Efficiency &  
Renewable Energy



## Systems Overview

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# Systems Overview

Systems Overview: DOE has a critical role to play in incentivizing development of innovative systems, as well as developing tools, components, and applying them to facilitate developers through the process of system innovation. This systems portfolio includes projects that develop products, advance technologies, and support innovators at the leading edge of the sector. While not always immediately apparent if and how these efforts at the leading edge will be relevant for enabling advancement of system innovations, examples over the last few years have demonstrated the value of these efforts.

The Challenge: The maturity of the sector is fortunately not yet to the state where there are only very minor cost reduction opportunities possible at a systems level. Rather the field is wide for game-changing innovation at the systems level (especially in wave energy). However, there exist few supporting tools and facilities that can manage a wide diversity of interesting system concepts to be explored.

### Wave Energy Converter Modeling

- Mixed support for government development of open source codes
- General sentiment that the developers are already outfitted with the software packages they need, and codes don't help those putting their devices in the water (understood as beyond the design stage of their development effort)
- “There appears to be no device developer input, but they are the end user.”
- “Modeling extreme conditions will be very useful.”

### Materials

- “Project of developing advanced materials and manufacturing reliability for biofouling issues is critical, but not clear that project is designed to avoid duplication and to tap prior research.” “It is crucial that the Department of Defense and the oil industry are being consulted on this project.”

### Industry support:

- “Very relevant. Brings DOE lab experience to MHK firms. Leverages relevant experience to de-risk MHK projects in support of industry.”
- “Budgeting has clearly been difficult and a fair amount of funds are allocated, but are unlikely to be spent.”

# Systems alignment with Program Strategic Priorities

## 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

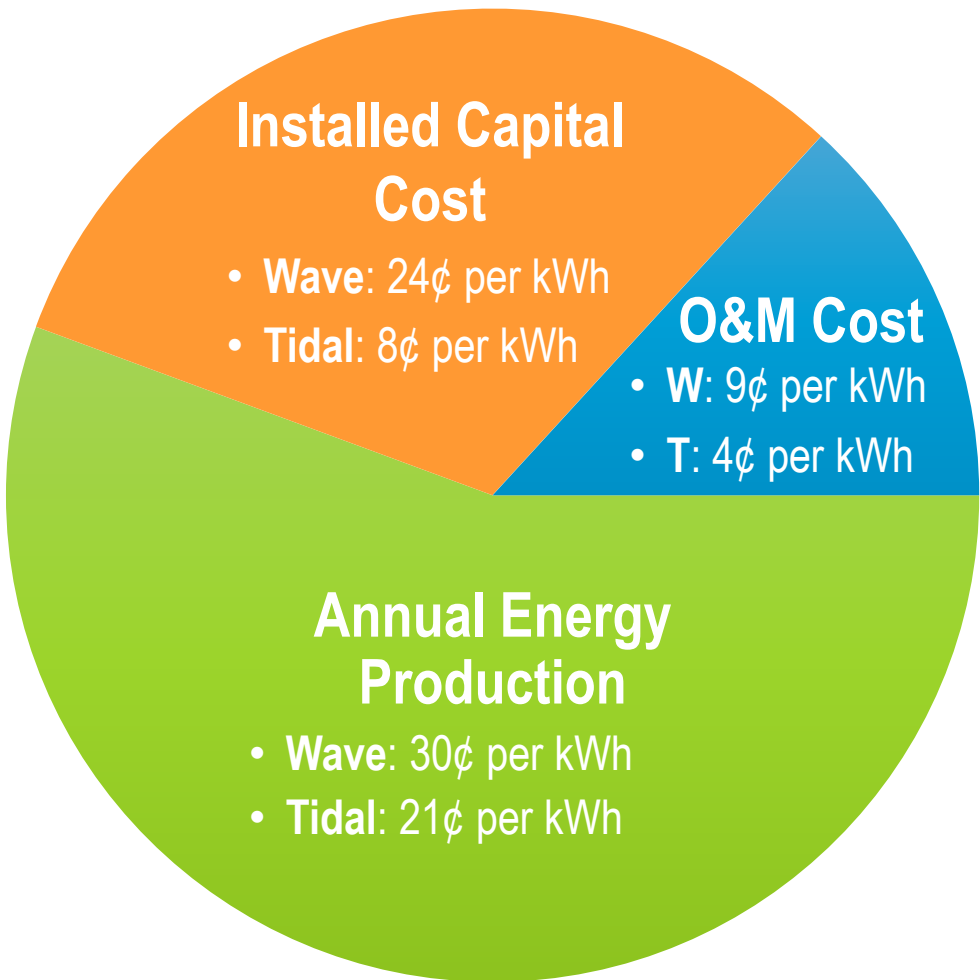
- **Exchange of data information and expertise**

# Marine and Hydrokinetic – Components R&D

## Cost Reduction Opportunities-informing Investments

- Cost reduction opportunity**
  - Averaged across wave and tidal
    - Wave: 63¢ per kWh
    - Tidal: 33¢ per kWh
- Installed Capital Cost**
  - Advanced Materials, innovative manufacturing, array layout, design for resource class, efficient installation and permitting
- Operations & Maintenance (O&M)**
  - Prognostic maintenance, design for service/survivability, advanced coatings
- Annual Energy Production**
  - Energy Capture/Conversion Efficiency, Resource Characterization, Advanced Controls, Optimized Structures

### Cost reduction potential between now and 2030



# Timeline



Technology Maturity

