

Water Power Technologies Office (WPTO) Marine and Hydrokinetic



Components Overview

Wednesday February 15^h, 2017

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Components Session Overview

Components Overview: Major cost reduction opportunities exist in the areas of Optimized structures, Power Take-Off (efficient marine energy to mechanical energy, and mechanical to electrical conversion), and advanced controls. The Projects presented here (structures and power take-off) reflect a suite of industry awards designed to advance R&D to address these key cost reduction opportunities, targeting increased power to weight and availability in order to, once integrated with overall system, improve system performance.

The Challenge: Marine and Hydrokinetic technology experience conditions that preclude the use of off-the-shelf component technology in MHK applications. A component supply line that is designed specifically for performance and reliability in the MHK application is needed.

Components Session Overview (Continued)

2014 Peer review:

- “Concentration on advanced controls, power take off, and optimized structures will benefit many different types of MHK devices. In other words, the results should be broadly applicable.”
- “Consider funding options that would enable company to have access to DOE funding to bring technology through full development, subject to matching funds and successful performance of milestones. Lack of private investment makes USDOE funding critical through successful beta test demonstration of commercial pilot project.
- “Concerned about the proprietary nature of the work.”
- “Consider a DARPA-like model that encourages collaboration between the Industrial Partners, but only if this is not too great a departure from existing corporate cultures”

Response

- Sequenced Funding Opportunities targeting objectives along a logical development path towards commercialization
- Required release of information after data protected periods expire
- Wave Energy Prize mechanism for incentivizing innovation enable teaming through a “marketplace”.

Component R&D 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

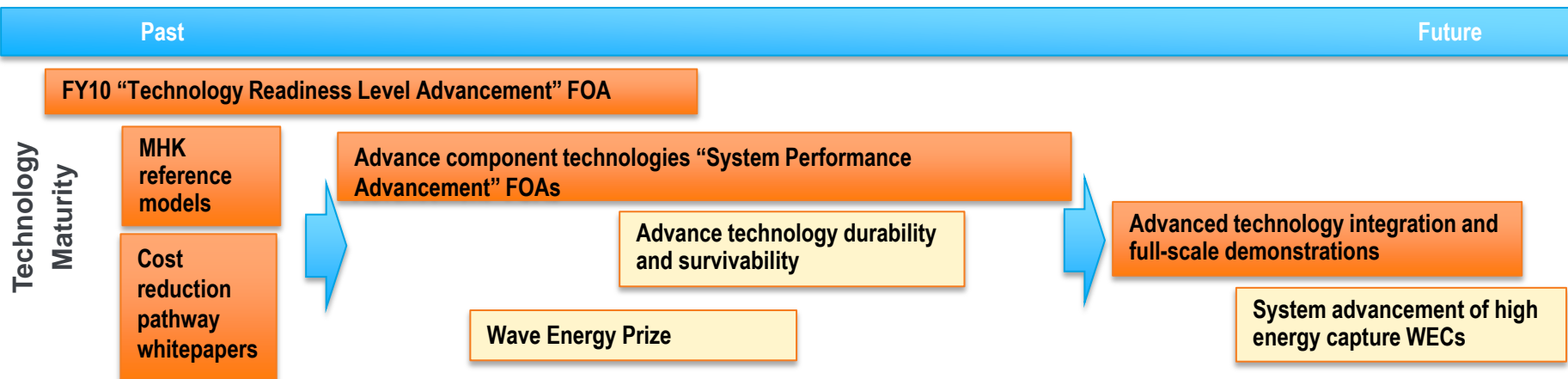
Market Development

- 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

Timeline



FY10 *Technology Readiness Level Advancement* FOA (all TRLs)
to develop an organized methodology to measure technological advancement of WEC components and systems

FY13 *Systems Performance Advancement* FOA Round I (TRL 4/5)
to advance WEC controls, structures, and power conversion efficiency

FY15 *Systems Performance Advancement* FOA Round II (TRL 4/5)
to advance WEC controls, structures, and power conversion efficiency

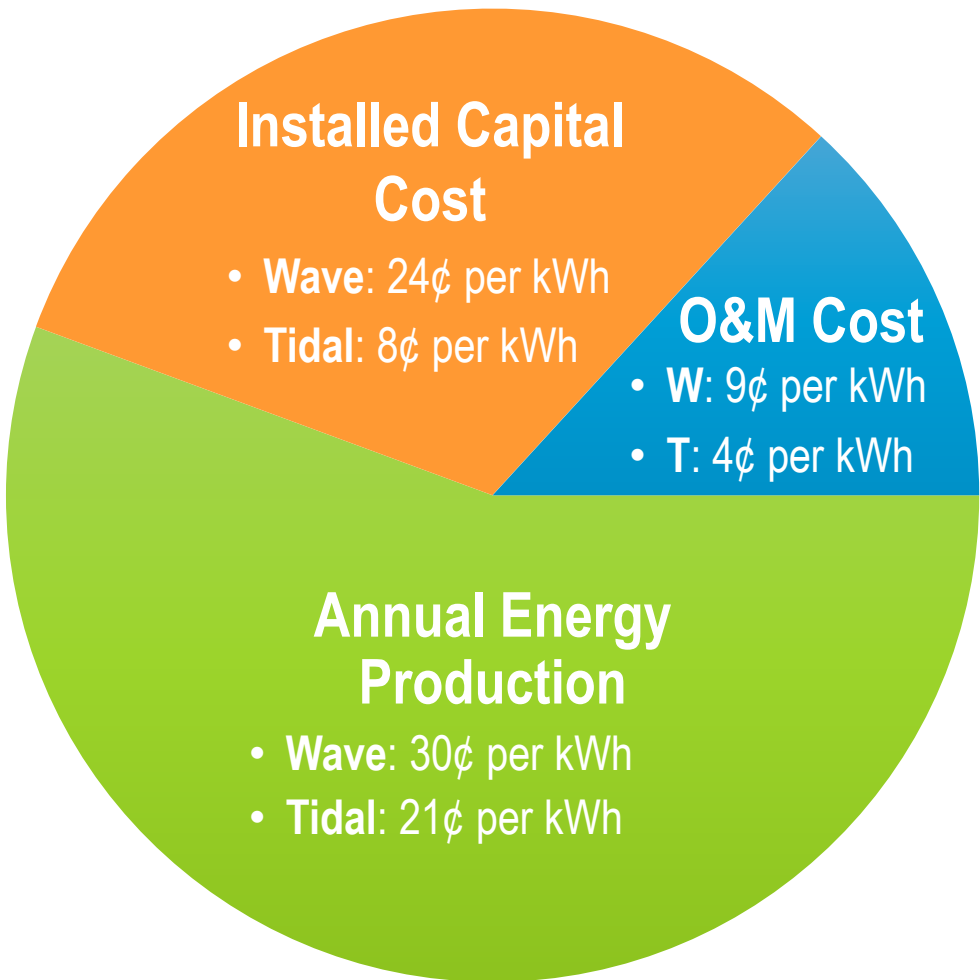
FY16 *Marine And Hydrokinetic Energy Conversion And Environmental Monitoring Technology Advancement* (FOA) Topic Area 1: (TRL 6 to 9)
to demonstrate full-scale systems with advanced technologies

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



Components R&D Projects Timeline

DRESSER-RAND
A Siemens Business

System Performance Advancement (SPA)

Round I:

Four Power Take-Off;
Two Structures Projects;

COLUMBIA POWER TECHNOLOGIES
power from the next wave



SPA Awards Round II:
Two Power Take Off;
One Structures



2013

2014

2015

2016

2017

2018

2019

DRESSER-RAND
A Siemens Business



Demonstrate full-scale systems
with advanced technologies (FOA)

