Techno-Economic Analysis and Program Support

WBS#: 2.4.3.401

Marine and Hydrokinetics Program

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Project Overview

Project Summary

- The techno-economic analysis and program support task provides techno-economic due diligence for the WPTO, develops analysis tools, and provides feasibility analyses for new and emerging technologies.

Project Objective & Impact

- This project provides techno-economic due diligence for the WPTO, uses analysis to quantify the economic viability of the existing and proposed technologies, and works to develop a robust and easy to use techno-economic tool using standardized methodologies from other EERE programs.

Project Information

Project Principal Investigator(s)

Scott Jenne

WPTO Lead

Bill McShane

Project Partners/Subs

Project Partners:
PNNL – Desalination/Powering the Blue Economy (PBE)
Marine Energy Industry – FOA Recipients
University of Washington – PBE Analysis
IEA/OES – U.S. LCOE Representative

Project Duration

- FY17
- FY20+

Marine and Hydrokinetics (MHK) Program Strategic Approaches

Data Sharing and Analysis

Foundational and Crosscutting R&D

Technology-Specific Design and Validation

Reducing Barriers to Testing

Alignment with the MHK Program

Foundational and Crosscutting R&D

- Drive innovation in components, controls, manufacturing, materials and systems with early-stage R&D specific to MHK applications

- Develop, improve, and validate numerical and experimental tools and methodologies needed to improve understanding of important fluid-structure interactions

- Improve MHK resource assessments and characterizations needed to optimize devices and arrays, and understand extreme conditions

- Collaboratively develop and apply quantitative metrics to identify and advance technologies with high ultimate techno-economic potential for their market applications

- Leveraging previous LCOE analysis, this task has been used with the WPTO to understand which metrics are best suited for LCOE proxies for low-TRL systems. Where applicable these metrics have been used to translate industry awardee data into annual cost reductions.

- This task works closely with other technology analysis teams (wind, hydropower, solar, geothermal, etc.) to develop consistent and proven methodologies.

Alignment with the MHK Program

Data Sharing and Analysis

- Provide original research to assess and communicate potential MHK market opportunities, including those relevant for other maritime markets

- Aggregate and analyze data on MHK performance and technology advances, and maintain information sharing platforms to enable dissemination

- Support the early incorporation of manufacturing considerations/information into design processes

- Leverage expertise, technology, data, methods, and lessons from the international MHK community and other offshore scientific and industrial sectors

- This task is primarily focused on data analysis and dissemination. Market opportunities (e.g., desalination and other PBE applications) originated under this task.

- FOA data has been aggregated and used to inform cost curves, along with internal models and external data collection efforts.

- The impact of manufacturing improvements and cost reduction activities has been analyzed to prioritize WPTO investments.

- Data collected from the U.S. MHK industry and offshore wind sector are consistently being analyzed to inform models and develop cost reduction pathways.
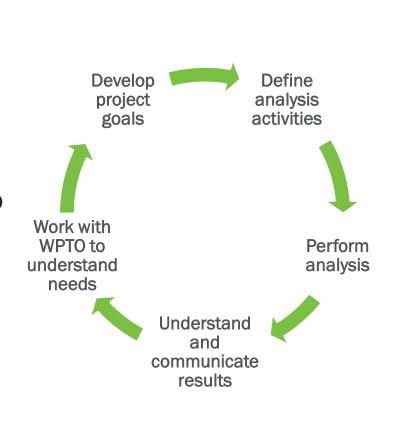
Project Budget

FY17	FY18	FY19 (Q1 & Q2 Only)	Total Project Budget FY17–FY19 Q1 & Q2 (October 2016–March 2019)	
Costed	Costed	Costed	Total Costed	Total Authorized
$90K	$160K	$185K	$435K	$1,330K

- The budget for this task has grown significantly since 2017 due to the addition of the System Advisor Model LCOE tool and a specific subtask to work with the WPTO to develop an LCOE strategy.

- This task was front-funded in FY19 for future years with a delay in staffing, which is primarily responsible for the discrepancy between Total Costed and Total Authorized.

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- The Programmatic Support Subtask (bulk of effort in FY17 and FY18) requires a dynamic management approach that is driven by the needs and timing of the WPTO. Regular phone and web meetings have been key to ensuring that communication is clear, and expectations can be met given the budget and scope.

- Quarterly milestones are regularly used to track and measure progress.

- As a non-biased 3rd-party, NREL has the unique ability to collaborate with industry, academic institutes, and other FFRDCs. NREL has developed guidance for MHK technologies in collaboration with DOE's wind and hydropower technologies, allowing MHK technologies to be compared with other EERE sectors (wind, solar, geothermal, etc.).

Develop project goals → Define analysis activities → Perform analysis → Understand and communicate results → Work with WPTO to understand needs →

End-User Engagement and Dissemination Strategy

- Results and methodology should be as transparent and easily accessible as possible.
  - LCOE Guidance Documentation (OpenEI.org)
  - SAM Tool (publicly available from sam.nrel.gov)
  - LCOE Strategic Planning (to be made available as public strategy)
  - Specific analysis results published in conferences and journals
    - Desalination techno-economic assessment (OMAE 2018)
    - Impact of PTO smoothing control (OMAE 2018)
    - Desalination modeling methodology (JMSE 2019)

Technical Accomplishments

- **Highlight promising near-term and long-term opportunities for the marine energy industry**
  - Powering the Blue Economy (PBE) was initiated under techno-economic analysis as an exploratory analysis task and maintained under this task until FY19.
  - Desalination was also initiated under this task as a feasibility analysis, it has since spun off into the Waves to Water Prize.

- **Initial SAM LCOE tool**
  - A first of its kind, easy to use LCOE tool has been developed under this task to simplify the analysis and reporting requirements for funding awardees and internal analysis.

- **Programmatic support**
  - Annually the team works closely with WPTO to develop LCOE targets that are used for Office of Management and Budget planning.
  - Reviews LCOE analysis to ensure consistency between LCOE analysis for varying funding awardees.

Future Work

- **Desalination efforts will continue**
  - Reverse osmosis (RO) membranes will be characterized, and their data publicized to enable techno-economic optimization of wave-powered RO systems.

- **SAM development will continue**
  - Data gaps will be evaluated, and existing cost methodologies will be refined.
  - Additional resources will be included for quicker and more accurate regional analysis.
  - Additional capabilities will be evaluated based on industry and other user needs.

- **WPTO LCOE strategy**
  - Marine energy technology baselining will continue.
  - Bottom-up and top-down analysis will be refined for future planning.
  - Workshops and webinars will be planned for further industry engagement.

R&D path for Wave Energy