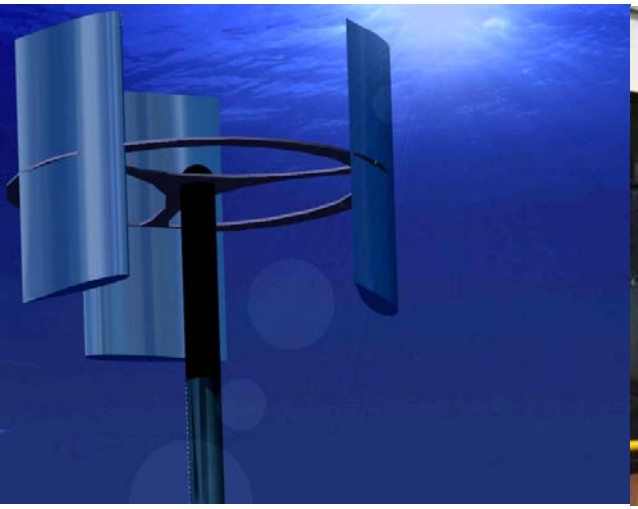
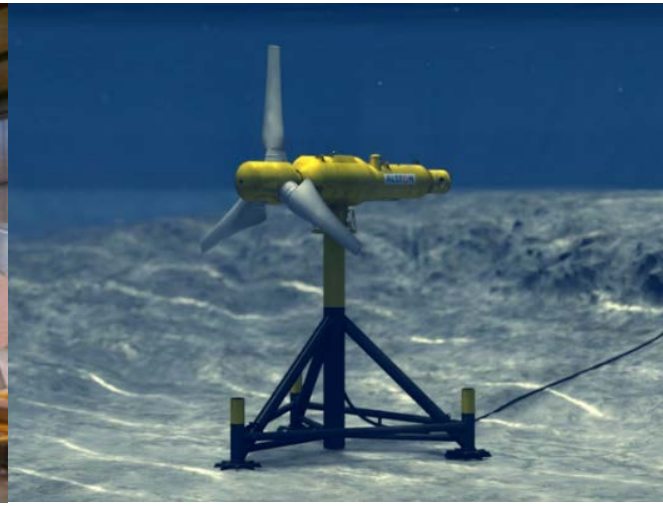


Fore 2015

Bassett 2015



Brown-Saracino 2015

MHK Environmental Compliance Cost Assessment

WBS 2.3.2.702

Marine and Hydrokinetics Program

October 8, 2019

Jesse Roberts

Sandia National Laboratories

Project Overview

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

Project Summary

- Reduce time and costs associated with licensing and permitting, and compliance for MHK projects.
- Collected detailed data on environmental compliance costs and regulatory concerns from industry and state and federal regulatory agencies.
- Benchmarked permitting and compliance costs with other renewable and marine technologies.
- Developed strategies and actions to reduce permitting/compliance costs, which are well supported by industry and state and federal regulators.

Project Objective & Impact

- Early MHK deployments in the U.S. have absorbed very high permitting costs increasing project risk and discouraging investment.
- Thoughtful and consistent collection and classification of cost data has facilitated an estimate of regulatory cost drivers and enabled development of cost-reduction strategies to achieve Programmatic LCOE targets.

Project Information

Project Principal Investigator(s)

Jesse Roberts

WPTO Lead

Samantha Eaves

Project Partners/Subs

Kearns & West
H.T. Harvey and Associates
Integral Consulting

Project Duration

- FY17
- FY20

Alignment with the Program

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

Reducing Barriers to Testing

- Work with agencies and other groups to ensure that existing data is well-utilized and identify potential improvements to regulatory processes and requirements.
- Support additional scientific research as needed, focused on retiring or mitigating environmental risks and reducing costs and complexity of environmental monitoring.

- With extensive outreach and discussions with regulatory agencies, as well as with developers, we have identified well supported strategies and actions to improve the efficiency and effectiveness of the regulatory process.
- Now that costs for conducting specific environmental studies are known, future efforts can use this information to decrease study costs.

Alignment with the MHK Program

Data Sharing and Analysis

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

Two data sharing and analysis efforts have informed development of strategies and actions to improve efficiency and effectiveness of MHK permitting.

- A review of costs for permitting of other industries, including offshore oil and gas, offshore telecommunications, terrestrial solar and wind projects;
- Discussions with developers and MHK federal and state regulators to gather quantitative data and qualitative findings.

Alignment with the MHK Program

Technology-Specific Design and Validation

- Improve methods for safe and cost efficient installation, grid integration, operations, monitoring, maintenance, and decommissioning of MHK technologies.

- Upfront industry costs for conducting specific environmental studies required for licensing and permitting impacts the costs associated with installation of projects, and once operational, compliance/monitoring costs.
- These costs can have a huge impact on overall project costs, particularly in the early stages of industry growth.
- Understanding these costs from current projects and building strategies and actions to reduce them will advance the industry.

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
$448K	$457K	$341K	$1,246K	$1,637K

- **No-cost extension for FY20 work scope**
  - Funded with FY19 Carryover

Management and Technical Approach

integral consulting inc.

Technical advisor on monitoring tools and techniques required for MHK environmental compliance

Sandia National Laboratories

Deep experience in all aspects of MHK research, energy economics, energy system dynamics, data analysis

KEARNS & WEST

Industry and agency facilitation and coordination expertise

H. T. HARVEY & ASSOCIATES
Ecological Consultants

Technical advisor with experience with MHK permitting

A Strong, Integrated Team

End-User Engagement and Dissemination Strategy

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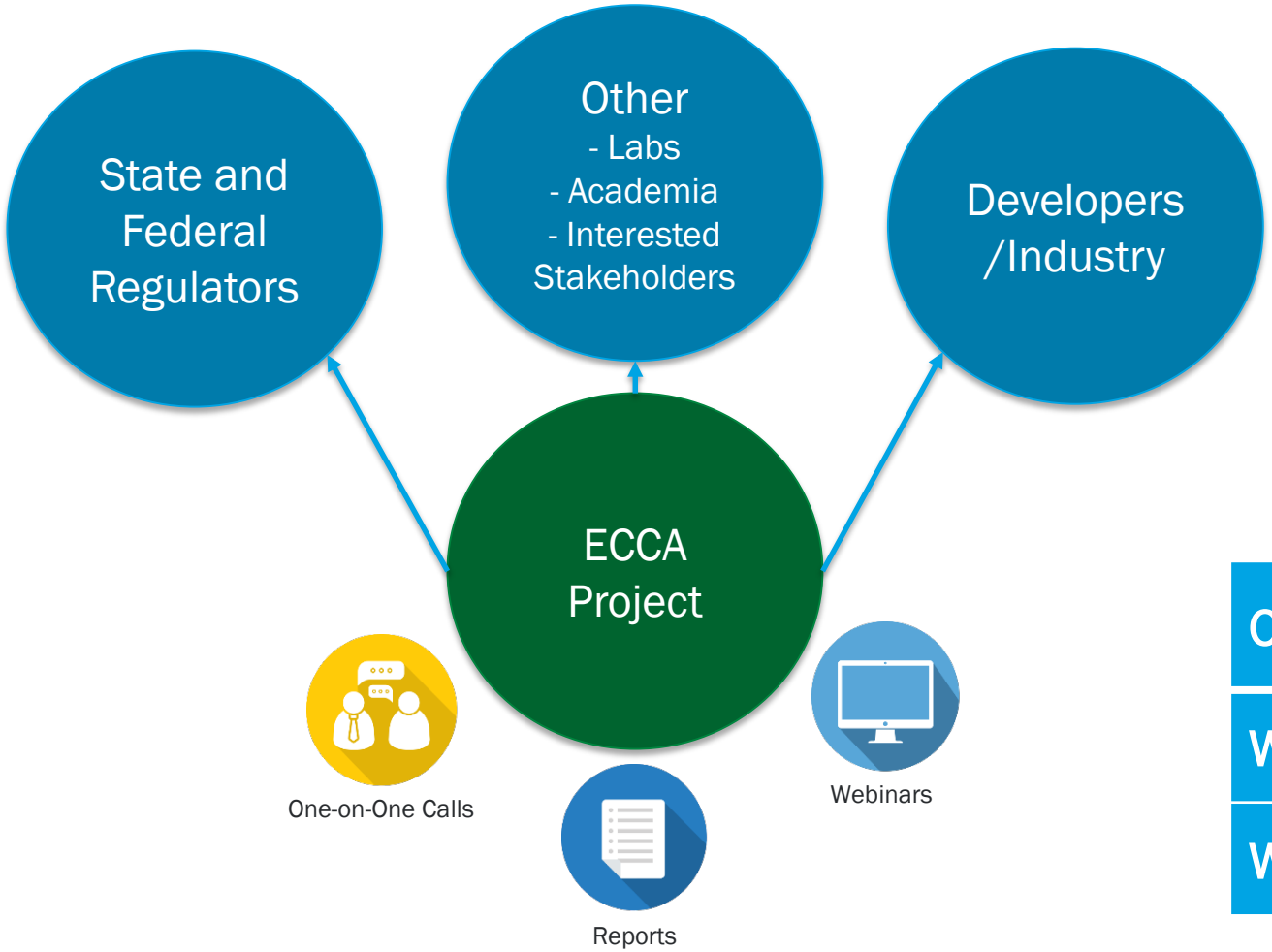
Strategy: The purposeful inclusion of the project developer and regulators promoted transparency and confidence in the process and outcomes of this effort, accelerating our path towards improved licensing and permitting for MHK projects.



One-on-One Calls	83
Workshops	5
Webinars	3

Technical Accomplishments – Gather Input from 19 Projects

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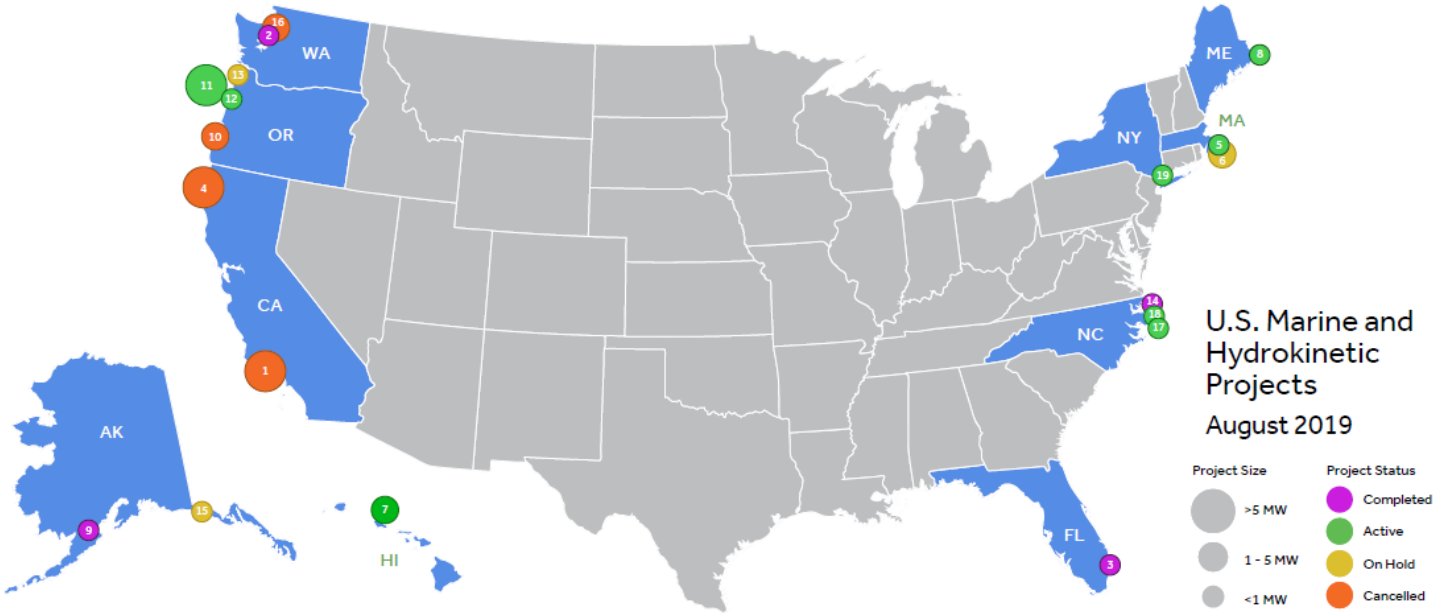


#	Project Name	Location	Type	Sub-Type	Capacity (KW)
1	CalWave	Central Coast, CA	Wave	Test Site	2-30 MW
2	Columbia Power - StingRay Wave Power System	Pudget Sound, WA	Wave	Test Deployment	500 kW
3	Florida Atlantic University - Brower Test Site	BocaRaton, FL	Ocean Current	Test Site	N/A
4	Humboldt WaveConnect Pilot Project	Central Coast, CA	Wave	Test Site	25 MW
5	MRECo - Bourne Tidal Test Site	MA	Tidal	Test Site	50 kW
6	MRECo - Muskeget Channel	Muskeget Channel, MA	Tidal	Test Deployment	5 MW
7	Navy Wave Energy Test Site	HI	Wave	Test Site	1 MW
8	ORPC - Cobscook Bay Tidal Energy Project	Eastport, ME	Tidal	Commercial Deployment	300 kW
9	ORPC - Igiugig	Igiugig, AK	Tidal	Test Deployment	25 kW
10	OPT Reedsport	Reedsport, OR	Wave	Commercial Deployment	1.5 MW
11	PacWave	Newport, OR	Wave	Test Site	20 MW
12	PMEC - North Energy Test Site	Newport, OR	Wave	Test Site	100 kW
13	Resolute Energy Camp Rilea Trials	National Guard Base Camp Rilea - Warrenton, OR	Wave	Test Deployment	60 kW
14	Resolute Marine Energy - Duck Field Research Facility - USACE	NC	Wave	Test Deployment	25 kW
15	Resolute Marine Energy Yakatut Project	Yakutat, AK	Wave	Test Deployment	500 kW
16	Snohomish PUD - Admiralty Inlet	Snohomish, WA	Tidal	Commercial Deployment	300 kW
17	UNC - Gulf Stream	Cape Hatteras, NC	Ocean Current	Test Deployment	N/A
18	UNC - Jeanette's Pier	Nags Head, NC	Wave	Test Site	N/A
19	Verdant Power - Roosevelt Island Tidal Project	NY	Tidal	Commercial Deployment	175 kW

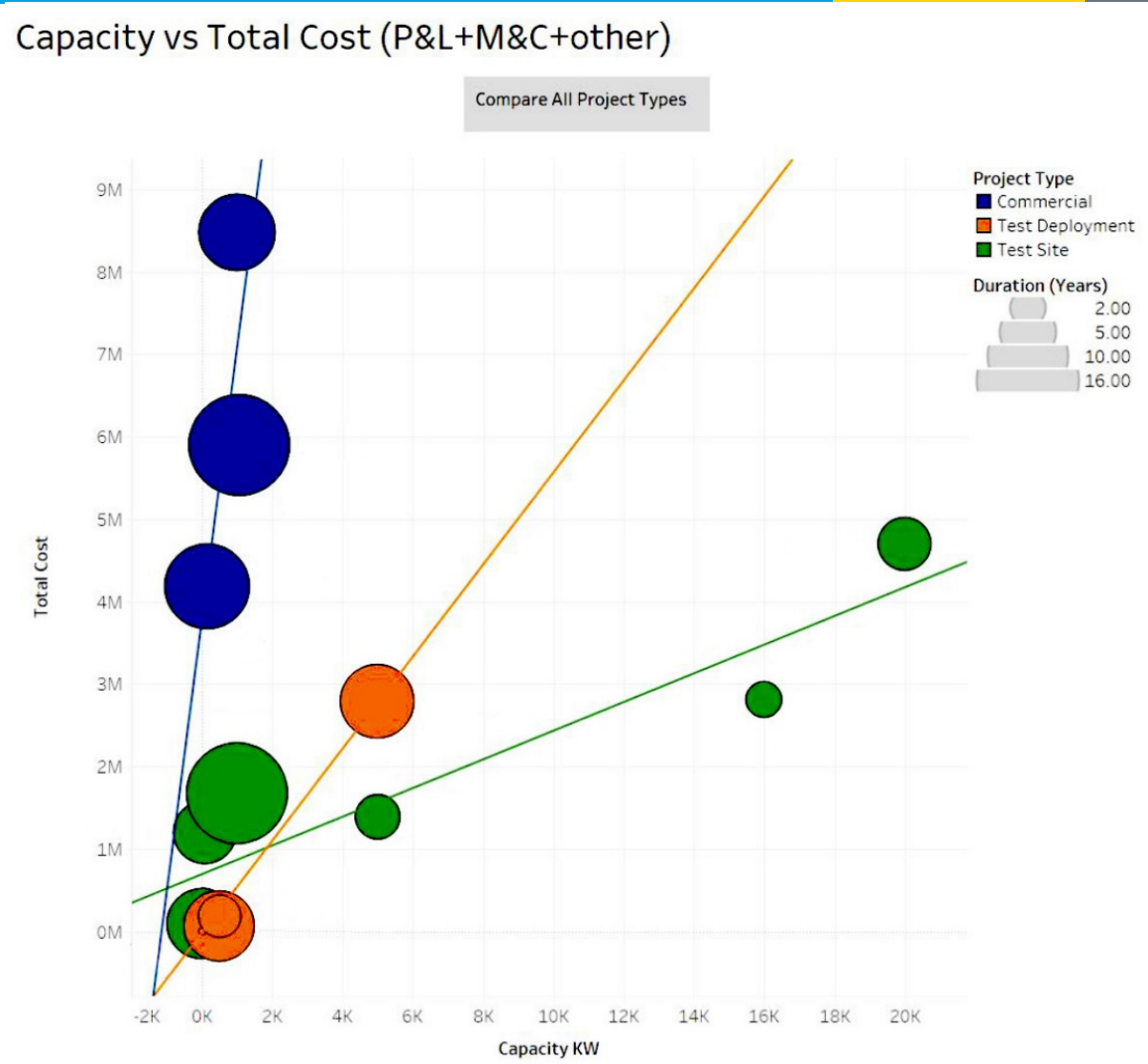
Technical Accomplishments

Collected extensive data from developers on project costs.

Developed a roadmap with strategies and actions that are vetted and supported by state and federal regulators and developers.

Received buy-in for implementation of these improvements to the efficiency and effectiveness of permitting.

Technical Accomplishments

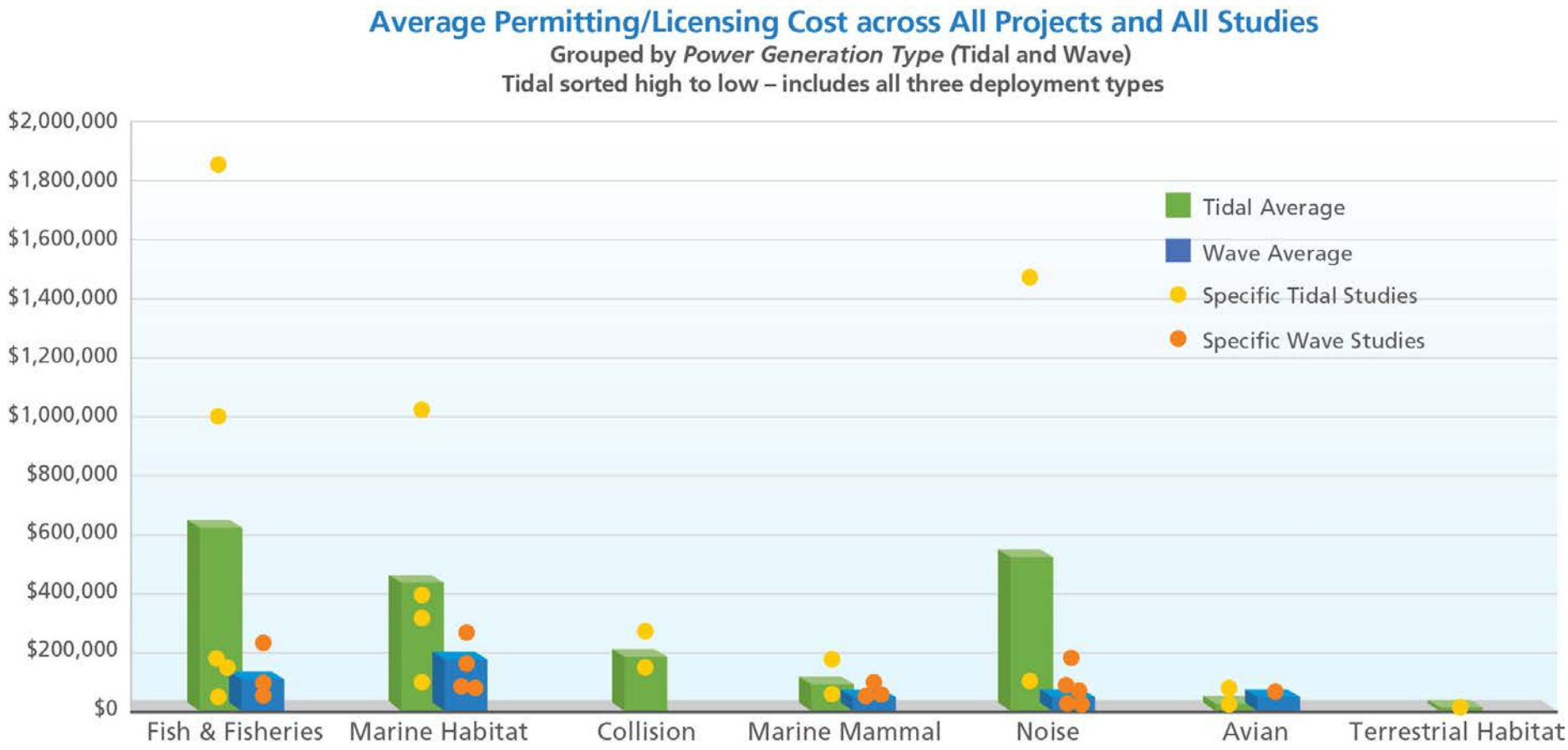


Capacity:

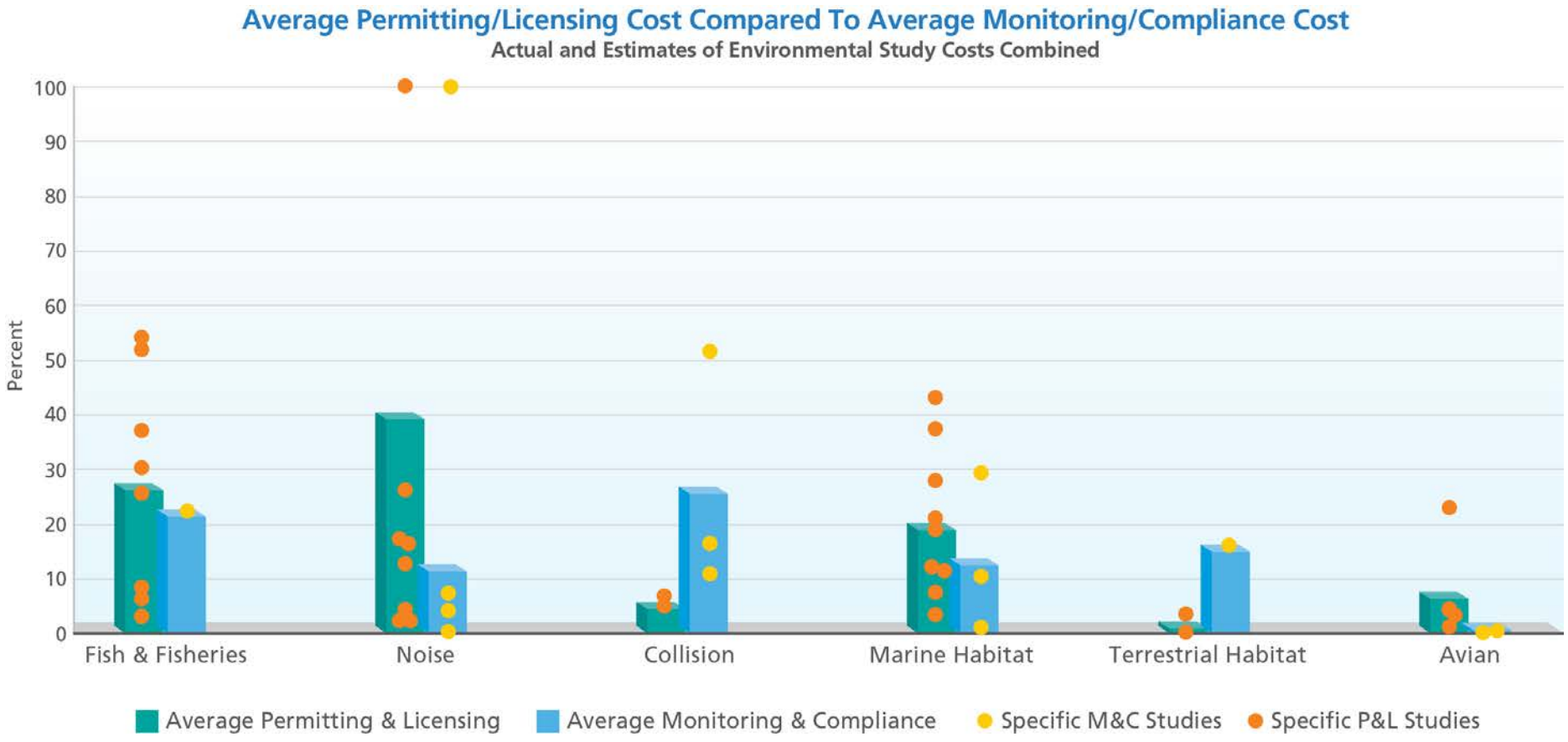
Permitted capacity or permit requested capacity

Total Project Cost includes: permitting and licensing costs + monitoring and compliance costs + other costs)

Technical Accomplishments



Technical Accomplishments



Technical Accomplishments – National Strategies and Actions

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Technical Accomplishments – Projects Strategies and Actions

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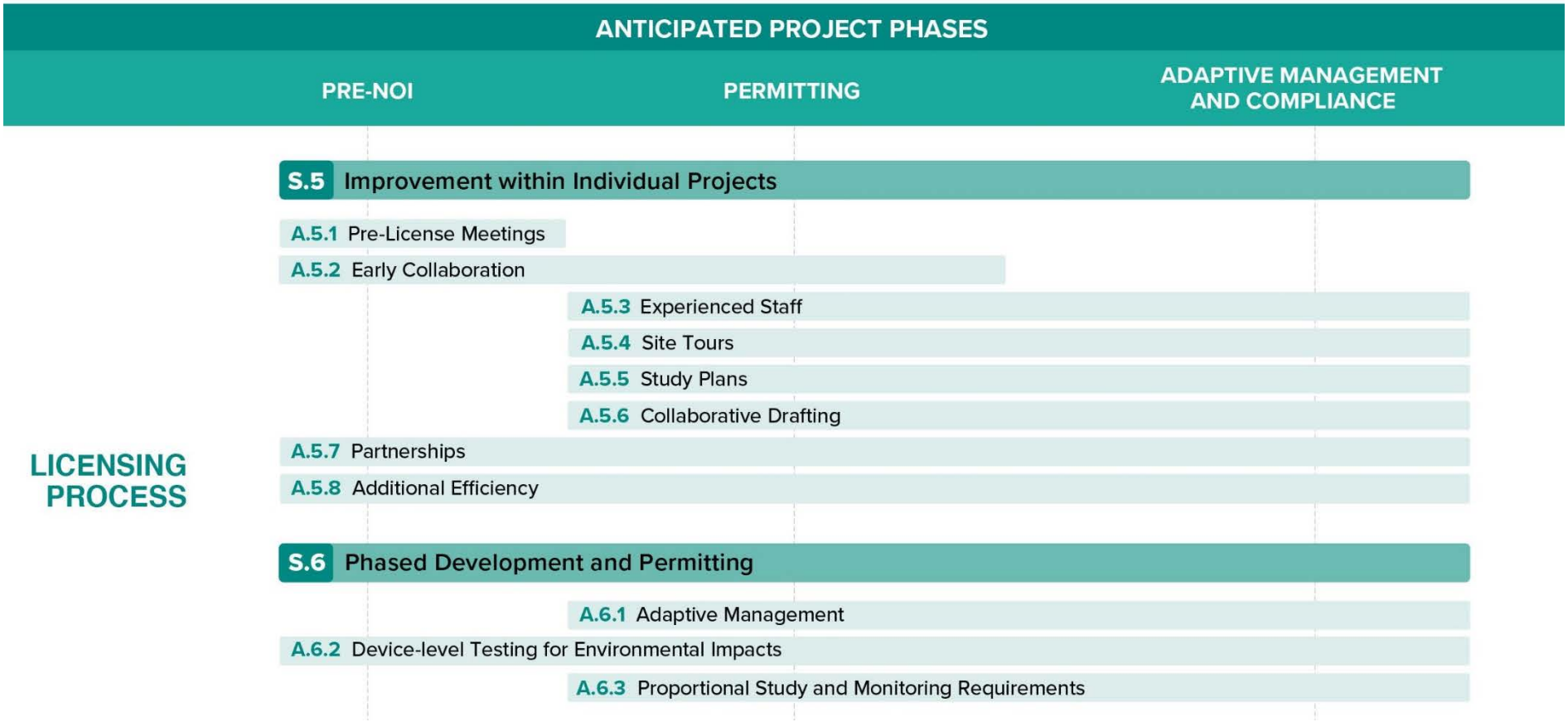
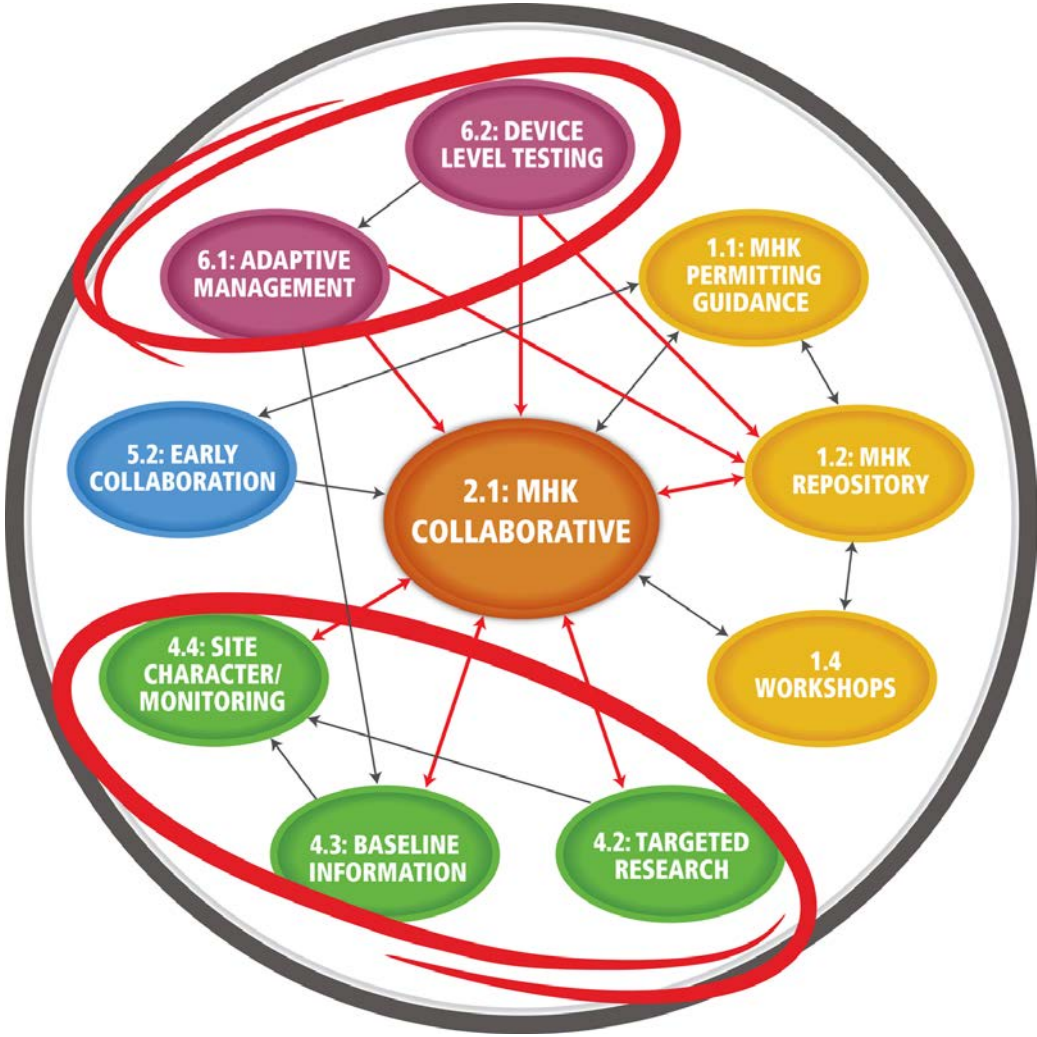


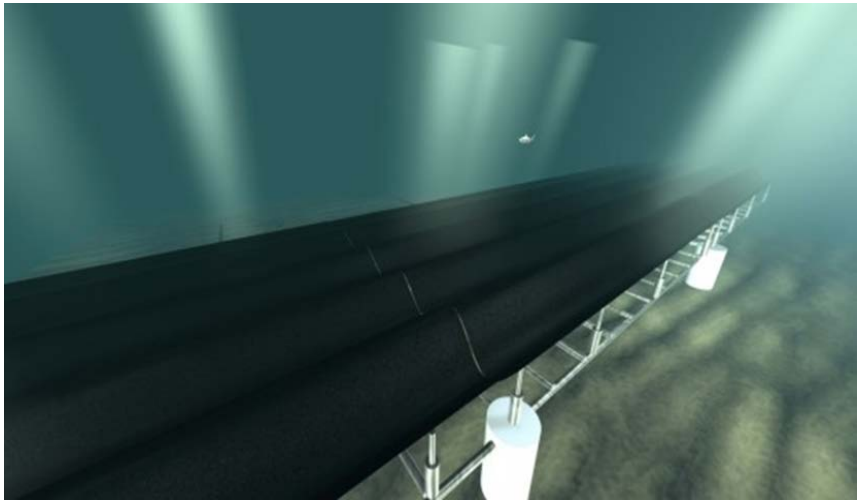
Progress Since Project Summary Submittal

- Demonstrating linkages in strategies and actions
- Hosting POET workshop and closing webinar with state and federal regulators and developers
- Developing more specific action plans for 10 of the 24 strategies and actions

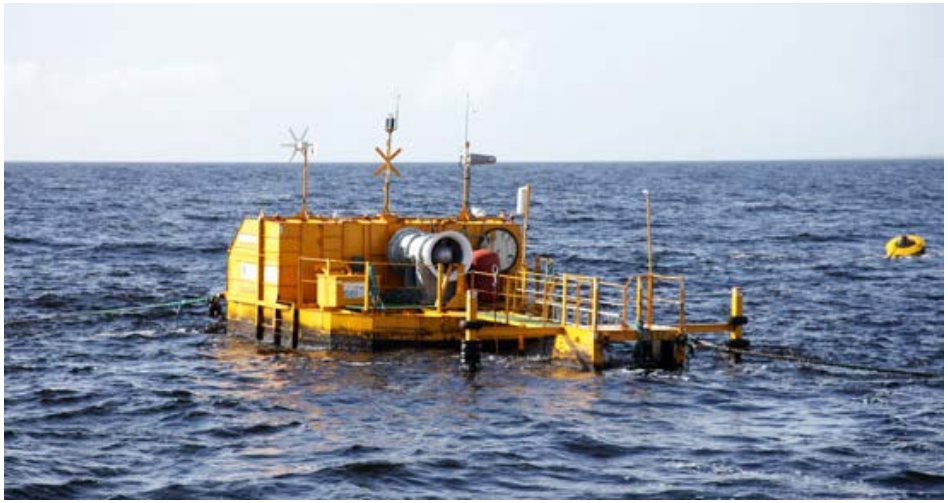


Future Work

- *Update MHK EC cost reduction strategies document*
- *Report on progress on action implementation*



Calwave Wave Carpet 2010



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