SAND2017-4578 PE

Project Overview

Marine and Hydrokinetic (MHK) Environmental Compliance Cost Reduction Strategies Workshop

May 3, 2017 DRAFT

Sandia National Laboratories

U.S. DEPARTMENT OF ENERGY

Sandia National Laboratories is a multi-mission laboratory managed and operated by National Technology and Engineering Solutions of Sandia, LLC., a wholly owned subsidiary of Honeywell International, Inc., for the U.S. Department of Energy's National Nuclear Security Administration under contract DE-NA0003525.

PROJECT TEAM

Sandia National Laboratories

integral consulting inc.

KEARNS & WEST

H.T. HARVEY & ASSOCIATES
Ecological Consultants

PROJECT OVERVIEW

Issue:
- High environmental permitting costs
- Costs not well understood

Goal:
- Create an economically competitive U.S. MHK industry
  - Create efficiencies in MHK environmental compliance process
    - Reduce time and costs to achieve environmental compliance, while meeting federal, state and local regulatory requirements.
  - Encourage investment in MHK projects
    - Reduce project deployment risk from environmental compliance

Project Objectives:
- Develop detailed and accurate estimates of the environmental compliance costs associated with licensing and permitting MHK developments.
  - Gathered from industry and federal / state regulatory agencies
- Determine how these respective costs contribute to LCOE and investment risk.
- Identify opportunities for cost reduction pathways.

PROJECT PROCESS

Determine Permitting and Compliance Costs

January - September 2017

1

Identify Cost Reduction Pathways

May - September 2018

2

Develop Cost Reduction Strategies

Fall 2018 - Winter 2019

3

PROJECT PROCESS: COSTS GATHERED

By Phase

- **Licensing**
  - Preliminary permit through draft license application or draft NEPA document
  - Draft license application through final license application or draft to final NEPA document.
  - Final license application through license issuance or final NEPA document through Record of Decision
- **Post-Licensing**
  - License issuance or permit issuance through construction
  - Project start up
  - Operations through license / permit termination
  - Decommissioning

Other Key Items

- **Mitigation measures** (thresholds, monitoring, adaptive management)
- **Study Topics** (entanglement, collision, sound, fish attraction, electromagnetic fields, habitat)
- **Background** (size, location, goal)
- **Cost Estimates / Planning** (staffing, project step timeframes, project collaborations / engagements / tools and resources)
- **Recommendations / Best Practices** (challenges / opportunities)

INDUSTRY INTERVIEWS

- Ocean Renewable Power Company (ORPC), **Western Passage** and **Cobscook Bay Project** - Maine, **Igiugig** - Alaska: John Ferland, Nathan Johnson, & Jarlath McEntee (in progress)
- Verdant Power, **RITE Project –** New York: Ron Smith & Mary Ann Adonizio
- Snohomish PUD, **Admiralty Inlet -** Washington: Craig Collar & Jessica Spahr
- Oregon State University, **PMEC SETS / NETS** - Oregon: Justin Klure & Dan Hellin
- Northwest Energy Innovations, **Azura -** Hawaii: Justin Klure & Steve Kopf
- **CalWave –** California, Cal Poly: Bill Toman & Doug Davy
- PG&E, **Humboldt WaveConnect –** California: Bill Toman & Doug Davy
- Marine Renewable Energy Collaborative of New England (MRECo), **Bourne Tidal –** New England: John Miller
- Columbia Power, **StingRAY –** HI/WA/OR: Reenst Lesemann & Bradford Lamb
- Resolute Marine Energy, **Camp Rilea** - Oregon, N / SC, **Yakutat** - Alaska: Bill Staby
- Florida Atlantic University, **Test Center -** Florida: Gabe Alsenas & Sue Skemp
- Hawaii National Marine Renewable Energy Center, **WETS** - Hawaii: Luis Vega & Patrick Crain (in progress)

FEDERAL AND STATE AGENCY INTERVIEWS

Federal Agencies

- **BOEM**
- **FERC**
- **DOD**
- **NMFS**
- **USFWS**

State Agencies

- **California**
- **Maine**
- **New York**
- **Washington**
- **Oregon**

MHK PROJECTS CONSIDERED

MHK projects that are undergoing – or have undergone – the permitting/licensing process represent a spectrum of scopes and include:

- Technology prototype test-site projects
- Scalable demonstration prototype deployment projects
- Re-deployments of tested technologies to optimize energy capture
- Pre-commercial, non-grid connected, in water technology demonstration projects, including installations at test centers
- Pre-commercial, grid-connected, in-water technology demonstration projects, including installations at test centers.
- Commercial, grid-connected, in water projects .

Target energy production by project ranges from 25 kW to 5 MW.

- MHK projects are evaluating technologies in both grid-connected and non-grid-connected deployments.

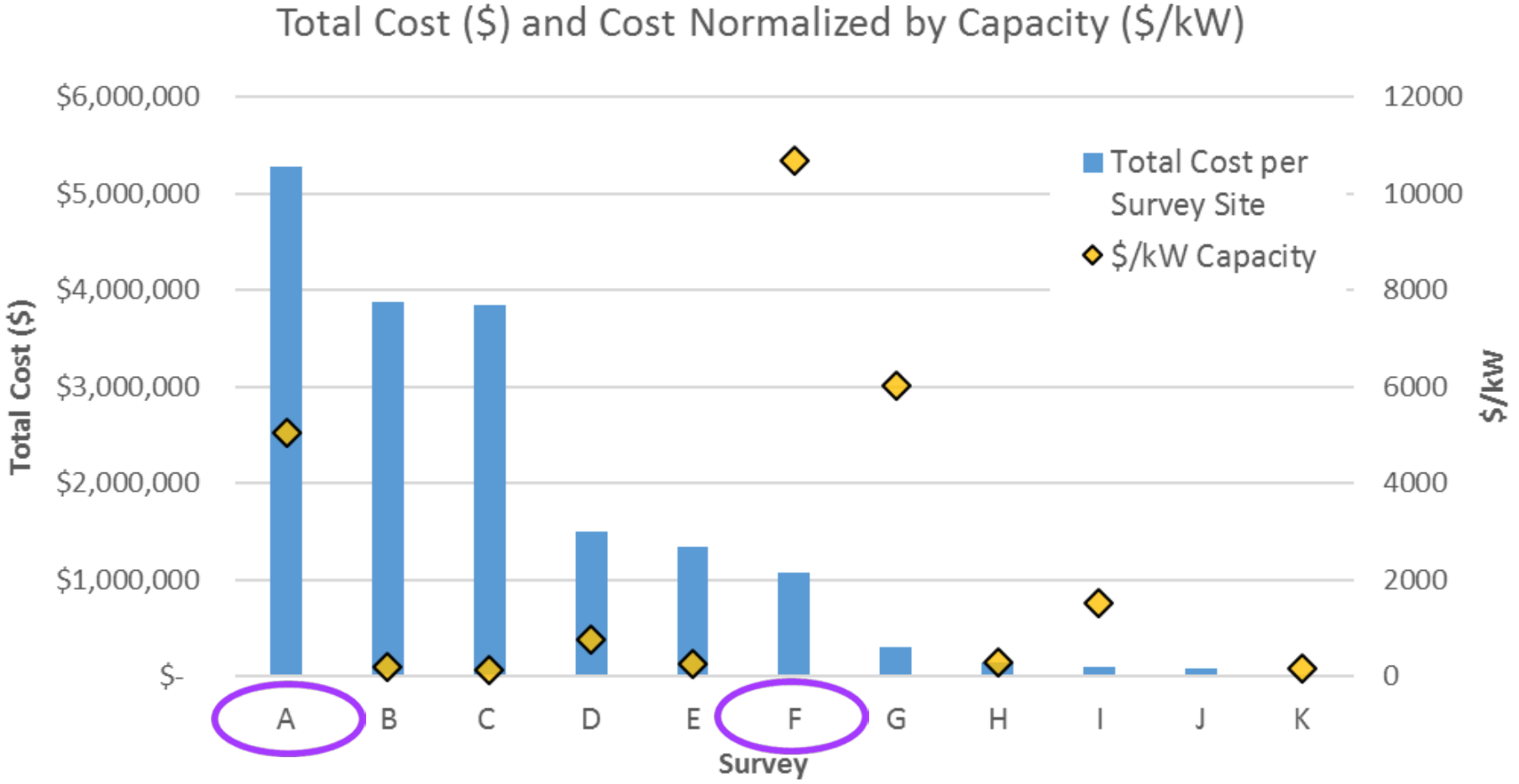
- Projects vary in permitting requirements based on project technology and location (in already permitted space or not), and agency partnerships (state policies have an impact on the nature of the permitting within that state)

Preliminary Cost Findings

Assumptions for *preliminary* cost analysis

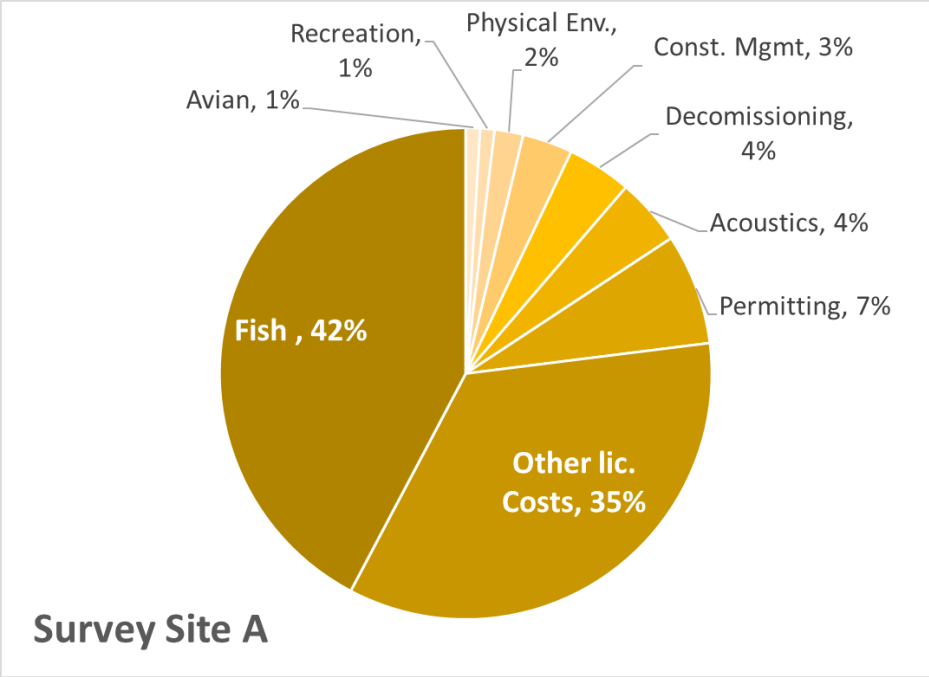
- We have noted License and Monitoring & Compliance activities, but not separated in today's presentation
- Costs provided include both incurred and estimated, but not separated
- Fish includes:
  - hydro-acoustic,
  - netting,
  - tracking,
  - avoidance/attraction behavior, and
  - invertebrate
- Physical Environment includes:
  - sediment transport,
  - water quality, benthic,
  - bathymetry habitat mapping, and
  - substrate composition (no geotechnical)
- State/Federal Permitting includes:
  - agency coordination,
  - stakeholder outreach,
  - draft and final permit preparation and submittal
- Other Licensing Costs include:
  - indirect costs,
  - AMF implementation,
  - other agencies,
  - engineering,
  - documentation

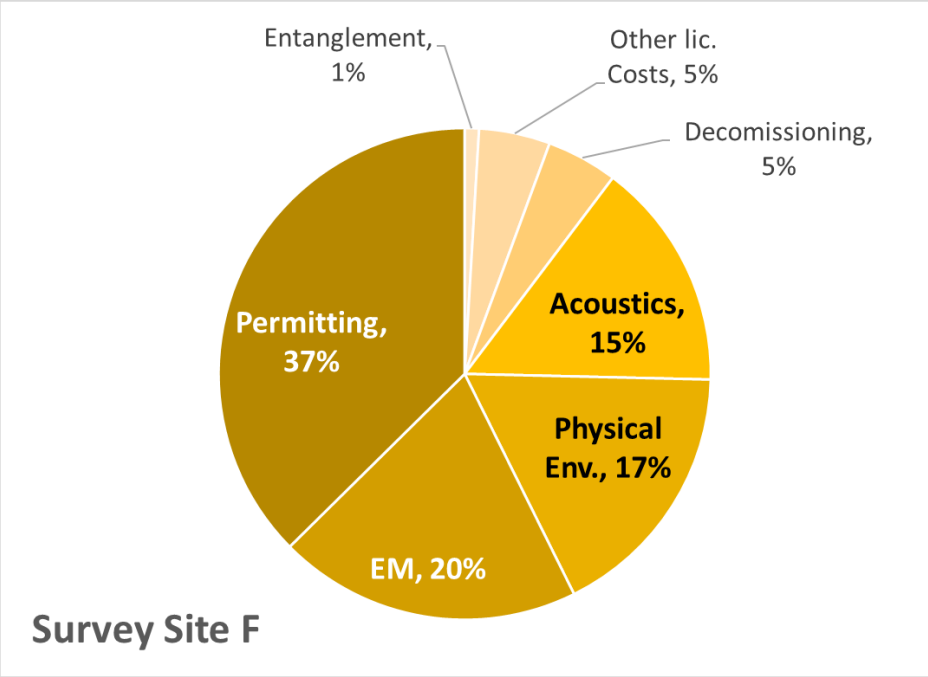
Preliminary Cost Findings



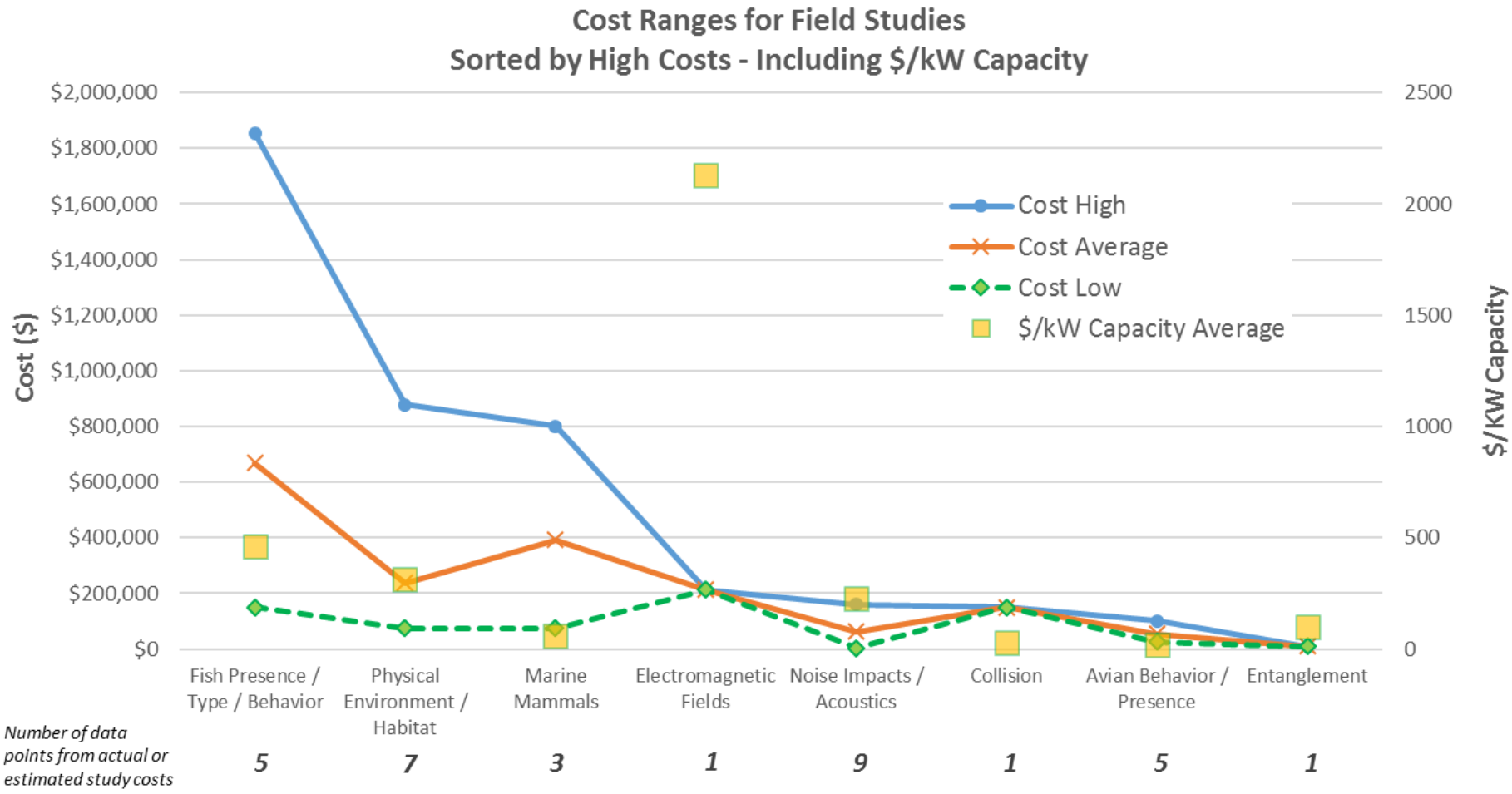
Preliminary Cost Findings

- Activity cost as a percentage of total cost taken from survey



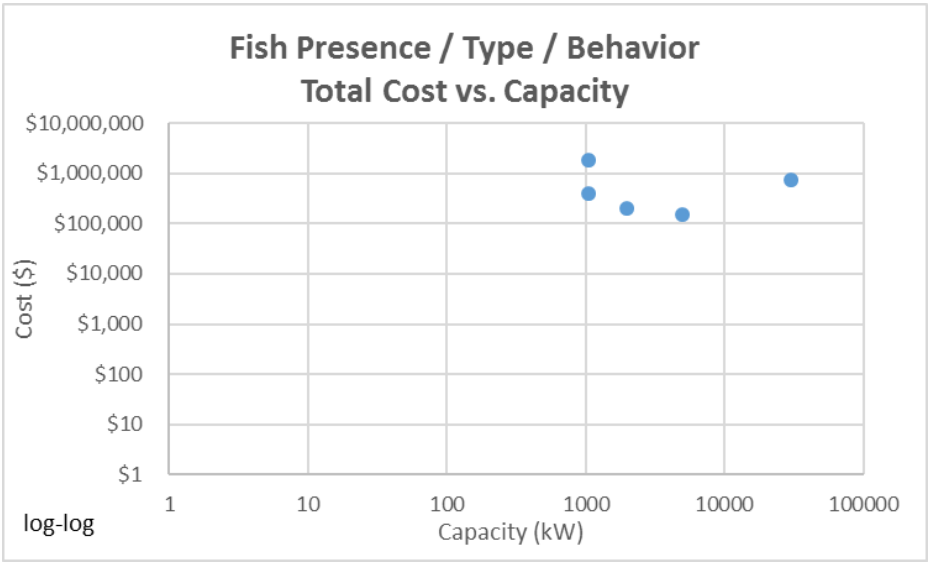


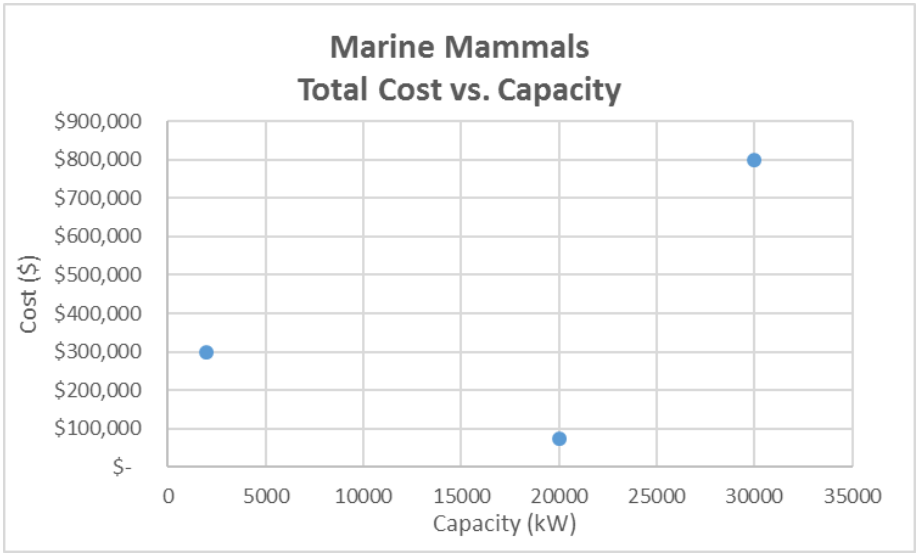
Preliminary Cost Findings

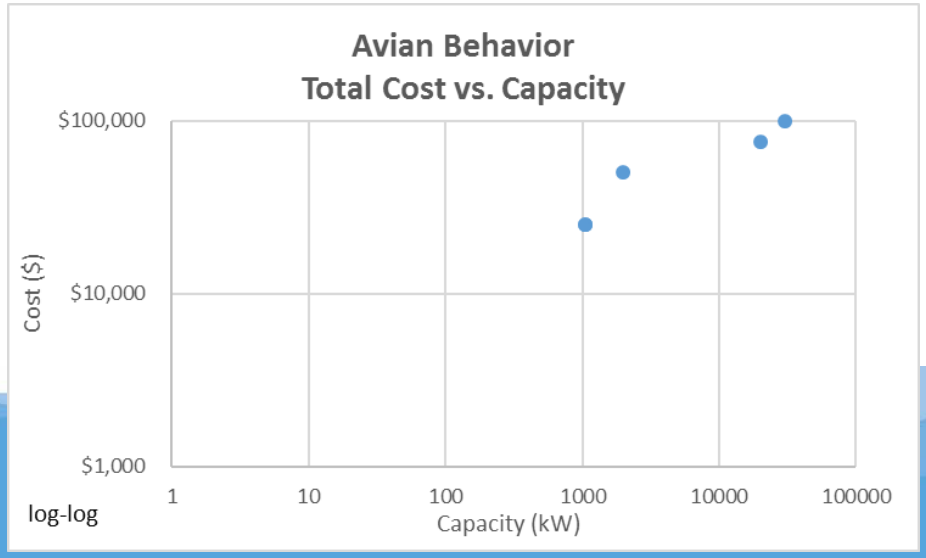


Preliminary Cost Findings

- Scatterplot of actual and estimated study costs to see how costs scale with capacity

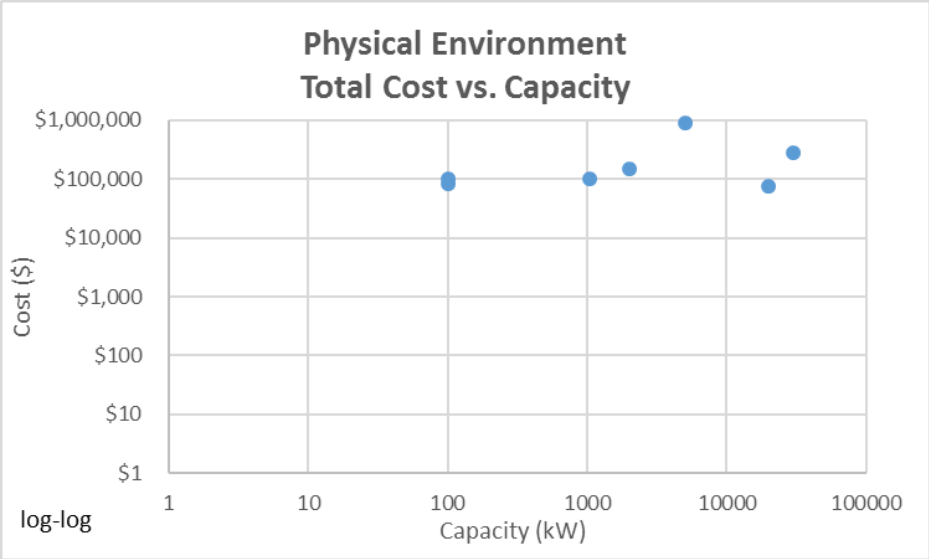


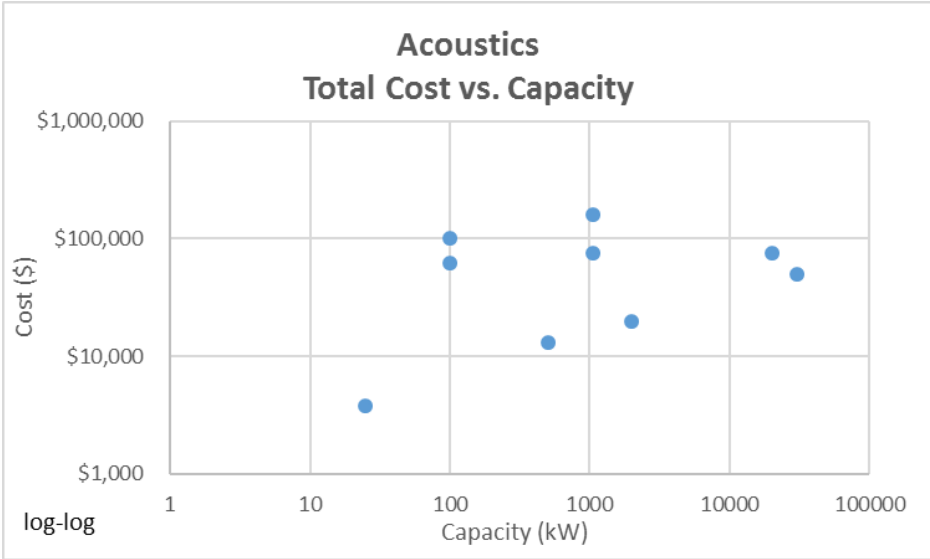




Preliminary Cost Findings

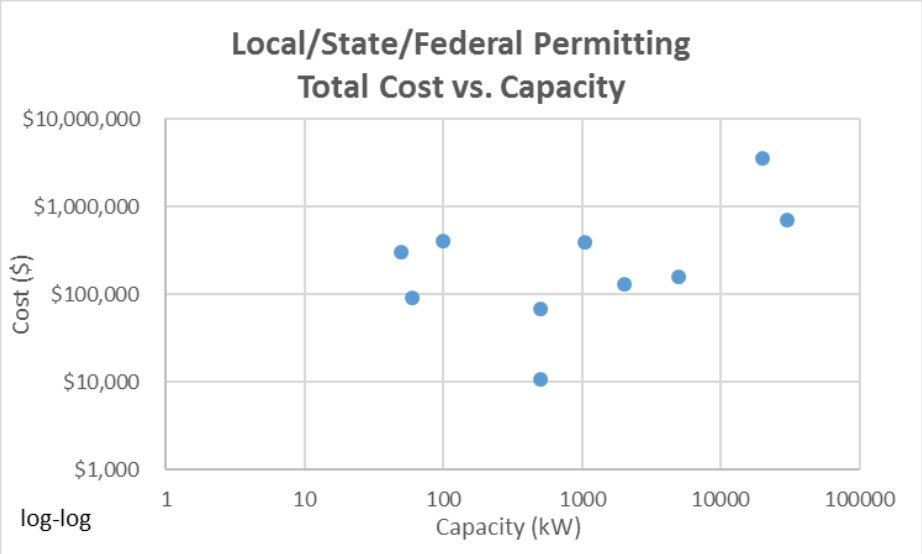
- Scatterplot of actual and estimated study costs to see how costs scale with capacity

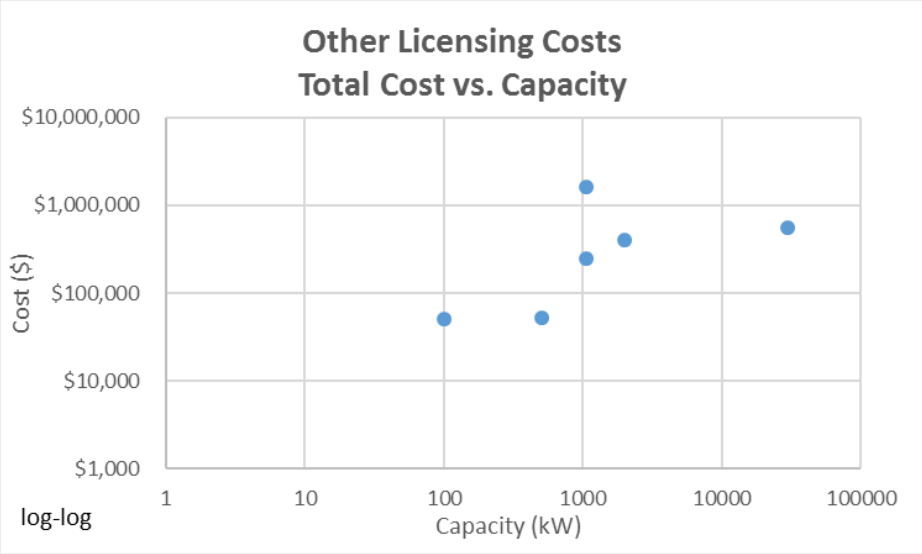




Preliminary Cost Findings

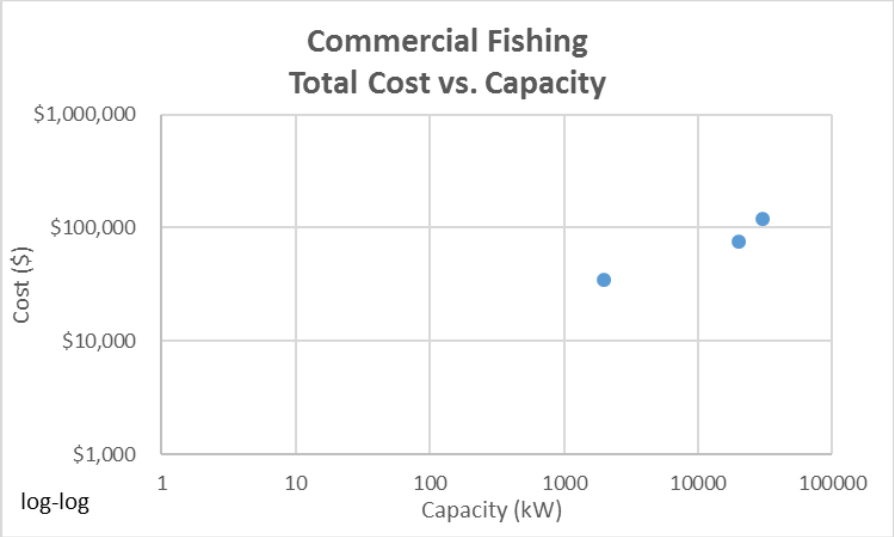
- Scatterplot of actual and estimated study costs to see how costs scale with capacity

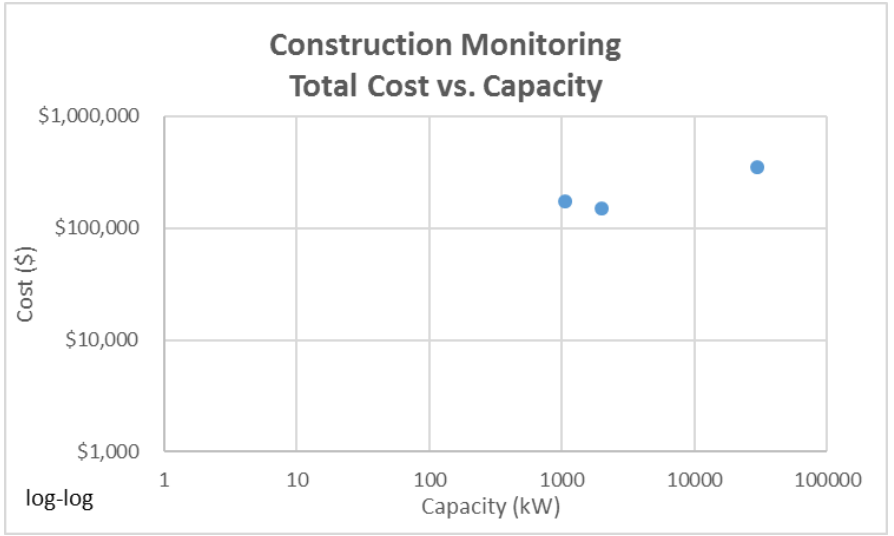


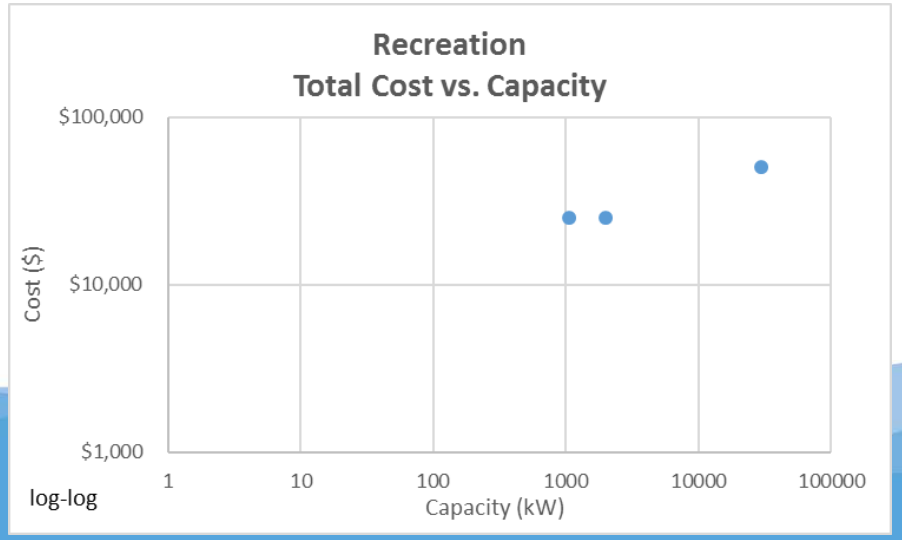


Preliminary Cost Findings

- Scatterplot of actual and estimated study costs to see how costs scale with capacity







INITIAL FINDINGS

- **Agencies Unfamiliar with MHK effects**: the lack of agency familiarity with MHK technology and potential environmental effects.
- **Lack of Cohesive Knowledge of Existing Science and MHK Project Experiences:** There's limited understanding of existing science on effects and applicability of best available science from other locations or projects to inform licensing and permitting.
- **New Entrants/Nascent Industry**: Some leaders within the industry are new to permitting generally (technology developers who now need to obtain permits). This can aggravate the applicant/agency relationships and process.
- **Limited Permitting Precedent:** With few successful fully permitted projects in the water and given that there is a wide range of types of technology deployments in different geographies we will likely have a wide range of costs.
- **Cost- and Time-Intensive Information Requests:** agency unfamiliarity with the technology and the potential effects, combined with a conservative/ risk averse approach given the unknowns can cause some regulators to request significant and sometimes long-term data collection and monitoring efforts.

INITIAL FINDINGS, CONTINUED

- **Insufficient Funding:** inconsistent, short-term, and insufficient funding for permitting/licensing is a critical challenge faced by MHK projects which can delay, suspend indefinitely, or halt projects altogether.
- **Many Permits/Agencies Roles in the Process:** local, state, and federal agency compliance requirements are not integrated or fully coordinated, which can create confusion and time-intensive coordination for permit-applicants (also true of hydropower projects).
- **Stakeholder Interests:** identifying and addressing stakeholder interests – particularly fisheries interests, environmental NGOs and coastal community interests, along with federal and state regulatory interests, requires significant time-investment, but is necessary for successful permitting.
- **Relatively New Use of our Marine Resources**: Given that MHK (and offshore wind) are relatively new uses of our marine environment, and that other more historic marine uses (fishing, navigation, oil and gas, etc.) are accustomed to use of marine waters, this new technology is perceived as encroaching on existing uses.

TECHNICAL CHALLENGES & INFORMATION GAPS

- **Varied responses** on which were the **most/least difficult challenges** to overcome.
- Responses have indicated that **advancing knowledge of baseline conditions** would help MHK projects in general, while also suggesting that project-specific research will be important to truly advance the field.
- Some project proponents encouraged **more studies** on the **potential positive impacts** of MHK technology on the marine environment (e.g., reduction in coastal erosion, habitat creation)
- Some project proponents have found a “chicken and egg” problem between **securing funding and getting through permitting**. Projects need regulatory certainty to attract funding; however, they also must raise funding to get through the pre-permitting and permitting phases.
- Several suggestions were made for **organizing future research** efforts including: tackle research by scale – micro-, meso-, and macro-impacts; use new technologies and remote monitoring methods to improve understanding of species interactions and behaviors with projects.

DISCUSSION

LESSONS FROM OTHER INDUSTRIES

Learn about permitting streamlining from other industries:

- Offshore Oil and Gas
- Solar
- Onshore wind
- Offshore wind
- Other marine industries (e.g., transmission cables)

This activity will ramp up in the coming months

NEXT STEPS

- Continue to collect cost information
- Complete Federal/State agency and industry interviews
- Conduct other industries interviews/analysis
- Conduct in-person meetings
- Continue analysis of cost data considering time elements, and costs incurred by other industries for similar studies

Project Overview

Questions?

Sandia National Laboratories

U.S. DEPARTMENT OF ENERGY