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Informed Engagement with Maine Fishing Communities through Virtual Offshore Wind Farms

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U.S. DEPARTMENT OF ENERGY
Office of ENERGY EFFICIENCY & RENEWABLE ENERGY
NOAA FISHERIES
Sea Grant Northeast
Colby INSITE Lab
Immersive Navigation Systems and Inclusive Technology Ethics

Lobstering in Maine:

- 10,000 jobs annually
- $2B in revenue
- Community management structure

Coastal communities have strong ties to fishing industry: heritage, tourism, supply chain.

Fishing Dependent Communities in Maine have concerns about offshore wind in Maine.

- Displacement
- Lost revenues
- ecological harm
- feelings of threat and lack of agency
- Difficulty participating in planning processes

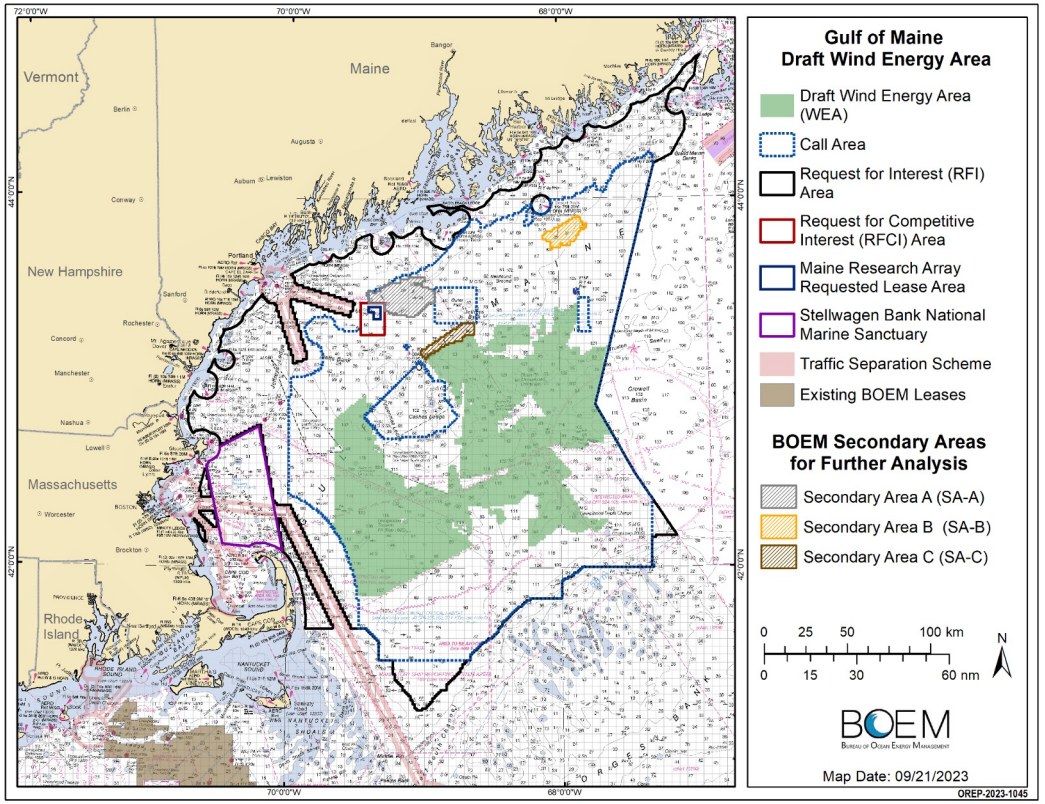
Offshore Wind in the Gulf of Maine

Maine Offshore Wind Roadmap - 10-year plan (EDA sponsored)

State sponsored "Research Array":

- 144 MW, 12 floating turbines
- Research funds directed by a state consortium

- 2023 Procurement target of 3GW by 2040:
  - Support for port development;
  - Labor standards
- Avoid key lobster fishing areas



Maine Offshore Wind Initiative

Attitudinal studies reveal the unique and nuanced aspects of communities.

- ★ Studies show that communities are concerned with **physical attributes** as well as **socially constructed** attributes.
- ★ Involving communities in decision-making is one component of a **just and equitable energy transition**

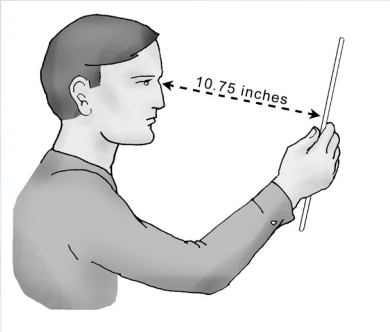
Research Questions

- In what ways does a multisensory virtual reality experience impact stakeholder group expectations and perceptions of offshore wind energy projects?
- How well are stakeholders able to accurately perceive size and distance of offshore wind turbines in a geographic scale immersive virtual environment?
- What are the constraints and opportunities for coexistence of ocean users and floating offshore wind?

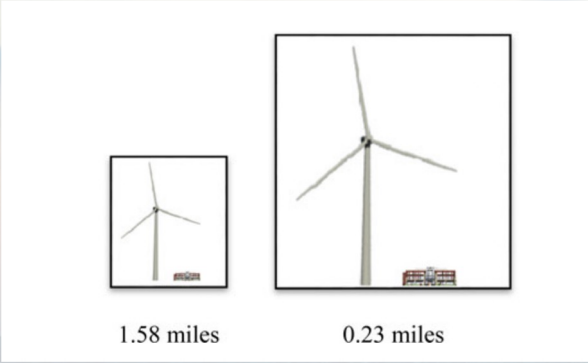
Research Methods

- ★ Co-design with stakeholders, effort on partnership development
  - o "Communities at sea" generated from participatory mapping: Harpswell ME and Boothbay ME
- ★ Purposive snowball sampling and word of mouth with local partners
- ★ Semi-structured in-depth attitudinal interviews using **dynamic multisensory visualization**
  - o 60 minute interviews with invited participants, n=37
  - o 3-part interview: context/baseline; within visualization; post-visualization.
- ★ Data Analysis
  - o 2-stage transcript coding to identify patterns and values;
  - o Constructionist analytical frame, thematic analysis
  - o Sentiment analysis using Natural Language Processing (NLP).

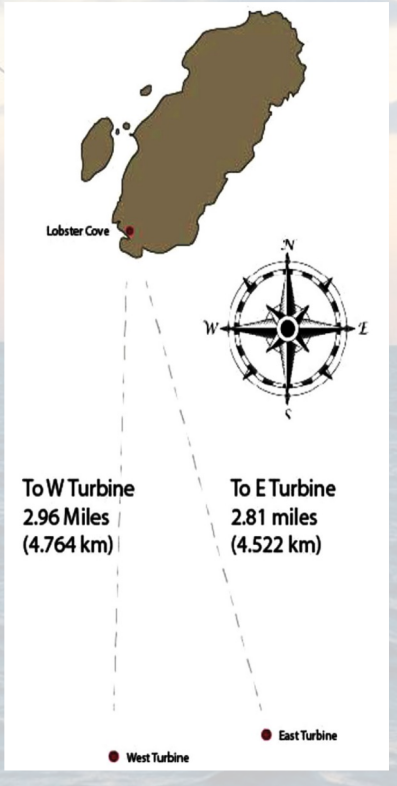
Static Visualization Examples



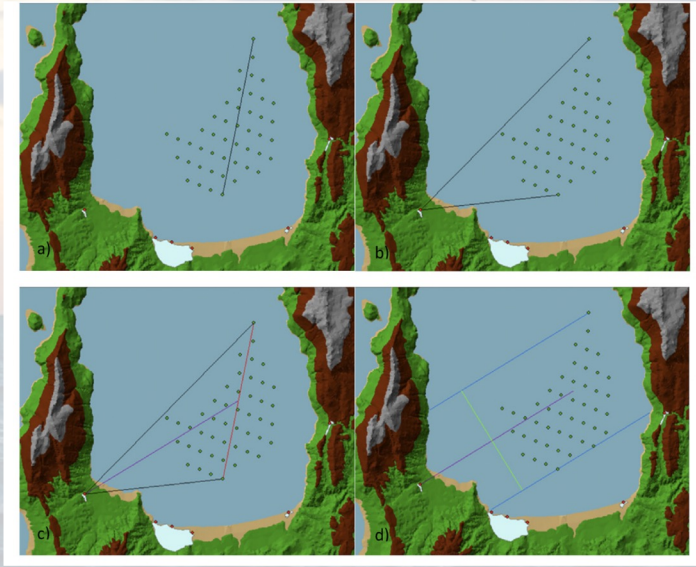
MacroWorks



Fooks 2017



Teisel 2018



Gkeka-Serpetsidaki, 2022

Knapp 2013

Spatial Information Access

Providing stakeholder spatial information access (i.e., sense of scale and distance)through an immersive virtual reality experience.

Virtual Reality (VR) can provide a highly realistic user experience where stakeholders can engage in informed energy and land-use decision-making with spatial information in a geographic scale context. (Slater and Sánchez-Vives, 2016).

Development Methodology and Workflow

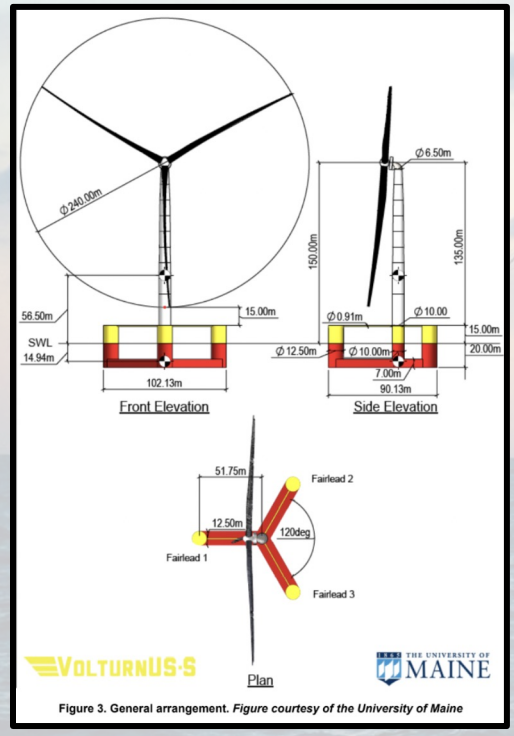
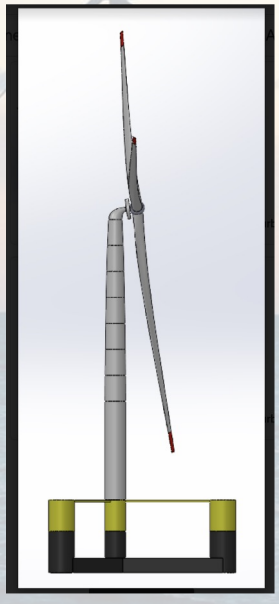
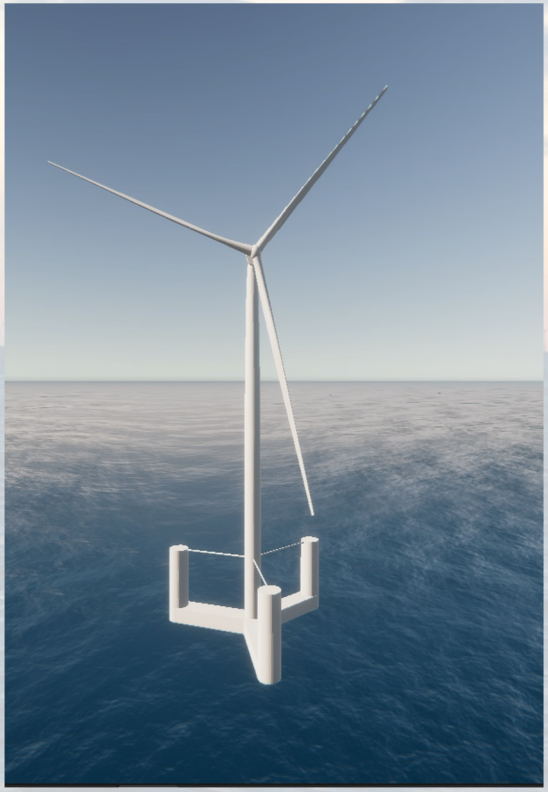


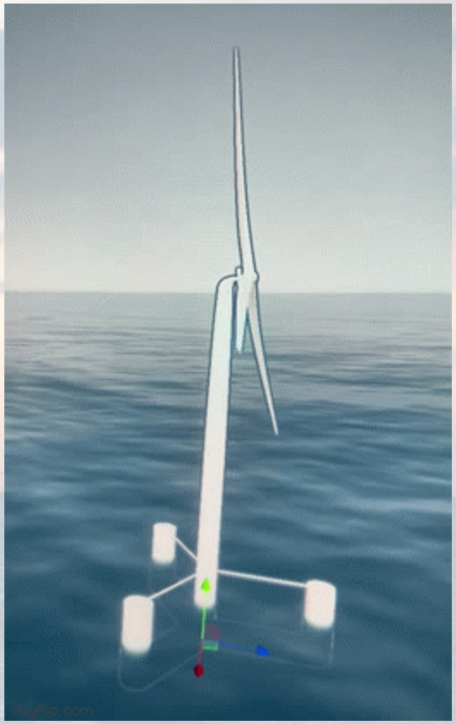
Figure 3. General arrangement. *Figure courtesy of the University of Maine*

Modeled in Blender



Imported into Unity with Ocean Model





Spatial Data Interactions

Ocean environment views at distant space (>30 m) from turbines:

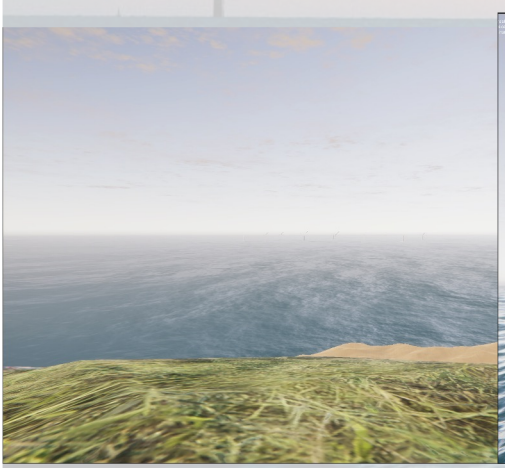
5 miles - 200 ft and 0 ft above sea level

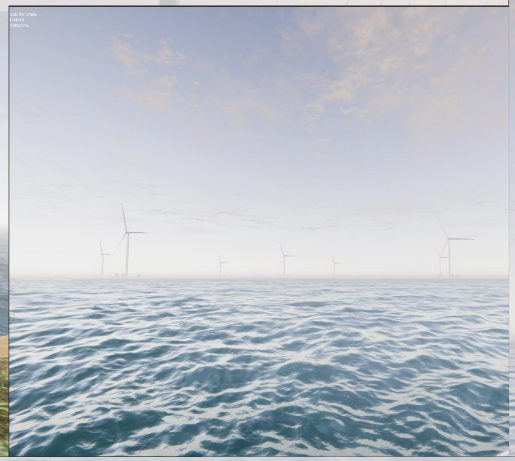
2.5 miles - sea level

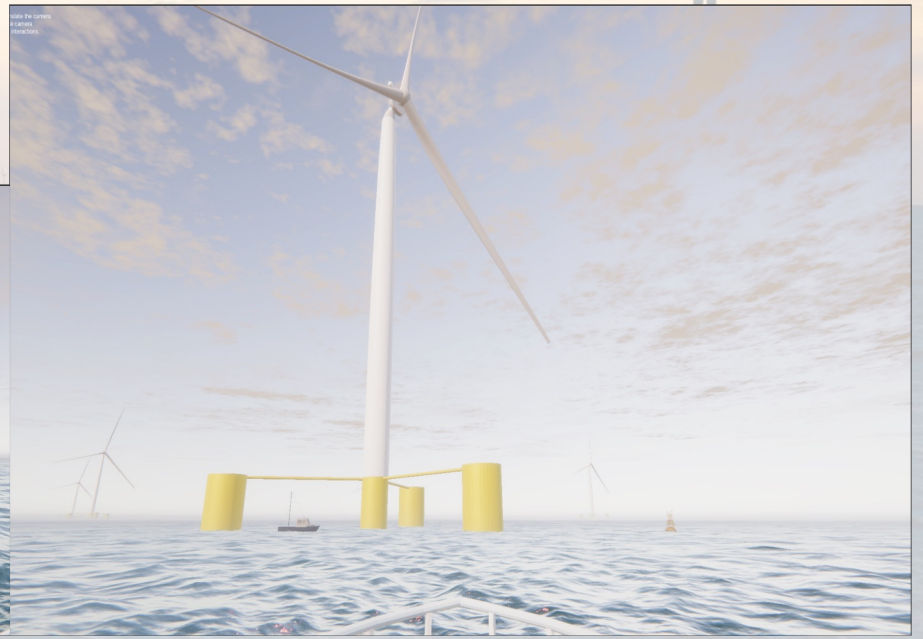
1 mile - sea level

400 ft - sea level

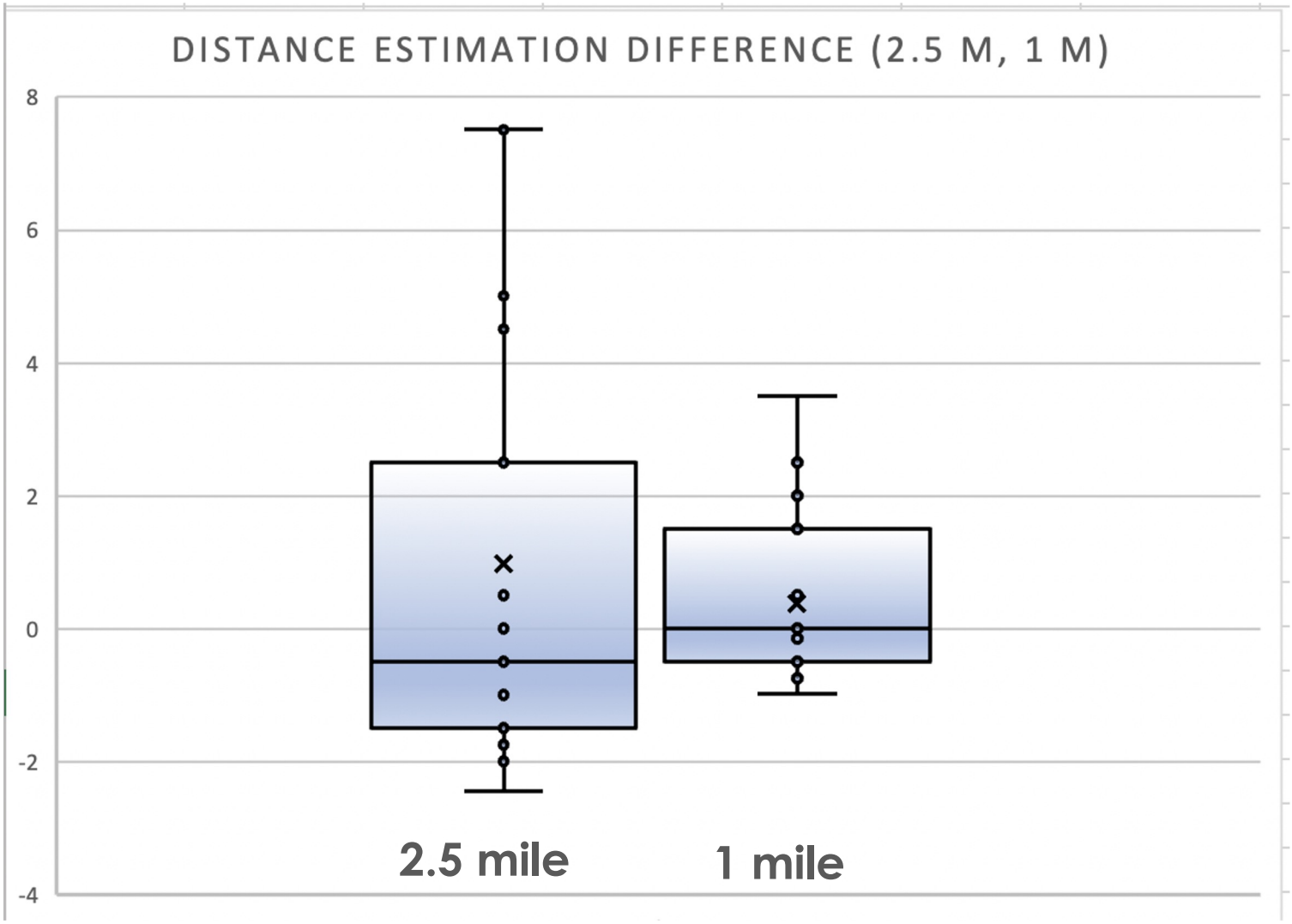
Scenes are intentionally minimalist



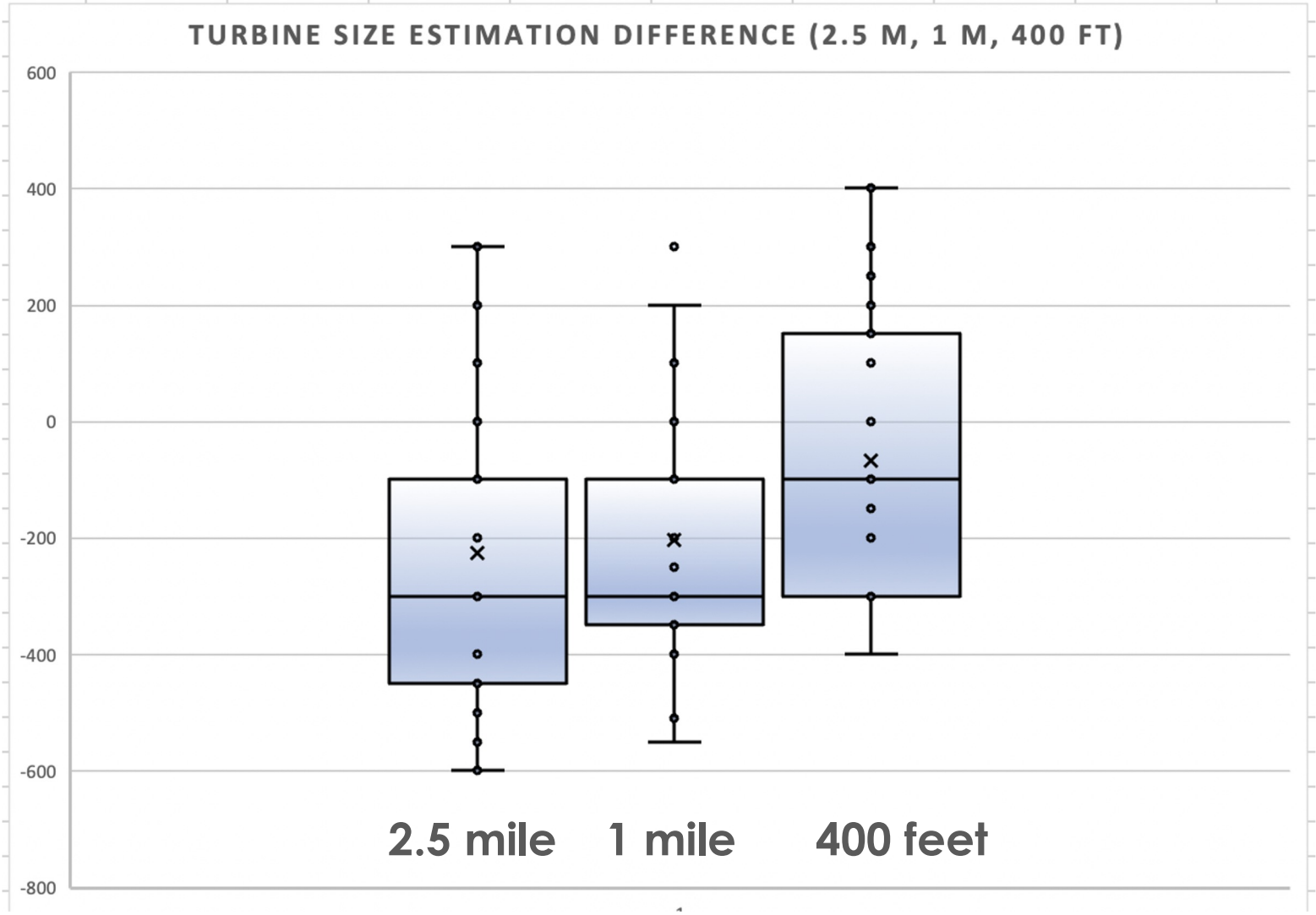




Distance Estimation Difference



Turbine Size Estimation Difference



Preliminary Findings

★ Most people had **preconceived ideas** about the negative aesthetics of a wind farm, and the spatial impact in seascape.

"being in the ocean doesn't make it as much as a monstrosity like people think that they are… Did I think it was big? Of course, I mean it's a wind turbine, but that was neat to see." Political advocate, age 29, Boothbay Harbor, ME

★ **Takeaway:** Participant expectations about the viewshed of a wind farm were largely inaccurate. This suggests that opinions are being formed with inaccurate spatial frames of reference.

Preliminary Findings

- ★ Access to spatial information through dynamic visualization tends to **confirm and harden beliefs**.
  - Opponents and supporters alike acknowledged that the spatial information confirmed their beliefs.
    - *"now I like it even more…"*
    - *"it's worse than i expected it to be…"*
- ★ **Takeaway:** There are **significant gains** in pragmatic application and the empowerment of stakeholders to participate in decision-making processes.

Preliminary Findings

★ **Industrialization of the ocean:** socially constructed perspective of the pristine ocean is affected by the wind farm.

"the peace and beauty of the ocean is just not there anymore"
(multigenerational Fisherman, age 32, Harpswell, ME)

*"it's taken a pretty **pristine environment** and putting something in it that just really, really kind of messes it up… we like to see the beauty of the ocean. and i think these things just **industrialize it** out there for me."*
(multigenerational Fisherman, age 61, Harpswell, ME)

★ **Takeaway:** Attitudes are driven by values that are complex (more than $). Design of mitigation, compensation or agreements should account for socially constructed ocean value.

Preliminary Findings

- ★ Participants - especially fishers - repeatedly referred to the usefulness of the visualizations to advance their understanding of decisions being made at the State and Federal levels.

  "It has not changed my mind…but this is actually honestly the best depiction of anything that I've seen so far,.." (Lobsterman, Boothbay Harbor)

  "I think that if this was something that was used more in the future, if you ended up at the Fisherman's Forum…I think adding some typical weather (conditions)...and it will be interesting to see if its possible (to see) what it looks like underwater " (Commercial Fisher, Harpswell)

- ★ **Takeaway:** Access to spatial information improved understanding of policy-relevant discourse.

Next Steps

- ★ Extract themes from interviews to mental modeling survey → Demonstrate how stakeholders perceive relationships among floating wind and other existing uses of the marine environment
- ★ Co-design next VR environment with fishers: underwater scenes to interact with fishing gear
- ★ Recommendations for co-existence, or co-use
  - Array Configurations, Policy Recommendations

<u>Outreach Activities</u> throughout the State to extend project impact

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thank you

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