Through Ice Energy Harvester

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INTRODUCTION

In the Arctic, there are limited resources to draw upon to power at-sea applications necessary for research and development. Conventional renewable solutions such as solar energy are not viable due to the limitations of the Arctic, which is why there is an increasing demand for mechanisms to utilize resources native to that environment. Our sponsor PNNL is interested in developing a deployment mechanism to position and secure an energy harvesting system to an ice/water interface. In the future, such autonomous energy harvesting deployment systems would reduce the need for human intervention in hazardous environments, aiding in climate change research.

PROBLEM STATEMENT

A way to **automatically** deploy and secure an **energy harvesting system** through an ice layer to power various sensors from a surface buoy in potentially hazardous conditions.

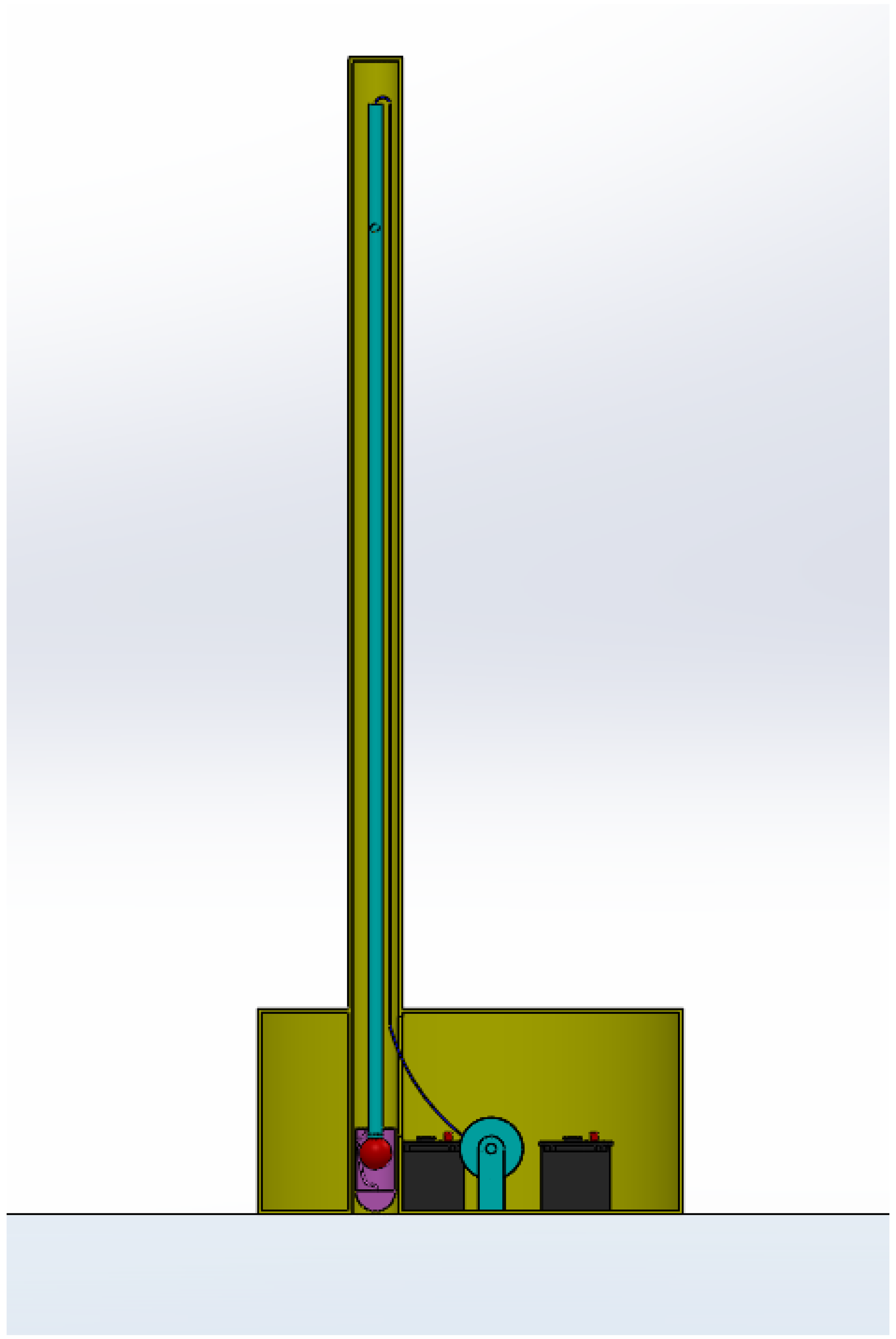
SCOPE

Conceptual solutions and **feasibility study** of an automated deployment/securement mechanism of an energy harvester below ice.

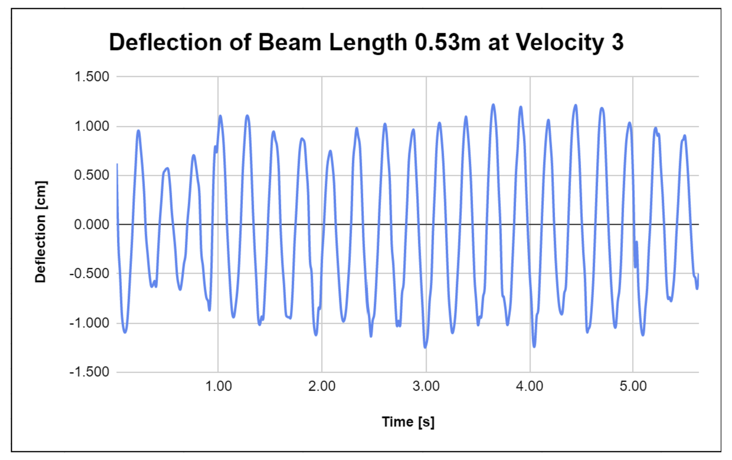
DESIGN AND DEVELOPMENT

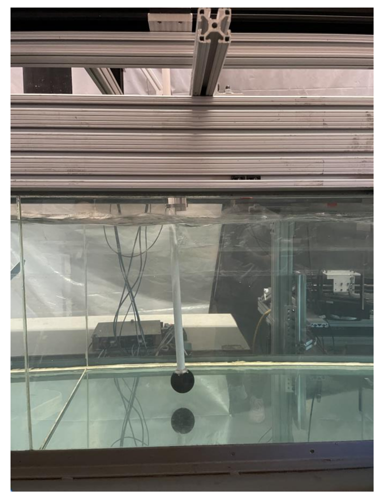
Conceptual Design Subsystems

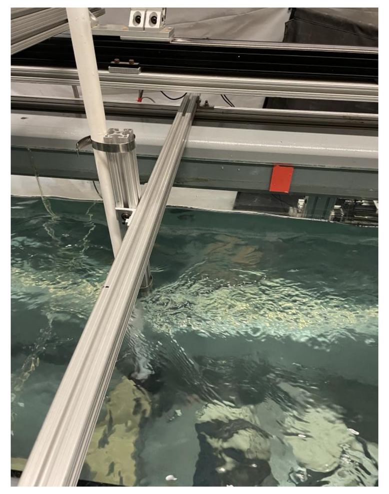
- Device Deployment
- Ice Boring Method
- Energy Harvester Deployment and Securement
- Energy Harvesting
- Power Transfer



HARRIS HYDRAULICS FLUME TEST







- Max Deflection = 1.2cm, Frequency = 3-4Hz
- Predicted Static Deflection = .3 cm
- Focus is on the relationship between deflection and frequency and the used flow velocity
  - ❖ This relationship would be used to more accurately predict vortex shedding deflection of cylinders in a flow

CONCLUSION & FUTURE WORK

- Flume test validated our energy harvesting design at resonant frequency.
- Hot point drilling is determined to be not feasible due to the battery pack required to power the drilling.
- In the next phase of the project, further feasibility studies and prototyping on device deployment, ice boring, energy harvester securement, and power transfer are required.

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